

# Installation

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0523		HebyN deC pointat dāLāom phāvri hessāum eāndālvāvānsD ēā: 1997E C. The product is CE marked with Body number 0523.
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FCC §15.21 - Information For Users  
 This equipment does not emit radio frequency energy and does not require any special precautions.

FCC §15.27 b) - Special Accessory Requirements  
 This equipment is a Class B digital device. It may emit radio frequency energy that can interfere with other electronic equipment. If you experience any interference, you should try to reorient or relocate the receiving antenna. If the interference persists, you should consult the dealer or a qualified technician for assistance.

FCC §15.105 - Information This equipment has been found

to comply with the Commission's rules. The equipment does not generate, use, or radiate radio frequency energy and it does not accept, process, or transmit information by any means. The equipment is not a radio transmitting device and it does not use a radio frequency transmitter. The equipment is not a radio receiving device and it does not use a radio frequency receiver. The equipment is not a radio transmitting and receiving device and it does not use a radio frequency transmitter and receiver. The equipment is not a radio transmitting, receiving, and transmitting device and it does not use a radio frequency transmitter, receiver, and transmitter. The equipment is not a radio transmitting, receiving, and transmitting device and it does not use a radio frequency transmitter, receiver, and transmitter.

- Receives signals from a mobile phone.
- Includes a separate antenna and a separate receiver.
- Contains a radio frequency transmitter and a radio frequency receiver.
- Contains a radio frequency transmitter and a radio frequency receiver.

History

Date	Version	Author	Details
22/2000	Draft	NTT, hom as	Completed User Manual
13/10/2000	Draft	TN Walsh	Discussion Forum comment
10/2001	Draft	Intel, epa	Discussion on support comment
29/2001	Draft	Intel, epa	Updated term comment and review by Har
02/2001	Draft	Intel, epa	Revised draft observation by Har
23/2001	Issue1	Har Ser	Initial version comment and changes
18/2001	Issue2 Draft	Tom Dumic	Included STYPE provision
20/2001	Issue2	Tom Dumic	Revised P code
06/2001	Issue2 Draft	Tom Dumic	Draft P code

# 1

## About this document

This document provides comprehensive details for installing the System. These include procedures to verify that the Nokia Inlite is installed correctly and is functional.

The information in the document has been arranged in a manner that the installation of a Nokia Inlite System is carried out with optimum efficiency. Actions requiring specific attention have been suitably highlighted.

The document content is organised as follows:

- Contents of delivery in Chapter 2
- Work order in Chapter 3
- Unpacking in Chapter 4
- Installation procedures in Chapter 5

Throughout the document, warnings, cautions and notes are given where appropriate. However, it is most important that before starting the installation, the Warnings and Cautions and Product Description associated with the System are carefully read.



# 2

## Contents of delivery

The Nokia InLite System is delivered in a number of packages. The number of packages is determined by the number of Local Units and Remote Units needed to ensure optimum cellular capacity within the building.

The packages are:

- MU package and accompanying smaller package
- Remote Unit package (comprising two boxes)
- Local Unit package (comprising two boxes)
- Package containing optional items.

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### Net

The Remote Unit and Local Unit packages are usually delivered in packages containing five unit packages.

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### 2.1 Main Unit

#### 2.1.1 Main Unit package

The contents of the MU package is:

Item description	Quantity
Housing	1
Cover	1
Bracket	1
Splice box (optional)	1
Cable	1
Cable support	1
Fixed power supply	1

Item description	Quantity
Screw for cable support	1
Screw M 4x 20mm	1
Cable tie	1
Power supply unit	2
Mounting plate:	1
• T-shaped mounting plate	1
• Screw M 4x 20mm for mounting plate (B2)	2
• Offset screw M 6x 25mm for mounting plate UL-bearing (B4)	2
• Screw M 6x 40mm for mounting plate	4
• Lock key for U cover	1
Mounting accessories:	
• Front plate	2
• Back plate	2
• Screw M 6x 20mm for mounting plate	4
• M 8x 12mm front back plate	4
• Washer	4
• Square 20x 20x 4mm metal	4
• Metal band 1010mm (B5)	2
• Locking device (used in ps)	2

Table. Contents of the MU package

### 2.1.1.2 Main Unit smaller package

The contents of the MU smaller package is:

Item description	Quantity
CD ROM: Instructions for use	1



Item description	Quantity
CD ROM: Inclusion and installation	1
Calibration kit	
<ul style="list-style-type: none"> <li>R F Jumper cable RG 222, 2m long, 4 length N (type) connected each end</li> </ul>	8
<ul style="list-style-type: none"> <li>L M P cable</li> </ul>	1
<ul style="list-style-type: none"> <li>Adm cable (type) connected fix each end</li> </ul>	1
<ul style="list-style-type: none"> <li>Adm connector (type) 2 pins</li> </ul>	1
<ul style="list-style-type: none"> <li>Adm connector (type) 3 pins</li> </ul>	1

Table Contents of Local Unit package

## 2.2 Local Unit

### 2.2.1 Local Unit package

The contents of the Local Unit package is:

Contents	Quantity
Local Unit package	1
Four jumpers (type) connected each end Note: <ul style="list-style-type: none"> <li>The person installing should take them into consideration when using in a specific environment.</li> <li>The person installing should take them into consideration when using in a specific environment.</li> </ul>	4

Table Contents of Local Unit package

### 2.2.2 Local Unit package (US)

The contents of the Local Unit package (US) is:

Contents	Quantity
1 x 1000MA PSM 900CD M A1900G SM1900CD M A, plug SCAP Cfem at ports	1
4 x 1000MA PSM 900CD M A1900G SM1900CD M A, plug SCAP Cfem at ports Note: • The power ratings should be taken into account when using the power supply. • The power ratings should be taken into account when using the power supply.	4

Table 1. Contents of the Remote Unit package (US)

## 2.3 Remote Unit

### 2.3.1 Remote Unit package

The contents of the Remote Unit package is:

Item description	Quantity
1 x 1000MA PSM 900CD M A1900G SM1900CD M A, plug SCAP Cfem at ports	1
500 hr min (typ)	1
Power supply connector • IE C32 type connector for AC • Bayonet type connector for DC	1
4 x 1000MA PSM 900CD M A1900G SM1900CD M A, plug SCAP Cfem at ports Note: • The power ratings should be taken into account when using the power supply. • The power ratings should be taken into account when using the power supply.	1

Table 6. Remote Unit package

2.3.2 Remote Unit package (US)

The contents of the Remote Unit package (US) is:

Item description	Quantity
Remote Unit A M P S 300 CD M A 1900 G S M 1900 CD M A 2, xS CAP C fem and power connector 110/220V AC or 48V DC	2
500 hr min run (type)	2
Power supply connector <ul style="list-style-type: none"> <li>• IE C320 power connector for AC</li> <li>• Bay type connector for DC</li> </ul>	2
Flange for mounting SCAP C fem connector. <p>Note:</p> <ul style="list-style-type: none"> <li>• The person installing should take care to use the correct flange for the remote unit.</li> <li>• The remote unit should be installed in a secure location.</li> </ul>	1

Table 6. Remote Unit package (US)

2.3.3 Remote Unit Installation Kit

The contents of the Remote Unit Installation Kit package is:

Item description	Quantity
Mounting rack	1
Support bracket (for mounting rack)	1
Spacers	1
M 3x10mm screws (for spacers)	2
M 3x20mm screws (for spacers)	2
M 6x40mm mounting screws	4

Item description	Quantity
M 3.8m mscrew in duralium with cork	5
Calcover	1
M 3.20m mscrew for calcover	4
Cal 75.2m m	2
Cal 100x25m m	3

Total Cost R em d U i K i

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### Net

Usually FO jumpers/pigtails used with LU and RU connections are to separate packages.

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## 2.4 Optional items package

This package contains optional items ordered from Nokia such as in antennas.

# 3

## Work order

The installation of a Nokia InLite System is described in detail in the chapters which are presented in a sequence deemed for optimum completion of installation, the Nokia Inlite System is configured according to the requirements.

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### Note

The work must be planned in advance.

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### Note

Prior to installation, it is most important that the installers familiarise themselves with the installation instructions and cautions.

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### Note

Prior to installation, ensure that the site is fully prepared. Prepare the site as provided in Line: Requirements for Operation and Installation

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Installing the Nokia Inlite System

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### WARNING

All fibre optic related work activities must only be performed by qualified and approved personnel.

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1. Unpack the delivery close to the point of installation and against the checklist included in each package.
2. Inspect the contents of the packages visually.
3. Ensure that all the tools needed for installation are present (laptop PC with Nokia Supervisor Software Version 1.0.0 or higher) .
4. Install fibre optic cables between the MU and RU locations

5. Install the MU in its allocated location.
6. Install the LUs into the MU.
7. Check the MU power supply.
8. Identify the RU locations and drill the holes for the RU mount screws.
9. Arrange the power supply at the RU locations.
10. Install the antennas.
11. Arrange/splice the FO pigtailed 4 m long to the FO cables between RUs at the LU end.
12. Arrange/splice the FO pigtailed 2 m long to the FO cables between RUs at the RU end.
13. Test the FO cables.
14. Label the FO cables at the RU and LU ends.
15. Mount the RU mounting racks to the supports and mount the RUs.
16. Connect the FO cables to the LUs and RUs.
17. Connect RF antenna cables between the antennas and the RUs.
18. Connect the RF jumper cables to the MU.
19. Connect power supply to the RUs.
20. Switch on the mains power to the MU.
21. Connect the LMP cable between MU and the local management laptop and start the Nokia Inlite System Supervisor Software.
22. Complete the MU and RU placing tables in the Nokia Supervisor Software.
23. Start the commissioning process as described in the Commissioning document.
24. Fit the cable cover and the MU cover.

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## Net

Splicing is not required if used jumpers.

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# 4

## Unpacking

Prior to unpacking the transportation packages, move them close to the installation area to avoid any unnecessary activity.



### WARNING

Ensure that all safety precautions are observed when moving the transportation packages and lifting items of equipment.



### Caution

Take care when removing items from their transportation packages to avoid damaging them or sustaining personal injury.



### Caution

Lift the MU by the backplate. Do not lift the MU by the splice cover. Exercise care not to damage the open door switch.

### Note

Ensure that the delivered packages are in accordance with the



### Unpacking the transportation packages:

1. Carefully remove the plastic wrapping from around the package.
2. Ensure that the package is correctly orientated for removal.
3. Open the package and carefully remove the contents of the package. Place the items on the plastic wrapping to avoid scratching them.

### Note

Do not remove the LUs from their anti-static packaging until you install them in the MU. This reduces the risk of ESD damage.

- 
4. Using the checklist contained in the package, ensure that all present.
  5. Carefully inspect each item for signs of damage.
  6. If there are signs of damage or an item(s) is missing, immediately report these findings to your local Nokia representative.
  7. Repeat steps 1 to 6 inclusive for all other packages as and when required.



# 5

## Installation

This chapter details the installation of the MU and Remote Unit. Figure 5-1 shows the block diagram of the InLite system.

The conversion factors used in this document are:

1 mm = 0.03937 inch; 1 inch = 25.4 mm

1 Nm = 0.7376 lbf ft; 1 lbf ft = 1.356 Nm



### Caution

Care must be taken when installing the Nokia InLite System. Components can be damaged and cause damage if not handled with care. Observe the instructions which items are installed.

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### Notes

Installation of the Nokia InLite System must be carried out by personnel who have completed the Nokia training course on Nokia InLite installation or have an equivalent understanding of the system.

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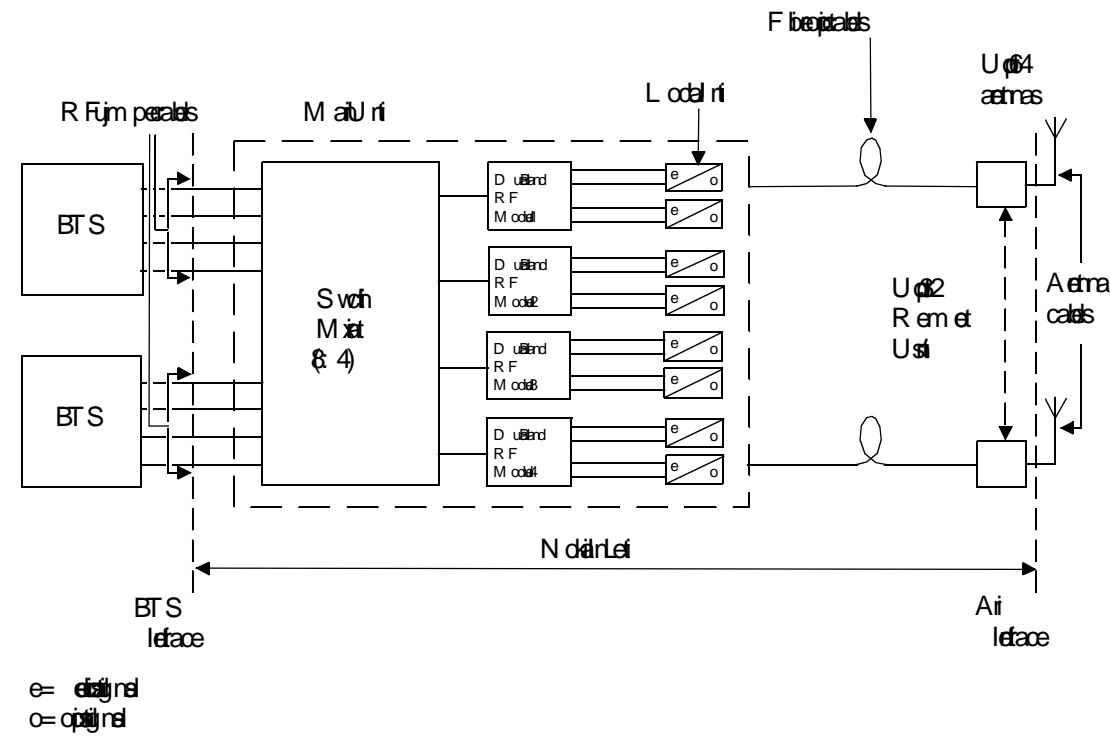


Fig. 1. Nokia System Architecture

## 5.1 Installing the fibre optic cables



### WARNING

All fibre optic related work activities must only be performed by a qualified and approved personnel.

The installers require an accurate and up-to-date RF planning document out the installation. The planning document provides detailed information for the FO cables are to be routed in the site.

### 5.1.1 Guidelines for fibre optic cable installation

Refer to site RF planning document at all times and respect the following guidelines:

- It is always recommended to provide extra FO cable length

- The common (and recommended) method is to run the FO cable connectors and splice short pre-connectorised pigtails onto avoid damaging connectors in the cable-running process. That adequate length is available at each end for correct relief.
- Optical connectors cannot be fitted in the field due to the process required. There is no significant loss in performance of using fusion splices.
- The optical cable must not be stressed, as this can cause loss and could create internal micro fractures.
- It is important not to squeeze the cable by, for example, cable ties.

## 5.2 Installing the Main Unit

The installation location and position is predefined.



### Caution

Always use the antistatic wrist strap when handling plug-in units.

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### 5.2.1 Removal of the plastic cover and associated parts

Prior to removal of the plastic cover of the MU, move the assembly to the installation location for installation.

Figure 5-2 shows the MU chassis assembly, cover and cable cover.

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### Notes

The MU is delivered with the Switch Matrix/Dual Band RF module, and Power Supply Units already installed. Figure 5-2 does not show the Power Supply Units.

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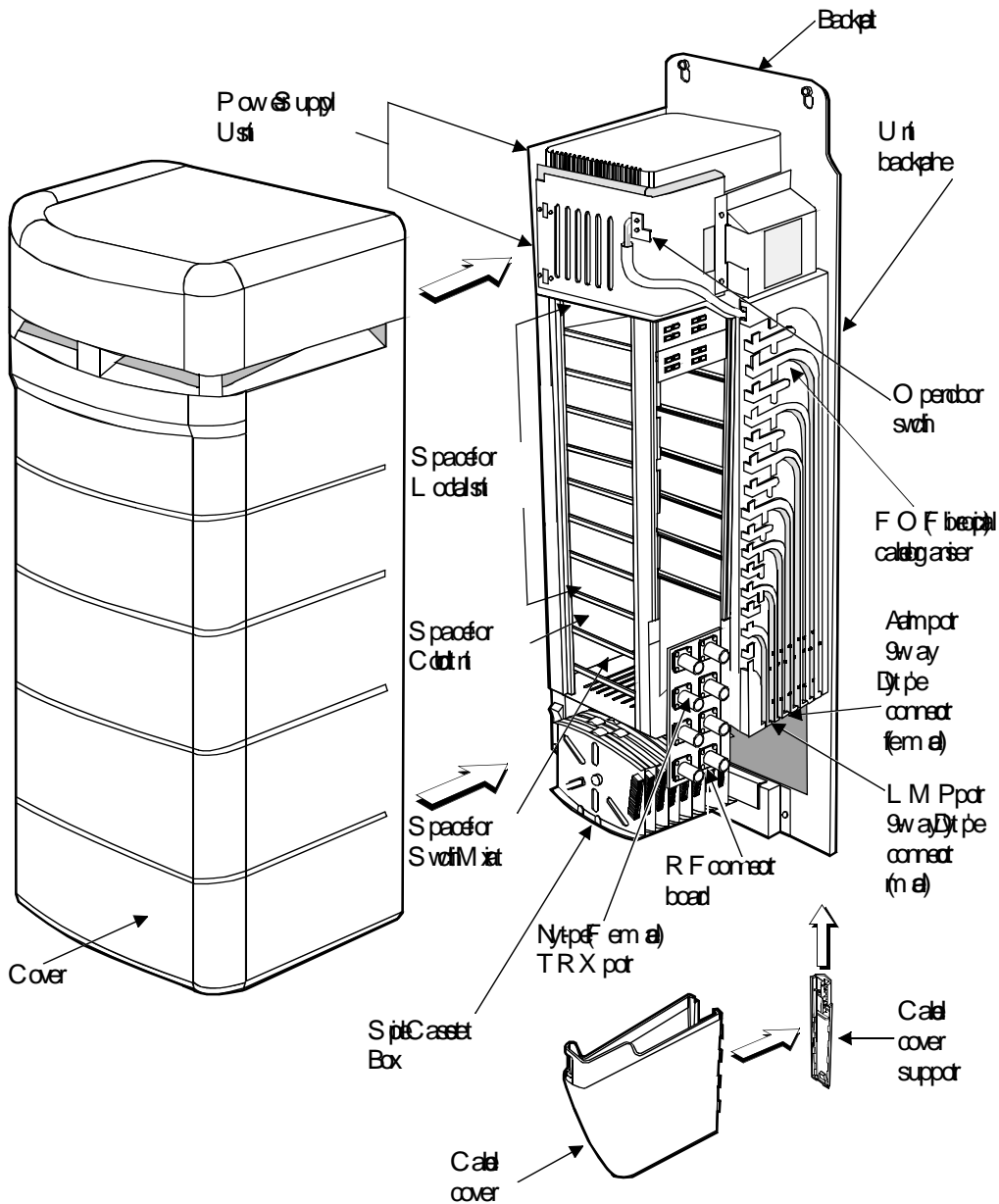


Figure 2 Multi-service cabinet cover and cable cover



- To remove the plastic and cable covers
1. Unlock the plastic cover using the key provided.

- 
2. Holding the cover firmly and against the chassis assembly, upwards until the cover locking guides are free of the backplate.
  3. Carefully pull the cover off the chassis assembly and store until required again.
  4. Remove the cable cover by carefully lifting until the lock is clear of the retention recesses on the cable cover support. Store in a safe place.
  5. Pull the plastic cable cover support downwards to disengage from the backplate.
  6. Remove the cable cover support and store it in a safe place.

### 5.2.2 Main Unit mounting frame

The mounting frame is used in both wall and pole installations as the base for the MU assembly.

Screw holes and dimensions of the mounting frame are presented in Figure 5.2.2. Screw holes R1, R2, R3 and R4 are intended for fixing the mounting frame to a wall or onto a pole bracket. The upper MU fixing screws are in holes B1 and B2.

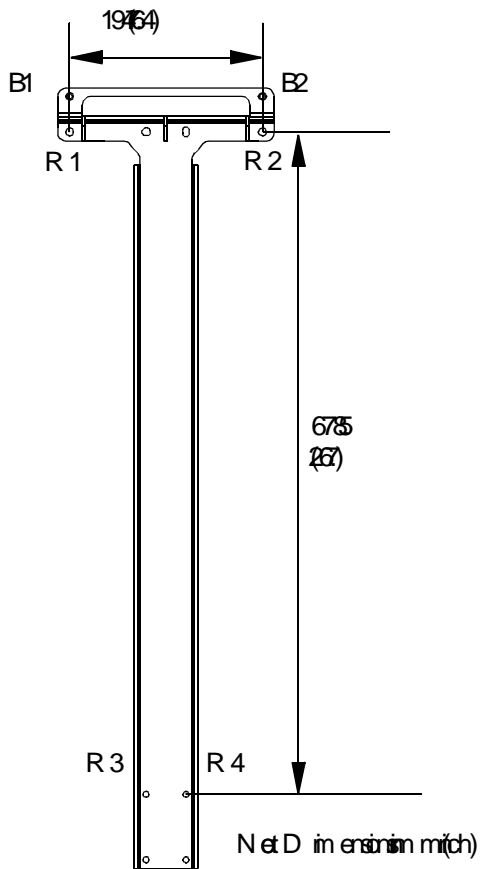


Figure 3 Main unit frame

### 5.2.3 Wall mounting



#### Caution

If a ladder is required to attain the height at which the MU is being installed, great care must be taken when using the ladder.



To fix the Main Unit to a wall.

1. Position the mounting frame in the correct location on the wall level to check that the mounting frame is in the straight position.
2. Mark the fixing points on the wall using the anchor screw hole R3 and R4 in Figure 3 on the mounting frame.

- 
3. Drill the holes in the wall and clean them out. Insert anchor screws into the wall, depending on the wall material.
  4. Install the mounting frame from the upper anchor screw hole in Figure 2 onto the wall. Use appropriate anchor screws. Use the screws (6.3 x 38) supplied by Nokia, use a 6 mm hexagon key to tighten.
  5. Position the U-plate (refer to Figure 3) onto the second lower holes (R3 and R4). Make sure the U-plate is in the correct position. The larger holes on the U-plate must be facing downwards as per Figure 3.
  6. Screw the anchor screws through the U-plate and anchor screws into the wall.
  7. Insert the M4 x 20 mm Allen screws to the upper fixing holes in the mounting frame (B1 and B2 in Figure 4).
  8. Hang the MU on the upper fixing screws. Do not tighten yet.
  9. Position the L-beam on the back of the MU into the U-plate holes.
  10. Tighten the upper MU fixing screws (B1 and B2 in Figure 4).
  11. Tighten the two offset screws (B3, B4) M6 x 25mm on the L-beam from the underside. Tighten to 24 Nm. Refer to Figure 5.

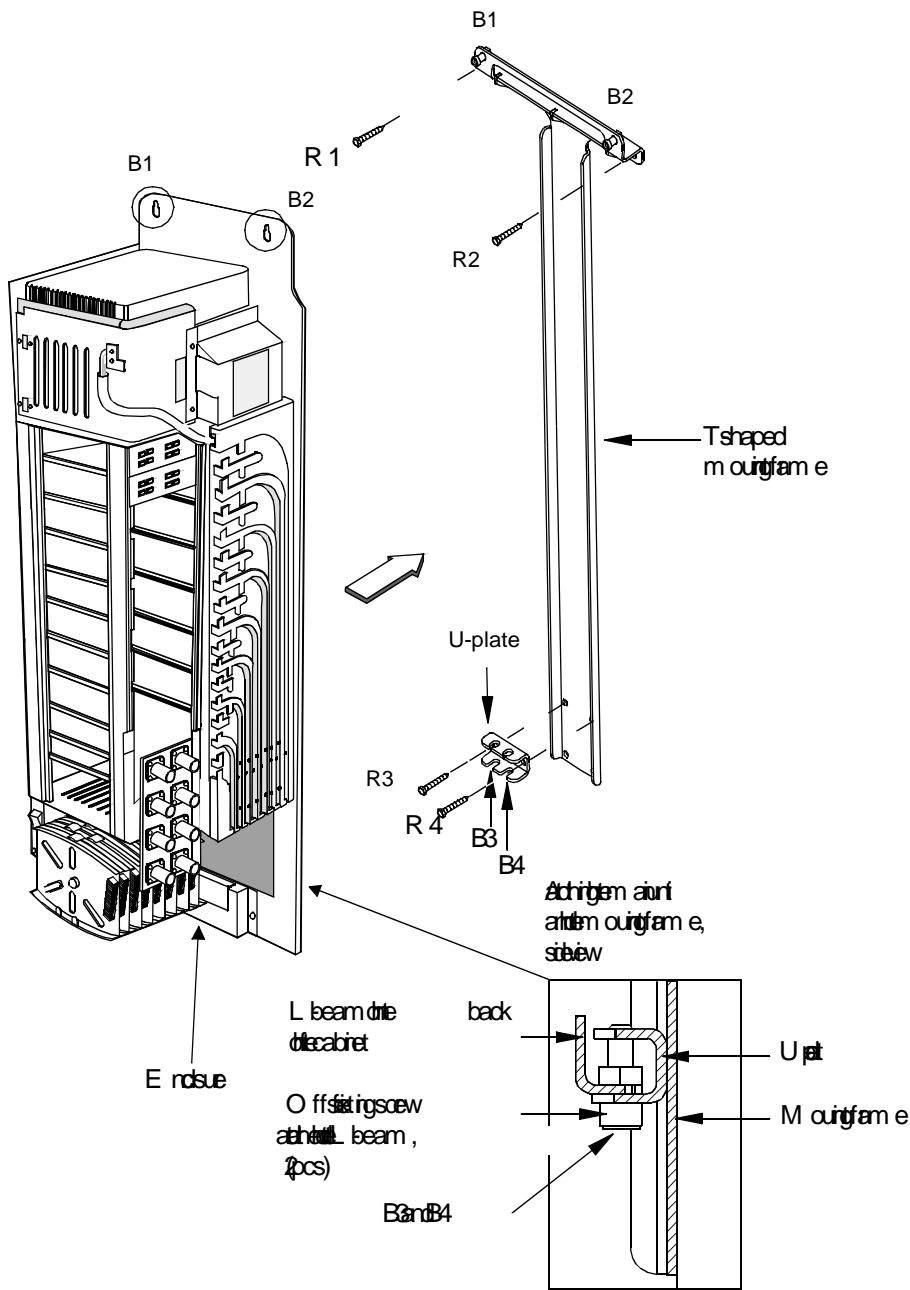


Figure 4. Mounting unit

5.2.4 Pole mounting

The MU can be mounted on a pole in two different ways depending on diameter. If the pole diameter is between 60 - 120 mm (2.4 - 4.7 in



mounting blocks (front and back) are used exclusively; if the between 120 - 300 mm (4.7 - 11.8 in) adjustable straps are use with the front mounting blocks.

Prior to mounting the MU to a pole it is necessary to prepare brackets.

**Net**

Pre-assemble the mounting blocks before taking them up the pole

Pole mounting of the Main Unit on a 60-120 mm diameter pole  
Figure shows one set of pole brackets.

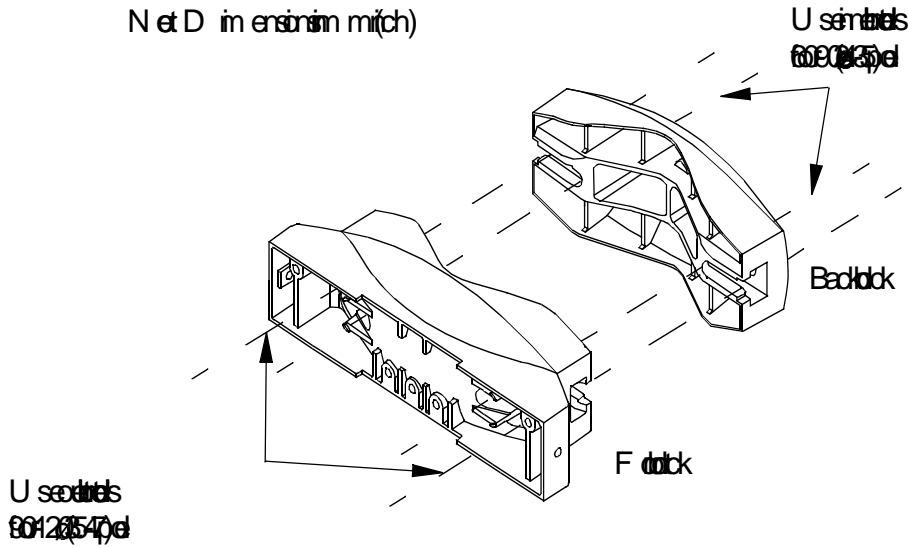


Fig. 5. Front and back pole bracket

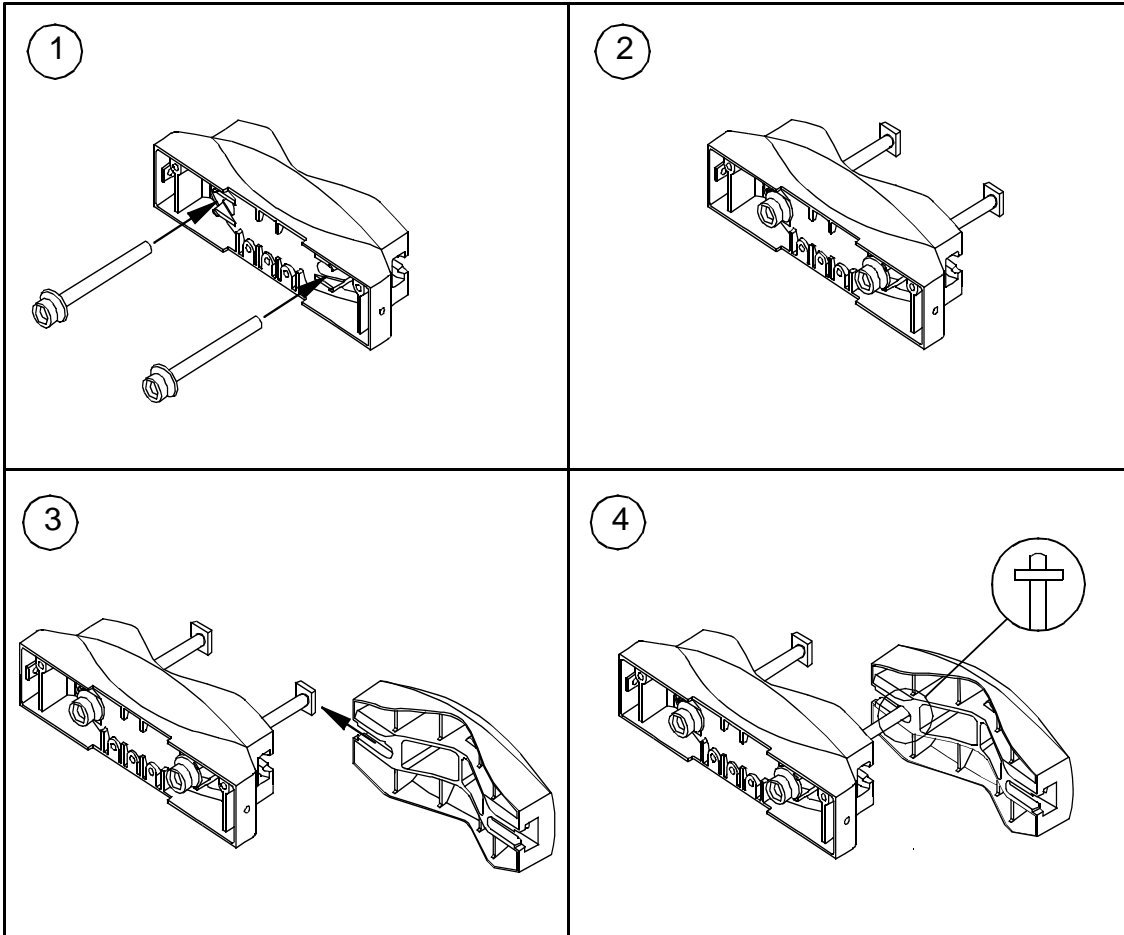
To pre-assemble the pole brackets:

### Net

If the diameter of the pole is 60-90 mm (2.4-3.5 in), use the inner pole diameter is 90-120 mm (3.5-4.7 in), use the outer holes.



To pre-assemble the pole brackets:



D N 00280689

Fig. 6 Pre-assembly of pole brackets

1. Insert the assembly bolts with washers into the bolt holes blocks. Refer to 1 in Figure .
2. Attach the square nuts to the ends of the bolts. Screw them to prevent them from falling off from the ends of the bolt blocks. Refer to 2 in Figure .
3. Slide one bolt with the square nut to the slot at the side of the back block. Refer to 3 in Figure .
4. Screw the bolt on enough to prevent the bolt and the nut from falling off from the side of the back block. Refer to 4 in Figure .



To install the pole brackets and the mounting frame onto a

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### Net

Before taking the mounting frame up the pole, carry out the tasks 1 to 3 inclusive.

---

Figure 1 shows the installation configuration for mounting the mounting frame on a pole.

1. Insert the two M4 x 20 mm fixing screws to the uppermost screws of the mounting frame (B1 and B2 in Figure 1). Tighten the screws to bear the weight of the MU.
2. Position the U-plate onto the screw holes R3 and R4 on the mounting frame. Refer to Figure 1.

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### Net

The larger holes on the U-plate must be facing down. Refer to Figure 1.

---

3. To fix the U-plate and the lower pole bracket to the mounting frame, insert the M6 x 20 mm Allen screws through the U-plate and through the holes R3 and R4 into the lower front block. Refer to Figure 1. Use a 6 mm Allen bit to tighten securely.
4. Position the pre-assembled upper pole bracket on the pole. The holes for screws R1 and R2 are on the upper edge of the bracket. Refer to Figure 1.
5. Rotate the back block of the upper pole bracket so that the square nut is inserted with the square nut into the slot at the side of the back block.
6. Tighten the bolts evenly to fix the upper pole bracket to the pole. Use a torque socket spanner/wrench with an 8 mm Allen bit to tighten to 8.85 ft/lb.).
7. Attach the mounting frame to the upper bracket from fixing R2 with M6 x 20 mm Allen screws. Refer to Figure 1. Use a 6 mm Allen bit to tighten.

- 
8. Fix the mounting frame to the pole with the lower bracket. Fix bracket in the same manner as the upper bracket. Tighten to 12 ft/lb.).

Net Makers  
 back  
 head  
 low edge

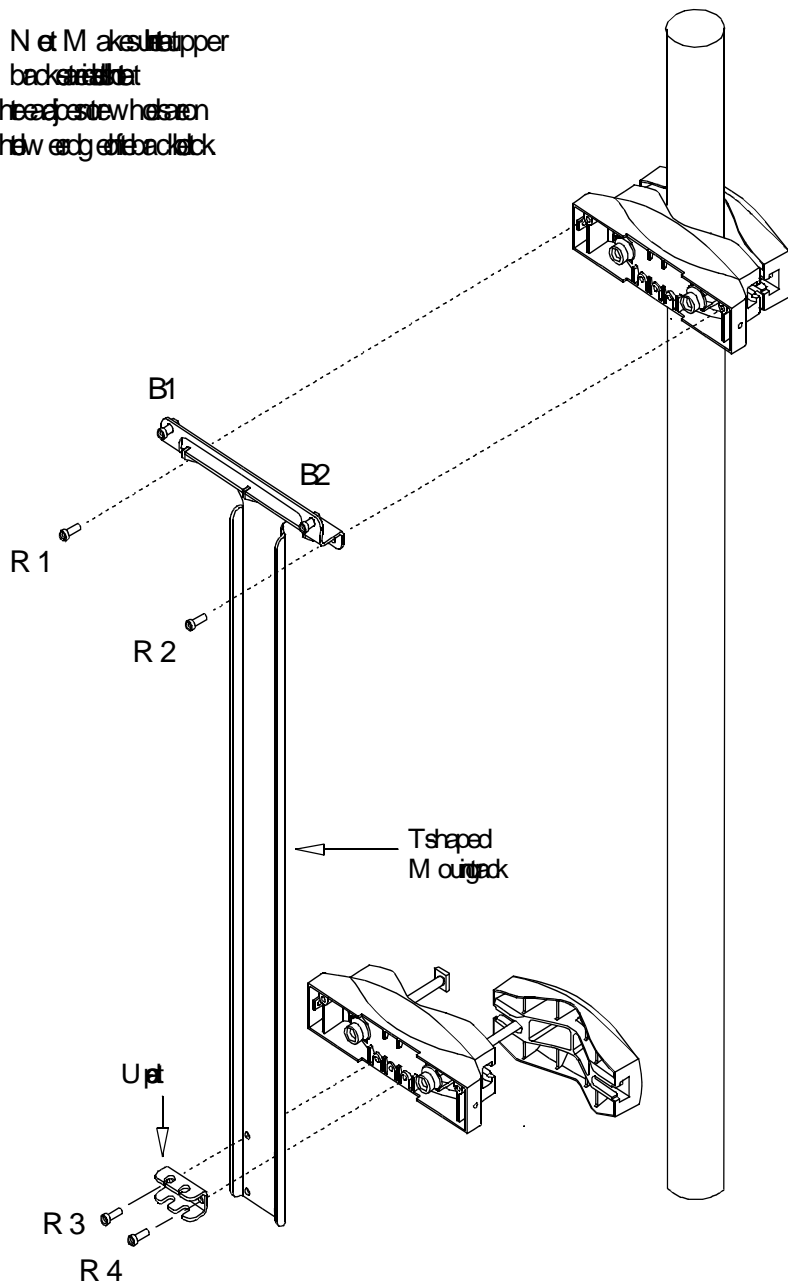


Figure 7. Main Unit on a pole



To mount the Main Unit on a 60-120 mm diameter pole:  
 Figure shows the manner in which a MU is mounted on a pole using

frame.



### Caution

If a ladder is required to attain the height at which the MU is being installed, great care when using the ladder.

---

1. Bring the MU to the mounting frame and position the L-beam on top of the cabinet into the U-plate.
2. Hang the MU on the two upper MU M4 x 20mm fixing screws (B1 and B2 shown in Figure 1).
3. Tighten the upper fixing screws (B1 and B2 shown in Figure 1).
4. Tighten the two M6 x 25 mm offset screws (B3 and B4 shown in Figure 1) on the L-beam into the U-plate from the underside. Use a torque spanner/wrench with a 6 mm Allen bit and an 80 mm extension to tighten to 12 Nm (8.85 ft/lb).

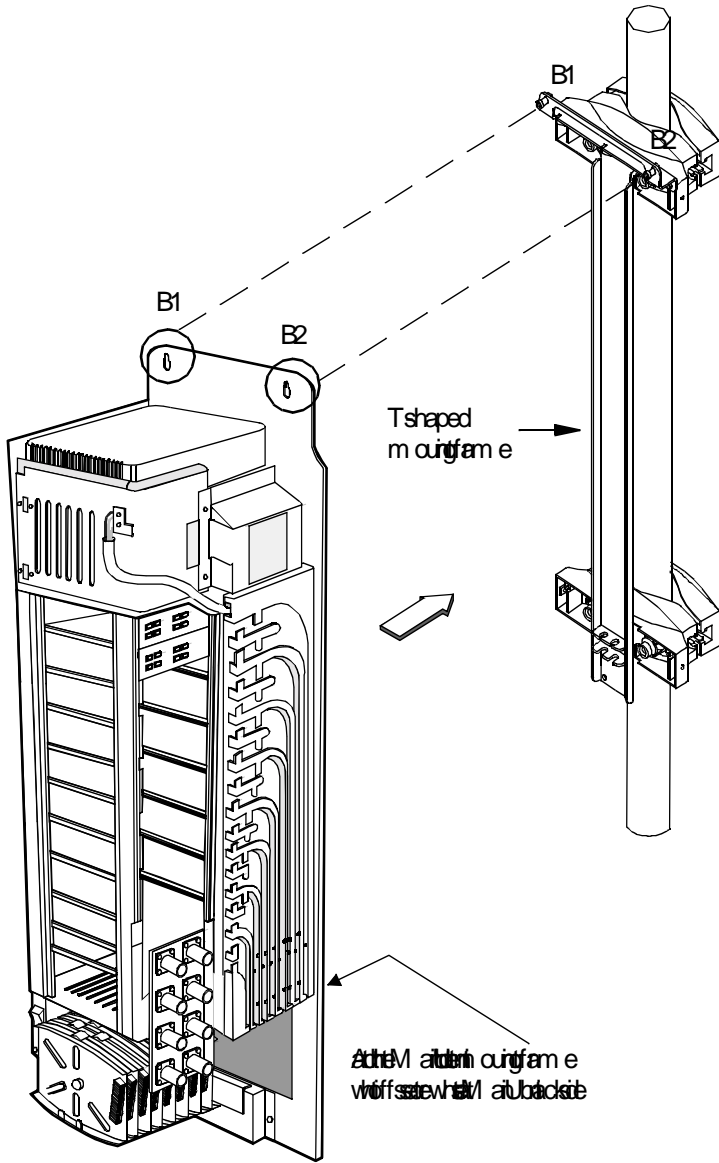


Figure 8. Main Unit alternative mounting frame

Pole mounting of a Main Unit on a 120-300 mm diameter pole  
 Figure shows the preparation of the bands and Figure shows the MU on a pole.

**Net**

Only the front blocks are required for this operation.

Table shows the relationship between the pole diameters and band length.

Pole Diameter (mm)	Band Length (mm)
140	580
160	630
180	680
200	740
220	790
240	850
260	900
280	950
300	1010

Table 1. Band lengths



To pre-assemble the pole brackets

1. Assemble the locking device. Insert the end of the rack into the housing just enough to engage the rack. Make sure that the word SIDE UP on the rack can be seen.
2. Cut the metal band to the appropriate length according to the pole diameter. Refer to Table 1 for the different pole diameters / band lengths.
3. Route the metal band through the holes in the top front block.
4. Bend one end of the metal band about 30 mm (1.2 in) towards the top to form a hook.
5. Insert the hook into the slot at the end of the locking rack.
6. Bend the other end of the metal band about 30 mm (1.2 in) towards the underside to form a hook. Leave it free for now.



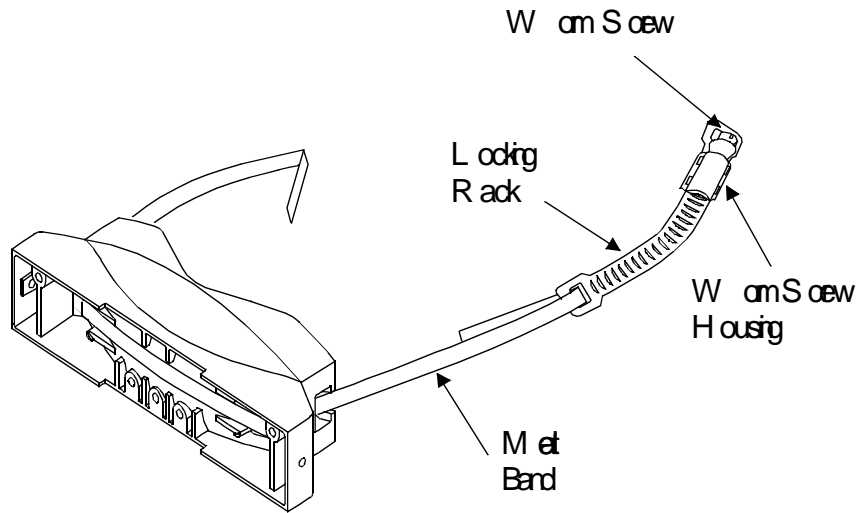


Figure 2 Pole bracket with band



To install the pole bracket and mounting frame onto a pole Figure shows the manner in which a mounting frame is installed on a 40mm diameter pole.



**Caution**

If a ladder is required to attain the height at which the MU is installed, great care must be taken when using the ladder.

**Notes**

Before taking the mounting frame up the pole, carry out the tasks 1 to 3 inclusive

1. Insert the two M4 x 20mm MU fixing screws into the uppermost holes on the mounting frame (B1 and B2 shown in Figure ). These holes are strong enough to bear the weight of the MU.

2. Position the U-plate onto the second lowest screw holes R3 and R4 and refer to Figure 1.

---

## Net

The larger holes on the U-plate must be facing downwards.

---

3. To fix the U-plate and the lower pole bracket to the mounting frame, insert the M6 x 20 mm Allen screws through the U-plate and through screws R3 and R4 into the screw holes on the lower bracket. Refer to Figure 1. Use a torque driver with a 6 mm Allen bit to tighten securely.
4. Position the pre-assembled upper bracket on the pole. Make sure the screw holes for the screws R1 and R2 are on the upper edge of the frame. Refer to Figure 1.
5. Wrap the metal band tightly around the pole.
6. Insert the hook-shaped free end of the band into the band slot on the screw housing.
7. Tighten the worm screw to 10 Nm (7.4 ft-lb) with an 8 mm hexagonal key.
8. Attach the mounting frame to the upper bracket from the front with screws R1 and R2 with M6 x 20 mm Allen screws. Refer to Figure 1. Use a torque driver with a 6 mm Allen bit to tighten the screws.
9. Fix the mounting frame to the pole with the lower bracket. Fix the lower bracket in the same manner as the upper bracket.

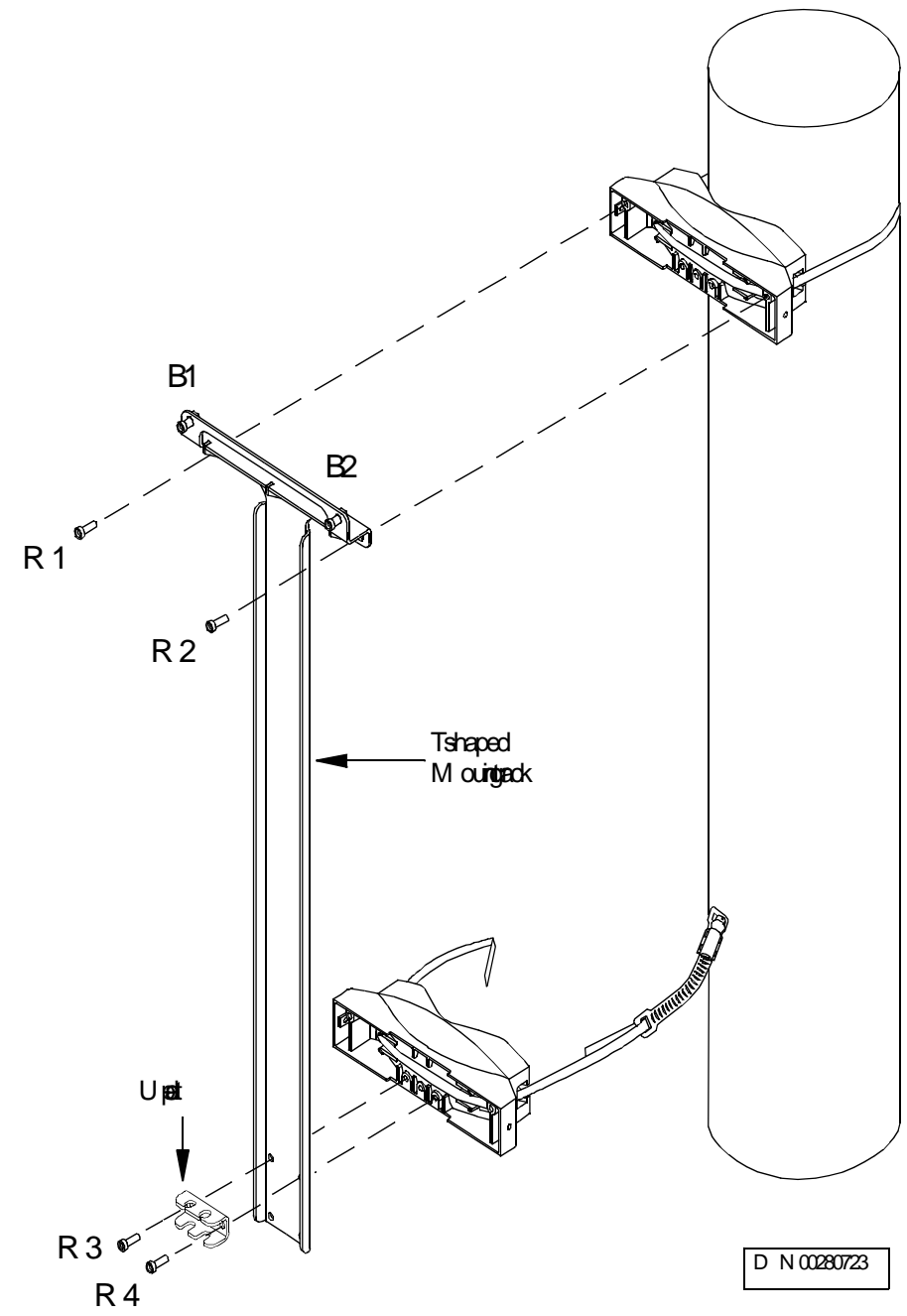


Fig. 0. Main unit frame



To install the Main Unit onto the mounting frame

- 
1. Bring the MU to the mounting frame and position the L-beam on top of the cabinet onto the U-plate.
  2. Hang the MU securely on the upper M4 x 20 mm MU fixing screws and B2 shown in Figure ).
  3. Tighten the upper MU fixing screws (B1 and B2 shown in Figure ) securely.
  4. Tighten the two offset screws (B3 and B4) M6 x 25 mm on the L-beam to the U-plate from the underside. Use a torque socket spanner/wrench with a 6 mm Allen bit, tighten to 12 Nm (8.85 ft/lb).

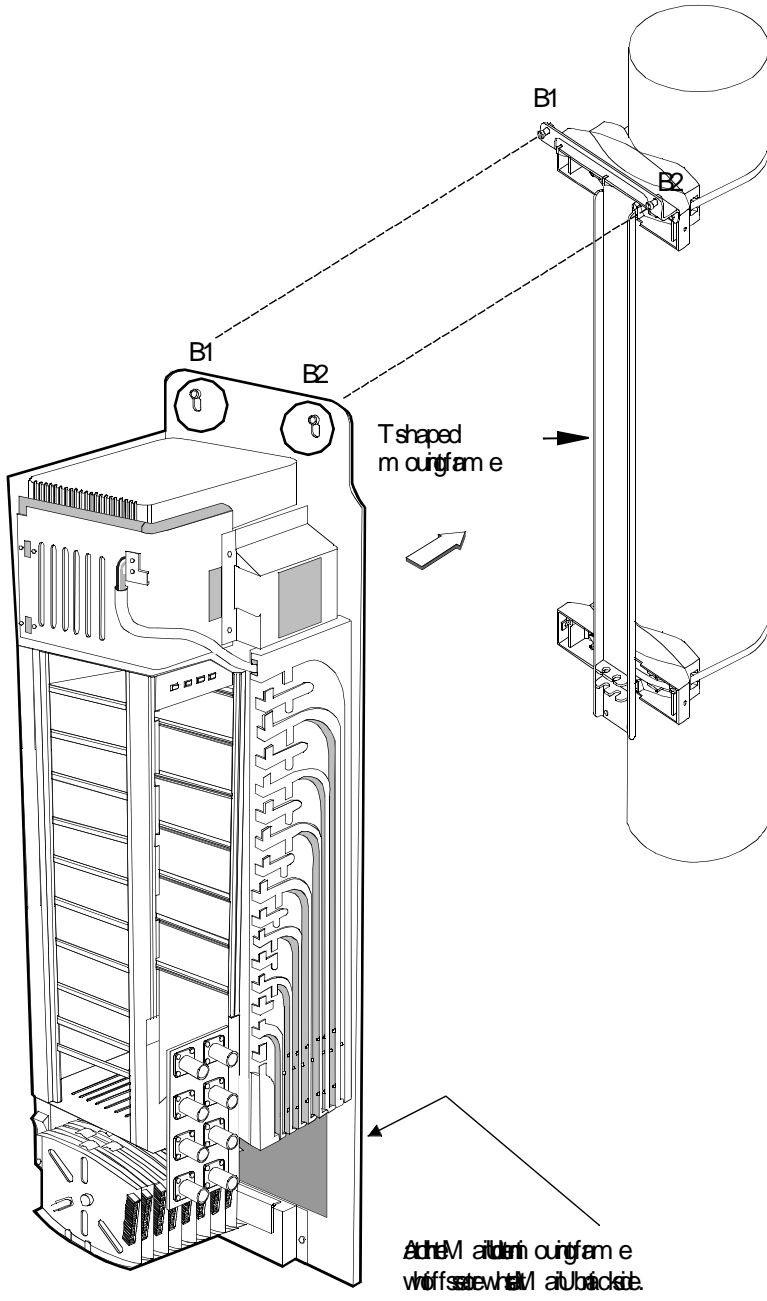


Figure 1. Penetration of the antenna into the back cover

## 5.3 Installing the Local Units

Check the RF Plan documents to find out how many RUs are to be connected to each LU. This information is needed to set the jumpers in the LUs.

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### Net

Before installing the LUs, check that the jumpers are in the correct position.

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### 5.3.1 Configuration of four RUs

When four RUs are to be connected to an LU, there is no need to change jumper settings; just make sure that the jumper settings are correct before installing the LU into its location in the MU.



Figure 2 Installing the LU

### 5.3.2 Configuration of less than four RUs

When less than four RUs are connected to the same LU, any unused ports must be disconnected. This can be done by changing the position of the appropriate jumper in the LU.



Installing the LUs - configuration less than four RUs

1. Check which RX and TX optical port are not used. For example, if only two RUs are connected, optical connector RX1 corresponds to RX1 switch in Figure

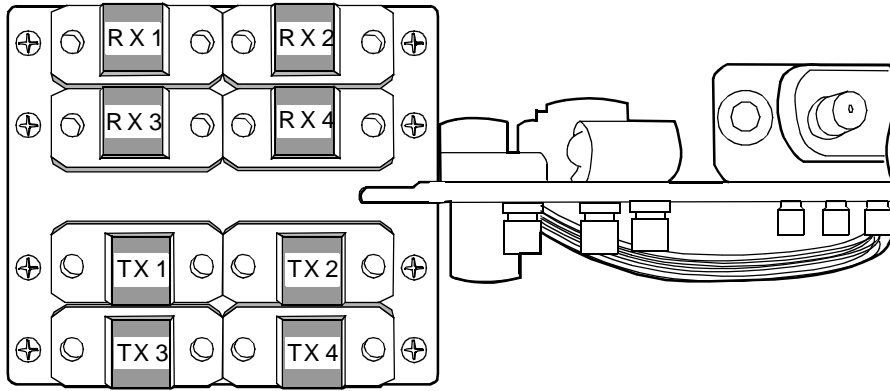


Figure 3. Optical array

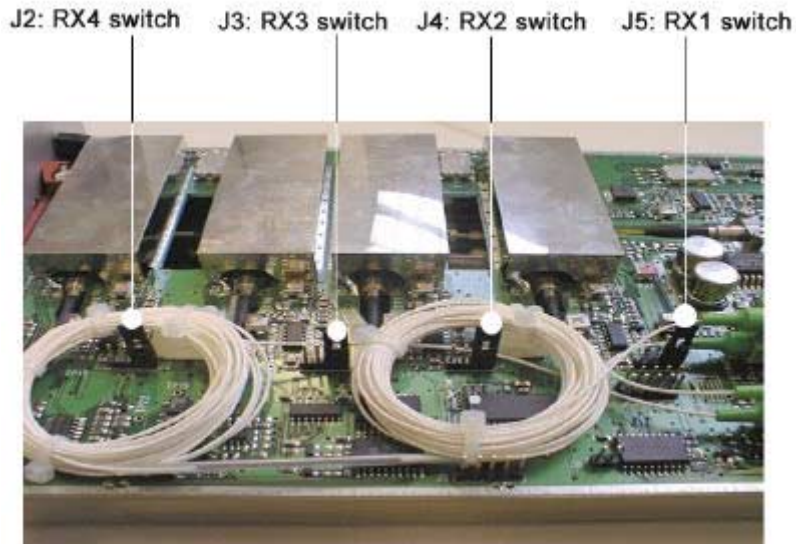


Figure 4. Localized ports

2. Move the appropriate jumper to the OFF position by moving onto the two left-hand pins of the jumper connector (see F

RX1 switch OFF



Figure 15. Local pin OFF position

3. Go to the Main Unit and Remote Unit placing window of the Supervisor Software. Add a note against each unused RU to indicate that it is unused.

---

### Net

If the Supervisor software is not running at this time, make a note to remember to record this information at the first available opportunity.

---



#### Adding more RUs to an LU

1. Check which Rx and TX optical ports are used.
2. Move the appropriate jumper to the ON position by moving the jumper onto the right-hand two pins of the jumper connector.
3. Go to the Main Unit and Remote Unit placing window of the Supervisor Software. Remove the existing note against the RU which indicates RX was unused.

---

### Net

If the Supervisor software is not running at this time, make a note to remember to record this information at the first available opportunity.

---



## 5.4 Preparing to install the RUs

Drill the holes for the RU mounting rack screws in the allocated to the RF planning document for the site for detailed information of the RUs.

---

### Tip

Do not mount the RU mounting rack at this stage.

---

## 5.5 Installing the antennas

Indoor panel or omni antennas can be used with the Nokia InLit

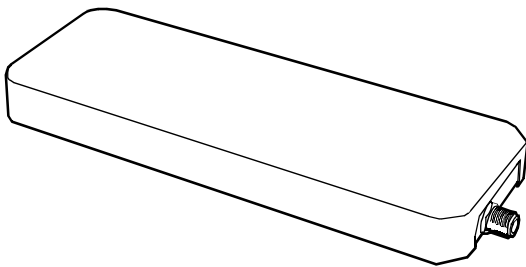


Figure 6. Panel antenna

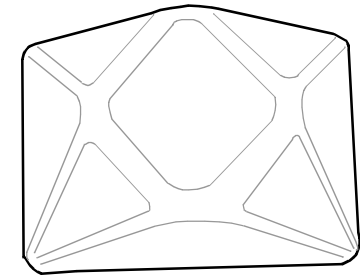


Figure 17. Omni antenna



To install the antennas

1. Install the panel or omni antennas at their allocated location as per the RF planning document for the site for detailed information on the location and orientation of the antennas

## 5.6 Splicing the fibre optic pigtailed



---

### WARNING

All fibre optic related work activities must only be performed by qualified and approved personnel.

---

Splicing is normally required at both the MU and RU ends of the FO pigtailed. A splice is a permanent joint that perfectly aligns two fibre optic pigtailed (Figure 18).

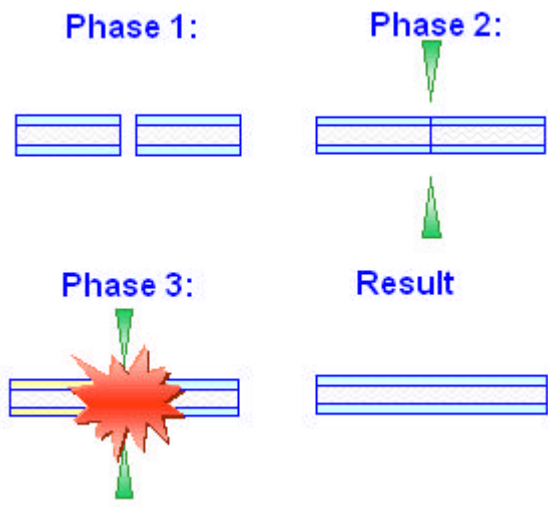


Figure 18. Example of fiber splicing

5.6.1 When splicing is required

Splices are required for the following reasons:

- The cable runs are too long for one straight cable pull
- You need to mix a number of different types of cable
- You need to connect a buried cable.

5.6.2 Types of splicing

Fibre splicing is accomplished by one of the following methods:

- Mechanical
- Fusion

Mechanical splicing

Mechanical splicing employs a splicing machine intended to splice single fibre and then mechanically join the two fibre ends. The splice is made in a relatively small enclosure which is typically pre-loaded with index matching gel. The index matching gel is placed in the splice to achieve high low loss.

Mechanical splices are best used for multimode fibres.

Fusion splicing

In fusion splicing the ends of the fibres are aligned either manually using manipulators and a microscope system for viewing the splice, or automatically using cameras or by measuring the light transmitted through the splice, and then adjusting the positions of the fibres to optimise the transmission. The ends of the fibre are then melted together using a gas flame or, more commonly, an electric arc.

There are two types of fusion splicing methods in use throughout the world today:

- Mass fusion
- Single fusion.

Mass fusion splicing is for splicing multiple fibres, such as ribbon fibres, in one operation

Single fusion splicing joins the fibres one at a time.

Near perfect splices can be obtained with losses as low as 0.02 dB (mechanical splice 0.2 dB).

Fusion splices give very low back reflections and are preferred for high speed fibres.

Fusion splicing uses expensive equipment and provides cheap splices; mechanical splicing uses less expensive equipment but provides more expensive splices.

5.6.3 Splicing defects

Splicing defects are illustrated in Figure 19

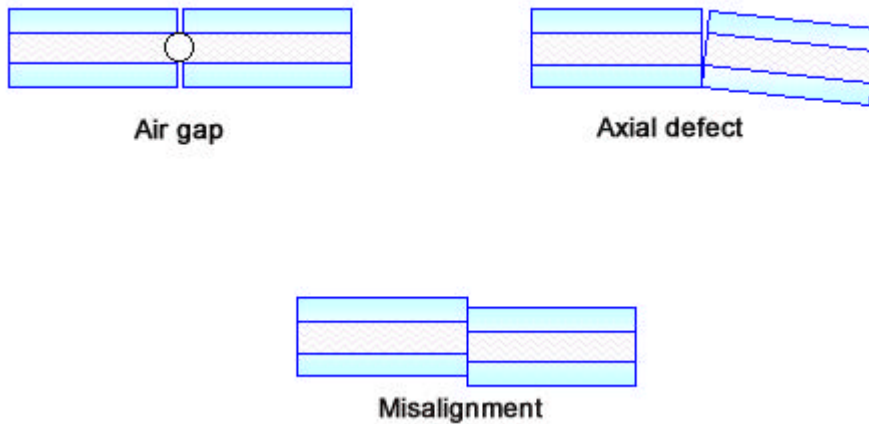


Figure 19 Splicing defects

#### 5.6.4 Testing the fibre optic cables

Using a Power Meter, the power that arrives to the far end of the fibre optic link is measured. This measurement is used to determine the total attenuation of the fibre optic link.

Backscattering is the more complete method for fibre optic transmission characteristics diagnostics and for the anomaly entity and position determination. The instrument used is called the OTDR.

A periodic optical pulse sequence is injected into the fibre optic link. The instrument determines the retro-diffuse power percentage.

The instrument is used to:

- Measure the total attenuation
- Verify the attenuation trend along the fibre optic cable and identify concentrated loss points.
- Show the loss results on the reflectometric diagram as a percentage variation.

If the measured optical connector attenuation is greater than 0.1 dB, the connections should be replaced.

---

#### Net

Appendix B provides detailed information on how to test the fibre optic installation.

---

#### 5.6.5 Cleaning the optical cables

Optical connectors are similar to eyeglass lenses and therefore can be degraded by dust particles, finger grease and scratches. The connector ferrule can be inspected by means of a microscope.



To clean the optical cables

1. Open the connectors.

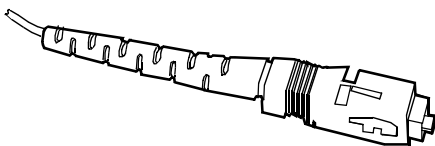


Figure 20. SCAP Connector

2. Apply a drop of cleaning liquid (pure alcohol) to the edge of then clean and dry it with a clean tissue, using a circular movement. Always use a clean tissue for each cleaning activity.
3. Remove any residue particles by using a clean dry air source.
4. Before reinserting the connectors, clean the adapter applying cleaning liquid into its center hole and removing it immediately with a clean dry air supply.
5. Reinsert the connectors into the adapter, avoiding any physical contact with the ferrules with fingers or with any other surface.

## 5.7 Connecting the cables to the Main Unit

The site will have been configured in accordance with the site requirements. The location of the Remote Units (RUs) within the building complex and the optic cables associated with each RU are identified.

---

### Net

Do not remove fibre optic cable connector covers until required to do so.

---

---

### Net

Do not bend the fibre optic cables beyond the recommended bend angle. This ensures that the cables are not stressed or damaged in any way.

---

Figure 5.7 shows the location of the MU cable connectors and the organised optical fibre cables.

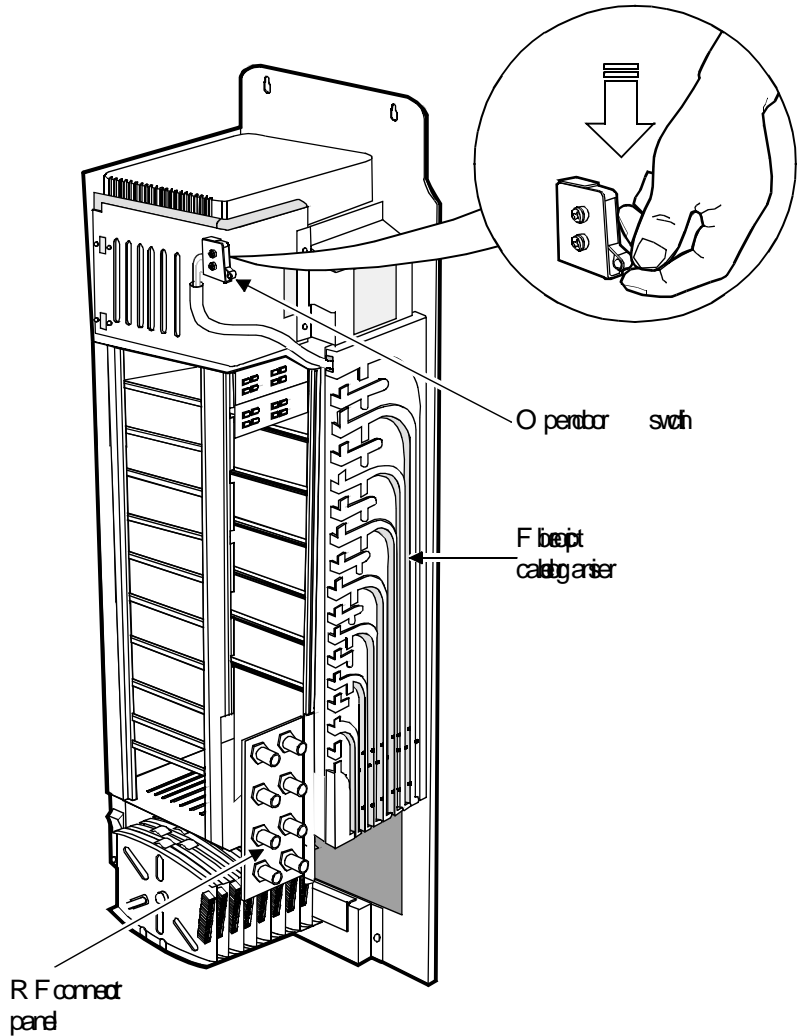


Figure 21. RF connect panel and optical switch

5.7.1 Connecting the fibre optic cables



WARNING

All fibre optic related work activities must only be performed by qualified and approved personnel.

5.7.1.1 Configurations

Two configurations are possible:

- Point-to-point
- Point-to-multipoint.

#### Point-to-point mode

The MU is installed in the centre of the building. Twin fibre optic cables connect each RU to the MU.

#### Point-to-multipoint mode

The main fibre optic cable contains up to 64 optical fibres. An RU is connected to the MU by separating the fibres from the main cable using a distribution block.

### 5.7.1.2 Connecting the fibres between the Local Unit and the Remote Unit



#### WARNING

All fibre optic related work activities must only be performed by a qualified and approved personnel.

Figure 5.7.1.2 shows the MU fibre optic cable channeling.

#### Note

Pigtails are used between the Local Units (LUs) and the splice cassette. The pigtails are arranged in the splice cassette box.

In the case of RUs, pigtails are used between the RU and the splice cassette. The pigtails are arranged inside the splice holder.



To connect the fibre optic cables:

1. Locate the fibre optic cables from the RUs.  
Check the following:
  - Each cable has an identifying label.
  - The cables are long enough for the splicing operation.
2. Check that the splicing tools are available and arrange the splicing area.
3. Check that every LU is correctly plugged into the MU.
4. Starting from the LU at the top of the MU (LU 1), select the corresponding labelled pigtail. Remove the connector cap.
5. Clean the optical connector and connect the pigtail to the corresponding LU.



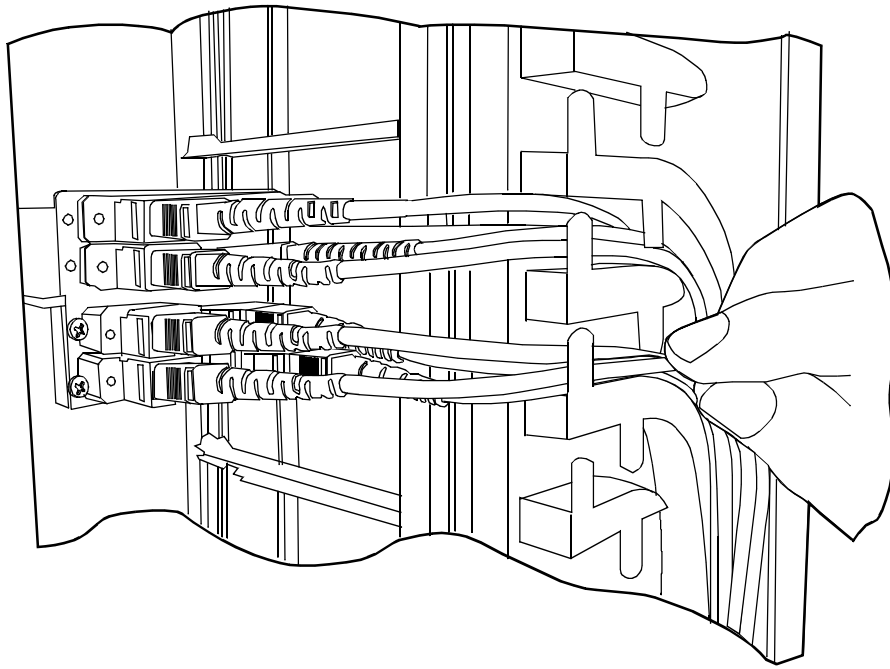


Figure 22 Arranging fibre patch panel

6. Arrange the pigtail in the correct cable channel in the fibre organiser. If required, cut the pigtail to the correct length.
7. Locate the corresponding fibre from the RU. Splice the fibre pigtail.
8. Open the splice cassette box by levering open the plastic top of the cassettes using a screwdriver. Shown in Figure 22.



Figure 23. Opening splice cassette

---

### Net

The splice cassette box contains eight cassettes. The box can be opened by cassette.

---

9. Arrange the splice and the loose fibre into the first cassette in the splice cassette box. Leave extra fibre, so that the cassette can be easily removed.

---

### Net

Each cassette holds the splices for one LU. For each LU there are 16 splices.

---

10. Repeat steps 4 to 9 for the remaining pigtails and the fibres. Figure 24 provides an example of how the fibres are arranged.

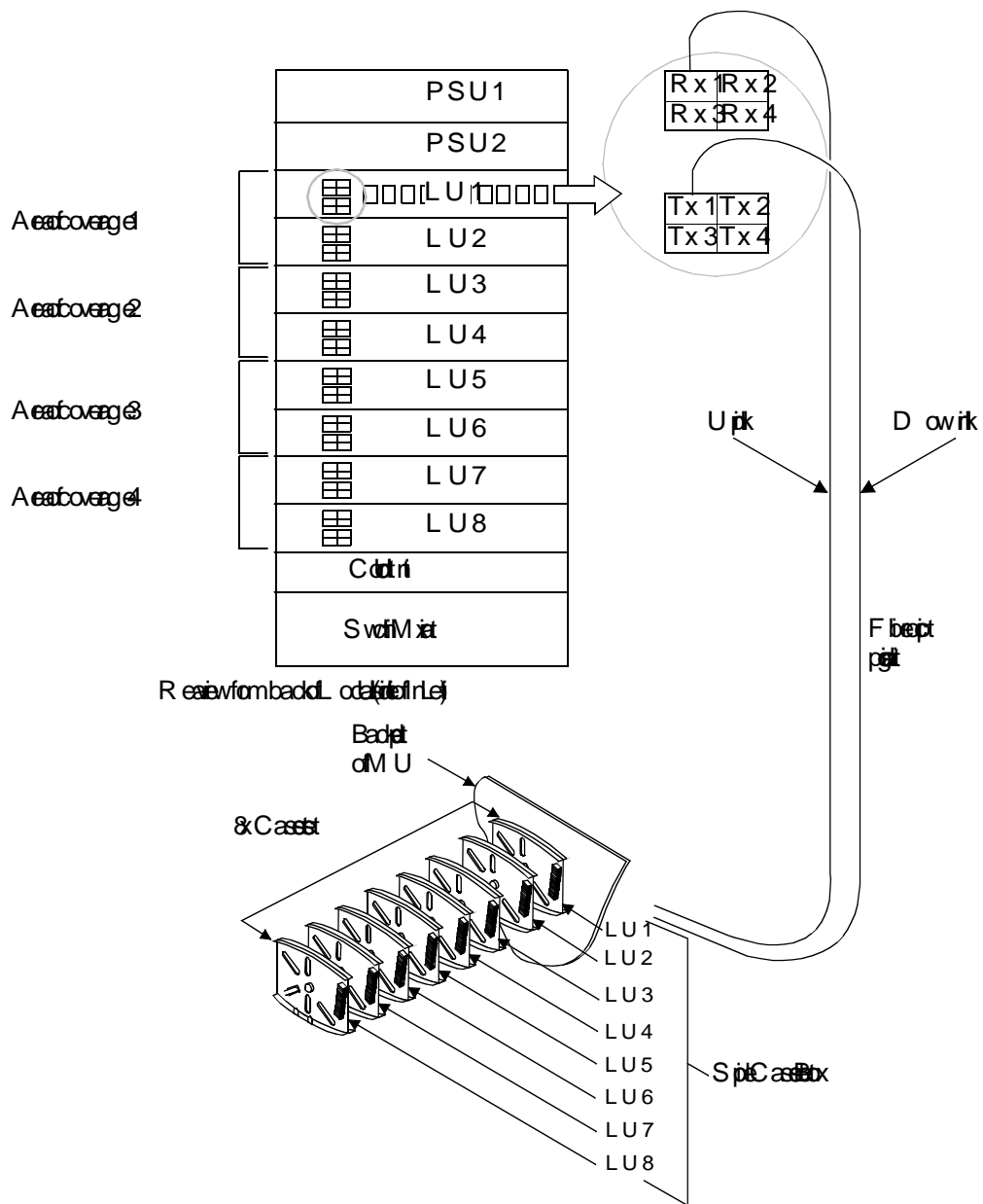


Figure 24. Communication

## 5.8 Installing the RUs

### 5.8.1 Pre-installation actions

Prior to installing the RUs, it is important that the site has been sufficiently to accommodate the equipment. Particular attention should be given to the following:

- Fibre optic cable lengths and type. The cables should be of a suitable weight, suitable bend radius and capable of withstanding tensile installation. The length of the cables will be determined by the coverage attainable by the strategic location of the RUs within the complex.
- Fibre optic cable terminations. These can be supplied suitably (cable lengths need to be known in this case) or cables can be terminated and then, by cable splicing, short cables provide connectors can be attached.
- The fibre optic cable connectors used must be angle-polished type connectors. Fusion splices to connect fibres are also suitable.
- RU locations. The most efficient manner for locating RUs is the minimum number of RUs for optimum cell coverage. The position of RUs must ensure the maintenance of their operating temperature.
- Power supply availability.
- All cables must be clearly labelled.
- The system configuration must be adequately documented.

### 5.8.2 RU IP41 Installation

Figure , shows the external interfaces of the RU.

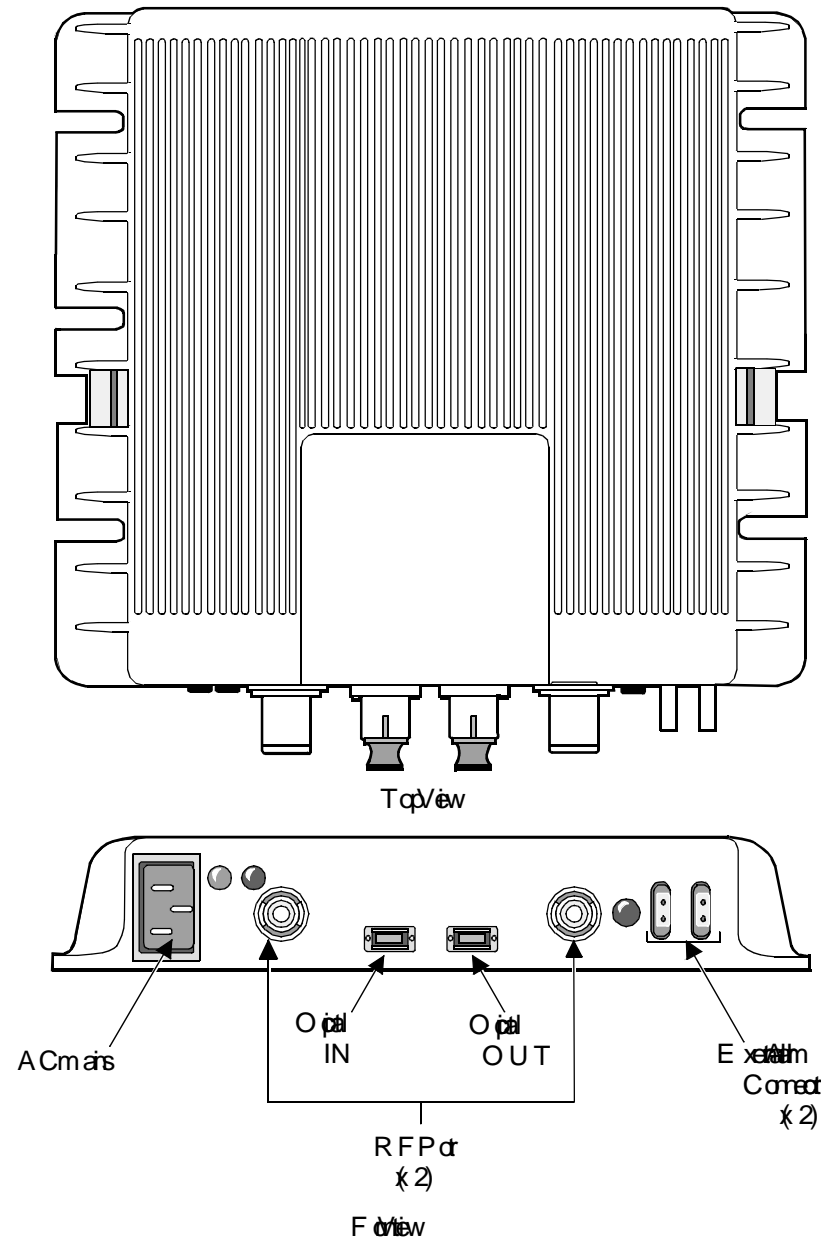


Figure 25. Remote RRU

Figure shows a typical installation configuration within a bu

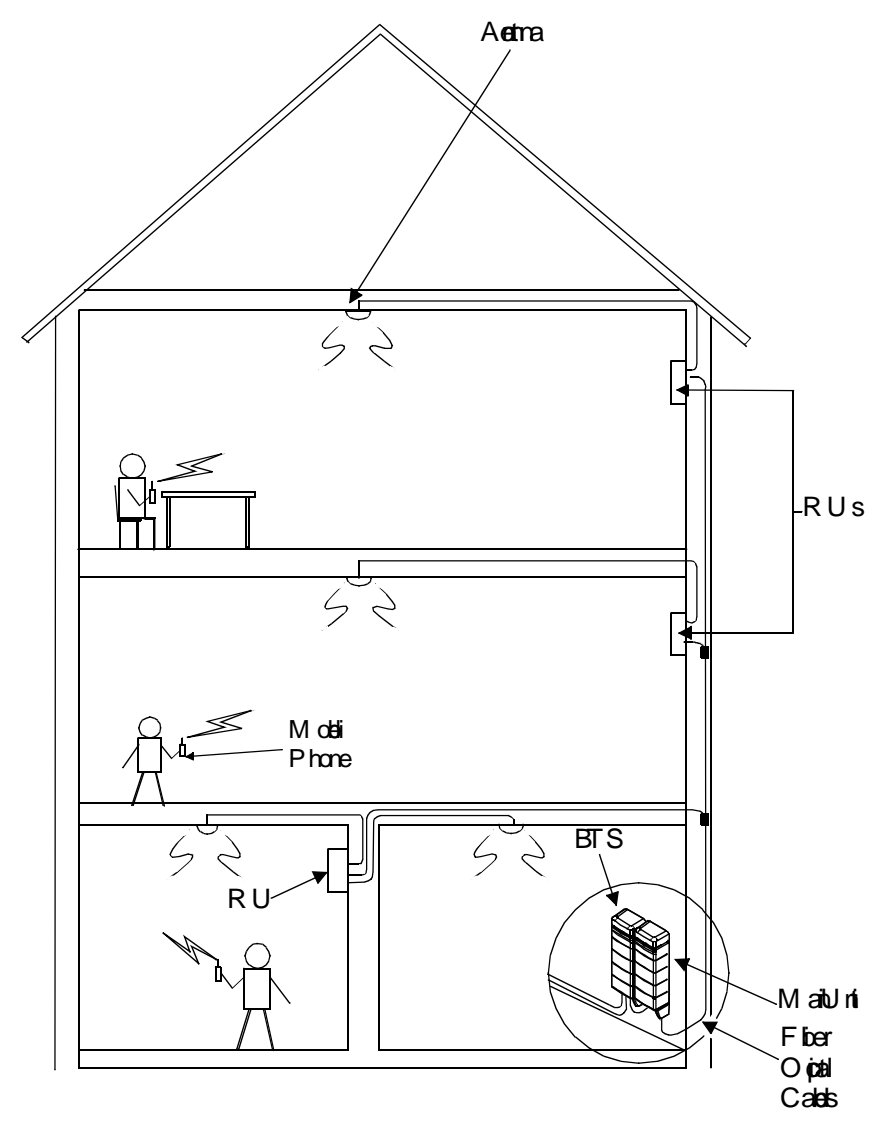
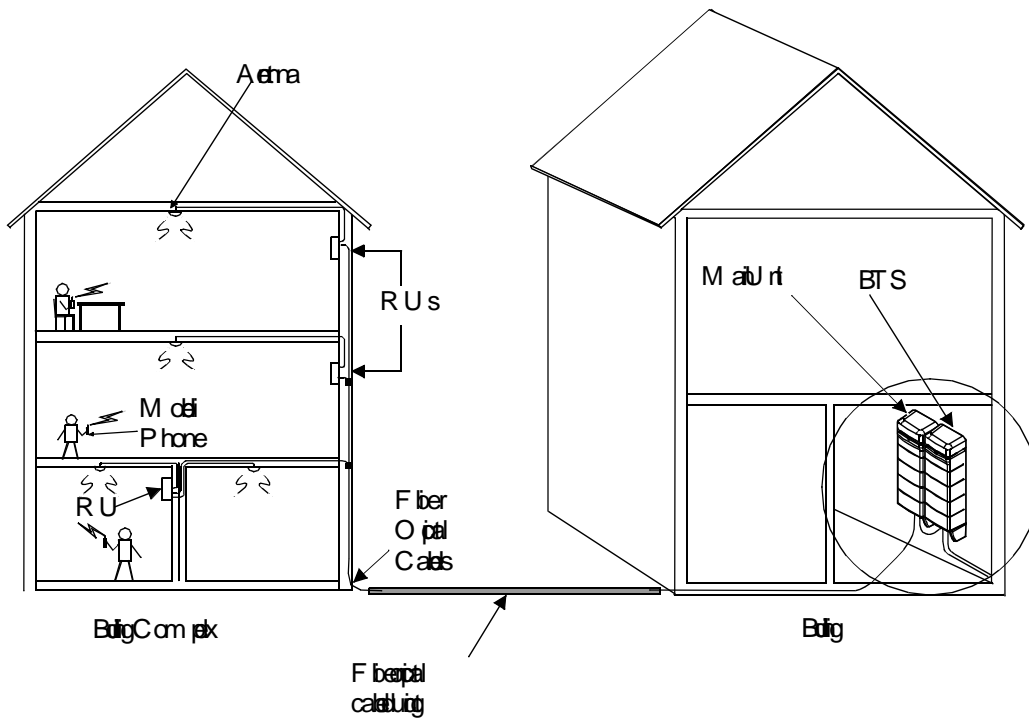


Figure 26. Network configuration in a building (typical)

The MU and the RUs do not have to be co-located in the same building; this shows a typical example of this type of installation configuration.



Net Max in um d h o r e m a n d R e m e d i a t i o n

Figure 27. Main and RU site buildings.



Installing the RU IP41, mounting rack and antennas:

**Net**

It is most important that the documentation showing the layout cable identification is consulted at all times.

1. Locate the holes drilled for the mounting of the RU or loc pole.

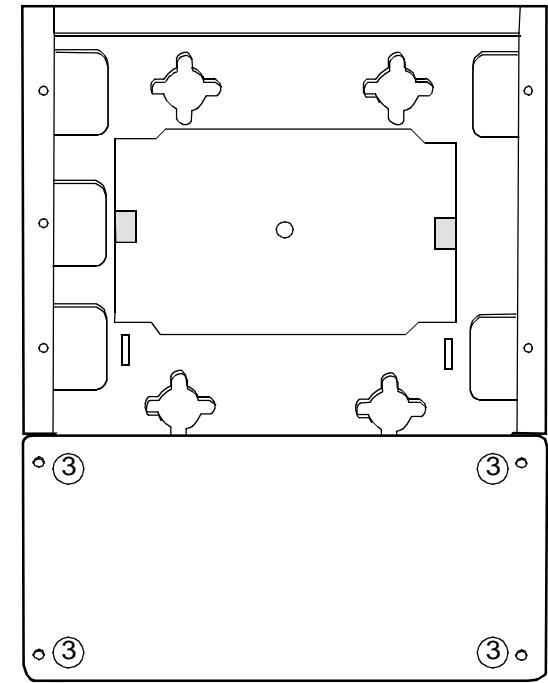


Figure 28. Remove mounting rack

2. Remove the four M3 x 20 mm screws (3) holding the mounting rack cover in place and remove the cable cover.



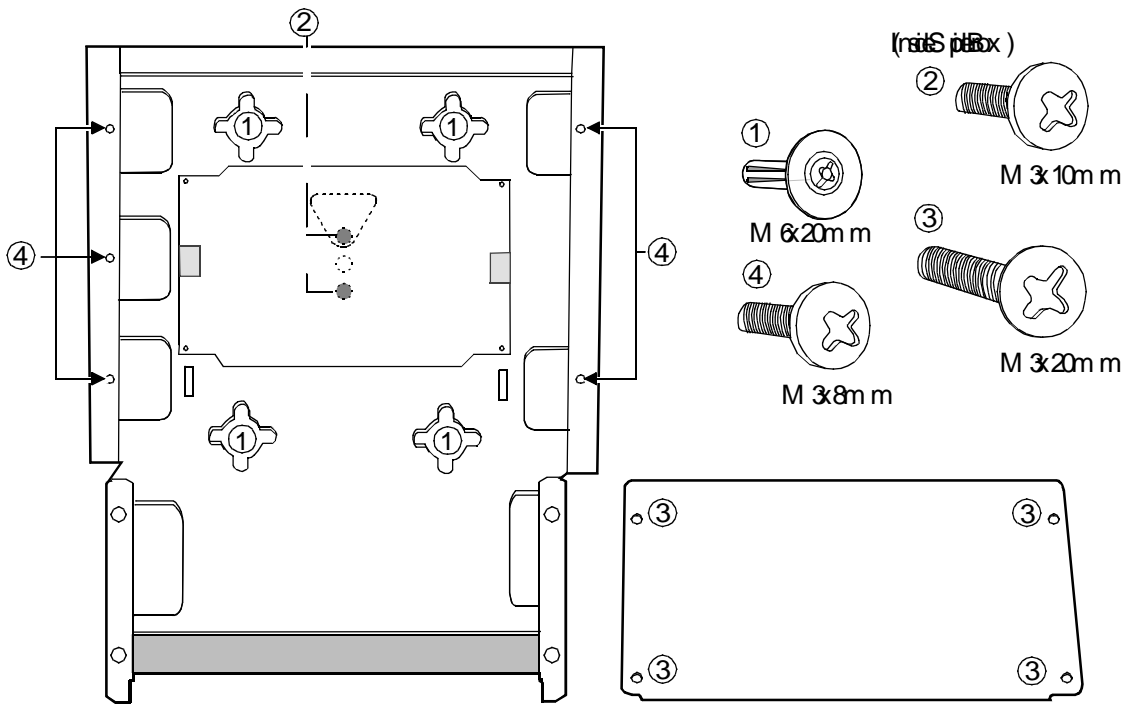


Figure 29. Remplacement des accessoires

3. Fix the mounting rack to the wall at the designated position using M6 x 20 mm Fisher screws
4. Open the splice tray cover and fix the splice holder using screws (2).

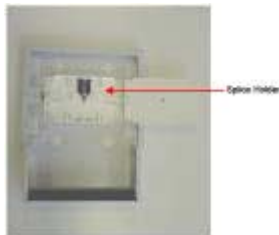


Figure 30. Remplacement des accessoires

5. Arrange the optical splices in the splice holder and close the cover.

- 
6. Fix the Remote Unit into the mounting rack using the five M3 x screws provided.
  7. Connect the antenna cable between the antenna and the RU. Up to 4 antennas can be connected to the RU. Ensure that the antenna cables are neatly routed and secured.

---

### Notes

If only one antenna is connected, use a 50 ohm termination for the unused connector.

---

---

### Notes

Do not over-tighten the connectors. If N-type connectors are used, hand tight is sufficient.

---

8. Connect the FO cables (uplink and downlink) to the RU.
9. Connect the power cable to the RU.
10. Screw the mounting rack cable cover in place, using the four M3 x 3 (3) provided.

## 5.8.3 RU IP53 Installation



Installing the RU IP53, mounting rack, mounting rack cover and antennas

---

### Notes

It is most important that the documentation showing the layout of the cables and cable identification is consulted at all times.

---

1. Locate the holes drilled for the mounting of the RU or locate the mounting pole.

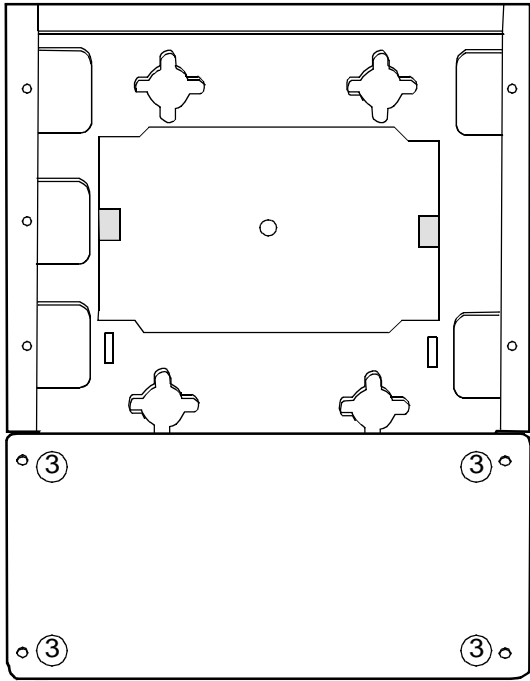


Fig. 81. Remontirozpak

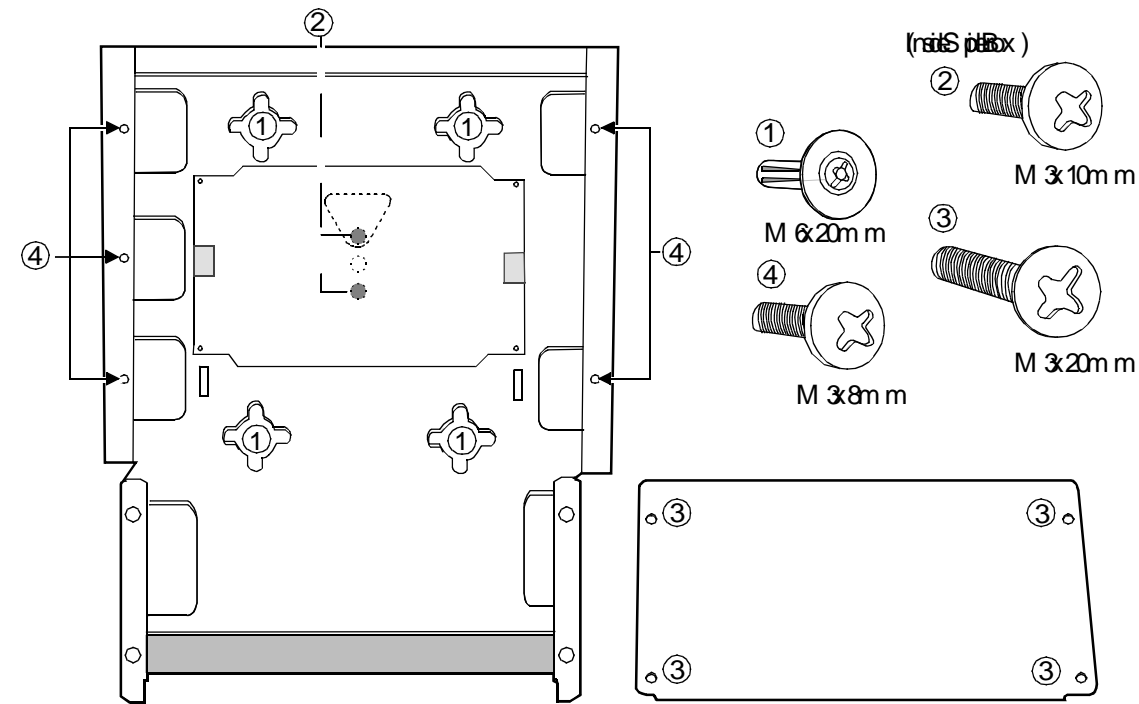


Figure 2 Removal of the unit from the mounting rack

2. Remove the cover of the mounting rack.
3. Fix the mounting rack to the wall at designated position using x 40 mm Fisher screws provided.
4. Open the splice tray cover and fix the splice holder.
5. Arrange the optical splices in the splice holder and close the
6. Fix the RU into the mounting rack using the five M3 x 8 mm scr provided.

- 
7. Connect the antenna cable between the antenna and the RU. antennas can be connected to the RU. Ensure that the antennas are neatly routed and secured.

---

#### **Net**

If only one antenna is connected, use a 50 ohm termination for connector.

---

---

#### **Net**

Do not over-tighten the connectors. If N-type connectors are used, the torque applied by hand is sufficient.

---

8. Connect the FO cables (uplink and downlink) to the RU.
9. Connect the power cable to the RU.
10. Screw the mounting rack in place, using the four M3 x 20 mm screws.
11. Insert the enclosure cover by sliding it downwards from the top of the backplate along the bars on both sides of the backplate.
12. Secure the cover to the wall using one M6 x 40 Fisher screw.

### 5.8.4 RU IP64 Installation



#### Installing the RU IP64

---

#### **Net**

It is most important that the documentation showing the layout and cable identification is consulted at all times.

---

1. Locate the holes drilled for the mounting of the RU or location pole.
2. Remove the ten M5 x 16 screws from front of the RU cover to allow the cover to be removed from the enclosure and open the cover.
3. Fix the enclosure backplate to the wall at designated position using the M6 x 40 mm Fisher screws provided.
4. Open the splice tray cover and fix the splice holder.
5. Draw the optic cables very carefully into the enclosure through the holes devoted to them.
6. Arrange the optical splices in the splice holder and close the cover.
7. Connect the FO cables (uplink and downlink) to the RU.

- 
8. Connect the antenna cable between the antenna and the RU. Up to 4 antennas can be connected to the RU. Ensure that the antenna cables are neatly routed and secured.

---

### Notes

If only one antenna is connected, use a 50 ohm termination for the unused connector.

---

---

### Notes

Do not over-tighten the connectors. If N-type connectors are used, a torque wrench is sufficient.

---

9. Connect the power cable to the RU.
10. Close the enclosure cover and secure it to the backplate using the screws provided.

## 5.9 Connecting the RF cables



To connect the RF jumper cables

---

### Net

The RF connectors on the MU connector panel are numbered (1-8)

---

---

### Net

Do not connect the RF jumper cables to the BTSs until required Inlite System commissioning phase. For more information, refer to [Nokia Inlite Commissioning](#)

---

1. Obtain the appropriate number of RF jumper cables (eight in their transportation package. The connectors have angled type).
2. Connect the RF jumper cable to the MU and connect it to the RF connector on the RF panel. Take care not to over bend or tighten the connector.
3. Repeat steps 2 and 3 for the remaining RF jumper cables.

Figure 33 shows two RF cables connected to the RF panel

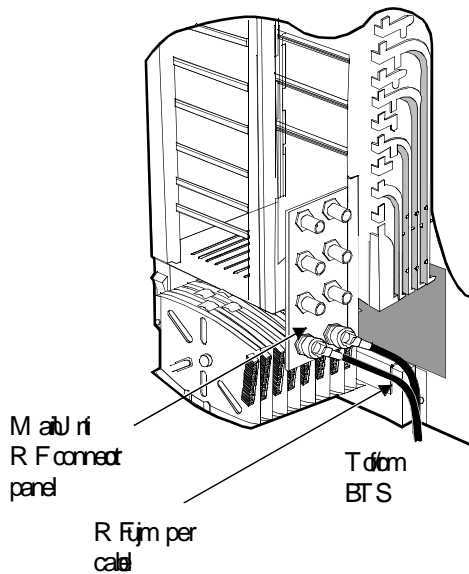


Figure 33. RF jumper cables connected to MU RF

## 5.10 Connecting the power

More information on the power connection is provided in Requirements for Installation and Operation information on the power cable requirements. Refer to: Product Description

### 5.10.1 Remote Unit

The RU can be supplied by a central power supply (-48 VDC) or a local (110 VAC or 220 VAC). Connect or switch on the power to the RUs.

### 5.10.2 Main Unit

The Main Unit has a fixed power cable for 110 VAC or 220 VAC power. The appropriate plug should be connected. For more information about the power supply cable, refer to the Nokia Product Description.

Switch the Main Unit power on.

## 5.11 Connecting the local management PC

### 5.11.1 Connecting the PC



To connect the PC and start the Supervisor Software

1. Connect the LMP cable to the LMP connector of the Main Unit and laptop PC.
2. Start the PC and the Supervisor Software.

---

#### Net

For more information about the Supervisor software, refer to the Nokia Commissioning

---

### 5.11.2 Checking the alarm status

If the FO cable connections between the RU and MU have been made correctly, the only alarm which should be active when the software is started is the door alarm. This alarm can be deactivated by manually operating the alarm switch (see Figure ) the alarm should then be cancelled.



If other alarms are active, Alarm Description

---

### Net

It is possible at powerup, the BkUp alarm will be active. If t  
click the BkUp button in the main window of the Supervisor soft  
the BkUpwindow. The alarm should now be cancelled.

---

#### 5.11.3 Recording RU and MU placing

Record the location of the MU and RUs in the Main Unit and Rem  
Placing window of the Supervisor Software.

More information on the software Nokia provides: Commissioning

#### 5.12 Labelling the fibre optic cables

Label every FO cable at the RU and LU ends.

The label at each end should provide the following information

- Floor/building where the RU is located
- RU number
- Downlink or uplink.

#### 5.13 Fitting the Main Unit cover

---

### Net

This procedure is carried out after the Nokia Inlite System ha  
commissioned.

---

The assembly comprises:

- Cable cover
- Cable cover support
- MU cover
- Plastic cover lock

The main cover and cable cover are shown in Figure .



To fit the Main Unit cable cover support, cable cover and cover

1. Obtain the cable cover support and secure to the bottom right of the MU backplate using the M4 nut and shakeproof washer provided. The cable cover support is located via a stud on the backplate.
2. Obtain the cable cover and holding the cables such as to allow the cover to pass over them, push the cable cover back then down until it is in position on the cable cover support.
3. Lift the MU plastic cover and carefully slide it over the enclosure. At the same time ensure that the cable cover locking pieces are aligned with the recesses on the backplate.
4. Ensure that no cables are trapped between the unit and the backplate.
5. Press the cover in position onto the MU backplate.
6. Push the cover down from the top and at the same time keeping it firmly pressed against the backplate, make sure that all cable cover pieces are securely located in the backplate recesses.
7. Insert the locking assembly in position as shown in Figure . Using the key provided, lock the plastic cover in position.

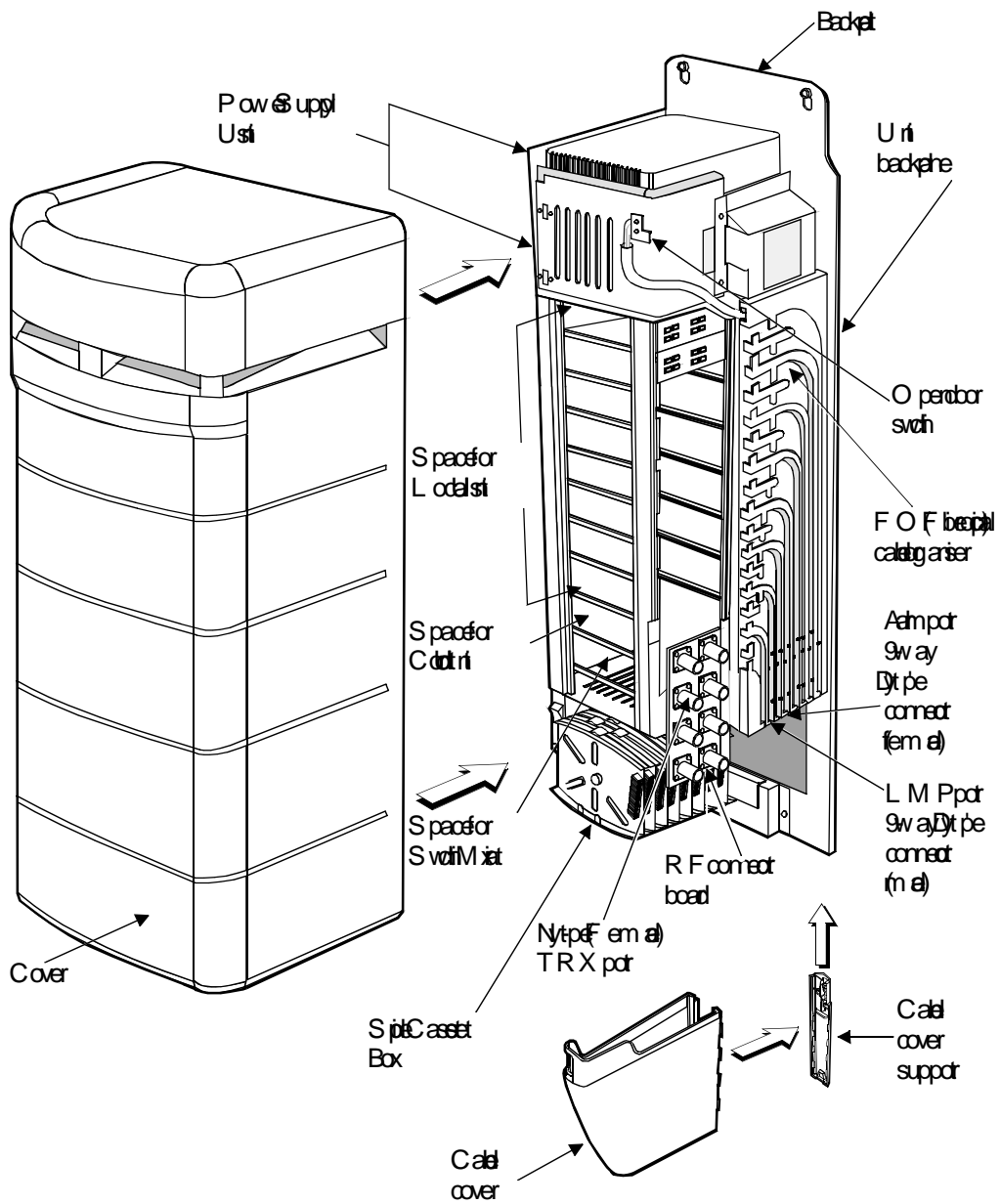
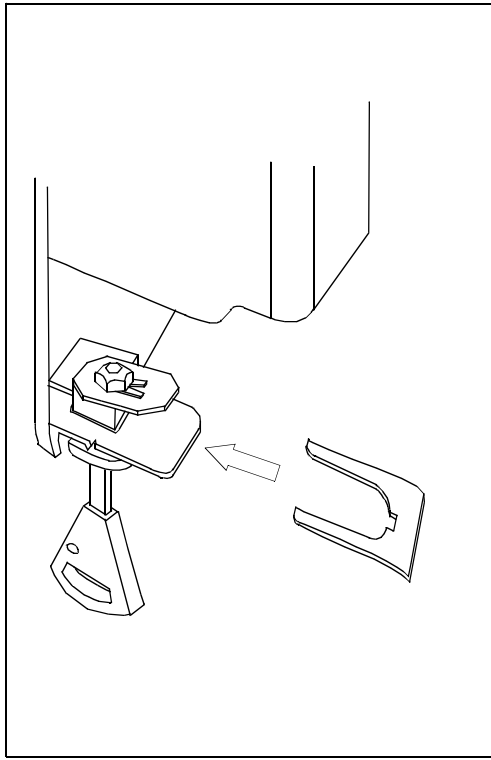
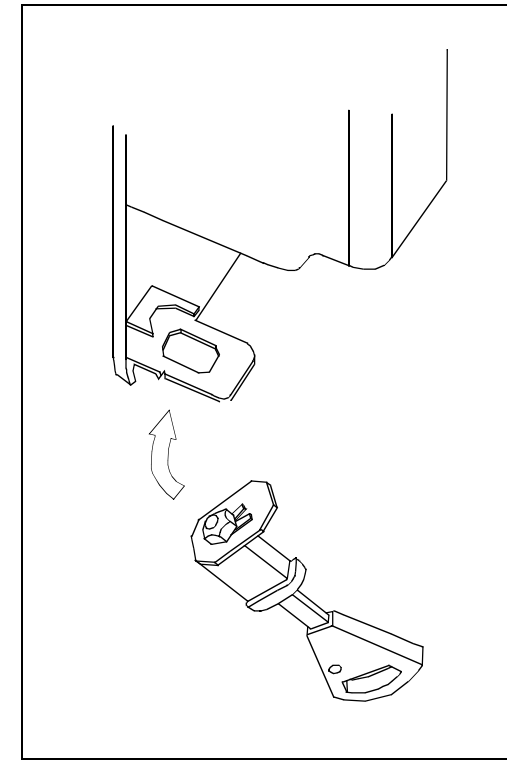


Figure 24. Mobile phone cover



D N 00280774

Figure 55 Lock cover

## 5.14 Installation checks



To check that installation of the Nokia Inlite System has been satisfactorily completed:

Check the following:

1. The RUs were installed in accordance with this document.
2. The MU was installed in accordance with this document.
3. The fibre optic cables have been correctly installed.
4. All FO cables have been tested.
5. There are no alarms in the LU and RU windows of the Supervisor Software.

- 
6. The cables between the RUs and LUs of the MU have been corrected according to this document.
  7. All fibre optic and RF cables have been correctly labelled
  8. Information for the Main Unit and Remote Unit Placement windows recorded and entered.

## Appendix A Technical instructions for optic fibre installation testing

### A.1 Scope

This Appendix describes the test procedure to be performed after the installation of fibre optic cables.

### A.2 Acronyms

Acronym	Meaning
SM	Single Mode
OTDR	Optical Time Domain Reflectometer
TPA	Two Point Attenuation Measurement
MTAV	Maximum Test Attenuation
ACR	Attenuation Compliance Requirement
UL	Up-link
DL	Down-link
RL	Return Loss

Table A.2 Acronyms

### A.3 Test activities definition

Test activities on fibre optic cabling are required in order to verify that the installation procedures and relevant optical material fulfil all the requirements and are compliant with the aims of the optical distribution system for which it is designed.

Installation tests shall check the optical system performances and shall be carried out following these steps:

- Test Measurements
- Compliance Declarations.

Test measurements results are required for fibre optic attenua evaluation; for any other specification, the Subcontractor has declaration of compliance referring to each technical constrai Section 5 of this Appendix.

#### A.4 Installation Test Measurements

This section describes the optical tests to be carried out dur: verify the compliance of the system with the technical require Section 5 of this Appendix.

The Subcontractor has to perform measurements on 100% of fibre in the system.

The optical signal at 3rd window (1550nm) has to be assumed as value for each measurement to be performed:

- Optical Attenuation Evaluation
- Optical Length Evaluation
- Back-reflected Power Diagram.

Section 6 of this Appendix shows a measurement report model bo attenuation and length evaluation; a copy of back-reflection d included in the installation test documentation.

The technique used is the Two-Point Attenuation measurement (T as illustrated in Figure .

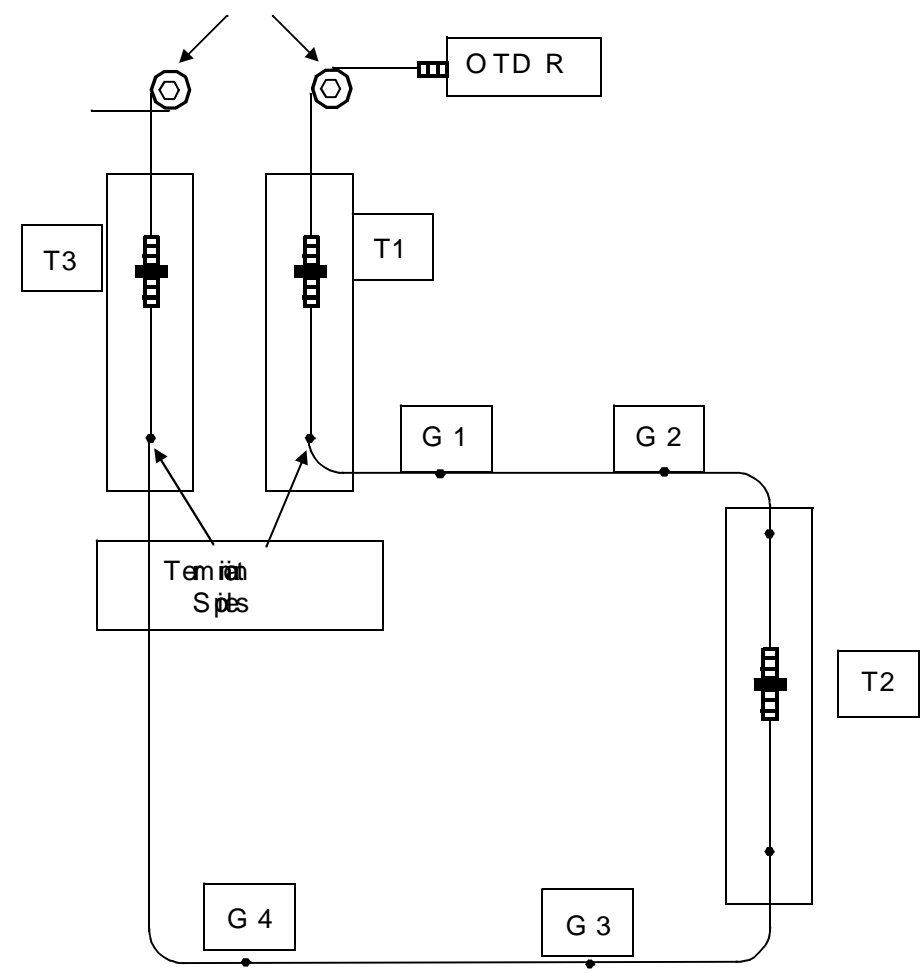


Figure 36. Illustration of an OTDR on a Ring (OTDR)

#### A.4.1 Optical Attenuation Measurement

The Subcontractor has to provide a report on optical attenuation measurements in order to guarantee that the attenuation of each fibre optic is not a theoretical value due to theoretical evaluation (MTAV) based on acceptance parameters. Measurements, carried out by means of OTDR using the back-reflected light technique, have to be as required for single-mode fibre. Two fibres



at least, called "launching fibres") must be connected with both ends so that connector attenuation is included in the measurement results.

**Net**

The measurement must be performed as follows:

1. Connect OTDR to one end of the fibre optic cable and perform a measurement.
2. Connect the OTDR to the other end of the fibre optic cable and perform a measurement.
3. Average the two measurement results to obtain the real optical loss.

The MTAV reference value is determined basing on the following formula:

$$MTAV = (\alpha \times L + S_n \times S_a) + C_n + C_a$$

Figure 37. MTAV formula

Where ...	Represents	Value
$\alpha$	Fiber optical loss coefficient (reference average 0.2 dB/km)	dB/km
L	Length of fiber under evaluation (L = D + L')	Km
$S_n$	Number of splices	-
$S_a$	Reference splice loss provided in the specification	dB
$C_n$	Number of connectors	-
$C_a$	Reference connector loss	dB

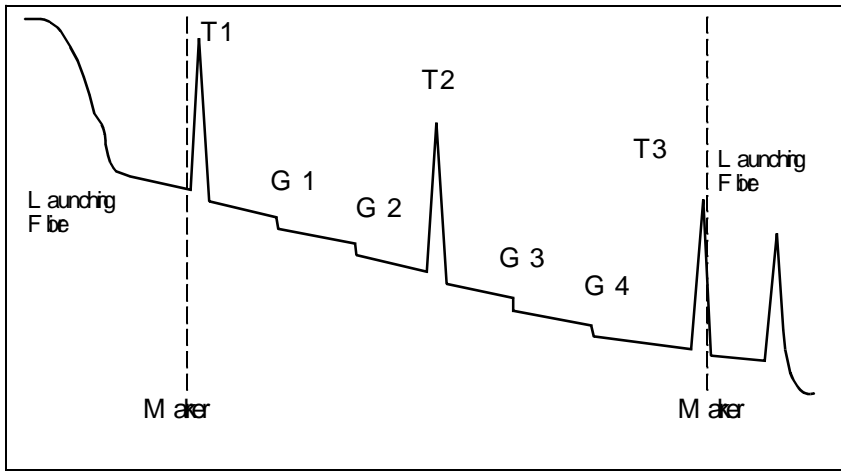


Figure 8. Optical measurement (OTDR)

A.4.2 Optical length measurement

Power back-reflection technique has to be assumed as the reference computing the fibre optic length.

The Subcontractor has to carry out an end-to-end measurement report optical length using the model shown in Section 6, which has to be in installation test documentation.

A.4.3 Back reflected power diagram

Fibre optic attenuation has to be uniformly spread without any high per the technical specification described in Section 5. The condition tested and reported by means of the back-reflected power diagram in installation documentation.

A.4.4 Optical link check

In order to verify installation activities and tests not to cause a between uplink and downlink, a link check by means of a visible optical required, even if no test report must be provided by the Subcontractor.

Figure shows how to connect the Optical Source and the Power Meter to perform the link check for uplink and downlink.

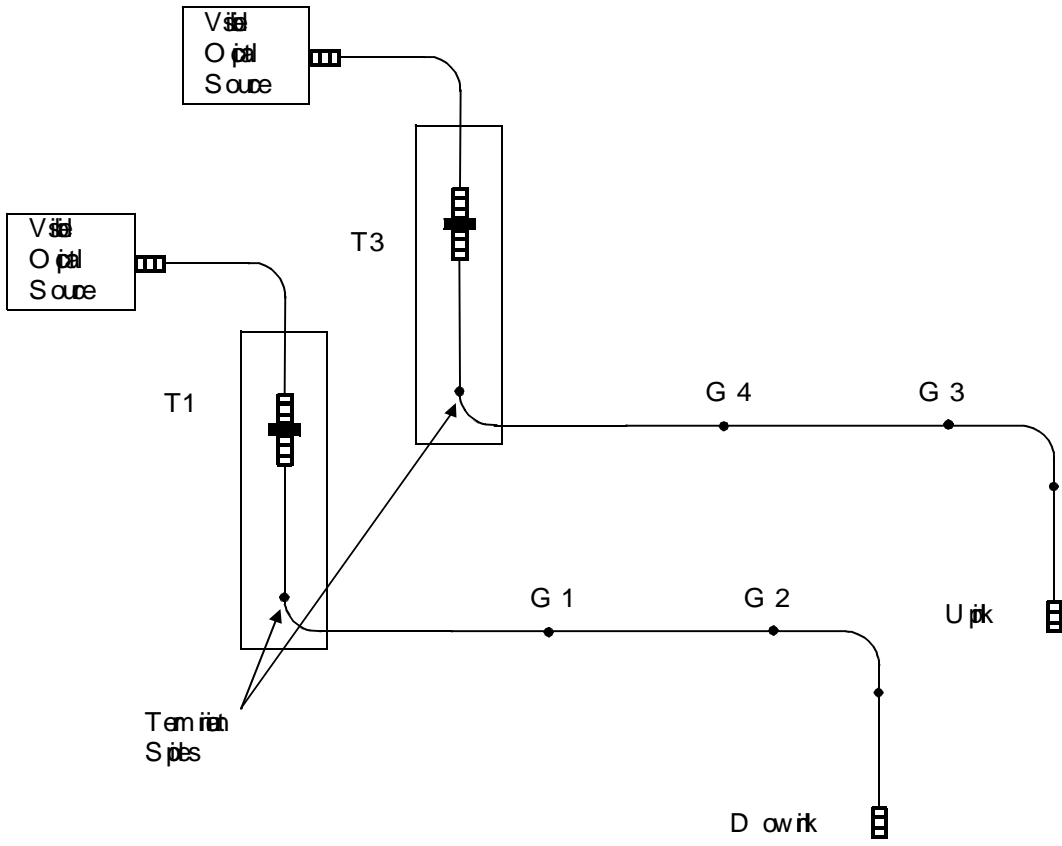


Figure 9. Compliance power net

## A.5 Compliances

A declaration of compliance is required from the Subcontractor technical specifications included in this chapter.

All the activities are supposed to be compliant with specific Subcontractor is responsible also for all of them, even if not

Splices on fibre optic cables have to be carried out by means semiautomatic devices, so that to provide efficiency of the operation for the technical specification included in this appendix.

Installation procedures, materials and equipment must be compliant requirement concerning the adoption of the fusion splicing technique.

However, a preliminary agreement with the Project Manager is required in these aspects.

Definition Attenuation Compliance Requirement is the maximum value due to a single component in the optical connection.

### A.5.1 Fibre optic

Specification	Value
Fibre type	SM R (125 $\mu\text{m}$ )
Wave length (nm)	
I bandwidth	1310 $\pm 10$
II bandwidth	1550 $\pm 10$
Splice loss (dB m)	
I bandwidth	0.10
II bandwidth	0.22
High speed (dB)	$\leq 0.1$

Table 1. Fibre specifications

### A.5.2 Splice and connector

Specification	Value
Splice AC R (dB)	$< 0.2$
Connector AC R (dB)	$< 0.5$
Connector L (dB)	$\geq 55$

Table 2. Splice and connector specifications

### A.5.3 Measurement parameters

Time-domain impulse to perform back-reflected power technique measurement has to be chosen in connection with the fibre optic length, in order to ensure measurement result reliability (See Table 10).

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Specification	Value
Reference [1]	1675
Weight [1]	1550

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A.6 Installation test document (example)

OPTICAL TEST

PAG \_\_\_/\_\_\_

Project \_\_\_\_\_ Company \_\_\_\_\_

Company Test
  Verification

**MEASUREMENT PARAMETERS**

Wavelength  $\lambda$  [nm]: \_\_\_\_\_

Refractive Index n: \_\_\_\_\_

TOTAL ATTENUATION AND OPTICAL LENGTH MEASUREMENTS

Theoretic Attenuation =  $[(\alpha \cdot L) + (S_a \cdot S_n) + (C_a \cdot C_n)]$  [dB]

Remote Unit Code	Fibre optic	Computed Att. (dB)	Total Att. (dB)	Optical Link Length (m)	Remote Unit Code	Fibre optic	Computed Att. (dB)	Total Att. (dB)	Optical Link Length (m)
	UL					UL			
	DL					DL			
	UL					UL			
	DL					DL			
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	DL					DL			
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Company Verifier Signature \_\_\_\_\_ Date \_\_\_/\_\_\_/\_\_\_

Verifier Signature \_\_\_\_\_ Date \_\_\_/\_\_\_/\_\_\_

Figure 0. ~~Open~~