Alcatel-Lucent OmniPCX Office
Communication Server

IBS (unofficial document)

Subset of Installation Manual

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Alcatel·Lucent

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1 *Installation and Cabling*

1.1 Intelligent Base Stations

1.1.1 Detailed description

This notice describes the rules to follow for an installation comprising three or four DECT bases.

For a larger installation, a preliminary study must be carried out using coverage tools. The bases are then installed according to the results of this study.

1.1.1.1 CONNECTION

The Alcatel-Lucent 4070 IO is designed for internal installation in the building, while the Alcatel-Lucent 4070 EO is designed for external installation.

The 4070 EO IBS comes in a plastic box and is protected against temperature variation.

The 2 antennae are outside the box so that they both have the same signal reception.

Intelligent Base Stations (IBS) are fitted with a red LED that gives information about the state of the Base Station:

- Fixed LED:
    1. Software downloading
    2. Initialization phase, waiting for synchronization
    3. Software problem, IBS stopped.

- Fast blink: There is a problem with the line.

- Short ON, long OFF: Running on 1 UA link.

- 500ms OFF, 500ms ON: Running on 2 UA link.

The IBSs can run and be powered remotely by the UA access (this is the most common configuration). But they can also be powered by a power device. This is used when there are a lot of IBSs and the system power cannot support all the connected IBSs.

A base station may be connected to 1 or 2 UA links (UAI boards) and allows 3 or 6 simultaneous connections with DECT/GAP terminals.

The need for three or six communication channels depends on the number of cordless stations and on the DECT traffic to be managed.

In the event of a two-cable connection:

- use two interfaces neighboring a UAI board

- use the even-numbered interface for the master link and the other for the slave link.

    Both cables should have the same length. The first interface of the system's UAI16 board

should not be used since the operator station uses those points.
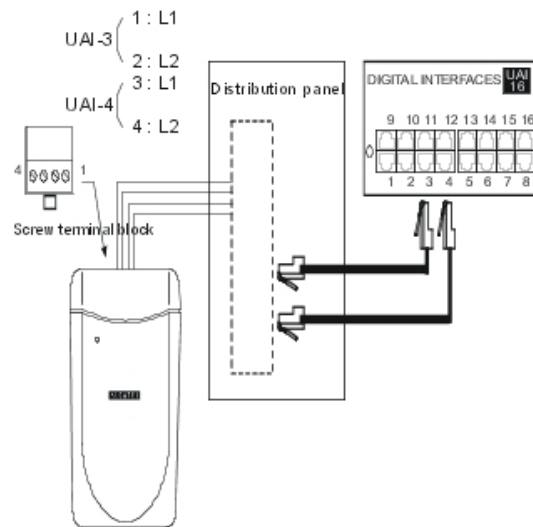
1.1.1.2 NUMBER OF USEFUL BASE STATIONS

Any radio signal is subject to various propagation phenomena: attenuation, reflection and diffraction. These phenomena are related to the environment of the Alcatel-Lucent 4070 IO/EO, and affect the radio performance of the system.

The effects can improve or deteriorate wave propagation.

Take as an example a building with a metallic structure. A radio wave will tend to be subject to many reflections which will consequently degrade system performance.

Moreover, the range of an Alcatel-Lucent 4070 IO/EO is very dependent on the amount of attenuation subjected to the radio wave across various zones.

The following table gives the values of global coverage zone (cell) for an Alcatel-Lucent 4070 IO/EO under normal environmental and topological conditions:

	Interior	Exterior
Coverage area	~ 50 m	~ 400 m
Area:	~ 7,000 m^2	~ 50 000 m^2

1.1.1.3 NUMBER OF USERS PER BASE STATION

Type of Base Station connection.	Number of DECT users
3 channels	4
6 channels	12

1.1.1.4 LOCATING DECT BASE STATIONS

As a result of the environment and the infrastructure, certain recommendations must be taken into account for locating Alcatel-Lucent 4070 IO/EO:

	Recommendations for location	Possible solutions
INTERIOR COVERAGE	As far as possible from walls	Suspend Alcatel-Lucent 4070 IO/EO in a clear zone
	Do not fix directly to a metallic structure	Move Alcatel-Lucent 4070 IO/EO into another zone
	Do not place in false ceilings or in telecom rooms	Place Alcatel-Lucent 4070 IO/EO in useful zones (corridors)
	As far as possible from industrial machines or electrical cabinets	Place 4070 IO/EO in useful zones
EXTERNAL COVERAGE	Place the base stations in an open space (as far as possible from buildings)	Attached to pylons for example
	Place the base stations higher than low obstacles (trees, cars etc.)	At the top of buildings on pylons for example

1.1.1.5   INTERACTIONS

Interactions with other features

IBS DECT and IBS PWT (Personal Wireless Telecommunications) cannot run together on the same system. The first IBS plugged determines the system type (DECT or PWT).

To switch from one system to another, unplug all IBSs, make a warm restart and plug in the IBSs.

Interactions with other applications

IBSs are fully compatible with other wireless technologies such as VOWLAN.

Interactions with other software releases

OmniPCX Office release 5.1 requires 4 kinds of DECT initialization: Europe, Latin America, United-States and China. See also: § IBS CONFIGURATION .

1.1.1.6   LIMITS

Number of IBSs: 20 IBSs per cabinet is recommended, however, the number of IBSs is only restricted by the available power.

DECT link limit: 3 links on an IBS with one UA access, 6 links on an IBS with 2 UA accesses.

DECT handset limit: up to 120 handsets on a system.

1.1.1.7   PERFORMANCE AND QUALITY

IBSs are downloaded during the system start phase or when hot plugged. A system with many IBSs plugged might take longer to complete the start phase.

Downloading 1 IBS takes about 30 seconds. It takes more time when several IBSs are plugged on the same UA resource.

The end of restart is only possible after all the devices have been taken into account.

If an **IBS downloading fails**, the IBS restarts with the previously installed software.

1.1.1.8   IBS CONFIGURATION

There is no hardware configuration for IBS other than selecting between an external power supply for each IBS and remote power by system.

To configure the IBS software:

ARI Number

The ARI number identifies each OmniPCX Office. Each OmniPCX Office has an identical default ARI number.

When you install a new OmniPCX Office, you have to change the default ARI number. You can only keep the first digit, which is "1" and which means "ARI type B".

- 1 In **OMC**, go to **System Miscellaneous** -->**DECT/PWT ARI/GAP**

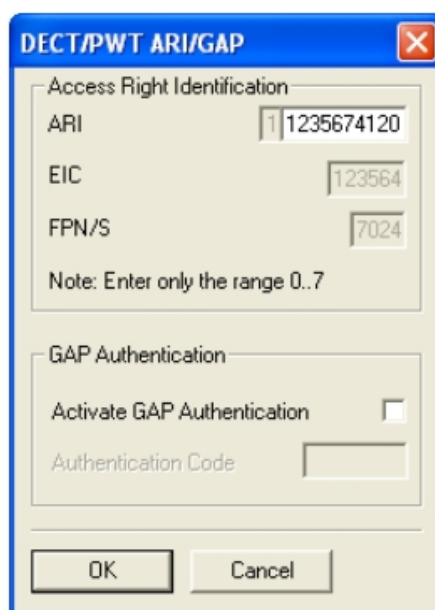- 2 Enter your own number (octal digit) to register your DECT handset.

Figure 1.2: ARI Number

Note 1:

*The **ARI Number** is the only non plug and play device on the IBS.*

The default configuration fits with the major systems. Modifications should answer to specific needs.

Line length

The Line length is the cable length used to plug the IBS to the system (distance between the IBS and OmniPCX Office). It enables the system to add a delay in signal and to avoid a shift in clock signal that creates a reset of the IBS.

- 1 In **OMC**, go to **Users/Base stations List**.

- 2 Select the **IBS Master** and click **Details**

There are 3 possibilities of configuration:

- Short line (0-400 meters)

- Medium line (400-800 meters)

- Long line (800-1200 meters)

Restart the IBS after you have modified the Line length parameter.

Antenna diversity

Antenna diversity is the ability of the IBS to move the transmission and reception from one antenna to the other so that the signal is always of the highest quality.

Restart the IBS after you have modified the Antenna diversity parameter.

Silent-Noisy IBS

Enable the Silent-Noisy IBS parameter to set up the echo canceller device.

The IBS is fitted with a software device that analyses audio signals and eliminates echo and noises. This device is activated by default.

When an IBS is deployed in a noisy environment, a lot of signals, including Speech ones, are eliminated while in Conversation state. This leads to bad Speech quality.

You have the option to disable the echo canceller. In that way, the speech and the noise signals are not filtered. It is then to the user to identify the speech.

Frequency plan

In **OMC**, go to **System Miscellaneous**# **DECT/PWT Frequencies** to select signals. In OMC, you can configure both the DECT and PWT frequency plans, regardless of what types of handsets are plugged on the system.
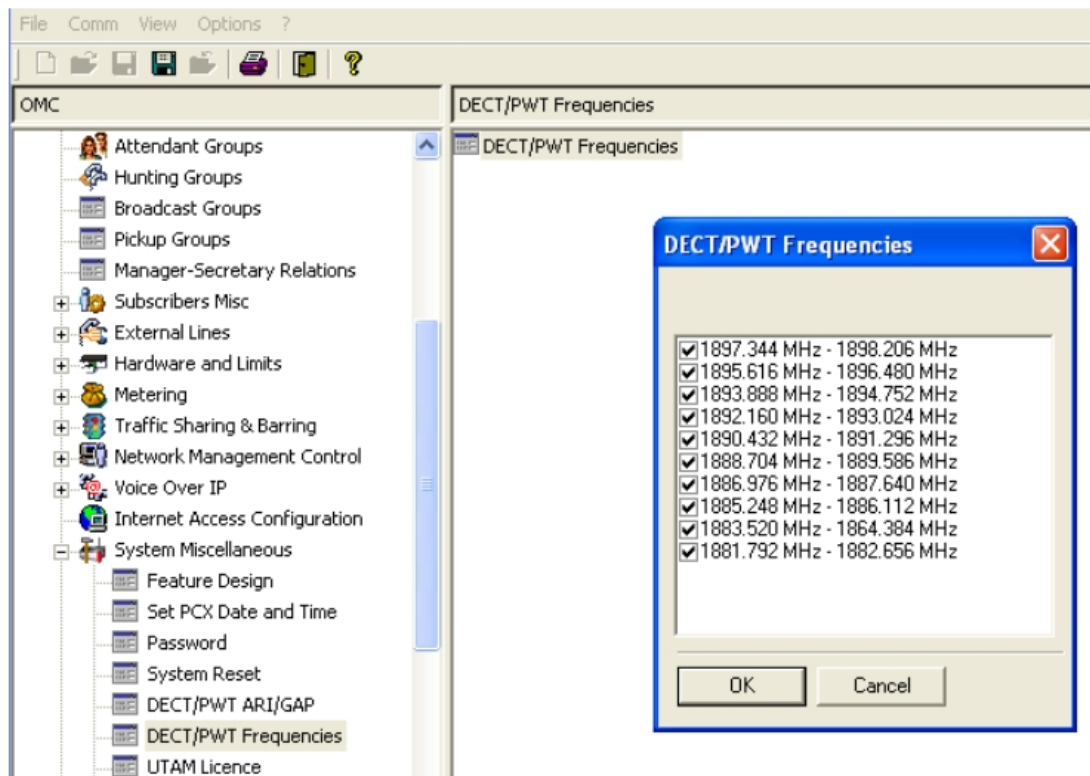
Figure 1.3: DECT/PWT Frequencies

Note 2:

Due to hardware, there is a limit in the number of channels that you can configure.

You can configure the following numbers of channels:

- *DECT EUROPE, LATAM, CHINA: 1, 2, 4, 5, 8, 10 channels*

- *DECT US: 1, 2, 4, 5 channels*

- *PWT: 1, 2, 4, 5, 8 channels*

1.1.1.9   Initialization

Once the IBS finishes the downloading, the system starts the initialization.

The system synchronizes the signals of the IBSs so that handovers are possible. The system selects the T0, T2, or CPU main board clock as the source.

Then the system sends the following data:

- Fixed part capabilities (Full slot, frequency control, page repetition, setup on dummy, basic A field setup): value sent = 0x007910

- Line length: Short line

- Frequency plan (2 bytes)

Some countries have shifted DECT frequencies. In order to be compatible with all frequency bands in the different countries, 4 types of initialization of frequency plans are available:

Europe, Latin America, The United-States and China.

table 1.4: RF Band Europe

Channel	TX Freq	RX Freq
0	1897.344	1898.206
1	1895.616	1896.480
2	1893.888	1894.752
3	1892.160	1893.024
4	1890.432	1891.296
5	1888.704	1889.566
6	1886.978	1887.840
7	1885.248	1886.112
8	1883.520	1884.384
9	1881.792	1882.656

Note 1:

By default, all frequencies used

Value sent to IBS: 0x3FF

0000 0011 1111 1111

table 1.5: RF Band China

Channel	TX Freq	RX Freq
0	1918.060	1918.944
1	1916.352	1917.216
2	1914.624	1915.446
3	1912.898	1913.760
4	1911.188	1912.032
5	1919.440	1910.304
6	1907.712	1908.576
7	1905.964	1906.848
8	1904.256	1905.120
9	1902.528	1903.392

Note 2:

By default, all frequencies used

Value sent to IBS: 0x3FF

0000 0011 1111 1111

table 1.6: RF Band Latam

Channel	TX Freq	RX Freq
0	1928.448	1929.312
1	1926.720	1927.584
2	1924.992	1924.992
3	1923.264	1923.264
4	1921.536	1921.536
5	1919.808	1919.808
6	1918.060	1918.060
7	1916.352	1916.352
8	1914.624	1914.624
9	1912.896	1912.896

Note 3:

By default, all frequencies used

Value sent to IBS: 0x3FF

0000 0011 1111 1111

table 1.7: RF Band US

Channel	TX Freq	RX Freq
3	1928.448	1929.312
4	1926.720	1927.584
5	1924.992	1925.856
6	1923.264	1924.128

7	1921.536	1922.400

Note 4:

By default, only 5 frequencies used

Value sent to IBS: 0x03E0

0000 0011 1110 0000

<p align="center">table 1.8: RF Band PWT</p>

Channel	Center Freq
0	1929.375
1	1928.125
2	1926.875
3	1925.625
4	1924.375
5	1923.125
6	1921.875
7	1920.625

Note 5:

By default, 8 frequencies used

Value sent to IBS: 0x03FC

0000 0011 1111 1100

1.1.2   Safety rules

1.1.2.1   ENVIRONMENTAL PROTECTION

For an exterior installation, it is necessary to take precautions against lightning affecting the location of the Alcatel-Lucent 4070 IO/EO.

1.1.2.1.1 Conditions for using lightning protection:

Protection of Alcatel-Lucent 4070 IO/EO against lightning should be used when they:

- are less than 1.5 m from a wall more than 2 m below the antenna.

- use an external airborne connection between the base station and the system.

1.1.2.2   RECOMMENDATIONS FOR EXPOSURE OF THE PUBLIC TO THE ELECTROMAGNETIC FIELD

1.1.2.2.1 MAGNETIC ABSORPTION RATE

Exposure of the public to the electromagnetic field from DECT sets and base stations is measured using the Specific Absorption Rate (SAR) measuring unit. 2W/kg is the SAR limit value indicated in international recommendations and also in the European recommendation (1999/519/EC).

The DECT authorised SAR limit value is 2 Watts/kilogram on 10g of body tissue (local SAR).

International recommendations include a safety margin for the public and take account of possible measuring variations.

SAR values

- Set: as the average power emitted from a set is lower than 20mW, the set is considered to comply without having to undergo any tests (see: EN 50371). The SAR value for DECT sets (e.g.: Mobile Reflexes) is not significant.

- Base station: the local SAR (head and chest) on 10g of body tissue for DECT base stations (e.g.: 4070) is lower than 0.5 W/kg (this is with an integrated omni-directional antenna).

1.1.2.2.2 ANTENNAE CHARACTERISTICS

Integrated antennae

The following is a list of characteristics for integrated antennae:

- Bandwidth: 1.88 to 1.93 Ghz

- Impedance: 50 Ohms

- TOS: 1.5:1

- Gain: 3 dBi (maximum)

- Polarization: vertical (axis of the antenna)

- Width of the beam at 3 dB (vertical): 90º

- Radiation diagram: omni-directional in the horizontal plane.

External antennae

According to the ETSI EN 301 406 standard, DECT antenna gain is limited to 12 dB +/-3dB. In the case of external directional antennae, if a minimum safety distance of 50 cm is respected, the SAR value is the same as the value obtained in the case of an integrated omni-directional antenna (and therefore, lower than: 0.5 W/kg).

1.1.2.2.3 CONFORMANCE PERIMETER FOR EXPOSURE OF THE PUBLIC

- Integrated omni-directional antennae: no limit for the conformance perimeter

- External antenna (directional): the installation must allow for a safety perimeter respecting a minimum distance of 50 cm.

1.1.2.3 RECOMMENDATIONS FOR INSTALLATION

1.1.2.3.1 Standard Topology.

The various building infrastructures are grouped into three types of geometric shape.

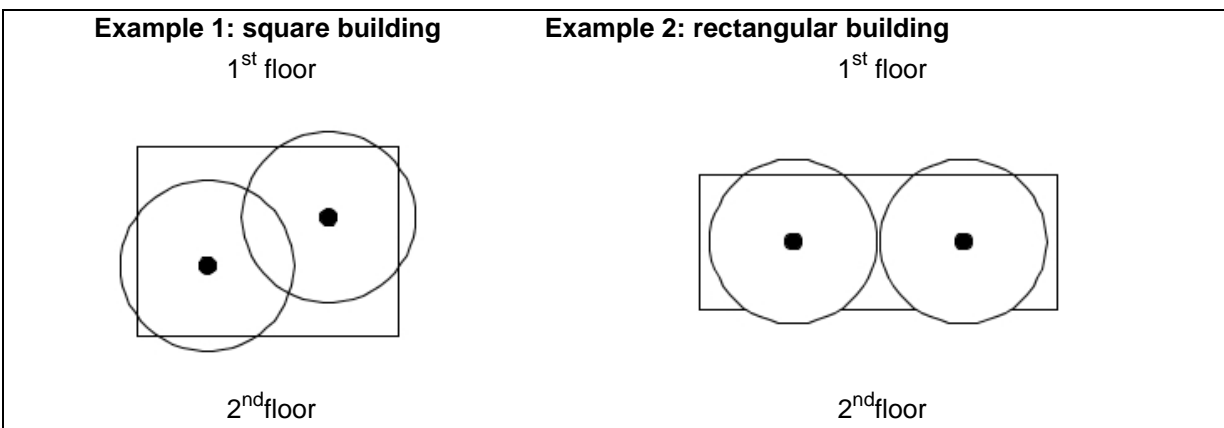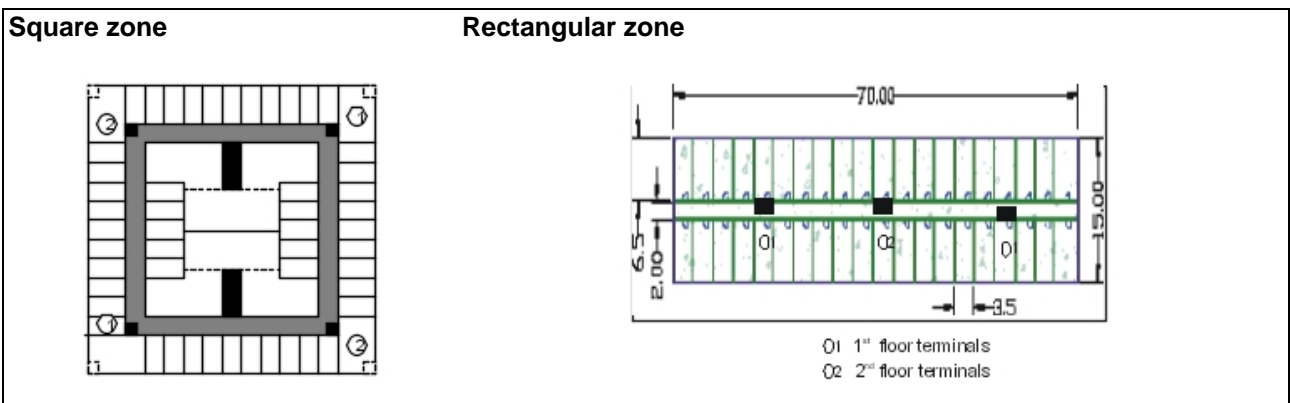| Coverage areas SQUARE:	Coverage areas RECTANGULAR:	Coverage areas ROUND
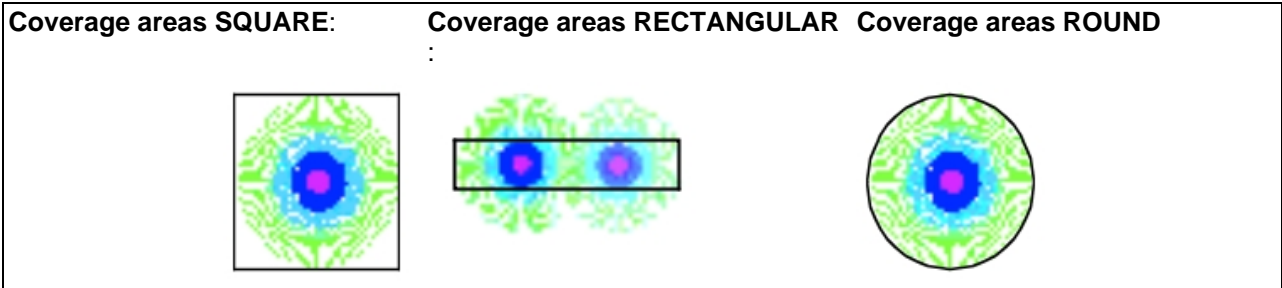
The distances quoted below give an idea of typical range of a base station. It is clear that a rectangular zone requires more base stations to provide full coverage.
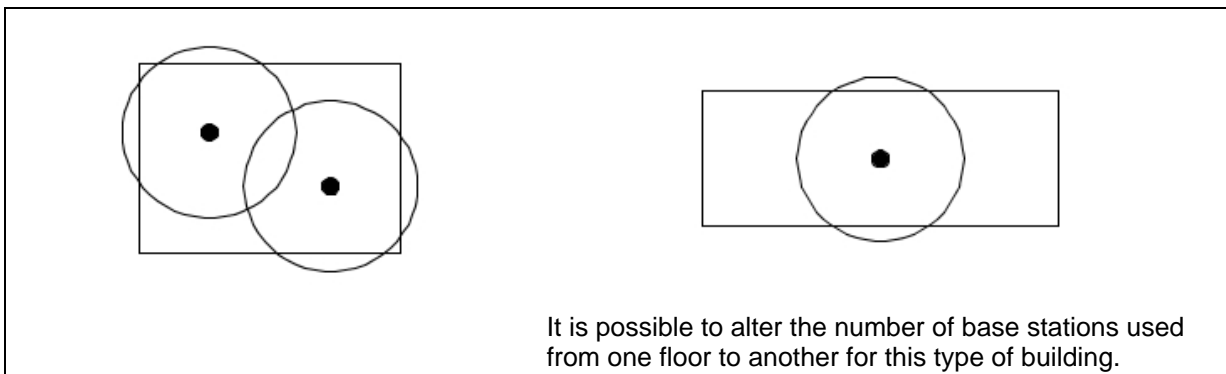
1.1.2.3.2 Layout technique

For structures with a number of floors, different solutions can be envisaged as a function of:

- the coverage obtained at each level.
- the position of the Alcatel-Lucent 4070 IO/EO (higher or lower level).

Installation examples

Square zone	Rectangular zone

O1 1st floor terminals
O2 2nd floor terminals

Example 1: square building	Example 2: rectangular building
1st floor	1st floor
2nd floor	2nd floor

It is possible to alter the number of base stations used
from one floor to another for this type of building.

The technique used is overlapping the location of base stations from one level to another. This technique can be used for alternate floors if the coverage of a level can be achieved from an adjacent level.

1.1.2.3.3 Coverage depending on the infrastructure
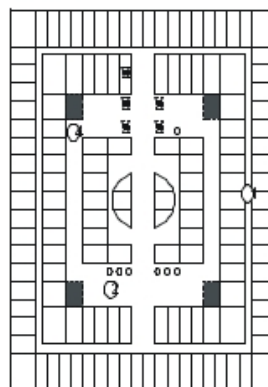
Description:
1st floor: 66m x 42 m
  (1) offices
  (2) corridors
  (3) lifts
  (4) stairs

2 floors to cover

The solution proposed alternates two stations per floor with overlapping locations from one floor to another. The zones shown by unbroken circles correspond to the zones covered by each station (B1, B2, B3, B4).

The zones in bold correspond to the coverage at a given level from a station on the floor above or below.