

AR Repeaters





Installation Guide

AR Repeaters

Channel Selective and Band Selective Repeaters

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English

This document describes installation, commissioning and the design of the LGP Allgon AR Repeaters.

Communication between LGP Allgon AR repeaters and operators is carried out either by using LGP Allgon OMT32 (Operation and Maintenance Terminal), or LGP Allgon OMS (Operation and Maintenance System). OMT32 is described in the *OMT32, User's Manual*. OMS is described in the *Advanced Repeater OMS, User's Manual*.

Hardware and software mentioned in this document are subjected to continuous development and improvement. Consequently, there may be minor discrepancies between the information in the document and the performance and design of the product. Specifications, dimensions and other statements mentioned in this document are subject to change without notice.

Federal Communications Commission (FCC)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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1. Safety

In this chapter, the word 'repeater' includes all LGP Allgon repeating units, such as repeaters, hubs and radio heads.

It is necessary that any personnel involved in installation, operation or service of units included in an LGP Allgon repeater system understand and follow the below points.

- The LGP Allgon repeaters are designed to receive and amplify signals from one or more base stations and retransmit the signals to one or more mobile stations. And, also to act the other way round, that is to receive signals from one or more mobile stations, amplify and retransmit the signals to the base stations. LGP Allgon repeater systems must be used exclusively for this purpose and nothing else.
- Units supplied from the mains must be connected to grounded outlets and in conformity with the local prescriptions.
- Power supply units supplied from the mains contain dangerous voltage that can cause electric shock. Disconnect the mains prior to any work in such a unit. Local regulations are to be followed when servicing such units.



Authorized service personnel only are allowed to service units while the mains is connected.



- The repeater cover must be secured in opened position, for instance by tying it up, at outdoor repeater work. Otherwise, the cover can be closed by the wind and cause your fingers getting pinched or your head being hit.



- When working on a repeater on high ground, for instance on a mast or pole, be careful not to drop parts or the entire repeater. Falling parts can cause serious personal injury.



- All RF transmitting units, including repeaters, will generate radio signals and thereby give rise to electromagnetic fields that may be hazardous to the health of any person who is extensively exposed close to an antenna.

See the *Human Exposure of RF Radiation* section on page 1-3.



Beryllium oxide

- Beryllium oxide (BeO) may be contained in power devices, for instance in dummy loads in directional couplers (DCC), in combiner units (CMB), and in attenuators on the FON board. Beryllium oxide is poisonous if present as dust or smoke that can be inhaled.

Do not file, grind, machine, or treat these parts with acid.



Hydrogen fluoride

- Coaxial cables used in many LGP Allgon systems have the insulation made of PTFE, polytetrafluoro ethylene, that gives off small amounts of hydrogen fluoride when heated. Hydrogen fluoride is poisonous. Do not use heating tools when stripping off coaxial cable insulation.

No particular measures are to be taken in case of fire because the emitted concentration of hydrogen fluoride is very low.



- A lithium battery is permanently mounted in repeater CU units, and in FON and OCM units. Due to the risk of explosion, this battery must only be removed from the board by an LGP Allgon authorized service technician.



- NiCd batteries are mounted on the FON unit. These batteries contain environmental poisonous substances. If replaced, the old batteries should be taken care of as stated in the local prescriptions.

- The FON unit contains a class IIIb laser transmitter that emits 2 – 4mW invisible laser radiation during operation. Avoid direct exposure from unconnected laser transmitter or fiber cord as follows:

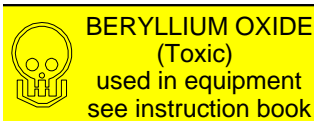
- Do not power up the FON unit if a fiber cable is not attached to the fiber output UL port, neither if a fiber cable is attached to the port but unattached in the other end.
- Never look in the end of a fiber cable. The 1310nm and 1550nm laser light is not visible, so no signal identification can be made anyway. Use always an instrument, such as a power meter to detect signaling.
- Never use any kind of magnifying devices that can focus the laser light to an unaided eye.

Warning Signs

The following warning signs must be observed and be kept clean and readable.

Beryllium oxide

This warning sign is applied on boards and units which contain beryllium oxide parts.



This warning sign is applied at the bottom, inside the cabinet, below the power supply unit.

The previous section details parts containing beryllium oxide and how to avoid dangerous dealing with these parts.

Human Exposure of RF Radiation

This section contains a few words about repeater antennas and prescriptions for installation and maintenance of antenna systems. Also, it describes how to calculate safety distances needed for RF radiation at different antenna power and frequencies.

Repeater Antennas

To be able to receive and transmit signals as described in the first bulleted paragraph on page 1-1, a repeater is connected to a donor antenna directed towards the base station, and a service antenna directed towards the coverage area. A fiber optic cable from the base station might, however, be substituted for the donor antenna.

Installation and Maintenance of Antenna Systems

Installation and maintenance of all repeater antenna systems must be performed with respect to the radiation exposure limits for public areas.

The antenna radiation level is affected by the repeater output power, the antenna gain, and by transmission devices such as cables, connectors, splitters and feeders.

Have also in mind that the system minimum coupling loss, typical between 25dB and 35dB, is determined by a standard with the purpose to protect base stations from noise and other performance dropping effects.

Radiation Exposure

WHO, World Health Organization, and ICNIRP, International Commission on Non-Ionising Radiation Protection, have determined recommendations for radiation exposure.

ICNIRP recommends not to exceed the following radiation power for public exposure:

Frequency	Radiation power
900MHz	4,5W/m ²
1800MHz	9,0W/m ²
2100MHz	10,0W/m ²

For antennas larger than 20cm the maximum radiation power can be calculated by using the following formula:

$$S = \frac{P}{4 \times \pi \times r^2}$$

where

S = Radiation power in W/m².

P = Output power in W.

r = Distance between antenna and human in meter.

To tackle the worst case successfully, the calculation does not consider system power reducing actions, such as power control and DTX.

Figure 1-1 shows the safety distance to an antenna due to the RF radiation. The distance is depending on the antenna output power and frequency, which is illustrated with two graphs in the figure.

One of the graphs applies to 4.5W/m² (900MHz) and the other to 9.0W/m² (1800MHz) or 10.0W/m² (2100MHz).

The safety distance range in Figure 1-1 is 0 to 1.4 meter that covers an antenna power range of 10dBm to 50dBm (0.01W to 100W).

Radiation Safety Distances

This section illustrates the safety distances to the antennas for some typical repeater configurations.

Outdoor GSM 900MHz

Repeater output power	+33dBm
Feeder loss	-5dB
Antenna gain	+17dBi
EIRP	+45dBm

The safety distance can be read to 0.75 meter in Figure 1-1 as the maximum radiation power is 4.5W/m² for 900MHz.

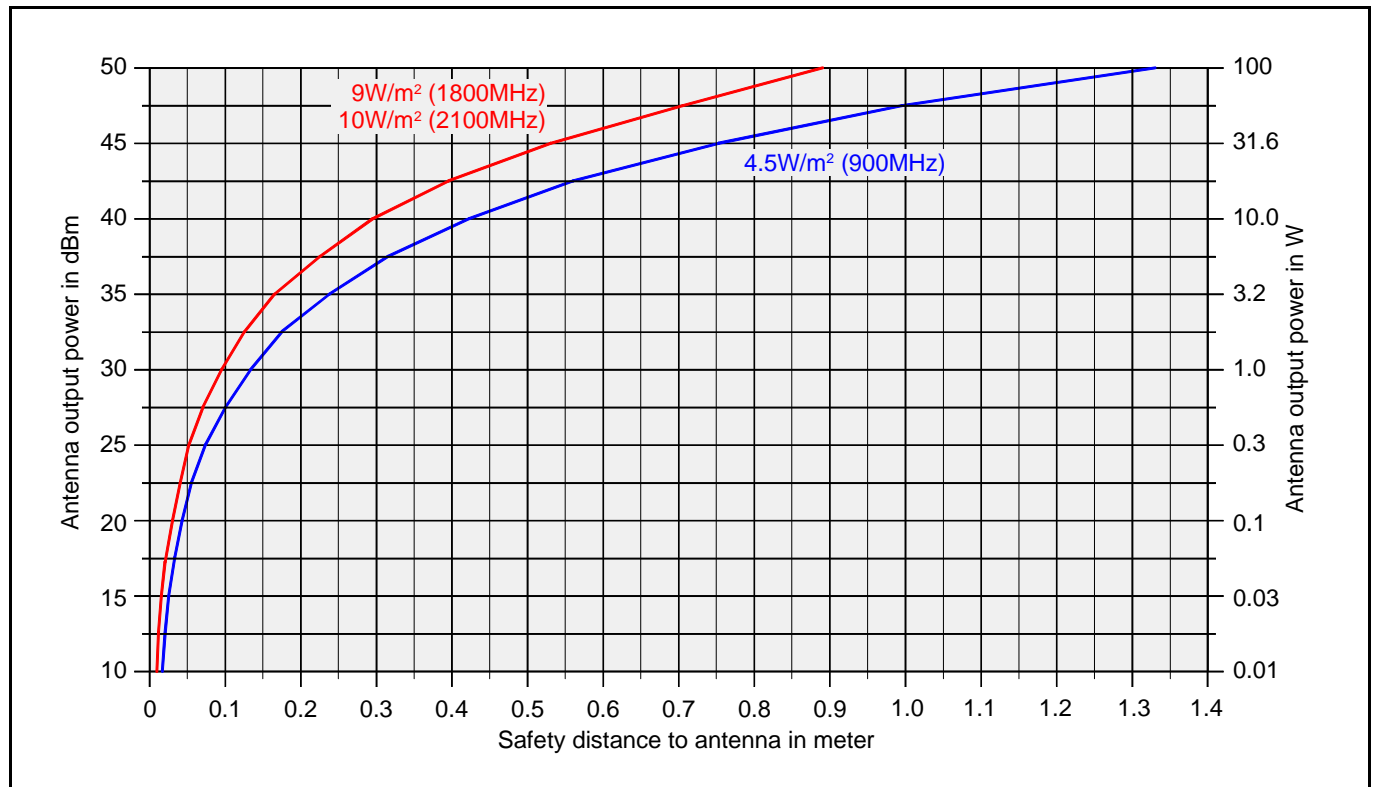


Figure 1-1. Safety distance to active antenna

Indoor GSM 900MHz

Repeater output power	+22dBm
Feeder loss	-5dB
Antenna gain	+1dBi
<hr/> EIRP	<hr/> +18dBm

The safety distance can be read to 0.035 meter for 4.5W/m² (900MHz).

Outdoor UMTS Standard High Power

Repeater output power	+38dBm
Feeder loss	-5dB
Antenna gain	+17dBi
<hr/> EIRP	<hr/> +50dBm

The safety distance can be read to 0.9 meter for 10W/m² (2100MHz).

Indoor UMTS

Repeater output power	+24dBm
Feeder loss	-5dB
Antenna gain	+3dBi
<hr/> EIRP	<hr/> +22dBm

The safety distance can be read to 0.035 meter for 10W/m² (2100MHz).

Static Electricity

Static electricity means no risk of personal injury but it can severely damage essential parts of the equipment, if not handled carefully.

Parts on the printed circuit boards as well as other parts in the equipment are sensitive to electrostatic discharge.



Never touch the printed circuit boards or uninsulated conductor surfaces unless absolutely necessary.

If you must handle the printed circuit boards or uninsulated conductor surfaces, use ESD protective equipment, or first touch the chassis with your hand and then do not move your feet on the floor.

Never let your clothes touch printed circuit boards or uninsulated conductor surfaces.

Always store printed circuit boards in ESD-safe bags.

2. Installation

Before installation, read carefully Chapter 1, *Safety*.

Siting the Repeater

LGP Allgon repeaters are designed for outdoor usage. However, humidity and temperature changes may have affect on the reliability. A preferable site for the repeater is thus indoor, in a tempered and ventilated room.

Sunshine

If a repeater is placed outdoor and can be exposed to direct sunshine, it is essential that the air can circulate around the repeater with no obstacle.

The operating temperature must not exceed +55°C. A shelter can be used to shade the repeater from direct sunshine.

Shelter

LGP Allgon repeaters are designed with a weather proof outdoor case that can be mounted without any kind of shelter from rain, snow or hail.

If a repeater is to be opened on the site when raining, snowing, or hailing there must be some kind of permanent or temporary shelter. This is applicable to gentle rainfall, snowfall or hail. Limitations for very bad weather is found in the next section.

LGP Allgon can provide a shelter designed for these repeaters. This shelter is shown in Figure 2-1.

Outdoor Installation and Service Limitations

Sited outdoors, the repeater must not be opened for installation or service at bad weather, such as:

- Intense rainfall, snowfall or hail.
- Storm or high wind.
- Extremely low or high temperature.
- High humidity of the air.

Dimensions and Weights

The dimensions of the repeater, including the mounting bracket, is shown in Figure 2-1. The repeater chassis consists of two main parts, a *cabinet* in which the circuitry is housed, and a *cover*, which can be either a low cover or a high cover (see the figure) depending on the repeater type.

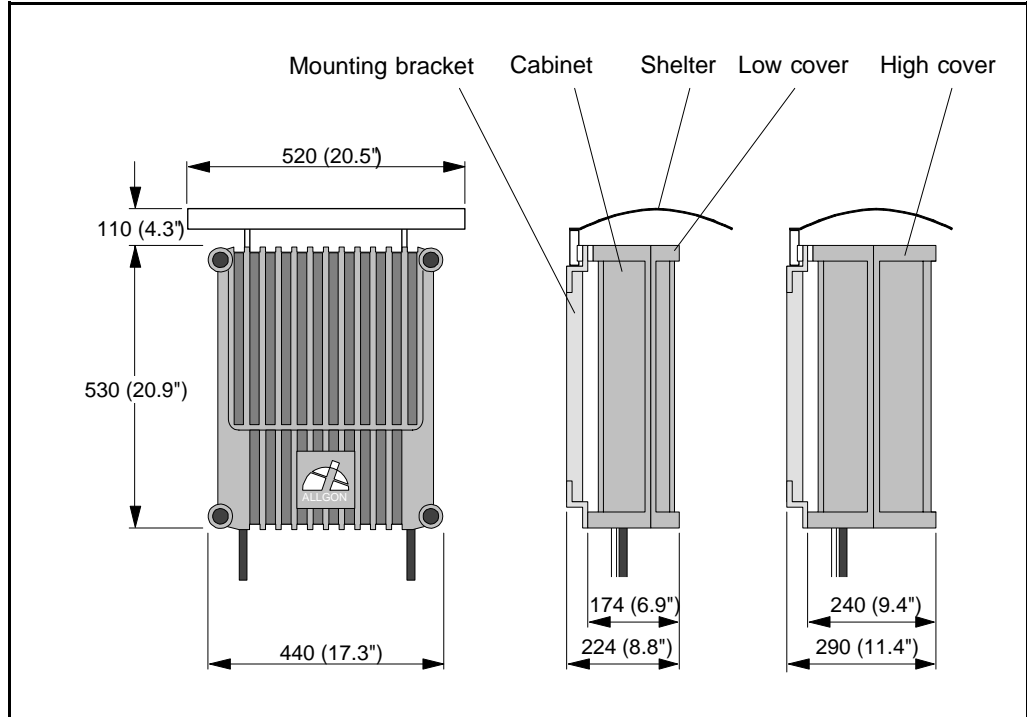


Figure 2-1. Repeater dimensions

The high power CDMA and WCDMA repeaters have an external heat sink on a high cover, see Figure 2-2.

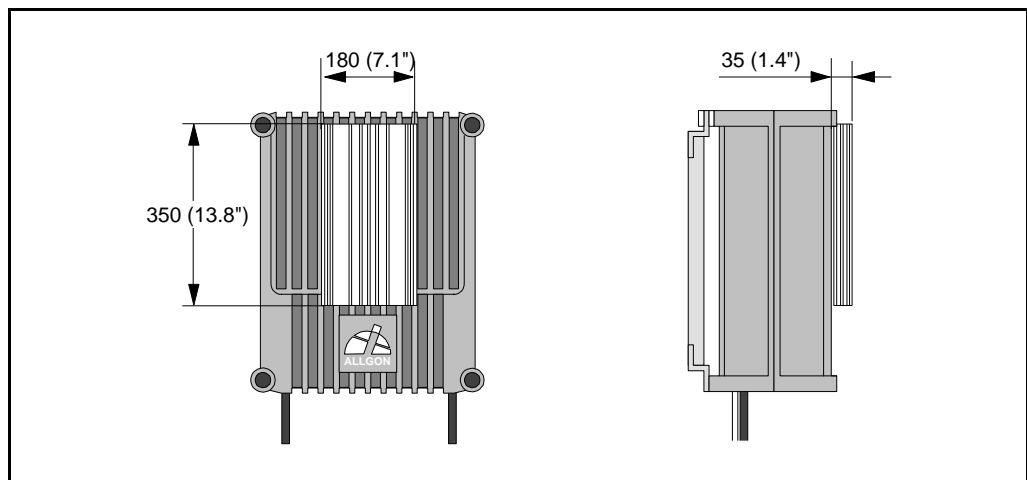


Figure 2-2. High power CDMA/WCDMA repeater

Approximately repeater weights

Repeater with a low cover	21 kg (46 lbs)
Repeater with an empty high cover	25 kg (55 lbs)
Combined repeater with a high cover	30 kg (66 lbs)



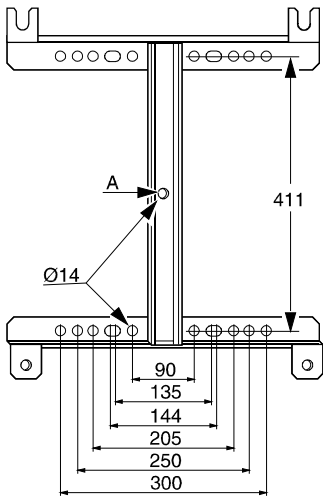
It is not recommended to remove the cover from the cabinet at the site.

However, if the cover, for some reason, has to be removed from the cabinet, then disconnect the interconnection cables, close the cover, remove the hinge shafts, and remove the cover.

The cabinet and cover weights are, approximately, as follows:

Empty low cover	6 kg (13 lbs)
Empty high cover	10 kg (22 lbs)
Equipped cabinet or high cover	15 kg (33 lbs)

Mounting



The AR repeater is easy to mount using the provided mounting bracket, which has $\text{Ø}14\text{mm}$ (9/16") holes for 10mm (3/8") or 12mm (1/2") fixing screws. Clamps with c-c measures of 90mm (3.5"), 135mm (5.3"), 144mm (5.7"), 205mm (8.1"), 250mm (9.8"), and 300mm (11.8") can be used as well. The vertical c-c measure for these are 411mm (16.2").

The mounting bracket is shown in the figure.

NOTE! There is a $\text{Ø}14\text{mm}$ (9/16") single hole in the middle of the mounting bracket, marked 'A' in the figure, which is intended for a locking screw, i.e. a screw which cannot be removed when the repeater is put in the bracket.

Mount the repeater as follows:

1. Mount the provided bracket.

Normally, the repeater is mounted on a wall, pole, or mast. These mounting cases are shown below.

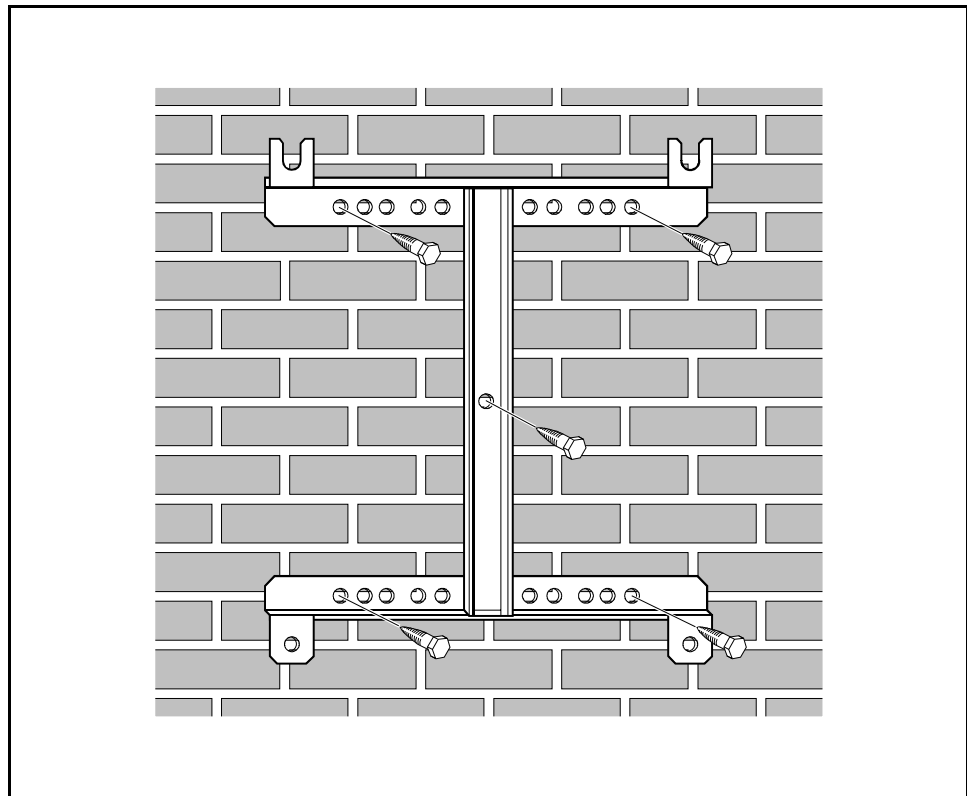


Figure 2-3. Attaching the bracket to a wall

Figure 2-3 shows a bracket attachment to a wall using four fixing screws and a locking screw.

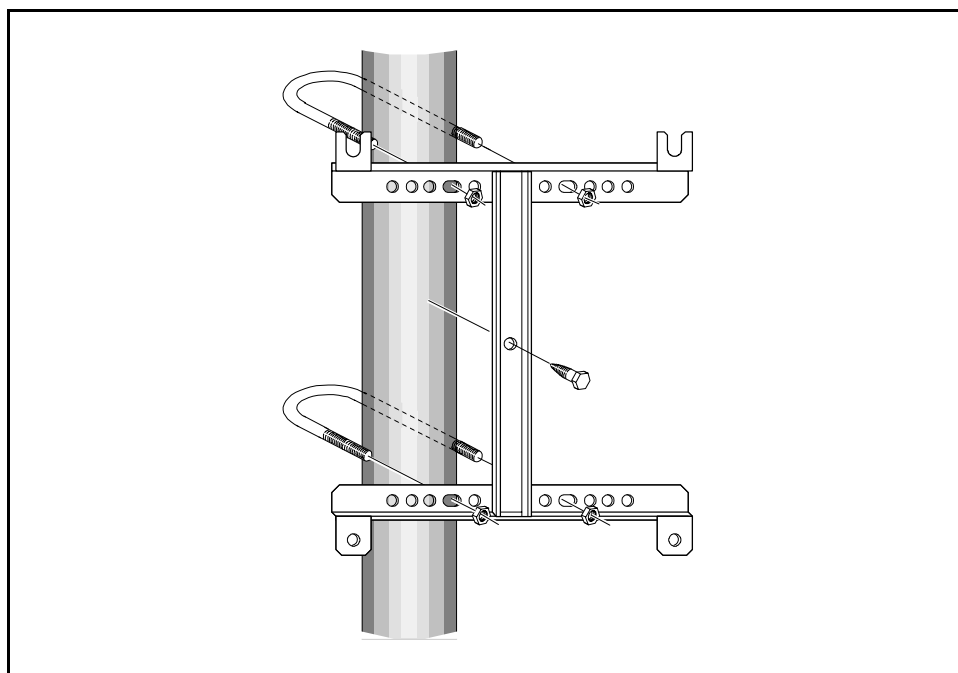


Figure 2-4. Attaching the bracket to a pole

Figure 2-4 shows a bracket attachment to a pole using two 144mm (5.7") U-shaped clamps and a locking screw.

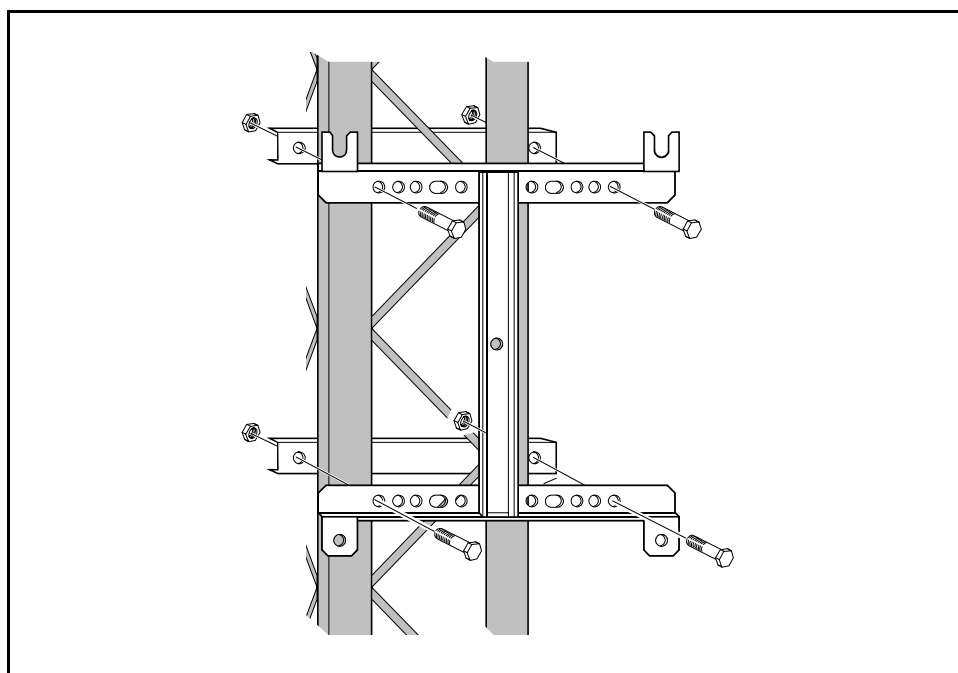


Figure 2-5. Attaching the bracket to a mast

Figure 2-5 shows a bracket attachment to a mast using two 300mm (11.8") bar-shaped clamps and no locking screw.

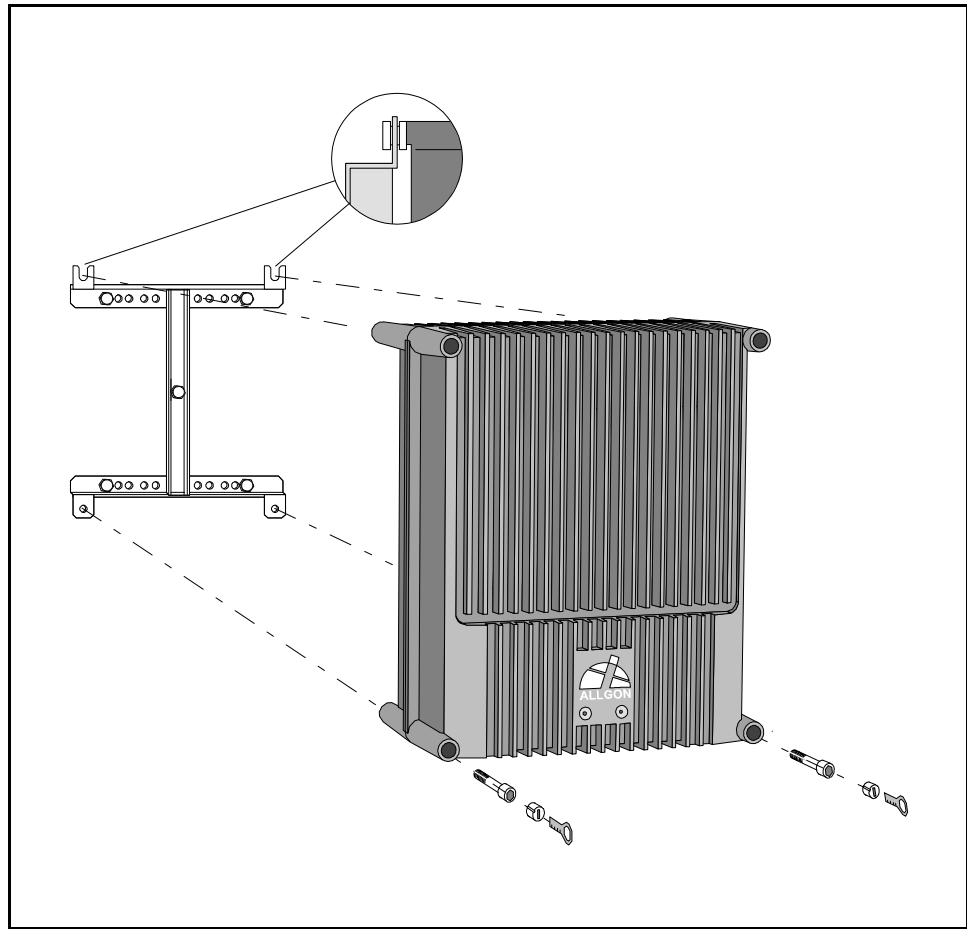


Figure 2-6. Attaching the repeater to the bracket

2. After attaching the bracket, hang the repeater on the upper supports (see Figure 2-6) and use the screws for the lower ones. Tighten the upper and lower screws.

There are locking cylinders that can be inserted and locked with a key after the lower screws have been tightened (see Figure 2-6). These prevent unauthorized removal of the repeater.

3. Make sure the donor antenna, directed towards the base station antenna, is mounted.
4. Make sure the service antenna, directed towards the area to be covered by the repeater, is mounted.

Connection

This section describes how to connect the input and output ports of the repeater types:

AR repeaters (except for high power CDMA/WCDMA)	page 2-8
High power CDMA/WCDMA	2-9
BMU	2-10
RMU	2-11
FOR	2-12

Common important instructions for the repeater types are found below.



Station ground

There is a screw to the left in the repeater that is intended for station ground only. This screw is marked with the ground symbol.

Mains connection

Note that local regulations are to be followed for the mains connection.



The AR repeater is approved in accordance with EN and UL/cUL regulations. This is, however, only valid if a classified power cord is used.

To get the repeater to meet these regulations, select one of the following classified and approved cord types:

- EN- H 05 W5 - F HMR.
- UL- AWM Style 2587.
- CSA - AWM 1 A/B 11 A/B.

For outdoor use the power cord should meet at least IP65 encapsulation requirements.



For repeaters supplied from the mains, the mains outlet must be grounded.

The mains connection described on the following pages means to mount the mains plug to the mains cord (if to be used) but it does not mean to connect the mains.



Do not turn the mains on until you are commissioning the repeater (see Chapter 4, Commissioning, in the AR Repeaters, User's Manual).

RCU and RCC remote control units

All AR repeaters can be equipped with an RCU, Remote Control Unit. The GSM antenna for this unit is internally connected in the repeater.



If the RCU is removed, then the jumper between pin 2 and 3 on the P27 port must be reconnected. Do not connect the jumper to another position than between pin 2 and 3 on the P27 port.

An RCC, Remote Communication Control unit, is required if the unit is to be connected to a FON board (the FON board does not support the RCU). A description of the RCC and its connection is found in the VD203 67/EN, *ALR Compact Repeater, User's Manual*. The RCU and RCC are described in Chapter 6, *Optionals*, in the *AR Repeaters, User's Manual*.

Connecting AR Repeater

This description is not applicable to a high power CDMA or WCDMA repeater.

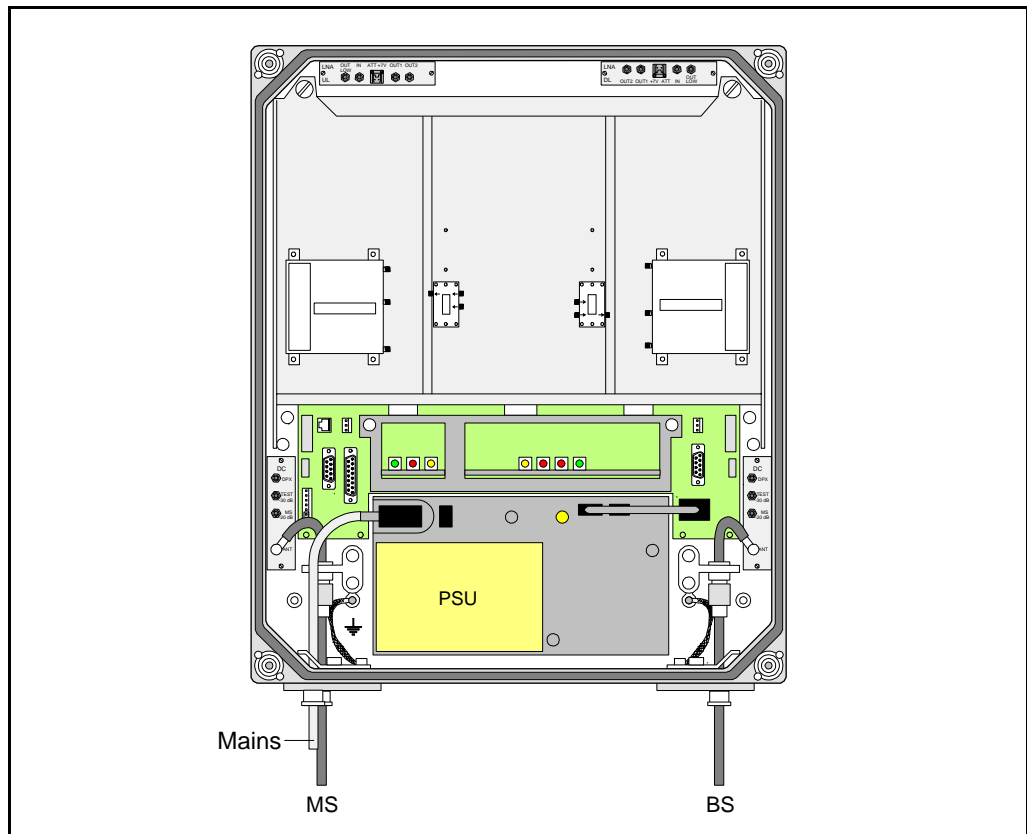


Figure 2-7. Connecting AR repeater

1. Connect the service and donor antenna coaxial cables (or RF cable from the BTS if no donor antenna is used). Use N type male connectors.
 - The donor antenna or RF cable from the BTS is connected to the right in the cabinet ('BS' in Figure 2-7).
 - The service antenna (MS) is connected to the left in the cabinet.
2. Connect station ground, if to be used (see page 2-7).
3. Mount the mains plug to the mains cord (if to be used) but do not connect the mains (see page 2-7).
4. Connect external alarm and optional door open alarm, if this feature is to be used. Descriptions are found on page 2-13.
5. Connect the R2R cables, if this feature is to be used (see page 2-14).
6. Connect a mains breakdown relay, if mains breakdown alarm is to be used (see page 2-15).

Connecting High Power CDMA or WCDMA Repeater

This description is applicable to a high power CDMA or WCDMA repeater.

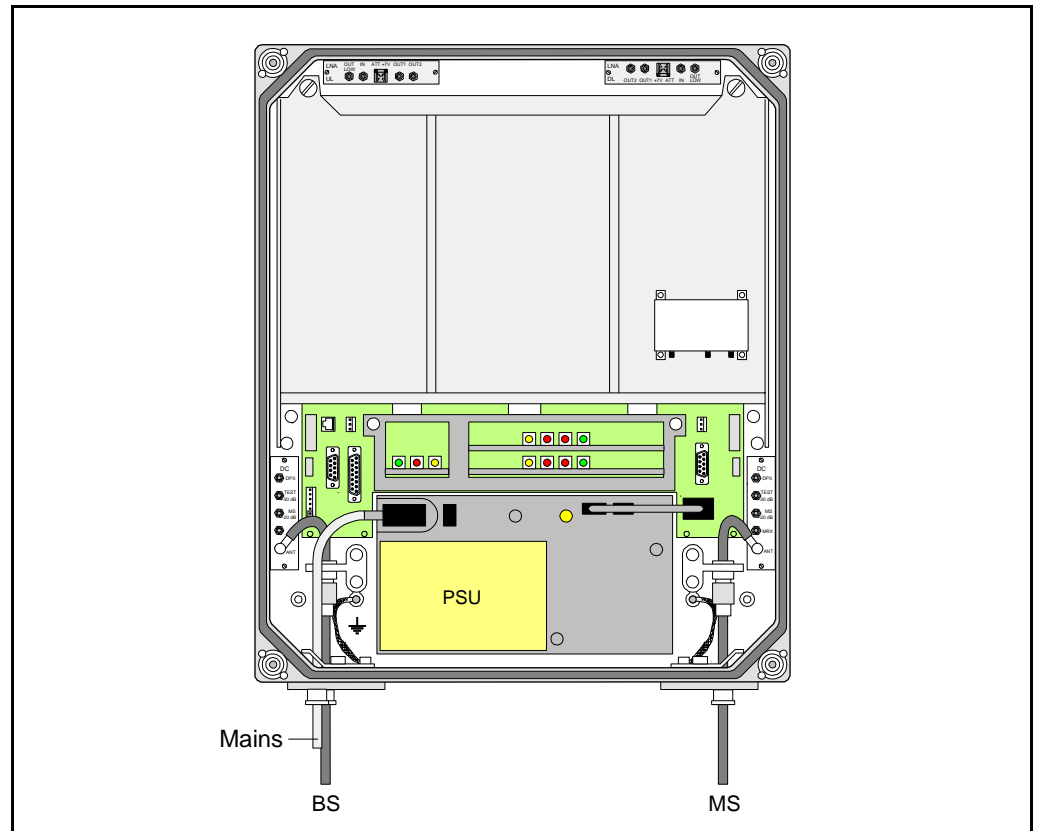


Figure 2-8. Connecting high power CDMA/WCDMA repeater

- 1.** Connect the service and donor antenna coaxial cables (or RF cable from the BTS if no donor antenna is used). Use N type male connectors.
 - The donor antenna or RF cable from the BTS is connected to the left in the cabinet ('BS' in Figure 2-7).
 - The service antenna (MS) is connected to the right in cabinet.
- 2.** Connect station ground, if to be used (see page 2-7).
- 3.** Mount the mains plug to the mains cord (if to be used) but do not connect the mains (see page 2-7).
- 4.** Connect external alarm and optional door open alarm, if this feature is to be used. Descriptions are found on page 2-13.
- 5.** Connect the R2R cables, if this feature is to be used (see page 2-14).
- 6.** Connect a mains breakdown relay, if mains breakdown alarm is to be used (see page 2-15).

Connecting BMU

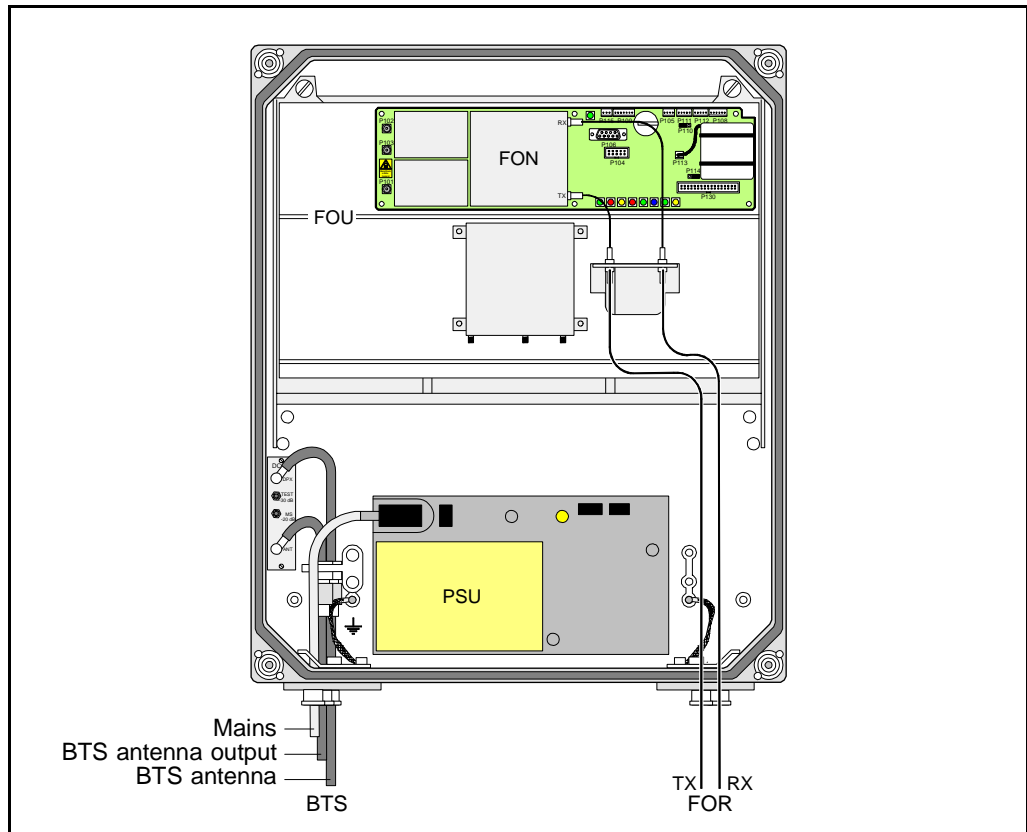


Figure 2-9. Connecting BMU

Figure 2-9 shows an BMU with separate RX/TX fiber optic cables to one FOR. By using WDMs and OSPs, up to four FORs can be fed in parallel by a BMU with double or single fiber communication. Up to eight FORs can be fed with a high cover and two FOUs.

1. Connect the BTS antenna output RF cable to the ANT port of the DC unit to the left in the cabinet. Use an N type male connector.
2. Connect an RF cable from the DPX port of the DC unit to the left in the repeater to the BTS antenna. Use an N type male connector.
3. Connect the RX and TX fiber optic cables from the FON board located in the upper part of the FOU to an FOR.
4. Connect station ground, if to be used (see page 2-7).
5. Mount the mains plug to the mains cord (if to be used) but do not connect the mains (see page 2-7).
6. Connect external alarm, if this feature is to be used. Descriptions are found on page 2-13.
7. Connect the R2R cables, if this feature is to be used (see page 2-14).
8. Connect a mains breakdown relay, if mains breakdown alarm is to be used (see page 2-15).

Connecting RMU

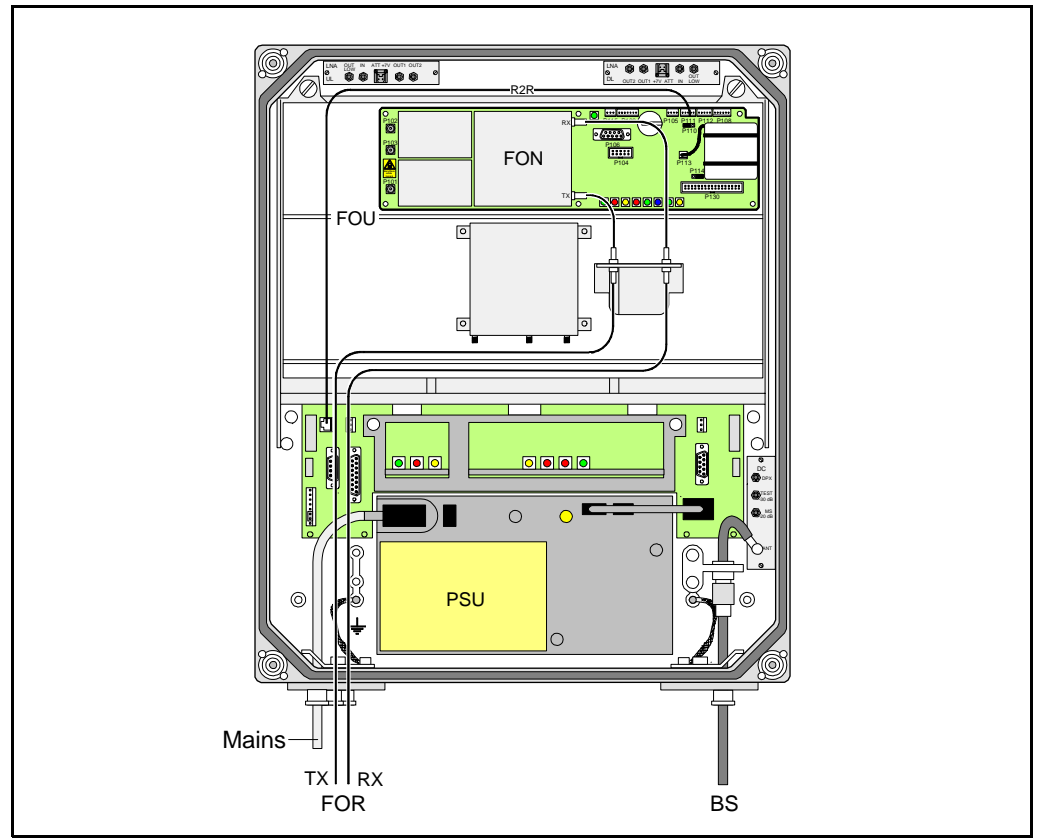


Figure 2-10. Connecting RMU

Figure 2-10 shows an RMU for donor antenna and separate RX/TX fiber optic cables to one FOR. By using WDMs and OSPs, up to four FORs can be fed in parallel by an RMU with double or single fiber communication. Up to eight FORs can be fed with a high cover and two FOU's.

1. Connect the donor antenna coaxial cable to the right in the cabinet ('BS' in Figure 2-10). Use an N type male connector.
2. Connect the RX and TX fiber optic cables from the FON board located in the upper part of the FOU to an FOR.
3. Connect station ground, if to be used (see page 2-7).
4. Mount the mains plug to the mains cord (if to be used) but do not connect the mains (see page 2-7).
5. Connect external alarm and optional door open alarm, if this feature is to be used. Descriptions are found on page 2-13.
6. Connect the R2R cables, if this feature is to be used (see page 2-14).
7. Connect a mains breakdown relay, if mains breakdown alarm is available and is to be used (see page 2-15).

Connecting FOR

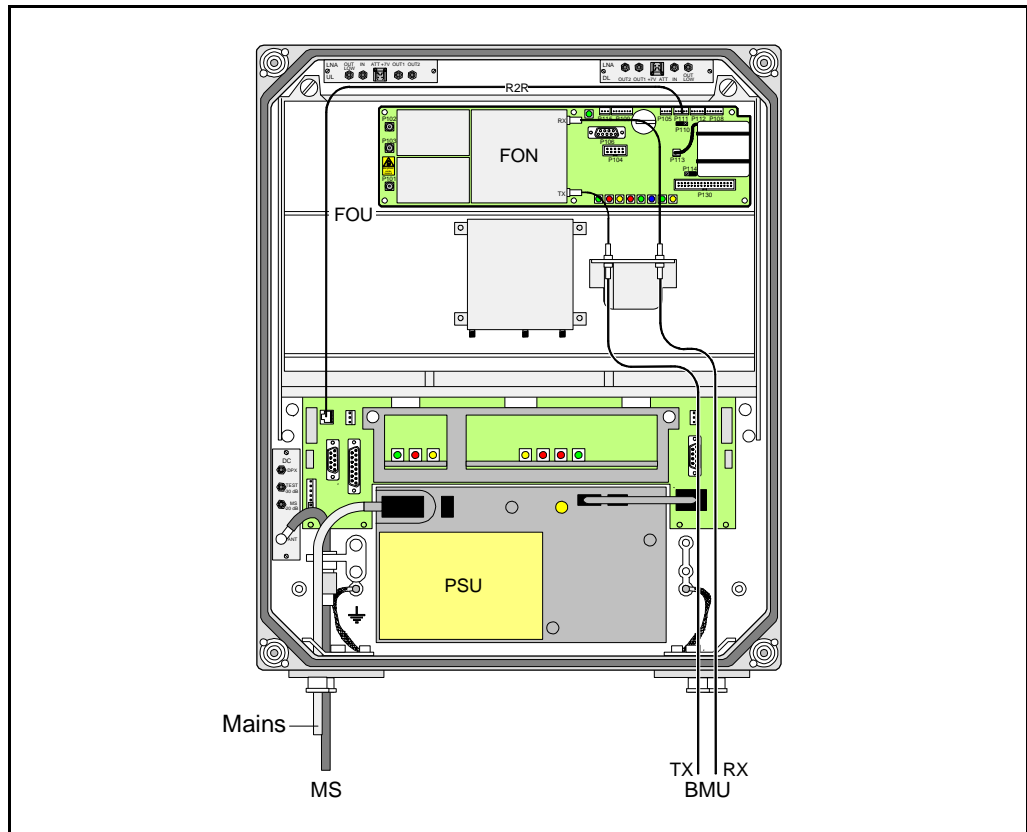


Figure 2-11. Connecting FOR

Figure 2-11 shows a FOR for service antenna and separate RX/TX fiber optic cables from a BMU. By adding WDMs and OSPs, a number of FORs can be fed by one BMU with double or single fiber communication.

1. Connect the service antenna coaxial cable to the left in the cabinet ('MS' in Figure 2-10). Use an N type male connector.
2. Connect the RX and TX fiber optic cables from the BMU to the FON board located in the upper part of the FOU.
3. Connect station ground, if to be used (see page 2-7).
4. Mount the mains plug to the mains cord (if to be used) but do not connect the mains (see page 2-7).
5. Connect external alarm and optional door open alarm, if this feature is to be used. Descriptions are found on page 2-13.
6. Connect the R2R cables, if this feature is to be used (see page 2-14).
7. Connect a mains breakdown relay, if mains breakdown alarm is to be used (see page 2-15).

External Alarm

Burglary, fire or other external alarm can be used in the repeaters. Optical or acoustic alarm can also be connected to the repeaters.

External alarm sensors and alarm signals are connected to the P33 alarm port located to the left in the cabinet (see Figure 2-12).

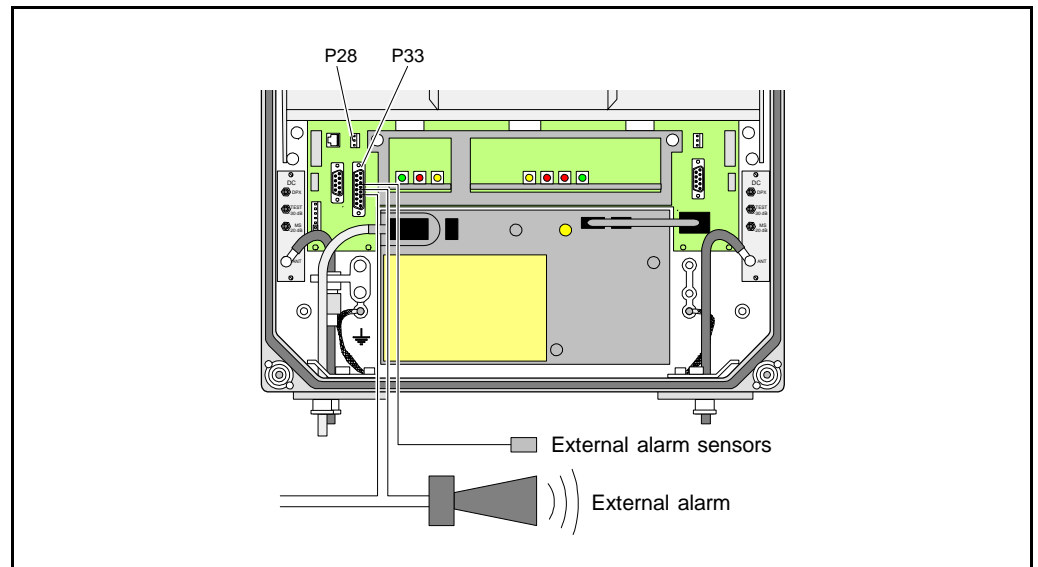


Figure 2-12. External alarm connection

The P33 alarm port is described in the Connection Ports section on page 2-18.

Use a 15 pole D-sub male connector for this connection.

The cable for this installation is taken through a strain relief bushing at the bottom of the repeater.

For a repeater without a CU board, i.e. BMU, external alarm is connected to the P109 port on the FON board. The P109 port is described in the *FON - Fiber Optic Node Board* section in the *AR Repeaters, User's Manual*, Chapter 5.

Door Open Alarm

A door open alarm can be used in all repeater types that have a CU board, i.e. all types except for BMU. This is arranged with a door switch connected to the P28 port (see Figure 2-12). The P28 port and the connection is described in the *Connection Ports* section on page 2-18.

R2R, Repeater to Repeater Link

Connect the R2R cable, if this optional feature is to be used. See also the *F2F, Fiber to Fiber Link* section below.

The R2R net cable is connected to the P34 Repeater to Repeater Link port via the P1 terminal on the R2R connector board to the right in the repeater (see Figure 2-13).

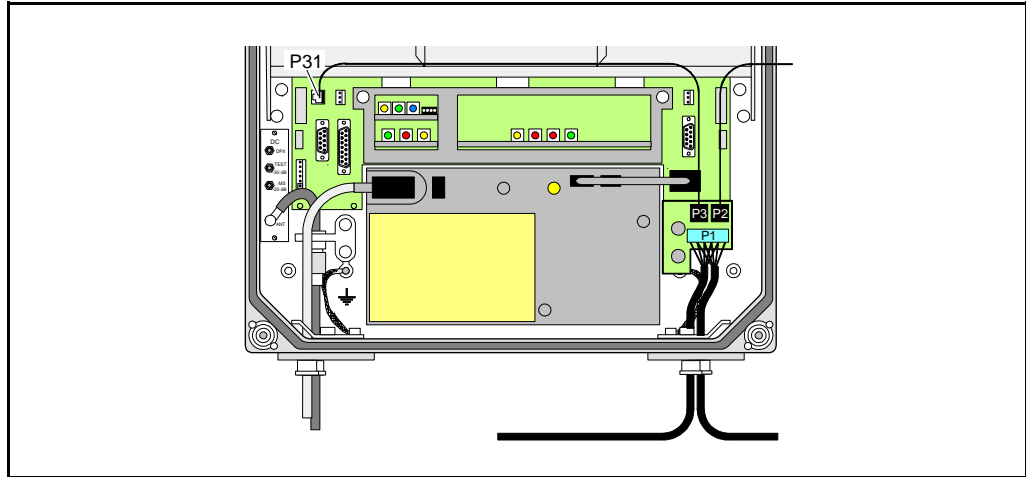
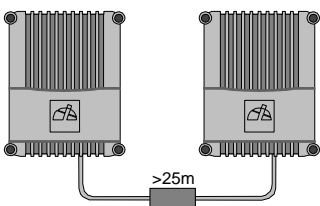


Figure 2-13. R2R connection

The P34, Repeater to Repeater Link port, is described in the *Connection Ports* section on page 2-18.

Any cable type can be used for indoor installation.

The following cable type is recommended for outdoor installation:
Li 2YC11Y, 2x2xAWG24/222, non-halogen, Metrofunkkabel-Union.



Use a strain relief bushing or a connector at the bottom of the repeater for the external net cable.

If the link cable between two repeaters in an R2R net is longer than 25 meters, then an RS-485 repeater is required, see the figure.

Further information about the *Repeater to Repeater Link* is found in the VD202 91/EN, *R2R, Repeater to Repeater Link Kit, Installation Guide*.

F2F, Fiber to Fiber Link

F2F is a feature that makes it possible to communicate with all repeaters that have a FON board (i.e. BMU, RMU and FOR) and are included in the same fiber optic net. By using the existing fiber optic distribution net, no wire or other communication device is required.

Communication with repeaters works also in mixed F2F and R2R net.

Mains Breakdown Relay

To be able to distinguish PSU faults from power failure, a mains breakdown relay can be used.

The mains breakdown relay is not included in the repeater. So, it has to be mounted outside the repeater chassis. The relay intended for this purpose must fulfil the following specifications:

Relay specification

Closing time: Max. 30 milliseconds.

Insulation coil/contact: Min. 4KV.

Mains connected relay must be in compliance with valid local regulations.

Connection

1. Connect a currentless closed relay contact to pin AI1 and AIC on the P33 alarm connector see Figure 2-14. Alarm is initiated by short circuiting pin AI1 and AIC in the P33 connector.

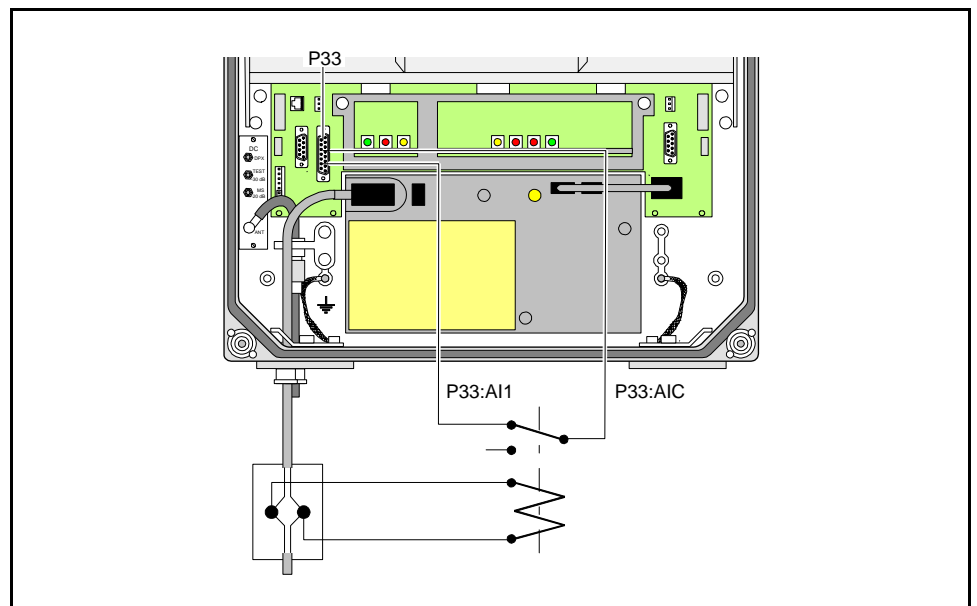


Figure 2-14. Mains breakdown relay connection

The P33 alarm port is described in the *Connection Ports* section on page 2-18.

2. Connect the relay coil. It must be supplied from the same fuse as the repeater.
3. After commissioning, select the *Mains Breakdown* option in the alarm configuration dialog box in the OMT32 or OMS program. Refer to the *OMT32, User's Manual* or the *Advanced Repeater OMS, User's Manual*.

Finishing the Installation

Check all connections made.

If a 24 Volt or 48 Volt power supply unit is to be used, then replace the PSU as described in the next section.

When ready with the installation, commission the repeater as described in Chapter 4, *Commissioning*, in the *AR Repeaters, User's Manual*.

Installing 24 Volt or 48 Volt DC Power Supply Unit

The 220V AC PSU can be replaced with a 24 Volt or 48 Volt DC PSU as described below.

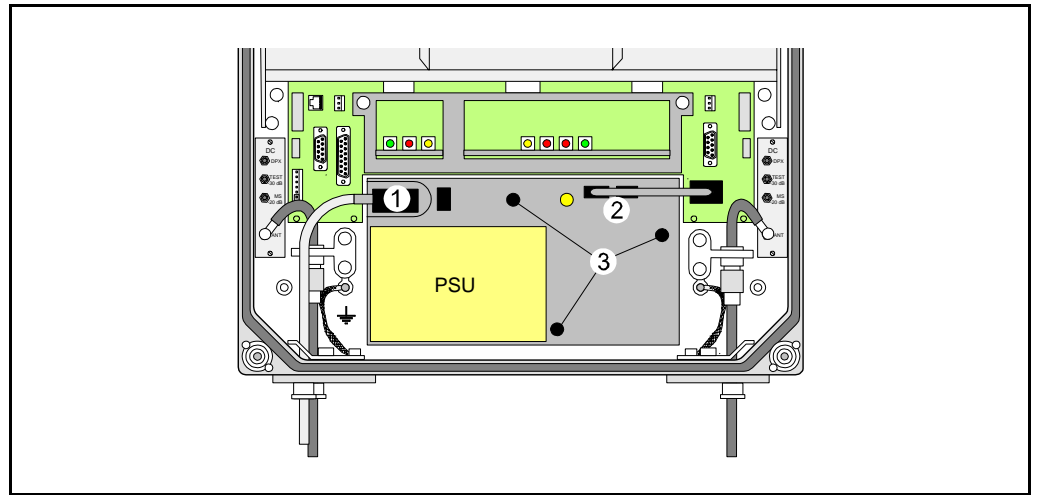
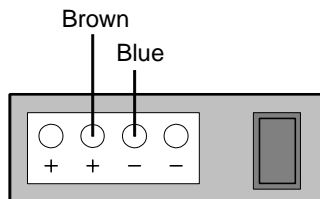


Figure 2-15. Replacing mains PSU with 24V or 48V

1. Switch the repeater off and remove the mains plug from the PSU ('1' in Figure 2-15).
2. Disconnect the two connectors (2) on the PSU.
3. Loosen the three fixing screws (3) using a 5mm Allen key.
4. Remove the PSU from the repeater.
5. Mount the 24/48 Volt DC PSU with the three fixing screws (3).
6. Connect the PSU to the DIA board (2).
7. Connect the DC power cable. The supplied cable should have a radiation limiter. The cable shall be connected as follows:



The + pole shall be connected to one of the left terminals in the PSU connector with the brown part of the DC cable.

The - pole shall be connected to one of the right terminals in the PSU connector with the blue part of the DC cable.

8. Switch the repeater on.
9. The yellow LED on the PSU shall now be lit.



The DC Power Supply Unit must be galvanically separated from the mains supply with an equipment fulfilling the IEC65 safety requirements.

Connection Ports

The DIA distribution board provides most of the internal connection between the repeater units, and to external ports. Connectors involved in the installation are also located on the DIA board. These connectors are described below. A complete DIA board connector list is found in Chapter 5 of the *AR Repeaters, User's Manual*.

Figure 2-16 shows the location of the connection ports.

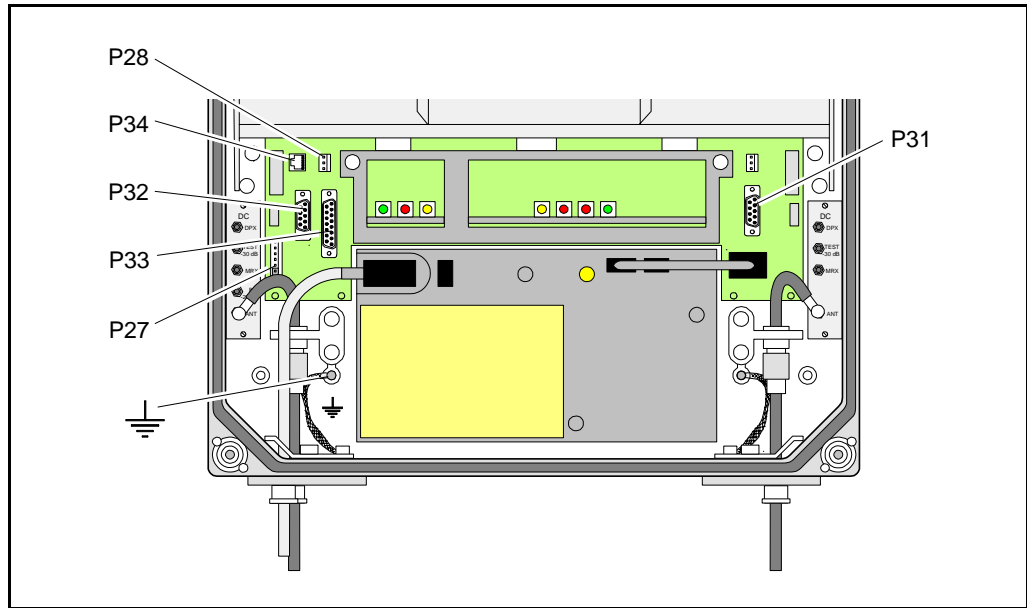


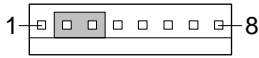
Figure 2-16. Connection ports and station ground

Station ground is also shown in Figure 2-16 (at the ground symbol).

The port descriptions are found on the following pages:

P27 Auxiliary Port	page 2-19
P28 Door switch alarm input port	2-21
P31 PC Port	2-19
P32 Modem Port	2-20
P33 Alarm Port	2-20
P34 Repeater to Repeater Link Port	2-22

P27 Auxiliary Port



Auxiliary port P27 is used to power the RCU, Remote Control Unit, for communication with the repeater.

The connector is found on the DIA board to the left in the cabinet.

P27 is an 8 pole, 1 line male connector.

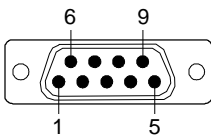


Pin 2 and 3 of the P27 port must always be interconnected to provide the CU and ALI boards with voltage supply. If there is no cable connected to the P27 port, pin 2 and 3 must be interconnected with a jumper.

P27 auxiliary connector pinning

Pin 1	+7V DC.
Pin 2	+7V DC.
Pin 3	CU and ALI power supply from pin 2.
Pin 4	GND
Pin 5	+26V DC or +13V DC depending on the repeater type.
Pin 6	Not used.
Pin 7	Output 200KHz reference.
Pin 8	GND

P31 PC Port



PC port P31 is a RS-232 port used for local PC communication.

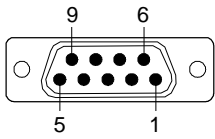
The connector is found on the DIA board to the right in the cabinet.

P31 is a 9 pole D-sub female connector.

P31 PC connector pinning

Pin 1	Not used.
Pin 2	Data from repeater to OMT32.
Pin 3	Data from OMT32 to repeater.
Pin 4	DTR from OMT32 to repeater.
Pin 5	GND
Pin 6	DSR from repeater to OMT32.
Pin 7	RTS from OMT32 to repeater.
Pin 8	CTS from repeater to OMT32.
Pin 9	Not used.

P32 Modem Port



Modem port P32 is a RS-232 port with V.24 interface used for the RCU, Remote Control Unit.

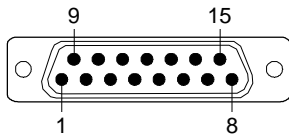
The connector is found on the DIA board to the left in the cabinet.

P32 is a 9 pole D-sub male connector.

P32 modem connector pinning

Pin 1	DCD
Pin 2	RXD
Pin 3	TXD
Pin 4	DTR
Pin 5	GND
Pin 6	DSR
Pin 7	RTS
Pin 8	RFS
Pin 9	RI

P33 Alarm Port



Alarm port P33 is used for external alarm sensors and alarm equipment.

The connector is found on the DIA board to the left in the cabinet.

P33 is a 15 pole D-sub female connector.

The port has four alarm inputs, EAL1 - EAL4, and two alarm outputs.

Four alarm inputs

The inputs are low-level inputs with common ground (AIC).

Use insulated switch or relay to initiate alarms (open switches in normal operating mode, closed switches cause alarm).

The alarm switch connection can be toggled between being active open or active closed. This is further described in the *OMT32, User's Manual* and in the *Advanced Repeater OMS, User's Manual*.

The alarm input voltage ratings, related to ground (AIC), are:

$$\begin{aligned} V_{in_{max}} &= 5.5V \\ V_{in_{min}} &= -0.5V \end{aligned}$$

P33 alarm connector pinning

Pin 14	AI1	External alarm input 1 - EAL1.
Pin 15	AI2	External alarm input 2 - EAL2.
Pin 7	AI3	External alarm input 3 - EAL3.
Pin 8	AI4	External alarm input 4 - EAL4.
Pin 6	AIC	Ground.



P28 - AI4 door switch alarm input

Normally, alarm input AI4 is used for repeater cover opening alarm EAL4, which is arranged using a door switch (optional). Because of that, AI4 and AIC are available also in the P28 connector, to which the door switch is connected.

The connector is found on the DIA board to the left in the cabinet.

The EAL4 door switch alarm is activated 10 – 30 seconds after the cover has been opened.

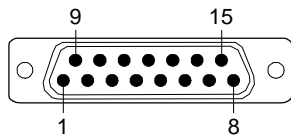
Two alarm outputs

Both the alarm outputs are 1 pole closing and 1 pole opening relay outputs insulated from each other.

Maximum ratings, related to ground or any other alarm terminal, are 50VAC/60VDC.

The alarm outputs are defined as follows:

- Pin 9-1 AO1 – AO8 Closed when operating, otherwise open.
- Pin 10-2 AO6 – AO7 Open when operating, otherwise closed.
- Pin 11-3 AO2 – AO5 Closed at alarm state, otherwise open.
- Pin 12-4 AO3 – AO4 Open at alarm state, otherwise closed.



P33 alarm connector pinning

- Pin 1 AO8
- Pin 2 AO7
- Pin 3 AO5
- Pin 4 AO4
- Pin 5 Not used.
- Pin 6 AIC
- Pin 7 AI3
- Pin 8 AI4
- Pin 9 AO1
- Pin 10 AO6
- Pin 11 AO2
- Pin 12 AO3
- Pin 13 Not used.
- Pin 14 AI1
- Pin 15 AI2

P34 Repeater to Repeater Link Port



The P34 port is used for the R2R, *Repeater to Repeater Link*, which is an optional feature for the AR repeaters. This port is also used to interconnect the F2F, *Fiber to Fiber Link* feature, to the R2R net.

The connector is found on the DIA board to the left in the cabinet.

P34 is an 8 pole RJ45 modular female connector.

By interconnecting the P111 or P112 on the FON board to this port, the F2F net is included in the R2R net and all repeaters in both the nets are accessible.

P34 Repeater to Repeater Link connector pinning

Pin 1	C/S
Pin 2	GND
Pin 3	D-
Pin 4	D+
Pin 5	D+
Pin 6	D-
Pin 7	GND
Pin 8	C/S

For further information about the *Repeater to Repeater Link* installation, refer to the VD202 91/EN *R2R, Repeater to Repeater Link Kit, Installation Guide*.

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