

Allgon Microwave Radio

Installation Manual

IMPORTANT NOTICE

This document is subject to revision without notice.

Allgon AB have no liability for typing errors in this document or damages of any kind that result from the use of this document.

Read this manual carefully before installing the Allgon Microwave Radio equipment and follow any and all instructions set forth herein. Non-compliance with, or non-observance to the instructions set forth in this manual may cause personal injury or damage to property and may be illegal. Allgon AB and its subsidiaries disclaim any and all liability in case of non-compliance with, or non-observance to the instructions set forth in this manual.

© Allgon System AB 1999 – All Rights Reserved

Contents

Introduction	5
Applicable Documents	5
Document Information	5
Syntax	6
Site Requirements	7
Safety Requirements	7
Indoor Requirements	10
Outdoor Requirements	13
Indoor Installation	16
Tools Required for Indoor Installation	16
Indoor Equipment	17
Indoor Accessories	18
Baseband Unit	19
Traffic Interface Unit	20
Mounting the Indoor Unit	24
Grounding the Indoor Unit	27
Installing the Cables for the Indoor Unit	28
Outdoor Installation	34
Tools Required for Outdoor Installation	34
Outdoor Equipment	34
Choosing Vertical or Horizontal Polarization	35
Integrating Antenna Unit and Radio Frequency Unit	36
Choosing Left or Right Side Antenna Mounting	37
Fastening the Mast Mounting Bracket	38
Mounting the Integrated Antenna/Radio Frequency Unit	39
Grounding the Antenna/Radio Frequency Unit	40
Outdoor Radio Cable Installation	40
Start-up and Configuration	42
Equipment Required for Configuration	44
Status LEDs	47
Start-up and Shut-down	48
Local Management Connection	49

Initial Radio Terminal Configuration	58
Remote Management Connection	68
Antenna Alignment	80
Tools Required for Antenna Alignment	80
Preparations	80
Alignment Procedure	81
Installation Verification and Test	83
Checking RF Path Status	83
Index	85

Introduction

Applicable Documents

WLDM001	Installation Manual This manual describes the installation of the Allgon Microwave Radio including start-up and configuration.
WLDM002	Operation and Maintenance Manual This manual describes how to use a web browser interface to manage the Allgon Microwave Radio. It also contains instructions for troubleshooting and maintenance.
WLDM003	Technical Description This document contains a detailed technical description of the Allgon Microwave Radio product range.
WLDM004	Product List This document lists all equipment and accessories for the Allgon Microwave Radio.

Document Information

This manual and all documents listed above cover the complete Allgon Microwave Radio product range:

- Baseband Unit (WAABxxx/yy)
- Traffic Interface Unit (WAADxxx/yy/zz)
- Radio Frequency Unit (WAAAxxyy/zz)
- Antenna Unit (WAACxxx/yy/zz)
- Accessories (WMxxyy/zz).

The letters x, y and z in the product numbers listed above are variables that depend on the product variant. For further details concerning product numbers, refer to the respective section in this manual and the Product List (WLDM004).

All documents, including this manual, also use the ITU standard designations for traffic channels. However, the information is also valid for ANSI standard applications if not otherwise noted.

Syntax

The following typing conventions are used throughout this manual:

"Select"	Prompts the user to perform a selection on the screen by clicking on an active object.
"Enter"	Prompts the user to type text using the keyboard.
"Press"	Prompts the user to press a button on the keyboard.
"Check"	Prompts the user to click in a check box to activate an option.
<code>command</code>	Prompts the user to enter the command <code>command</code> .
<code><variable></code>	Prompts the user to enter a value for the variable <code><variable></code> .
<code>[<variable>]</code>	The user may enter a value for the variable <code><variable></code> but is not required to.
<code><variable1></code> <code><variable2></code>	The user may enter a value for either the variable <code><variable1></code> or the variable <code><variable2></code> .
<code>response</code>	Text displayed in response to an executed command.
Request	Prompts the user to perform a specific action or enter a specific value.

Site Requirements

Safety Requirements

Terminology

This manual contains two kinds of safety warnings which represent different degrees of danger:



CAUTION!

This warning is used for dangers which could cause injuries to personnel or damage to the equipment if ignored.



DANGER!

This warning is used for dangers which could cause life-threatening injuries to personnel or destroy the equipment if ignored.

Safety Precautions

- Access to the Allgon Microwave Radio shall be restricted to service personnel.
- Observe the safety warnings and take all precautions listed in this manual.
- Follow the installation procedures in this manual and use the correct tools, preferably the recommended tools, for tightening of nuts etc.

Site Requirements

- Do not use any components (screws, nuts etc.) other than those delivered together with the Allgon Microwave Radio equipment or recommended by Allgon AB.
- Use the necessary safety devices (helmet, safety line etc.) when working on, or around the mast. Be aware of the risk of falling objects. Secure the integrated Antenna/Radio Frequency Unit before lifting it up the mast.

Beryllium Oxide

Some components in the Radio Frequency Unit contain beryllium oxide (BeO) which is poisonous if inhaled as dust or smoke. This can only happen if these components are damaged in some way. The product is completely safe as long as the components are not damaged.

Warning signs indicate parts containing beryllium oxide.



Beryllium
oxide
hazard

DANGER!

Do not file, grind, machine or apply acid to parts containing beryllium oxide!

Voltage Hazards



DANGER!

All safety precautions must be carried out! Contact with power lines can be lethal! Even voltages below 60 V can be dangerous!

Grounding

It is recommended to ground all equipment before the power cable is connected.



CAUTION!

All indoor and outdoor grounding systems on the installation site must meet the requirements of the applicable national standards!

Electrical Safety

The Allgon Microwave Radio equipment meets the electrical safety requirements in EN 60950.

Indoor Requirements

Indoor Space Requirements

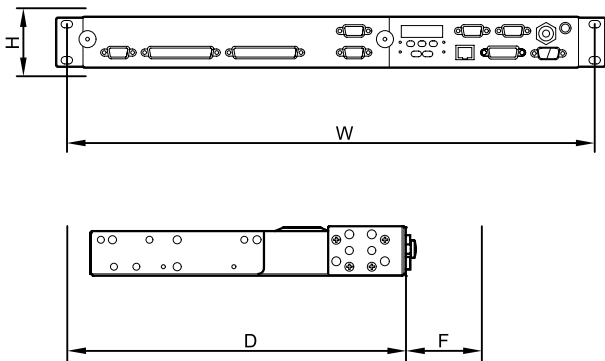


Table 1 Space requirements for the Indoor Unit

Installation	W	H	D	F ¹
Single Indoor Unit	19"	1U	270 mm	70 mm
2U Magazine	19"	2U	290 ² mm	70 mm
6U Magazine	19"	6U	290 ² mm	70 mm

1. Space required for connecting cables and connectors.
2. The units will extend an additional 20 mm in front of the rack, compared to Single Indoor Unit mounting.

All interfaces are accessible on the front of the Indoor Unit.

Indoor Power Requirements

Power Supply

The power supply should be a two wire power distribution between 20 V and 72 V DC, any polarity.



CAUTION!

The supply voltage must not exceed 72 V!

Internal Protection Circuits

The radio terminal is equipped with two 5 A fuses on the power supply input to the Indoor Unit. These fuses are mounted for safety reasons and can only be exchanged by the manufacturer.

Power Consumption

The maximum power consumption is 50 W per radio terminal (dependent on traffic capacity).

Grounding of Indoor Equipment

Normally, the Indoor Unit is grounded via the rack's connection to ground.

If the rack is not connected to ground, it is recommended to ground the Indoor Unit via a separate cable. The cable should be connected to the M6 grounding lug located on the front of the Baseband Unit (BBU). A flat copper braid is recommended for this purpose.

Indoor Electromagnetic Interference (EMC)

The Indoor Unit meets the electromagnetic interference requirements of ETS 300 385.

Indoor Environmental Requirements

The Indoor Unit meets the requirements of ETS 300 019-3.

Table 2 Requirements for indoor temperature and humidity

Characteristic	Value
Temperature:	
Single units and rack mounted units with >1U spacing (above and below).	-25°C to +55°C
Rack mounted units with <1U spacing.	-25°C to +45°C
Relative Humidity¹:	95% RH

1. See ETS 300 019 for detailed requirements for humidity vs. temperature.

Outdoor Requirements

Outdoor Space Requirements

The standard method for mounting the Radio Frequency Unit (RFU) and the Antenna Unit is to mount them together as one integrated unit.

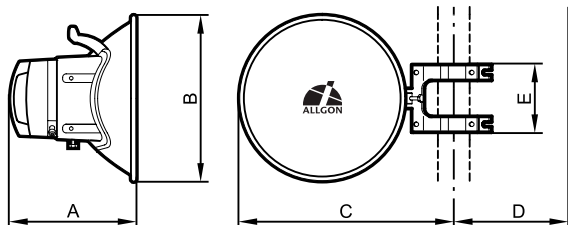


Table 3 Space requirements for the integrated Radio/Antenna Unit

Antenna Unit	A	B	C	D	E
1 ft. HP antenna	300 mm	380 mm	390 mm	125 mm	165 mm
2 ft. HP antenna	390 mm	635 mm	520 mm	125 mm	165 mm

Mast Requirements

Table 4 Requirements for antenna mast

Requirement	Value
Mounting pole diameter	40–130 mm
Mast stability: variation in direction of antenna	$\leq 0.25^\circ$

Outdoor Power Requirements

Power supply to the outdoor equipment is fed from the BBU via the radio cable. There is no need for a separate power supply.

Grounding of Outdoor Equipment

Grounding of Radio Cable

It is recommended to ground the radio cable every 50 metres along the mast, at the foot of the mast and before entering a building.

Grounding of Antenna/Radio Frequency Unit

Normally, the Antenna/RF Unit is grounded via the mast's connection to ground.

If the mast has no connection to ground it is recommended to ground the Antenna/RF Unit via a separate cable. The cable should be connected to one of the unused M10 screw holes on the antenna. A flat copper braid is recommended for this purpose. A cable can also be used for long distances.

Outdoor Electromagnetic Interference (EMC)

The outdoor equipment meets the electromagnetic interference requirements of ETS 300 385.

Outdoor Environmental Requirements

The outdoor equipment meets the requirements of ETS 300 019-4.

Table 5 Requirements for outdoor temperature and humidity

Characteristic	Value
Operating temperature¹	-45°C to +45°C
Relative Humidity²	100% RH

1. Excluding solar radiation.
2. See ETS 300 019 for detailed requirements for humidity vs. temperature.

Indoor Installation

Tools Required for Indoor Installation

- Pozidrive screwdriver PZ2 and PZ3
- Necessary tools for assembling the cables and connectors.

Indoor Equipment

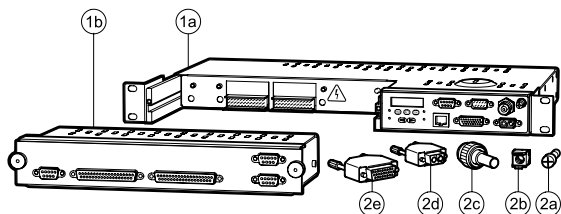


Table 6 Indoor equipment

Pos.	Part	Part Number	Qty.
1	Indoor Unit, consisting of:	–	1
a)	Baseband Unit (BBU) <ul style="list-style-type: none"> • ITU • ANSI 	WAAB001/01 WAAB001/02	1
b)	Traffic Interface Unit (TIU)	WAADxxxxyy/zz	1
2	Installation Kit for 19" rack, consisting of:	WMSA001	1
a)	Rack Mount Screw (M6x16, PZ3)	–	4
b)	Rack Mount Captive Nut	–	4
c)	TNC Connector	–	1
d)	DC Power Connector and Hood	–	1
e)	26 pin D-SUB Connector and Hood	–	1

Indoor Accessories

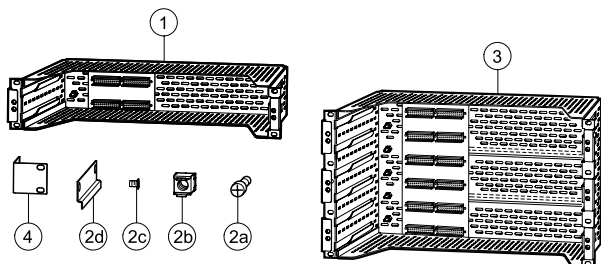
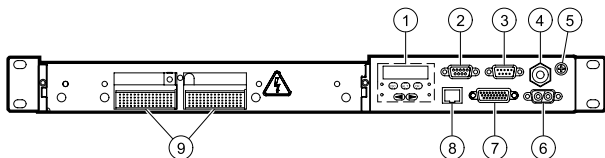


Table 7 Indoor accessories

Pos.	Part	Part Number	Qty.
1	2U Magazine	WMMA001/02	1
2	2U Magazine Installation Kit, consisting of:	WMSA002/02	1
a)	Rack Mount Screw (M6x16, PZ3)	—	4
b)	Rack Mount Captive Nut	—	4
c)	Mounting Rail	—	4
d)	Mounting Rail Screw (M4x8, PZ2)	—	8
3	6U Magazine	WMMA001/06	1
2	6U Magazine Installation Kit, consisting of:	WMSA002/06	1
a)	Rack Mount Screw (M6x16, PZ3)	—	8
b)	Rack Mount Captive Nut	—	8
c)	Mounting Rail Screw (M4x8, PZ2)	—	24
d)	Mounting Rail	—	12
4	ETSI Rack Mounting Kit	WMSA003	1

Baseband Unit



Interfaces on the Baseband Unit

Table 8 Baseband Unit interfaces

Pos	Interface	Function
1	User interface	Control panel with keypad and display for configuring the radio terminal without a PC, and status LEDs for monitoring of the radio terminal. For further information about the control panel, refer to the Operation and Maintenance Manual (WLDM002).
2	9 pin D-SUB jack	LM/NMS 1 port, used for connecting a PC or for daisy-chaining radio terminals. The interface standard is RS-232/DCE.
3	9 pin D-SUB plug	MODEM/NMS 2, used for modem connection or for daisy-chaining radio terminals. The interface standard is RS-232/DTE.
4	TNC jack	Used for connection to the RFU.
5	M6 grounding lug	Used for grounding of the Indoor Unit.
6	2 pin D-SUB plug	DC power connector.
7	26 pin D-SUB High Density jack	External I/O port, used for monitoring and control of external functions, and for status/ alarm reporting.
8	RJ-45 jack	10baseT Ethernet port, used for connection to a LAN. The interface standard is Ethernet/DTE.

Pos	Interface	Function
9	Sofix ¹ /Metral ² connectors	Used for connection of the TIU.

1. Ericsson designation
2. Berg designation

Traffic Interface Unit

All traffic interfaces are located on the TIU of the Indoor Unit. The interfaces are compliant with ITU-T G.703. Two different types of interfaces are available:

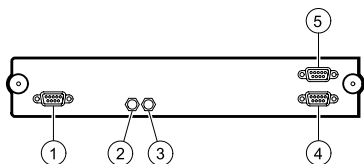
- Unbalanced interface: SMZ connector, 75 Ω .
- Balanced interface: 9 pin or 37 pin D-SUB connector, 120 Ω (E1) / 100 Ω (DS1).
- Ethernet standard interface: RJ-45 connector.



CAUTION!

When mounting the TIU in the BBU, the two screws must be fastened by hand! Do not use any tools or excessive force!

Unbalanced Interfaces



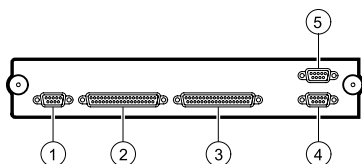
Traffic Interface Unit, unbalanced interface (E3 + E1)

Table 9 Traffic Interface Unit, unbalanced interface (E3 + E1)

Pos	Connector	Function
1	9 pin D-SUB	Traffic Channel (E1:17)
2	SMZ	Traffic Channel (E3:1), outgoing direction (TX) ¹
3	SMZ	Traffic Channel (E3:1), incoming direction (RX) ¹
4	9 pin D-SUB	Overhead Channel (OH:1)
5	9 pin D-SUB	Overhead Channel (OH:2)

1. The channel number and the direction (TX/RX) for the SMZ connectors are indicated on the TIU.

Balanced Interfaces

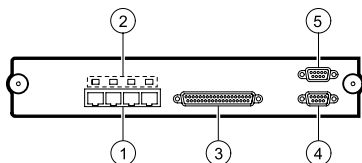


Traffic Interface Unit, balanced interface (17xE1/DS1)

Table 10 Traffic Interface Unit, balanced interface (17xE1 or 17xDS1)

Pos	Connector	Function
1	9 pin D-SUB	Traffic Channel (E1:17 or DS1:17)
2	37 pin D-SUB	Traffic Channel (E1:1-8, DS1:1-8)
3	37 pin D-SUB	Traffic Channel (E1:9-16, DS1:9-16)
4	9 pin D-SUB	Overhead Channel (OH:1)
5	9 pin D-SUB	Overhead Channel (OH:2)

Ethernet Interfaces



Traffic Interface Unit, Ethernet interface (Ethernet + 4xE1/DS1)

Table 11 Traffic Interface Unit, Ethernet interface (Ethernet + 4xE1/DS1)

Pos	Interface	Function
1	RJ-45	Traffic Channel (10/100baseT)
2	LED, multicolor	ON, green: Link available. ON, orange: Link activity.
3	37 pin D-SUB	Traffic Channel (E1:9–12 or DS1:9–12)
4	9 pin D-SUB	Overhead Channel (OH:1)
5	9 pin D-SUB	Overhead Channel (OH:2)

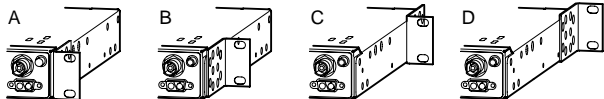
Mounting the Indoor Unit

There are three different ways of mounting the Indoor Unit:

- single unit mounted in 19" rack;
- single unit mounted in ETSI rack; and
- 2–6 units in a common backplane magazine for 19" rack.

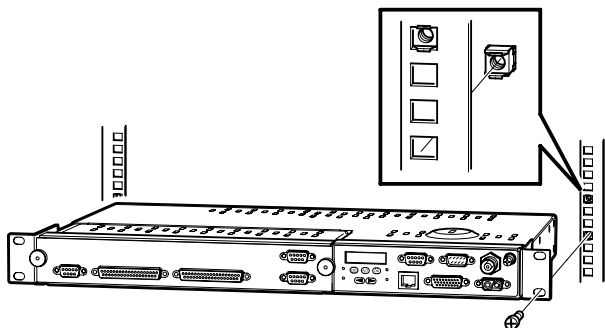
The following sections describe *Single Unit Mounting in 19" Rack* and *Common Backplane Mounting In Magazine for 19" Rack*.

Single Unit Mounting in 19" Rack



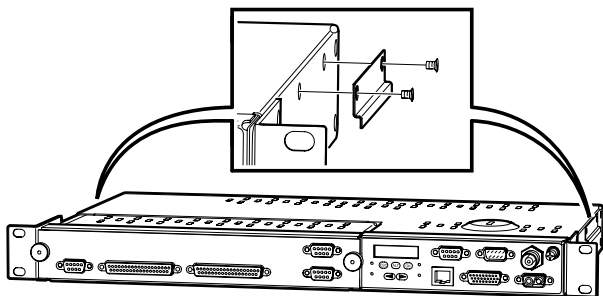
Optional positions for mounting the brackets

The brackets can be mounted in four different positions (A–D) to make the Indoor Unit fit in your particular rack set-up. Use a Pozidrive screwdriver PZ2 if you want to move the brackets.

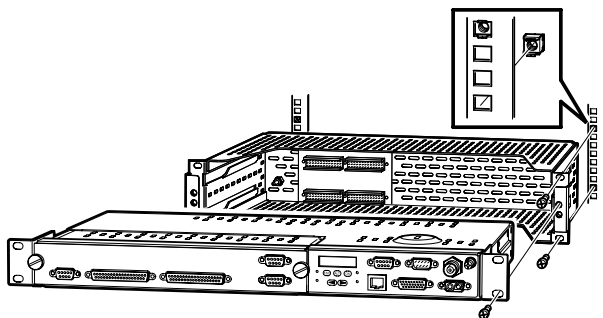


Mounting a single Indoor Unit in a 19" Rack

Common Backplane Mounting In Magazine for 19" Rack



Preparing the Indoor Unit for mounting in magazine



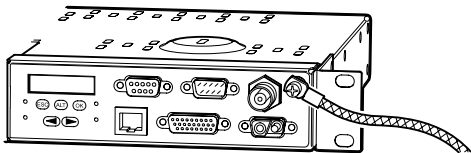
Common backplane mounting of Indoor Units in 2U or 6U Magazine

Note: The magazine must be mounted in the rack before you remove the transport safety panels.
The numbering of the Indoor Units in the magazine starts at the bottom of the magazine; unit number 1 is at the bottom and unit 2 (6) is at the top.

Grounding the Indoor Unit

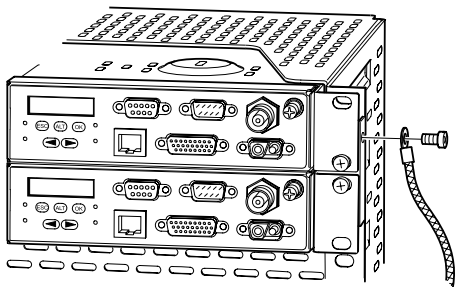
Normally, the Indoor Unit is grounded via the rack's connection to ground.

If the rack is not connected to ground, it is recommended to ground the Indoor Unit via a separate cable. The cable should be connected to the M6 grounding lug located on the front of the BBU. A flat copper braid is recommended for this purpose.



Grounding the Indoor Unit via a separate cable

Indoor Units mounted in a magazine can be grounded by connecting the grounding cable to the M6 grounding lug located on the magazine.

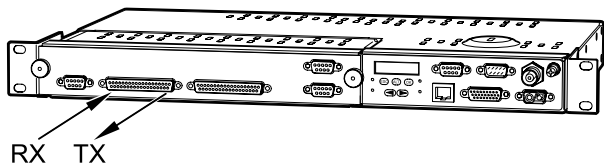


Grounding all Indoor Units in a magazine via a separate cable

Installing the Cables for the Indoor Unit

Note: The connector manufacturer's instructions for mounting of the connectors must always be followed!

Definition of TX and RX Signals



TX signals are defined as signals coming **out of** the TIU.

RX signals are defined as signals going **into** the TIU.

Unbalanced Traffic Interface SMZ Connectors

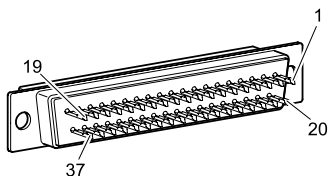
Mount the SMZ connectors on the cables and connect the cables to the Indoor Unit. The channel number and the direction (TX/RX) for each SMZ connector are indicated on the TIU.

Balanced Traffic Interface D-SUB Connectors

Mount the connectors on the cables according to the pin allocation listed in the tables below and connect the cables to the Indoor Unit.

Note: The cables for the balanced traffic interface must be of type shielded twisted pair!

Traffic Channel D-SUB Connectors (E1:1–16, DS1:1–16)

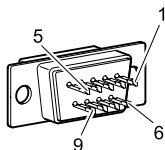


37 pin D-SUB external cable connector (rear view)

Table 12 Traffic channel connector pin allocation

Channel no.	TX Pin no.	RX Pin no.	Connector
1	19 / 37	18 / 36	E1:1–8, DS1:1–8
2	17 / 35	16 / 34	E1:1–8, DS1:1–8
3	15 / 33	14 / 32	E1:1–8, DS1:1–8
4	13 / 31	12 / 30	E1:1–8, DS1:1–8
5	11 / 29	10 / 28	E1:1–8, DS1:1–8
6	9 / 27	8 / 26	E1:1–8, DS1:1–8
7	7 / 25	6 / 24	E1:1–8, DS1:1–8
8	5 / 23	4 / 22	E1:1–8, DS1:1–8
9	19 / 37	18 / 36	E1:9–16, DS1:9–16
10	17 / 35	16 / 34	E1:9–16, DS1:9–16
11	15 / 33	14 / 32	E1:9–16, DS1:9–16
12	13 / 31	12 / 30	E1:9–16, DS1:9–16
13	11 / 29	10 / 28	E1:9–16, DS1:9–16
14	9 / 27	8 / 26	E1:9–16, DS1:9–16
15	7 / 25	6 / 24	E1:9–16, DS1:9–16
16	5 / 23	4 / 22	E1:9–16, DS1:9–16

Traffic Channel D-SUB Connector (E1:17, DS1:17)



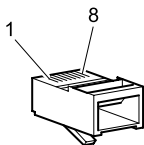
9 pin D-SUB external cable connector (rear view)

Table 13 Traffic channel connector pin allocation

Channel no.	TX Pin no.	RX Pin no.	Connector
17	5 / 9	4 / 8	E1:17, DS1:17

Traffic Interface Ethernet Connectors

Mount the RJ-45 connectors on the cables and connect the cables to the Indoor Unit.



RJ-45 external cable connector (rear view)

Table 14 Traffic channel connector pin allocation

Channel no.	TX Pin no.	RX Pin no.	Connector
1	3 / 6	1 / 2	10 BASE T / 100 BASE TX

Overhead Channel D-SUB Connectors (OH:1, OH:2)

The two 64 kbps OH channels are compliant with ITU-T G.703 requirements for co-directional interfaces.

Mount the connectors on the cables according to the pin allocation listed in the table below and connect the cables to the Indoor Unit. Refer to the figure 9 *pin D-SUB external cable connector (rear view)* above for the pin numbering.

Table 15 Overhead channel connector pin allocation

Channel no.	TX Pin no.	RX Pin no.	Connector
1	5 / 9	4 / 8	OH:1
2	5 / 9	4 / 8	OH:2

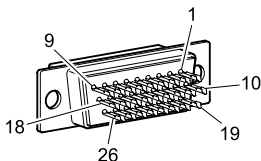
External I/O D-SUB Connector

The External I/O port consists of the following software configurable interfaces:

- 4 relay outputs for status/alarm functions;
- 8 TTL inputs for monitoring of external functions; and
- 8 TTL outputs for control of external functions.

For information on how to configure the inputs and outputs of the External I/O port, refer to the Operation and Maintenance Manual (WLDM002).

Mount the connector on the cable according to the pin allocation listed in the table below and connect the cable to the Indoor Unit.

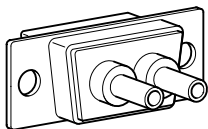


26 pin D-SUB external cable connector (rear view)

Table 16 External I/O connector pin allocation

Signal	Pin no.
Relay 1	1-2
Relay 2	3-4
Relay 3	5-6
Relay 4	7-8
TTL Inputs	10-17
Ground	18
TTL Outputs	19-26

DC Power Connector



External DC power cable connector (rear view)

The power cable should be AWG 16/20 or equivalent. The two wires can be connected to the DC power plug with any polarity.

Use a crimping tool to mount the connector pins onto the cable.

Note: Do not connect the power cable to the Indoor Unit at this stage!

Indoor Radio Cable

It is recommended to mount a surge arrester at the wall entrance as an adapter between the indoor and outdoor radio cable. The surge arrester should be mounted in a copper plate with a low resistance connection ($< 0.1 \Omega$) to ground on the outside. This will protect the indoor equipment in case of lightning strikes.

It is also recommended to fasten the length of the indoor radio cable to the rack or in an existing cable bundle.

Table 17 Recommended indoor radio cable and connectors

Cable/Connector	Manufacturer/Model
Indoor Radio Cable	RG400, \varnothing 5 mm
Indoor Unit Connector	Type TNC, plug crimp
Surge Arrester Connector	Type N, plug crimp
Surge Arrester	N jack–N jack bulkhead 20 kA (8/20 μ s pulse)
Surge Arrester Capsule	$U_{\text{static}} = 90 \text{ V}$, $U_{\text{dynamic}} < 800 \text{ V}$

1. Mount the coaxial connectors on the indoor radio cable.
2. Connect the indoor radio cable to the Indoor Unit and the adapter between the indoor and outdoor radio cable.

Outdoor Installation

Tools Required for Outdoor Installation

- Pozidrive screwdriver PZ2
- 17 mm torque wrench
- Necessary tools for assembling the cables and connectors.

Outdoor Equipment

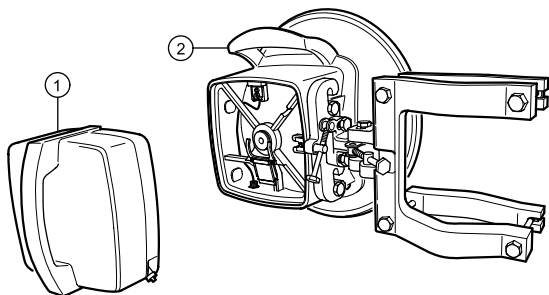


Table 18 Outdoor equipment

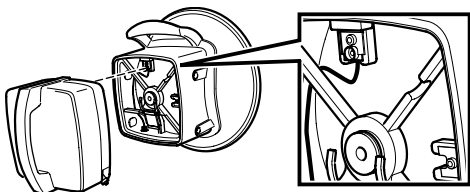
Pos.	Part	Part Number	Qty.
1	Radio Frequency Unit (RFU)	WAAAxxyy/zz	1
2	Antenna Unit (including Mast Mounting Bracket)	WAACxxyy/zz	1

Choosing Vertical or Horizontal Polarization

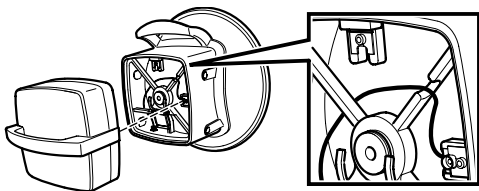
The position of the RFU determines the polarization of the radio signal. The handle serves as an indicator: horizontal handle = horizontal polarization, vertical handle = vertical polarization.

The coaxial connector on the back of the Antenna Unit must fit the connector on the RFU. Use a Pozidrive screwdriver PZ2 if you need to move the connector on the Antenna Unit.

Note: Do not remove the screw or the washer when you move the connector.



Position of coaxial connector for vertical polarization



Position of coaxial connector for horizontal polarization



CAUTION!

For horizontal polarization, make sure that the coaxial cable runs in the dedicated slot on the back of the Antenna Unit!

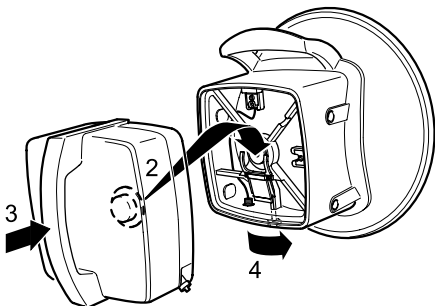
Integrating Antenna Unit and Radio Frequency Unit

1. Remove the plastic covers for moisture protection from the waveguides on the RFU and the Antenna Unit.



CAUTION!

After the plastic covers have been removed, make sure that no moisture enters the waveguides.



Integrating the Antenna Unit and the Radio Frequency Unit

2. Hook the circular part of the RFU, containing the waveguide, onto the locking device on the back of the Antenna Unit.

Note: The direction of the handle on the RFU must be in accordance with the desired polarization! Make sure that the coaxial connector on the back of the RFU fits the connector on the back of the Antenna Unit!

3. Gently push the RFU as far as it can go into the Antenna Unit.

- Use the 17 mm wrench to fasten the RFU by turning the locking screw on the bottom of the antenna 1/4 turn. You will feel a gentle click when the RFU is locked in position. Stop turning when you feel the resistance increasing.

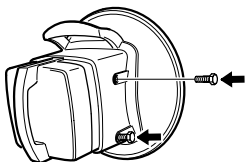
**CAUTION!**

Do not continue turning the locking screw when you feel the resistance increasing!

**CAUTION!**

When you carry or lift the Antenna/RF Unit, use the handle on the top of the antenna! The handle on the back of the RFU is not intended for this purpose!

Choosing Left or Right Side Antenna Mounting

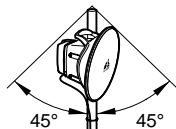


Mounting the M10 screws on the antenna

Two M10 screws are used for fastening the Antenna/RF Unit on the Mast Mounting Bracket. They can be mounted on either side of the antenna.

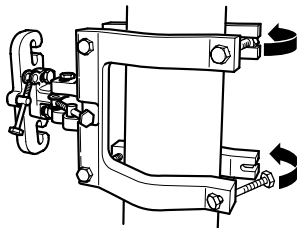
- Make sure that the screws are placed in the screw holes on the correct side of the Antenna Unit, and that there is enough space to allow mounting of the Antenna/RF Unit to the Mast Mounting Bracket.

Fastening the Mast Mounting Bracket



Recommended mounting of the Antenna/RF Unit

It is recommended to mount the Antenna/RF Unit within a limiting angle of 45° originating from the top of the mast. This will protect the Antenna/RF Unit from direct lightning strikes.



Fastening the Mast Mounting Bracket

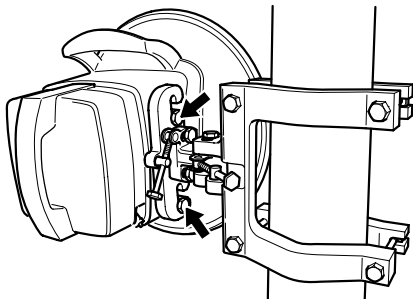
1. Position the Mast Mounting Bracket around the mast.
2. Use a compass to roughly align the Mast Mounting Bracket so that the antenna will point in the radio link path.

Fine tuning will be performed when you reach section *Antenna Alignment* on page 80. The maximum possible fine tuning adjustment is ± 20 degrees in both azimuth and elevation.

3. Tighten the screws that hold the Mast Mounting Bracket to the mast with the 17 mm torque wrench.

Note: The torque must be 35 Nm \pm 10% when tightening the screws!

Mounting the Integrated Antenna/Radio Frequency Unit



M10 screws used for mounting the integrated Antenna/Radio Frequency Unit

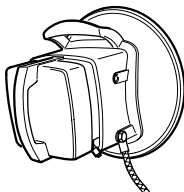
1. Mount the integrated Antenna/RF Unit on the Mast Mounting Bracket by inserting the two M10 screws in the dedicated slots.
2. Use the 17 mm torque wrench to tighten the two M10 screws.

Note: The torque must be $35 \text{ Nm} \pm 10\%$ when tightening the M10 screws!

Grounding the Antenna/Radio Frequency Unit

Normally, the Antenna/RF Unit is grounded via the mast's connection to ground.

If the mast has no connection to ground it is recommended to ground the Antenna/RF Unit via a separate cable. The cable should be connected to one of the unused M10 screw holes on the antenna. A flat copper braid is recommended for this purpose. An ordinary cable can also be used for long distances.



Grounding the Antenna/Radio Frequency Unit via a separate cable

Outdoor Radio Cable Installation

The maximum length of the outdoor radio cable is 300 m when using RG214 or RG213 foil. Longer cables can be connected if they have higher performance.

Table 19 Recommended outdoor radio cable and connectors

Cable/Connector	Manufacturer/Model
Outdoor Radio Cable	RG214 or RG213 foil, Ø 10 mm
Outdoor Connector	Type N, plug crimp

1. Mount the coaxial connectors on the outdoor radio cable.

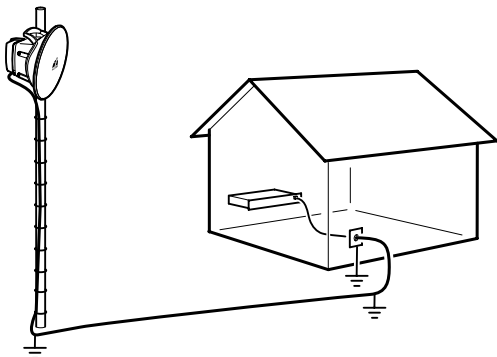
Note: The connector manufacturer's instructions for mounting of the connectors must always be followed!

2. Connect the outdoor radio cable to the RFU and the adapter between the indoor and outdoor radio cable.

Grounding the Radio Cable

It is recommended to ground the radio cable every 50 m along the mast, at the foot of the mast and before entering a building.

If a surge arrester is mounted in the wall, it should be mounted in a copper plate with a low resistance connection ($< 0.1 \Omega$) to ground on the outside. This will protect the indoor equipment in case of lightning strikes.



Recommended grounding of the radio cable

Start-up and Configuration

The radio terminal can be managed either locally or remotely. When accessing the radio terminal for the first time, you must manage it locally. During the initial configuration, you should configure it for remote management to be able to manage it remotely subsequently.

Note: You only have to carry out the instructions in this section the first time you access the radio terminal. If you have accessed the radio terminal before and configured the ports that you will use for communicating with it, proceed to section *Accessing the Web Pages* on page 60.

The easiest way to configure the radio terminal is by using a web browser. In order to establish communication between the web browser and the radio terminal you must first configure the communication interface.

In some cases you may need to use a text terminal program for this purpose. The instructions in this manual are written for the HyperTerminal program which is included in Windows 95/98/NT. However, other communication applications can also be used.

The management connection depends on whether the radio terminal should have static or dynamic IP addresses. For more information about this, refer to the Operation and Maintenance Manual (WLDM002).

When accessing the radio terminal for the first time, do the following:

1. Switch on the radio terminal. Refer to section *Start-up and Shut-down* on page 48.
2. Connect the radio terminal to a local manager. Refer to section *Local Management Connection* on page 49.
3. Perform initial radio terminal configuration. Refer to section *Initial Radio Terminal Configuration* on page 58.

4. Connect the radio terminal to a remote manager according to one of the following alternatives:
 - For set-up of a TCP/IP network on an Ethernet LAN, refer to section *Connecting to Ethernet LAN* on page 68.
 - For set-up of a TCP/IP network via a modem, refer to section *Connecting via Modem* on page 70.
 - For set-up of a TCP/IP network via an ECC, refer to section *Connecting via ECC* on page 73.

Alternatively, you may connect the radio terminal to another radio terminal already connected to a remote manager. Do this according to one of the following alternatives:

- For set-up of a TCP/IP network via a common backplane, refer to section *Connecting via a Common Backplane* on page 75.
- For set-up of a TCP/IP network on a daisy chain, refer to section *Daisy-chaining* on page 76.
- For set-up of a TCP/IP network on an Ethernet LAN, refer to section *Connecting to Ethernet LAN* on page 68.

Equipment Required for Configuration

Table 20 lists the equipment required for configuration of the radio terminal on site, i.e. to establish a local management connection.

Table 21–Table 25 list additional equipment required to establish a remote management connection. The required equipment depends on which type of remote management network you are going to install the radio terminal in.

Table 20 Equipment for local management connection

Equipment	Description
PC	This manual describes how to use a PC with Windows installed as local manager. Other platforms can be used, but this is not described.
Windows 95/98 or NT 4.0 Operating System	Operating system for PC. Other operating systems are possible.
Web Browser	Used as operator interface. The web browser could be Netscape Navigator 4.0 or Internet Explorer 4.0, or later versions.
Text Terminal	Used as operator interface to send commands directly to the Management Information Base via RS-232 serial interface. The text terminal could be HyperTerminal, which is usually included in Windows, or equivalent.
Dial Up Networking Software	Used for dialling up via the serial port. This software is included in Windows but not always installed by default.
The file "amr.inf"	Supplied by Allgon AB on the disc marked "AMR Software".
Serial PC Cable	For connection of the PC to the radio terminal. The interface in the radio terminal end should be a 9 pin D-SUB plug. The interface in the other end should fit the serial port of your PC (e.g. COM1).

Table 21 Additional equipment for remote management, Ethernet LAN connection

Equipment	Description
TCP/IP-based LAN	For connection of a remote manager. For further information, refer to the Operation and Maintenance manual (WLDM002).
UTP Cable	For connection of the radio terminal to an Ethernet LAN. If two radio terminals are to be connected to each other, connect them directly using a null modem UTP cable (DTE-wired in both ends).

Table 22 Additional equipment for remote management, modem connection

Equipment	Description
Modems	For placement at the radio terminal site and a remote manager site respectively. For further information, refer to the Operation and Maintenance manual (WLDM002).
Serial Modem Cable	For connection of a modem to the radio terminal. The interface in the radio terminal end should be a 9 pin D-SUB jack. The interface in the other end should fit the serial port of your modem.

Table 23 Additional equipment for remote management, ECC connection

Equipment	Description
Ethernet E1/DS1 Router	For routing of ECCs to a remote manager. For further information, refer to the Operation and Maintenance manual (WLDM002).

Start-up and Configuration

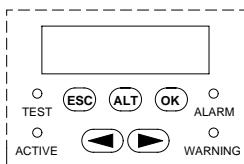
Table 24 Additional equipment for remote management, common backplane connection

Equipment	Description
2U Magazine or 6U Magazine	For connection of two or six radio terminals mounted in the same rack. For further information, refer to section <i>Indoor Accessories</i> on page 18.

Table 25 Additional equipment for remote management, daisy-chaining

Equipment	Description
Serial Cable	<p>For connection of two radio terminals via the serial interfaces.</p> <ul style="list-style-type: none">• For an LM/NMS 1–MODEM/NMS 2 connection, use a straight-through serial cable with one 9 pin D-SUB plug and one 9 pin D-SUB jack.• For an LM/NMS 1–LM/NMS 1 connection, use a null modem cable with two 9 pin D-SUB plugs.• For a MODEM/NMS 2–MODEM/NMS 2 connection, use a null modem cable with two 9 pin D-SUB jacks.

Status LEDs



LEDs on the control panel of the Baseband Unit

Table 26 Baseband Unit LEDs

LED	State	Function
ACTIVE ¹	OFF	The radio terminal is starting up or reconfiguring (INACTIVE state).
	Blinks 1 Hz	The radio terminal is ready to transmit (STANDBY state).
	Blinks 15 Hz	The radio terminal is transmitting (ACTIVE state).
TEST	Blinks 15 Hz	The radio terminal is in TEST mode.
WARNING	ON	An alarm of severity WARNING ² has been generated in the radio terminal.
ALARM	ON	An alarm of severity ALARM ² has been generated in the radio terminal.
	Blinks 3 Hz	An alarm of severity SEVERE ALARM ² has been generated in the radio terminal.

1. The radio terminal can be in either NORMAL mode or in TEST mode. The blinking pattern for the ACTIVE LED is the same in both modes.
2. These alarms are software-configurable. For further information, refer to the Operation and Maintenance manual (WLDM002).

Start-up and Shut-down

Switching ON the Radio Terminal

1. Make sure that the power supply feeding the BBU has an output voltage somewhere between 20 V and 72 V, any polarity.



CAUTION!

The supply voltage must not exceed 72 V!

2. Connect the power cable to the BBU.
3. During start-up, the TEST LED blinks with 15 Hz. Wait until the system is in STANDBY state (this normally takes around 30 seconds); the ACTIVE LED should blink (1 Hz or 15 Hz) and all other LEDs should be switched off before you start to configure the radio terminal.

Switching OFF the Radio Terminal

Before you have started to configure the radio terminal via the web interface, you can switch off the radio terminal at any time by disconnecting the power cable.

After you have reached section *Accessing the Web Pages* on page 60, and have started to configure the radio terminal via the web interface, you should do the following to prevent the radio terminal from transmitting transients at switch off:

1. Select **Traffic** → **RF Channel**; set "TX Mute" to **Forced mute**.

Accept changes

2. Disconnect the power cable.

Local Management Connection

Before connecting the radio terminal to local management equipment, in this case a PC, you must prepare the PC according to section *Setting up the PC* below. When this is done, connect the radio terminal locally by setting up a point-to-point network between the radio terminal and the PC using a static IP address. Refer to section *Connecting Directly Using Static IP Address* on page 55.

Setting up the PC

This section describes how to set up your PC to be able to connect it locally to any radio terminal. You only have to carry out the instructions in this section once.

Configuring Serial Port

You must create a text terminal session with the correct settings for the serial port that will be used for radio terminal connection.

1. Start the terminal program (HyperTerminal or equivalent) on your PC. If the program asks if you want to install a modem, select **No**.
2. Select **File** → **New Connection**.
3. Enter **SerialPortAMR** as the name and select an icon for the connection.
4. Connect to **COM1** or equivalent serial port.
5. The port settings for the serial port should be:
 - Bits Per Second (bps) = **115200** (other values are possible, refer to the Operation and Maintenance Manual (WLDM002))
 - Bits = **8**

- Parity = **None**
 - Stop Bits = 1
 - Flow Control = **None**
6. Click **OK**.
 7. Save the session.
 8. Exit the HyperTerminal program and close the connection.
 9. Proceed to section *Installing Null Modem Driver* below.

Installing Null Modem Driver

The radio terminal is seen as a telephone modem by the PC. You must therefore install a null modem driver on your PC.

1. In the Windows **Start** menu, select **Settings** → **Control panel**.
2. Double click on the **Modems** icon.
3. Select **Add...**
4. Select **Other**. Click **Next >**.
5. Select **Don't detect my modem, I will select it from a list**. Click **Next >**.
6. Click **Have disc...**
7. Insert the computer disc marked "AMR Software" containing the file "amr.inf" in your PC.
8. Select the path to where the file "amr.inf" is stored. Click **OK**.
9. Select the **Allgon Microwave Radio** modem. Click **Next >**.

10. Select **COM1** or equivalent serial port that you want to connect the modem to. Click **Next >**.
11. Click **Finish**.
12. If the dialogue box "Modem properties" does not automatically appear, double click on the **Modem** icon in the Control panel.
13. Click **Properties**.
14. Under **General**, select Max speed = **115200**(other values are possible, refer to the Operation and Maintenance Manual (WLDM002)).
15. Under **Connection**, select Bits = **8**, Parity = **None**, Stop bits = **1**. Make sure that **Wait for dial tone** is unchecked.
16. Click **Advanced**. Uncheck **Use error control** and **Use flow control**.
17. Click **OK** two times.
18. Click **Close**.
19. Restart your computer for the changes to take effect.
20. Proceed to section *Configuring Dialling Up via the Serial Port* below.

Configuring Dialling Up via the Serial Port

The configuration for dialling up the radio terminal via the serial port depends on which operating system you are using on your PC; choose the correct alternative below.

Windows NT

1. On your PC, double click on the **Dial Up Networking** icon located under the icon **My computer** on the desktop, or under **My computer** in the Explorer.
2. Enter **DialUpAMR** as the Entry name in the dialogue box "New phonebook entry". Click **Next >**.
3. Check **The non-Windows NT server I am calling expects me to type login information after connecting, or to know TCP/IP addresses before dialling.**; all other boxes should be unchecked. Click **Next >**.
4. Leave the text box "Telephone number" empty. If the program requires that you enter a telephone number, enter any random number. This is of no importance for the function of the radio terminal modem. Click **Next >**.
5. Select **Point-to-Point Protocol (PPP)**. Click **Next >**.
6. In the "Login script" dialogue box, select **None**. Click **Next >**.
7. Enter the IP address of your computer in the text box marked "My IP address". Click **Next >**.
8. If there is a DNS server in your network, enter its IP address in the dedicated text box. If you have no DNS server, enter **0.0.0.0** in this text box. Click **Next >**.
9. Click **Finish**.

10. In the dialogue box "Dial Up Networking", select **More** → **Edit entry and modem properties...**
11. Under **Basic**, make sure the **Allgon Microwave Radio** modem is chosen in the box marked "Use:".
12. Click **Configure**.
13. Select Initial Speed (bps) = **115200** (other values are possible, refer to the Operation and Maintenance Manual (WLDM002)).
14. Check **Enable hardware flow control**.
15. Click **OK**.
16. Click **Close**.

Windows 95/98

1. On your PC, double click on the **Dial Up Networking** icon located under the icon **My computer** on the desktop, or under **My computer** in the Explorer.
2. In the dialogue box "Welcome to Dial Up Networking", click **Next >**.
3. Enter **DialUpAMR** as the name for the connection in the dialogue box "New connection".
4. In the list box "Select a device", select the **Allgon Microwave Radio** modem.
5. Click **Configure**.
6. Under **General**, select Maximum speed = **115200** (other values are possible, refer to the Operation and Maintenance Manual (WLDM002)).

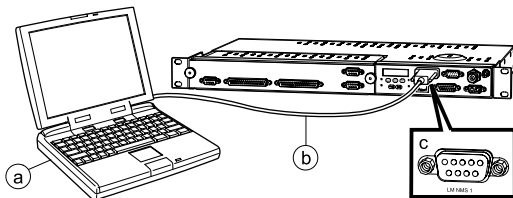
7. Under **Connection**, select Data bits = **8**, Parity = **None**, Stop bits = **1**. Make sure that the box **Wait for dial tone** is unchecked.
8. Click **Advanced**. Check **Use flow control, Hardware (RTS/CTS)**. Click **OK**. Click **Next >**.
9. Leave the text box "Telephone number" empty. If the program requires that you enter a telephone number, you can enter any random number. This is of no importance for the function of the radio terminal modem. Click **Next >**.
10. Click **Finish**.

Your PC is now set up for local management and may be connected to a radio terminal. Proceed to section *Connecting Directly Using Static IP Address* below.

Connecting Directly Using Static IP Address

Before connecting a PC to the radio terminal, make sure that the PC has been configured as described in section *Setting up the PC* on page 49. Then, do the following:

1. Make sure the radio terminal is switched ON.



Connecting the PC to the radio terminal via a serial PC cable

2. Connect the PC to the radio terminal according to the figure above:
 - a) Serial port (COM1 or equivalent) of the PC.
 - b) Serial PC cable.
 - c) RS-232 port on the BBU marked LM/NMS 1.
3. Start the terminal program (HyperTerminal or equivalent) on your PC. If the program asks if you want to install a modem, select **No**.
4. Open the session **SerialPortAMR**.
5. The terminal program window should now be active. Hold down the Enter key until the login dialogue appears. The default settings are:
 - Username: **Level2**
 - Password: **Kirk**

Note: The Username and the Password are case sensitive.

6. Allocate an IP address to the serial port LM/NMS 1 of the radio terminal by executing the command

```
setip 3 <ipaddress>
```

where <ipaddress> is the desired IP address.

7. Allocate a subnet mask to the serial port by executing the command

```
setnm 3 <subnetmask>
```

where <subnetmask> is the desired subnet mask (default = **255.255.255.0**).

8. After you have changed the system settings according to step 9–10 above, you must restart the terminal for the changes to take effect. Execute the command

```
restart soft
```

and wait until the terminal is ready and idle again.

9. Log in and use the command

```
ipconfig
```

to verify that the commands in step 9–10 above were successfully executed. This command will return the current IP addresses for the ports of the radio terminal.

10. Exit the HyperTerminal program and close the connection.
11. Proceed to section *Dialling Up via the Serial Port* below.

Dialling Up via the Serial Port

The procedure for dialling up the radio terminal via the serial port depends on which operating system you are using on your PC; choose the correct alternative below.

Windows NT

1. On your PC, double click on the Dial Up Networking icon located under the icon for "My computer" on the desktop, or under "My computer" in the Explorer.
2. Select **DialUpAMR**.
3. A login dialogue box should now appear. The default settings are:
 - Username: **Level2**
 - Password: **Kirk**

Note: The Username and the Password are case sensitive.
4. Proceed to section *Initial Radio Terminal Configuration* below.

Windows 95/98

1. On your PC, double click on the Dial Up Networking icon located under the icon "My computer" on the desktop, or under "My computer" in the Explorer.
2. Double click on the **DialUpAMR** icon under Dial Up Networking located under the icon "My computer" on the desktop, or under "My computer" in the Explorer.
3. A login dialogue box should now appear. The default settings are:
 - Username: **Level2**
 - Password: **Kirk**

Note: The Username and the Password are case sensitive.

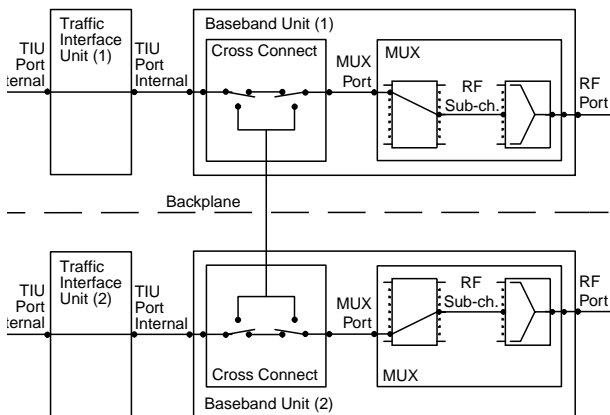
4. Click **Connect**.
5. Proceed to section *Initial Radio Terminal Configuration* below.

Initial Radio Terminal Configuration

To get the radio terminal up and running, the minimum configuration you must perform is as follows:

1. Access the web pages of the radio terminal. Refer to section *Accessing the Web Pages* on page 60.
2. Supply the radio terminal with system information. Refer to section *Editing System Information* on page 61.
3. Configure the RF channel. Refer to section *Configuring the RF Channel* on page 62.
4. Configure the traffic channels. Refer to section *Connecting the Traffic Channels* on page 63.
5. Configure the backplane cross-connections. Refer to section *Cross-connecting Traffic Channels* on page 64.
6. Configure the RF subchannel cross-connections. Refer to section *Cross-connecting RF Subchannels* on page 64.
7. If applicable, configure the Ethernet traffic interface. Refer to section *Ethernet Traffic Ports* on page 65.
8. Proceed to section *Remote Management Connection* on page 68.

Traffic Routing in the Indoor Unit



Model for traffic routing in the Indoor Unit

The Allgon Microwave Radio has the possibility of cross-connecting channels from one radio terminal to another via a common backplane. Any traffic channel on a TIU port or MUX port of one radio terminal can be connected to any TIU port or MUX port of another terminal. This makes it possible to drop or add traffic channels at a node, or reroute traffic channels to another node.

It is also possible to associate a MUX port with a different RF subchannel number to cross-connect a traffic channel over the hop. The RF subchannel number corresponds to the MUX port in the radio terminal at the other end of the hop if no additional cross-connection is performed in that terminal. This means that the port number for a traffic channel can be different from one end of the hop to the other.

Before starting traffic configuration, a system administrator must have planned the radio terminal network concerning frequency bands, traffic load, and so on.

Note: For further information on the traffic routing in the radio terminal, refer to the Operation and Maintenance Manual (WLDM002).

Accessing the Web Pages

1. Start the web browser on your PC/management equipment.
2. Enter the name or the IP address of the radio terminal in the URL address box marked "Location" (Netscape) or "Address" (Explorer).
3. A login dialogue box should now appear. The default settings are:

- Username: **Level2**
- Password: **Kirk**

Note: The Username and the Password are case sensitive.

4. You will now automatically be transferred to the main page of the radio terminal. Choose the web page that you want to access in the pull-down menus at the top of the web pages.

Note: The first time you access the web pages, you should change the default password settings. Do this on the web page "Access Level Configuration" (**Terminal** → **Access Level**).

Editing System Information

Select **Terminal** → **Identification**, and edit the following parameters:

- | | |
|--------------------|--|
| Terminal ID: | Enter an ID for the radio terminal. |
| Terminal location: | Enter the name of the location for the radio terminal. |
| Contact: | Enter name and means of contact for the system administrator or the department responsible for maintaining the radio terminal network. |
| Domain name: | Enter a valid fully qualified domain name for the radio terminal. (The default hostname AMR must be changed if you are going to connect more than one radio terminal. Remember to define the new hostname in your network. You may also have to change the proxy settings in your web browser.) |

Accept changes

Configuring the RF Channel

Select **Traffic** → **RF Channel** and edit the following parameters:

Bandwidth	Select a bandwidth value.
RF frame format	Select an RF frame format.
RF channel no	Enter the RF channel number (or TX frequency.)
TX frequency	Enter the correct transmitter frequency (or RF channel no).
TX mute	Select "Normal function".
Output power	Enter the desired output power level (in steps of 0.1 dBm). ≤ 19 dBm for 37–40 GHz, ≤ 20 dBm for 21–30 GHz.
Security code	Enter the correct security code. 0–255; this number must be the same for the terminals at both ends of the hop.
Expected RSL	Enter the expected Received Signal Level (in steps of 0.1 dBm). The RSL value will correspond to a maximum ideal AGC voltage level of 3.5 V on the RFU when you align the antenna.
Use channel filter in RSL calculation	Select if the RSL should be calculated after bandpass filtering of the received signal.

Accept all changes

Connecting the Traffic Channels

Select **Traffic** → **Traffic Channel** and edit the following parameters:

Ports	Function
Traffic channels from the TIU. These correspond to the traffic ports on the front of the terminal.	Select how to connect each traffic channel. <ul style="list-style-type: none">• Not used: The traffic channel will not be used for any traffic.• Connect to MUX: The traffic channel will be connected to the MUX and transmitted by this radio terminal.• Cross-connect: The traffic channel will be connected to the backplane for cross-connection to another radio terminal (provided that the radio terminal is connected to a backplane).

Accept changes

Cross-connecting Traffic Channels

Select **Traffic** → **Backplane Cross-connect** and edit the following parameters:

Local Port	Remote Terminal	Remote Port
TIU and MUX ports available for cross-connection.	Select the backplane partner ¹ that you want to connect each TIU and MUX port to.	Select the TIU or MUX port on the backplane partner that you want to connect each TIU and MUX port to.

1. Numbering of the Indoor Units in the magazine starts at the bottom of the magazine; unit number 1 is at the bottom and unit number 2/6 is at the top.

Accept changes

Cross-connecting RF Subchannels

Select **Traffic** → **RF Subchannel Cross-connect** and edit the following parameters:

MUX Port	RF Subchannel
MUX ports available for cross-connection across the hop.	Select the desired RF subchannel to connect each MUX port to.

Accept changes

Ethernet Traffic Ports

Select **Traffic** → **Ethernet TIU** and edit the following parameters:

Maximum packet size **Select the maximum packet size for the ports.**

Individual port setting: The maximum packet size is determined by the "Packet Size" for each individual port below.

6 kB packet size: The maximum packet size will be 6 kB. This setting overrides the "Packet Size" for each individual port below.

Ethernet VLAN tagging **Select if it should be possible to use different VLAN IDs for the ports.**

Buffer threshold enabled **Select if the number of buffers allocated to each port should be limited.**

If set to **No**, "Maximum buffers allocated", "XOFF threshold", and "XON threshold" will be ignored.

Maximum buffers allocated **Enter the maximum number of buffers that may be allocated to each port.¹**

Default = 160

XOFF threshold **Enter the number of allocated buffers that must be exceeded to apply flow control to a port¹.**

Default = 128

XON threshold	Enter the number of allocated buffers that must be passed below to remove flow control from a port¹. Default = 104
Address lookup algorithm	Select MAC address lookup algorithm. Optimized for sequential MAC addresses Optimized for random MAC addresses

1. The actual number of buffers is truncated to the nearest lower multiple of 8.

Port no	The Ethernet traffic ports on the front of the terminal.
Enabled	Select if traffic transmission should be enabled on each port.
Duplex	Select duplex mode for each port. Half duplex/Full duplex/Auto-negotiate. If you choose Auto-negotiate , the speed will be forced to Auto-negotiate .
Speed	Select speed for each port. 10 Mbit/s, 100 Mbit/s, or Auto-negotiate. If you choose Auto-negotiate , the duplex mode will be forced to Auto-negotiate .
Flow control	Select if flow control should be used for each port. No flow control/Flow control/Auto-negotiate.

- Packet size** **Select packet size for each port (bytes).**
1518: Used for most Ethernet types.
1536: Used for VLAN tagging.
This setting may be overridden by "Maximum packet size" above.
- Port VLAN ID** **Enter a VLAN ID for each port.**
The VLAN ID is only applicable if "Ethernet VLAN tagging" is enabled above.


Accept changes

Remote Management Connection

Connect the radio terminal remotely according to one of the following alternatives:

- For set-up of a TCP/IP network on an Ethernet LAN, refer to section *Connecting to Ethernet LAN* below.
- For set-up of a TCP/IP network via a modem, refer to section *Connecting via Modem* on page 70.
- For set-up of a TCP/IP network via an ECC, refer to section *Connecting via ECC* on page 73.

Connecting to Ethernet LAN

1. Allocate an IP address to the Ethernet port (10baseT) of the radio terminal in one of the following ways:
 - For set-up of a TCP/IP network on an Ethernet LAN using static IP addresses, allocate a static IP address, subnet mask and broadcast address to the Ethernet port. Refer to section *Allocating Static IP Address* on page 78.
 - For set-up of a TCP/IP network on an Ethernet LAN using dynamic IP addresses, configure the Ethernet port to use dynamic IP addresses. Refer to section *Allocating Dynamic IP Address* on page 79.
2. Perform a soft restart of the radio terminal for the changes to take effect:
 - Select **Terminal** → **State Control** and select Restart type = **Soft**.

 - Wait until the radio terminal is in STANDBY state.
3. Go to the web page "Address Configuration" (**Network** → **IP Addresses**) to verify the changes above.

4. Go to the web page "Network Interface Configuration" (**Network** → **Interfaces**) and make sure that the status of the Ethernet port (10baseT) is set to "Up".
5. Exit the web browser and disconnect the serial PC cable between the local PC and the radio terminal.
6. Make sure the remote management equipment is connected to the Ethernet LAN network, or to another radio terminal connected to the Ethernet LAN network, and that it is set up to work properly in this environment. For further information, refer to the Operation and Maintenance Manual (WLDM002).
7. Connect the radio terminal to the network by connecting an UTP cable to the 10baseT port on the BBU.
8. Proceed to section *Antenna Alignment* on page 80.

Connecting via Modem

1. Allocate an IP address to the serial port (MODEM/NMS 2) of the radio terminal in one of the following ways:
 - For set-up of a TCP/IP network on a modem connection using static IP addresses, allocate a static IP address, subnet mask and broadcast address to the serial port (MODEM/NMS 2). Refer to section *Allocating Static IP Address* on page 78.
 - For set-up of a TCP/IP network on a modem connection using dynamic IP addresses, configure the serial port (MODEM/NMS 2) to use dynamic IP addresses. Refer to section *Allocating Dynamic IP Address* on page 79.
2. Configure the serial port (MODEM/NMS 2) for modem connection by selecting **Network** → **Serial Interfaces** and editing the following parameters:

Interface	Baudrate	Usage
RS-232/2	Select the baudrate to use.	Select the connection type "External modem".

Accept changes

3. Configure the modem behaviour for the serial port (MODEM/NMS 2) by selecting **Network** → **Serial Interfaces** and editing the following parameters:
 - Telephone number;
 - Modem mode; and
 - Modem idle timeout.

4. Configure the modem AT commands for the serial port (MODEM/NMS 2) by selecting **Network** → **Serial Interfaces** and clicking **Configure** for the "Initialize sequence", "Dial sequence" or "Disconnect sequence". Edit the following parameters:

Command	Response
<p>Edit AT commands for initializing, dialling or disconnecting the modem.</p> <p>For the dial sequence, the telephone number will be automatically added after the last command provided that you have entered a value for "Telephone number" above.</p>	<p>Enter the expected response to each AT command.</p> <p>Leave empty if no response is expected.</p>

Update

Update the database with the new settings for the AT command.

Delete

Delete the AT command in the database.

Create entry

Add a new AT command, entered on the row "Add command", to the database.

5. Configure the modem security by selecting **Network** → **Serial Interfaces** and editing the following parameters:
- Authentication protocol (**No authentication, PAP or CHAP**);
 - PAP user (if PAP is used);
 - PAP password (if PAP is used);
 - PAP password confirmation (if PAP is used);

- CHAP secret (if CHAP is used); and
- CHAP secret confirmation (if CHAP is used).

Accept changes

6. Perform a soft restart of the radio terminal for the changes to take effect:

- Select **Terminal** → **State Control** and select Restart type = **Soft**.

Accept changes

- Wait until the radio terminal is in STANDBY state.
7. Go to the web page "Address Configuration" (**Network** → **IP Addresses**) to verify the changes above.
8. Go to the web page "Network Interface Configuration" (**Network** → **Interfaces**) and make sure that the status of the serial port (MODEM/NMS 2) is set to "Up".
9. Exit the web browser and disconnect the serial PC cable between the local PC and the radio terminal.
10. Make sure the remote management equipment is connected to a remote modem, and that it is set up to work properly in its environment. For further information, refer to the Operation and Maintenance Manual (WLDM002).
11. Connect the radio terminal to a modem by using the serial port (MODEM/NMS 2) on the BBU.
12. Proceed to section *Antenna Alignment* on page 80.

Connecting via ECC

- Allocate an IP address to the ECC port of the radio terminal in one of the following ways:
 - For set-up of a TCP/IP network on a ECC connection using static IP addresses, allocate a static IP address, subnet mask and broadcast address to the ECC port. Refer to section *Allocating Static IP Address* on page 78.
 - For set-up of a TCP/IP network on a ECC connection using dynamic IP addresses, configure the ECC port to use dynamic IP addresses. Refer to section *Allocating Dynamic IP Address* on page 79.
- Configure the ECC port by selecting **Network** → **ECC** and editing the following parameters:

Port no	Slot no	Use 7 bits	Force connection
<p>Select the traffic port to use for the ECC.</p> <p>Traffic ports available for an ECC are E1:1–17, DS1:1–17, and OH:1–2.</p>	<p>Select the timeslot to use for the ECC.</p> <p>0–31 (E1) 0–23 (DS1)</p>	<p>Choose if 7 bit signalling should be used.</p> <p>Yes: The 7 most significant bits will be used.</p> <p>No: All 8 bits will be used.</p>	<p>Choose whether the ECC should override an AIS or not.</p>

Accept changes

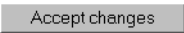
3. Perform a soft restart of the radio terminal for the changes to take effect:
 - Select **Terminal** → **State Control** and select Restart type = **Soft**.

Accept changes

- Wait until the radio terminal is in STANDBY state.
4. Go to the web page "Address Configuration" (**Network** → **IP Addresses**) to verify the changes above.
 5. Go to the web page "Network Interface Configuration" (**Network** → **Interfaces**) and make sure that the status of the ECC port is set to "Up".
 6. Exit the web browser and disconnect the serial PC cable between the local PC and the radio terminal.
 7. Make sure the remote management equipment is connected to the ECC, and that it is set up to work properly in its environment. For further information, refer to the Operation and Maintenance Manual (WLDM002).
 8. Proceed to section *Antenna Alignment* on page 80.

Connecting via a Common Backplane

Connection of the radio terminal via a common backplane requires that it has been mounted in a 2U or 6U Magazine.

1. Allocate an IP address to the backplane port in question in one of the following ways:
 - For set-up of a TCP/IP network on a backplane connection using static IP addresses, allocate a static IP address, subnet mask and broadcast address to the backplane port. Refer to section *Allocating Static IP Address* on page 78.
 - For set-up of a TCP/IP network on a backplane connection using dynamic IP addresses, configure the backplane port to use dynamic IP addresses. Refer to section *Allocating Dynamic IP Address* on page 79.
2. Perform a soft restart of the radio terminal for the changes to take effect:
 - Select **Terminal** → **State Control** and select Restart type = **Soft**.

 - Wait until the radio terminal is in STANDBY state.
3. Go to the web page "Address Configuration" (**Network** → **IP Addresses**) to verify the changes above.
4. Go to the web page "Network Interface Configuration" (**Network** → **Interfaces**) and make sure that the status of the backplane port in question is set to "Up".
5. Exit the web browser and disconnect the serial PC cable between the local PC and the radio terminal.
6. Make sure the remote manager is connected to the management network, and that it is set up to work properly in

its environment. For further information, refer to the Operation and Maintenance Manual (WLDM002).

7. Proceed to section *Antenna Alignment* on page 80.

Daisy-chaining

1. Allocate an IP address to the serial port (LM/NMS 1 or MODEM/NMS 2) of the radio terminal in one of the following ways:
 - For set-up of a TCP/IP network on a daisy chain using static IP addresses, allocate a static IP address, subnet mask and broadcast address to the serial port (LM/NMS 1 or MODEM/NMS 2). Refer to section *Allocating Static IP Address* on page 78.
 - For set-up of a TCP/IP network on a daisy chain using dynamic IP addresses, configure the serial port (LM/NMS 1 or MODEM/NMS 2) to use dynamic IP addresses. Refer to section *Allocating Dynamic IP Address* on page 79.
2. Configure the serial port (LM/NMS 1 or MODEM/NMS 2) for connection to a radio terminal by selecting **Network** → **Serial Interfaces** and editing the following parameters:

Interface	Baudrate	Usage
RS 232/1 or RS 232/2	Select the baudrate to use.	Select the connection type "BBU via NULL modem".

Accept changes

3. Make sure the serial port (LM/NMS 1 or MODEM/NMS 2) on the radio terminal to connect to has been configured for connection to a radio terminal as well.

4. Perform a soft restart of the radio terminal for the changes to take effect:
 - Select **Terminal** → **State Control** and select Restart type = **Soft**.

Accept changes

- Wait until the radio terminal is in STANDBY state.
5. Go to the web page "Address Configuration" (**Network** → **IP Addresses**) to verify the changes above.
 6. Go to the web page "Network Interface Configuration" (**Network** → **Interfaces**) and make sure that the status of the serial port (LM/NMS 1 or MODEM/NMS 2) is set to "Up".
 7. Exit the web browser and disconnect the serial PC cable between the local PC and the radio terminal.
 8. Make sure the remote manager is connected to the management network, and that it is set up to work properly in its environment. For further information, refer to the Operation and Maintenance Manual (WLDM002).
 9. Connect the radio terminal to the other radio terminal by using the serial port (LM/NMS 1 or MODEM/NMS 2) on the BBU.
 - For an LM/NMS 1–MODEM/NMS 2 connection, use a straight-through serial cable with one 9 pin D-SUB plug and one 9 pin D-SUB jack.
 - For an LM/NMS 1–LM/NMS 1 connection, use a null modem cable with two 9 pin D-SUB plugs.
 - For a MODEM/NMS 2–MODEM/NMS 2 connection, use a null modem cable with two 9 pin D-SUB jacks.
 10. Proceed to section *Antenna Alignment* on page 80.

Allocating Static IP Address

Select **Network** → **IP Addresses** and follow the link **static addresses here**. Edit the following parameters for the interface in question:

Interface	Address	Subnet mask	Broadcast address
Management network interface.	Enter the IP address for the network interface.	Enter the subnet mask for the network interface. Default = 255.255.255.0	Enter the broadcast address for the network interface. Default = 255.255.255.255

Accept changes

For further information on static IP addresses, refer to the Operation and Maintenance Manual (WLDM002).

Allocating Dynamic IP Address

Select **Network** → **DHCP** and edit the following parameter for the interface in question:

Interface	Use DHCP
Management network interface.	<p>Select if the interface should be allocated a dynamic IP address from a DHCP server.</p> <p>No: DHCP will not be used.</p> <p>Yes, send request on all interfaces: The DHCP request will be sent on all interfaces. Use this alternative if only one DHCP server is present in the network, and if you are not sure which path the DHCP request may follow to the DHCP server.</p> <p>Yes, send request on this interface: The DHCP request will be sent on this interface only. Use this alternative if the DHCP server that you want to use is connected towards this interface, and you want to be sure that the DHCP request does not reach a DHCP server connected towards any of the other interfaces.</p>

Accept changes

Antenna Alignment

Tools Required for Antenna Alignment

- 17 mm torque wrench
- Voltmeter (0–5V DC) with BNC adapter (the AGC contact on the RFU is of BNC socket type).

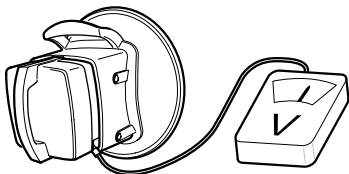
Preparations

1. Check that all relevant instructions in the preceding sections of this manual are completed for both installation sites before you start aligning the antennas.
2. Arrange for speech communication between the installation sites if possible. This will make it easier to align the antennas correctly.

Alignment Procedure

When aligning the antennas, the AGC port on the RFU (BNC connector) is used to indicate the Received Signal Level (RSL). Use a standard multimeter with a BNC adapter to measure the AGC voltage. The AGC voltage is somewhere in the range 0–5V DC.

Note: The alignment procedure should be performed for one antenna at a time. If the initial alignment error is large, however, you may need to begin by moving both antennas to achieve contact.



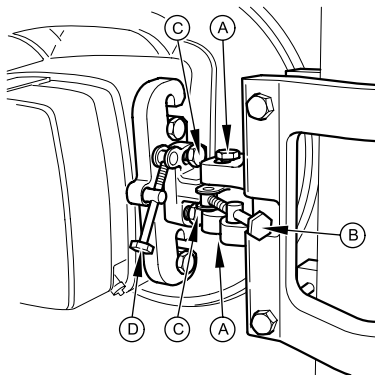
1. Connect the voltmeter to the AGC port on the RFU.

The voltmeter will always show a value of at least 0.5V if the radio terminal is working correctly.

If the antenna is receiving an unknown signal, or a signal from a radio terminal which has the wrong security code, the voltmeter will show an oscillating value.

2. Maximize the voltmeter value by using the azimuth and elevation screws to adjust the antenna. The maximum possible adjustment is ± 20 degrees in both azimuth and elevation.

Note: If the alignment error is more than approximately 4 degrees, there is a risk that the maximum AGC voltage that you have found is for a side lobe. The maximum value of the AGC voltage is lower for a side lobe than for the main lobe.



– **Azimuth fine tuning**

Loosen the two locking screws (A).

Use the azimuth screw (B) to adjust the antenna.

– **Elevation fine tuning**

Loosen the two locking screws (C).

Use the elevation screw (D) to adjust the antenna.

Note: Do not loosen the locking screws too much. There should be a slight friction when aligning the antenna.

3. Use the torque wrench to secure the antenna position by tightening the locking screws for both azimuth and elevation. These are indicated in the figure above (A and C).

Note: The torque should be $35 \text{ Nm} \pm 10\%$ when tightening the screws. The azimuth and elevation screws must not be touched after the locking screws have been tightened.

4. Check the RSL on the web page "RF Path Status" (**Status** → **RF path status**) of the Indoor Unit and record the value.

Installation Verification and Test

Checking RF Path Status

1. Make sure that all relevant instructions in the preceding sections have been performed for both installation sites.
2. Make sure that your PC is connected to one of the radio terminals in the hop according to section *Local Management Connection* on page 49.
3. Follow the instructions in section *Accessing the Web Pages* on page 60 to access the web pages for one of the radio terminals.
4. Access the web page "RF Path Status" (**Status** → **RF Path Status**).
5. Check that all status values are in accordance with the table below:

Parameter	Status
RF Path Availability	Available
Received Signal Level	Compare this value with the expected RSL.
Security Code	OK
Modem Phase Lock	OK
Modem Bit Synchronization	OK
MUX Bit Synchronization	OK
Last Second Errored	No
Last Second Severely Errored	No

Parameter	Status
Background Block Error during last second	No
Errored Second Rate	0%
Severely Errored Second Rate	0%
Background Block Error Rate	0%
RF Present	Yes
RF Measured Power	Compare this value with the configured TX Output Power.

6. Repeat step 3–5 above for the radio terminal at the far end of the hop.

Index

Numerics

1 ft. antenna	13
19" rack	
Installation Kit for.....	17
mounting the Indoor Unit in	25
2 ft. antenna	13
26 pin D-SUB connector	19
2U Magazine	18
Installation Kit for.....	18
space requirements.....	10
6U Magazine	18
Installation Kit for.....	18
space requirements.....	10
9 pin D-SUB connector	
modem	19
PC	19

A

accessories	
indoor	18
product numbers	5
ACTIVE LED	47
AGC port	81
contact type	80
AGC voltage.....	81
ALARM LED.....	47
alignment	80
error	81
amr.inf	44, 50
ANSI standard.....	6
Antenna Unit	34
1 ft.	13
2 ft.	13
alignment.....	80
integrating with RFU.....	36

left or right side mounting.....	37
mounting	13, 39
moving coaxial connector	35
product numbers	5
Antenna/RF Unit	
grounding	40
left or right side mounting.....	37
lifting.....	37
mounting	39
recommended mounting	38
AT commands	71
azimuth	
fine tuning	82
screw.....	81

B

background block error	84
background block error rate.....	84
backplane	
connection set-up.....	75
cross connect conf.	64
balanced interface	20, 22
connector mounting	28
bandwidth	62
Baseband Unit	17
product numbers	5
BBU, see Baseband Unit	
beryllium oxide.....	8
BNC adapter	80
brackets	25
broadcast address allocation.....	78

C

captive nut	
magazine	18
rack mount	17
CHAP	72

- common backplane connection .75
- configuration
 - local management49
 - radio terminal.....58
 - remote management68
- connecting the power cable48
- connector
 - 26 pin D-SUB for ext. I/O. 17, 31
 - 37 pin D-SUB for traffic29
 - 9 pin D-SUB for traffic30
 - DC power 17, 32
 - mounting.....28
 - N type 33, 40
 - TNC 17, 33
- contact person61
- control panel19
- copper braid 11, 14, 27, 40
- cross connect.....59
 - RF subchannels59
 - traffic channels59

- D**
- daisy-chaining
 - connection set-up76
 - equipment.....46
- DC connector19
- Dial Up Networking
 - software44
 - Windows 95/98 53, 57
 - Windows NT 52, 57
- dialling up
 - configuration.....52
 - serial port.....57
- documentation5
- domain name61
- D-SUB connector
 - 26 pin for external I/O. 17, 19, 31
 - 37 pin for traffic channel29
 - 9 pin for modem 19
 - 9 pin for OH channel 31
 - 9 pin for PC 19
 - 9 pin for traffic channel.....30
 - DC power 32
- dynamic IP addresses 79

- E**
- ECC connection set-up.....73
- electrical safety9
- electromagnetic interference
 - indoor 11
 - outdoor 14
- elevation
 - fine tuning 82
 - screw.....81
- EMC
 - indoor 11
 - outdoor 14
- environment
 - indoor requirements 12
 - outdoor requirements 15
- errored second83
- errored second rate 84
- Ethernet
 - DTE 19
- Ethernet for management
 - cable45
 - connection set-up.....68
 - interfaces 19
- Ethernet TIU
 - buffers65
 - configuration 65
 - connectors, mounting.....30
 - duplex mode 66
 - enable 66
 - flow control.....66
 - interfaces 20, 23

- MAC address lookup66
 - packet size 65, 67
 - speed.....66
 - VLAN 65, 67
 - ETS 300 019 12, 15
 - ETS 300 385 11, 14
 - ETSI rack mounting kit.....18
 - external I/O connector..... 17, 31
- ## G
- grounding
 - Antenna/RF Unit..... 14, 40
 - indoor equipment.....11
 - Indoor Unit..... 19, 27
 - M10 screw holes for 14, 40
 - M6 lug for 11, 27
 - outdoor equipment14
 - radio cable 14, 41
 - requirements9
- ## H
- horizontal polarization35
 - hostname61
 - humidity
 - indoor12
 - outdoor15
 - HyperTerminal 42, 44
- ## I
- I/O port19
 - indoor
 - accessories18
 - equipment.....17
 - requirements10
 - indoor radio cable33
 - Indoor Unit17
 - EMC11
 - grounding 11, 27
 - installation 16
 - installing the cables for28
 - mounting24
 - mounting in 19" rack25
 - mounting in magazine.....26
 - numbering in magazine.....26
 - space requirements 10
 - initial configuration58
 - installation
 - indoor16
 - outdoor.....34
 - verification.....83
 - Installation Kit
 - for 19" rack.....17
 - for 2U Magazine.....18
 - for 6U Magazine.....18
 - Installation Manual.....5
 - interfaces
 - balanced 20, 22
 - co-directional.....31
 - Ethernet TIU..... 20, 23
 - unbalanced 20–21
 - internal protection circuits 11
 - IP addresses
 - allocation.....78
 - dynamic.....79
 - static.....78
 - ITU standard6
 - ITU-T G.703..... 20, 31
- ## L
- LAN.....45
 - LEDs.....19
 - blinking pattern.....47
 - lightning protection 38, 41
 - LM/NMS1 port19

local management.....	49
equipment.....	44
locking screw	37
login	60

M

M10 grounding screw holes .	14, 40
M10 screws.....	37
M6 grounding lug	11, 19, 27
magazine	
2U.....	18
2U Installation Kit	18
6U.....	18
6U Installation Kit	18
mounting of.....	26
Mounting Rail for	18
Mounting Rail Screw for	18
mounting the Indoor Unit in ...	26
numbering of Indoor Units	26
space requirements.....	10
transport safety panels	26
main lobe	81
management	
backplane connection.....	75
daisy-chaining	76
direct connection, static.....	55
ECC connection	73
Ethernet connection	68
local.....	49
modem connection.....	70, 75-76
remote	68
Mast Mounting Bracket	34
fastening to mast.....	38
mast requirements	13
mast stability	13
Metral connector	20
modem	45
AT commands	71

authentication.....	71
bit synchronization status.....	83
cable	45
connection set-up.....	70
dial sequence.....	71
disconnect sequence	71
driver for null modem	50
idle timeout.....	70
initialize sequence.....	71
mode	70
telephone number	70
MODEM/NMS2 port.....	19
modular connector.....	19
moisture protection	36
mounting pole diameter	13
Mounting Rail.....	18
Screw	18
muting the TX	62
MUX	
bit synchronization status.....	83
port.....	59

N

N connector	33, 40
null modem driver	50

O

OH channel connector	
9 pin D-SUB for OH	31
OH channels, see traffic channels	
operating system for PC	44
Operation and Maintenance	5
operational modes	47
operational states	47
outdoor	
EMC	14
equipment	34

- installation34
- requirements13
- outdoor radio cable
 - grounding41
 - installation40
 - maximum length40
- output power62
 - measured84
- P**
- PAP71
- password60
 - changing60
- PC
 - cable44
 - connection55
 - serial port configuration49
 - setting up49
- phase lock
 - status for Baseband Unit83
- polarization36
 - choosing35
- power
 - cable 9, 32
 - consumption11
 - DC connector 17, 19, 32
 - indoor requirements11
 - outdoor requirements14
 - output level configuration62
 - supply 11, 48
- PPP network
 - dialling up57
 - dialling up configuration52
 - set-up of55
- Product List5
- product numbers
 - accessories 5, 18
 - Antenna Unit 5, 34
 - Baseband Unit 5, 17
 - Radio Frequency Unit 5, 34
 - Traffic Interface Unit 5, 21–23
- product range5
- protection circuits11
- R**
- Rack Mount Captive Nut 17–18
- Rack Mount Screw 17–18
- radio cable
 - grounding 14, 41
 - indoor mounting 33
 - maximum length 40
 - outdoor mounting 40
- Radio Frequency Unit 34
 - BBU connection status 84
 - integrating with Antenna Unit 36
 - mounting 13
 - product numbers 5
- remote management 68
 - equipment 45–46
- requirements
 - indoor 10
 - indoor environment 12
 - indoor power 11
 - indoor space 10
 - mast 13
 - outdoor 13
 - outdoor environment 15
 - outdoor power 14
 - outdoor space 13
 - safety 7
 - site 7
- RF channel
 - availability 83
 - configuration 62
 - measured power 84
 - number 62

status.....	83	dialling up configuration	52
RF frame format.....	62	modem connection.....	70, 75–76
RF subchannel cross connect....	64	PC configuration	49
RFU, see Radio Frequency Unit		PC connection, static	55
RG213 cable	40	radio terminal connection	76
RG214 cable	40	settings.....	49
RG400 cable	33	severely errored second	83
RJ-45 connector.....	19	severely errored second rate	84
router.....	45	side lobe	81
RS-232		site requirements	7
DCE.....	19	Sofix connector	20
DTE	19	space requirements	
RSL.....	81	indoor	10
checking	82	outdoor.....	13
expected.....	62	start-up and configuration	42
status.....	83	equipment for	44
		static IP address	78
		allocating to serial port.....	55
		subnet mask allocation	78
		surge arrester	33, 41
		switching	
		OFF	48
		ON.....	48
		syntax	6
		system information conf.....	61
S		T	
safety		TCP/IP network	
devices	8	set-up	68, 70, 73, 75–76
electrical	9	Technical Description	5
precautions.....	7	temperature	
requirements	7	indoor	12
warnings.....	7	outdoor.....	15
screw		terminal	
azimuth.....	81	ID	61
elevation.....	81	location.....	61
locking	37	TEST LED	47
magazine.....	18	text terminal	44
mounting rail.....	18		
rack mount.....	17		
security code.....	81		
configuration.....	62		
status.....	83		
serial port			
baudrate	70, 76		
connection type	70, 76		
dialling up	57		

-
- TIU, see Traffic Interface Unit
- TNC connector 17, 19, 33
- tools
- for indoor installation16
 - for outdoor installation34
- torque wrench 34, 80
- traffic channels
- configuration63
 - connecting to backplane63
 - connecting to MUX63
 - connectors 29-30
- Traffic Interface Unit 17, 20
- balanced22
 - balanced, cables for28
 - balanced, connecting28
 - Ethernet23
 - Ethernet, connecting30
 - mounting20
 - port59
 - product numbers5
 - unbalanced21
 - unbalanced, connecting28
- traffic interfaces20
- traffic routing59
- transients
- preventing transmission of ...48
- transmitter
- frequency62
 - muting62
 - output power62
- transport safety panels26
- TX/RX signal definition28
- U**
- unbalanced interface 20-21
 - connector mounting28
 - username60
 - UTP cable45
- V**
- vertical polarization 35
 - VLAN 65, 67
 - voltage
 - hazards 8
 - supply 11
 - voltmeter 80-81
- W**
- WARNING LED 47
 - web browser 44
 - web pages
 - accessing 60
 - backplane cross connect 64
 - choosing 60
 - Ethernet TIU configuration 65
 - RF channel configuration 62
 - RF path status 83
 - RF subchannel cross con. 64
 - system information conf. 61
 - traffic channel configuration .. 63

