User's Manual

AR Repeaters

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User's Manual

AR Repeaters

Channel Selective and Band Selective Repeaters

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English

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

Communication between Allgon AR repeaters and operators is carried out either by using Allgon OMT32 (Operation and Maintenance Terminal), or 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.

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Abbreviations

Abbreviations used in this manual, in the software, and in the repeater:

AGC	Automatic Gain Control
ALI	Alarm Interface board
AMPS	Advanced Mobile Phone Service
BCCH	Broadcast Control Channel (GSM broadcast channel time slot)
BS	Base Station, BS antenna = towards the base station
BSA	Band Selective Amplifier board for uplink or downlink band with fixed or adjustable band width
BSel	Band Selective
CDMA	Code Division Multiple Access
CHA	Channel Amplifier board with 2 channel selective uplink or downlink channels
CMB	Combiner unit
CSA	CDMA Segment Amplifier board with 2 channel selective uplink or downlink channels
CSel	Channel Selective
CU	Control Unit board
CW	Continuous Wave
DAMPS	Digital Advanced Mobile Phone Service
DC	Directional Coupler
DCS	Digital Communication System (same as PCN)
DIA	Distribution board
DL	Downlink signal direction (from base station via repeater to mobile station)
DPX	Duplex filter
EEPROM	Electrical Erasable Programmable Read Only Memory
EGSM	Extended Global System for Mobile communication
ETACS	Extended Total Access Communication System
ETSI	European Telecommunications Standard Institute
GSM	Global System for Mobile communication
HW	Hardware
LED	Light Emitting Diode
LNA	Low Noise Amplifier, uplink and downlink
MS	Mobile Station, MS antenna = towards the mobile station
MSC	Mobile Switching Center
NMT	Nordic Mobile Telephone system
OMS	Operation and Maintenance System
OMS/PC	Desktop or notebook with installed OMS software
OMT32	Operation and Maintenance Terminal
OMT32/PC	Desktop or notebook with installed OMT32 software
PA	Power Amplifier board for uplink or downlink
PCN	Personal Communication Network (same as DCS)
PCS	Personal Communication System
PSU	Power Supply Unit
PTFE	Polytetrafluoro Ethylene (Teflon)
RCU	Remote Control Unit
RF	Radio Frequency
RIA	Repeater to Repeater Interface Adapter
RSSI	Received Signal Strength Indication
RTC	Real Time Clock
SW	Software
TACS	Total Access Communication System
TDMA	Time Division Multiple Access
UL	Uplink signal direction (from mobile station via repeater to base station)
UPS	Uninterruptible Power Supply

1. Safety

Any personnel involved in installation, operation or service of Allgon repeaters **must** understand and obey the following:

- 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. Also, the repeaters are designed to receive signals from one or more mobile stations, amplify and retransmit to the base stations. The repeaters must be used exclusively for these purposes and nothing else.

- Repeaters supplied from the mains must be connected to grounded outlets and in conformity with any local regulations.

- The power supply unit in repeaters supplied from the mains contains dangerous voltage that can cause electric shock. Disconnect the mains prior to any work in such a repeater. Any local regulations are to be followed when servicing repeaters.

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

- The repeater cover must be secured in opened position, e.g. 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, e.g. on a mast or pole, be careful not to drop parts or the entire repeater. Falling parts can cause serious personal injury.

- Any repeater, including this repeater, 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 to the signals at the immediate proximity of the repeater and the repeater antennas.

BERYLLIUM OXIDE

- The CHA channel board power transistors, the PA amplifier board power transistors, and the combiners (CMB) contain beryllium oxide (BeO) that is poisonous if present as dust or smoke which can be inhaled. The power transistors mentioned are mounted with two screws as opposed to other transistors.

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

  Warning signs are applied on boards and units that contain beryllium oxide. These warning signs are shown in the next section.

HYDROGEN FLUORIDE

- The coaxial cable insulation is 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.

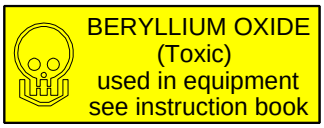
- A lithium battery is permanently mounted on the CU board. Due to the risk of explosion, this battery must not be removed from the board. In case of battery malfunction, replace the CU board. The old CU board can be sent to Allgon for repair.
- The heat sink element on the CDMA High Power repeater can be very hot. Do not touch this surface during operation.

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.

Static Electricity

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

Parts on the printed circuit boards as well as other parts in the repeater 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 repeater 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. Introduction

Figure 2-1. Allgon AR Repeater

Allgon repeaters are used to fill out uncovered areas in cellular mobile systems, such as base station fringe areas, road tunnels, business and industrial buildings, etc.

A repeater receives signals from a base station, amplifies and retransmits the signals to mobile stations. Also it receives, amplifies and retransmits signals in the opposite direction. Both directions are served simultaneously.

To be able to receive and transmit signals in both directions, the repeater is connected to a donor antenna directed towards the base station and to a service antenna directed towards the area to be covered.

Control of the repeaters is performed using a desktop or notebook loaded with the Allgon OMT32, *Operation and Maintenance Terminal*, which can communicate with the repeaters, either locally or remotely via modem. Remote operation can be performed either via a traditional telephone line or via a mobile phone that can be installed inside the repeater.

To be able to control many Allgon AR repeaters in common, there is an Allgon OMS, *Operation and Maintenance System*.

The repeaters and the OMT32 is described in this manual. The OMS is described in the *OMT32, User's Manual*.

Repeater Types

The following repeater types are currently available:

- Channel selective GSM repeater
- Channel selective CDMA repeater
- Channel selective high power CDMA repeater
- Band selective repeater with fixed bandwidth
- Band selective repeater with adjustable bandwidth
- Combined repeater

In the OMT32, the channel selective 900, 1800, and 1900 systems are called GSM, DCS and PCS respectively, even though these systems may have different names in other parts of the world.

Channel selective GSM repeater

A channel selective GSM repeater can be equipped with two, four, six or eight channels. This repeater type is used for channel selective systems, such as GSM, DCS, PCN and GSM 1900 (PCS).

Channel selective CDMA repeater

A channel selective CDMA repeater can be equipped with one or two channels. This repeater type is used for digital code division systems in accordance with IS-95 or J-std-008 standard.

Channel selective high power CDMA repeater

A channel selective CDMA repeater like the previous one, but equipped with a 6dB (typically) BA (Booster Amplifier) unit.

Band selective repeater with fixed bandwidth

A band selective repeater with fixed bandwidth has fixed filters for a certain bandwidth. This repeater type is used for analog or digital systems, such as NMT, GSM, TACS, ETACS, AMPS, DAMPS and CDMA.

Band selective repeater with adjustable bandwidth

A band selective repeater with adjustable bandwidth has filters that can be set to various bandwidths. This repeater type is used for analog or digital systems, such as NMT, TACS, ETACS, AMPS, DAMPS and CDMA.

Combined repeater

Some of the above mentioned types can be combined in the same repeater chassis and be in operation in parallel.

Using Repeaters

In areas where the radio signal propagation is poor repeaters can be used to fill out those areas which are not covered by the base station.

The following scenarios are examples on this:

- Sports arenas
- Fair halls
- Large shopping centres
- Road and railway tunnels
- Indoors in buildings with metal or concrete walls

Other examples where repeaters can be used to increase the coverage are:

- Shaded areas
- Fringe coverage areas

In areas where the traffic intensity is low, it is not cost efficient to install a base station. An Allgon repeater, which can be installed with a minimum of investments, is a much better solution. You save installation costs as well as operational costs.

Examples of using repeaters

Two examples are described in the following sections. An outdoor example in a shaded valley and an indoor example in a sports arena.

Shaded Area

A valley is shaded by hills. There is a base station 5 kilometers away, but the lowest signal strength in the valley is less than –100dBm. A mast used for other purposes is available for a repeater installation. The mast height is 42 meter and it is located on a hill. The scenario is illustrated in Figure 2-2.

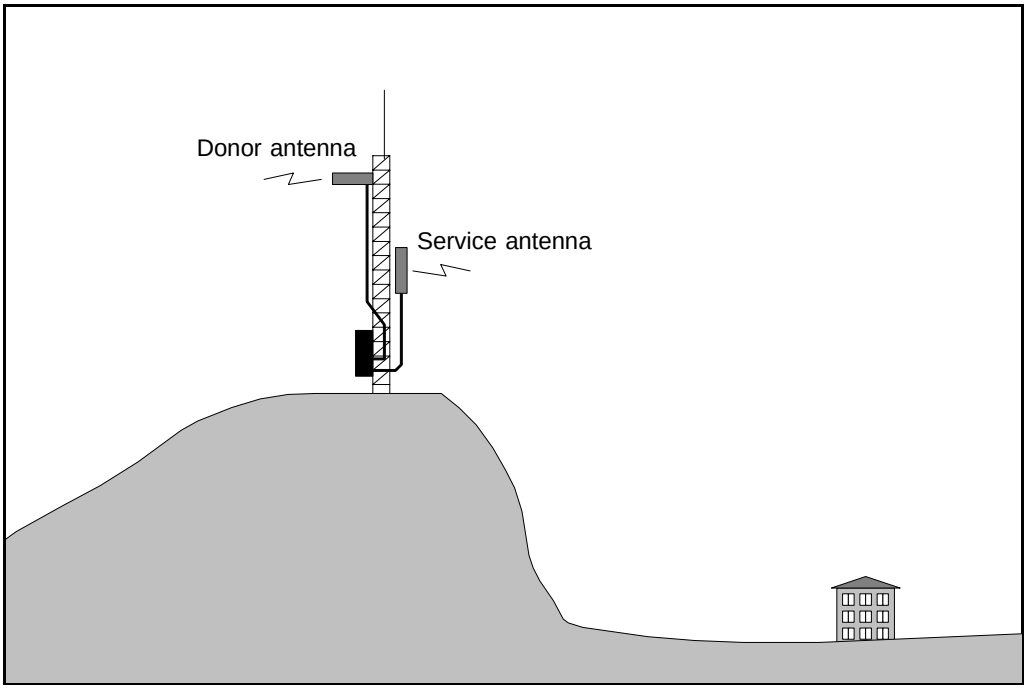


Figure 2-2. Repeater coverage of shaded area

The donor antenna of the repeater was mounted at the top of the mast and the service antenna was mounted at the half mast. The antenna isolation was measured to over 100dB. The repeater was set to 80dB gain.

Measured levels:	Received signal level	– 60.0 dBm
	Donor antenna gain	15.0 dBi
	Cable loss	– 5.0 dB
	Repeater input level	– 50.0 dBm
	Adjusted repeater gain	70.0 dB
	Repeater output level	20.0 dBm
	Cable loss	– 5.0 dB
	Service antenna gain	8.0 dBi
	Radiated output level	23.0 dBm

The measured result in the valley was better than –90dBm.

Sports Arena

A 2000 spectators sports arena with metallic roof had an indoor signal strength too low to provide a fair service in most parts of the arena. The nearest base station was 8 kilometers away and it was equipped with one carrier only.

A donor antenna directed towards the base station was mounted on a mast outside the building and a repeater was installed inside the building with the service antenna on the arch vault. The scenario is illustrated in Figure 2-3.

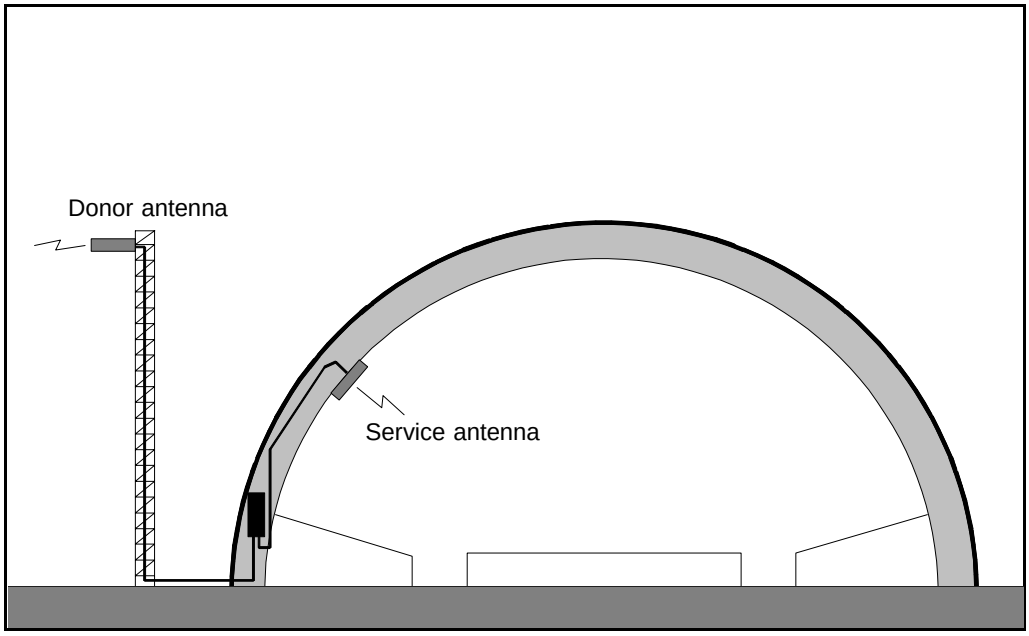


Figure 2-3. Repeater in sports arena

The antenna isolation was measured to over 85dB.

Measured levels:	Received signal level	– 80.0 dBm
	Donor antenna gain	15.0 dBi
	Cable loss	– 5.0 dB
	Repeater input level	– 70.0 dBm
	Adjusted repeater gain	75.0 dB
	Repeater output level	5.0 dBm
	Cable loss	– 2.0 dB
	Service antenna gain	7.0 dBi
	Radiated output level	10.0 dBm

The signal strength was fair for service in the entire arena.

3. Installation

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

Siting the Repeater

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

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.

Allgon can provide a shelter designed for these repeaters. This shelter is shown in Figure 3-1.

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 3-1. The repeater chassis consists of two main parts, a *cabinet* in which the circuitry is housed, and a *cover*, which can be either a thin cover or a large cover (see the figure) depending on the configuration.

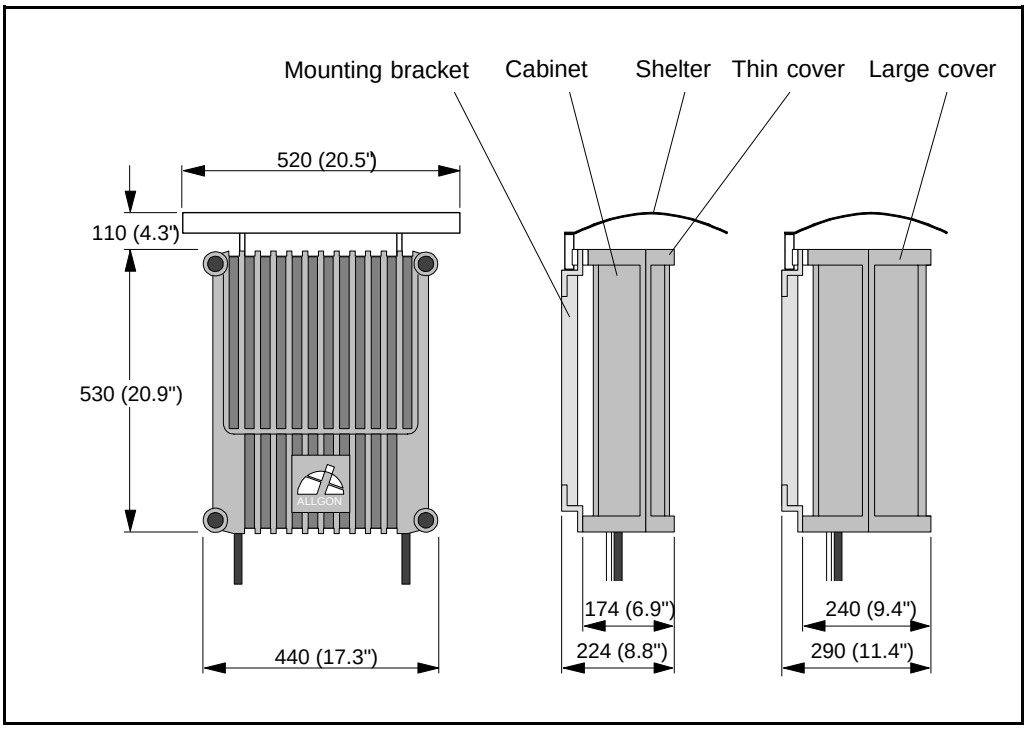


Figure 3-1. Repeater dimensions

The high power CDMA repeater has an external heat sink on a large cover, see Figure 3-2.

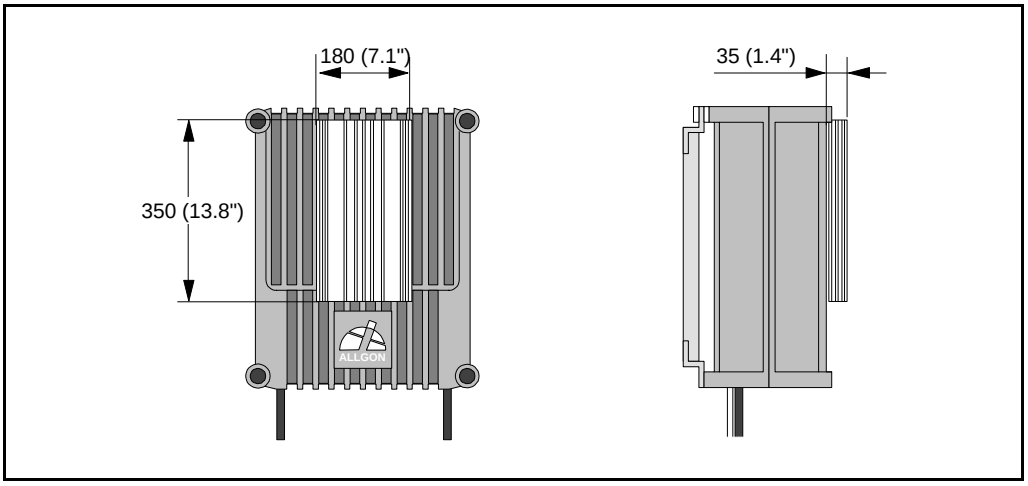


Figure 3-2. High power CDMA repeater

Approximately repeater weights

Channel selective repeater, four channels, thin cover ..... 21 kg (46 lbs)
Channel selective repeater, four channels, large cover ..... 25 kg (55 lbs)
Band selective repeater, thin cover ..... 21 kg (46 lbs)
Band selective repeater, large cover ..... 25 kg (55 lbs)
Channel/band selective combi repeater, large cover ..... 30 kg (66 lbs)
Channel selective high power CDMA repeater, large cover ... 30 kg (66 lbs)

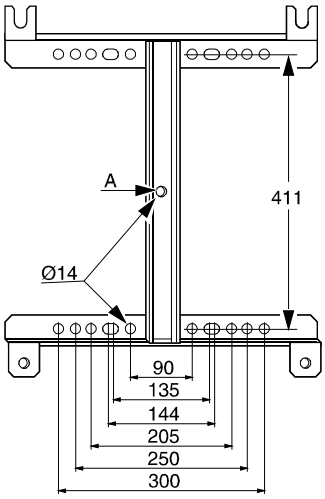
It is not recommended to remove the cover from the cabinet at the site.

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 thin cover ..... 6 kg (13 lbs)
Empty large cover ..... 10 kg (22 lbs)
Equipped cabinet or large cover ..... 15 kg (33 lbs)

Mounting



The AR repeater is easy to mount using the provided mounting bracket, which has Ø14mm (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 Ø14mm (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.

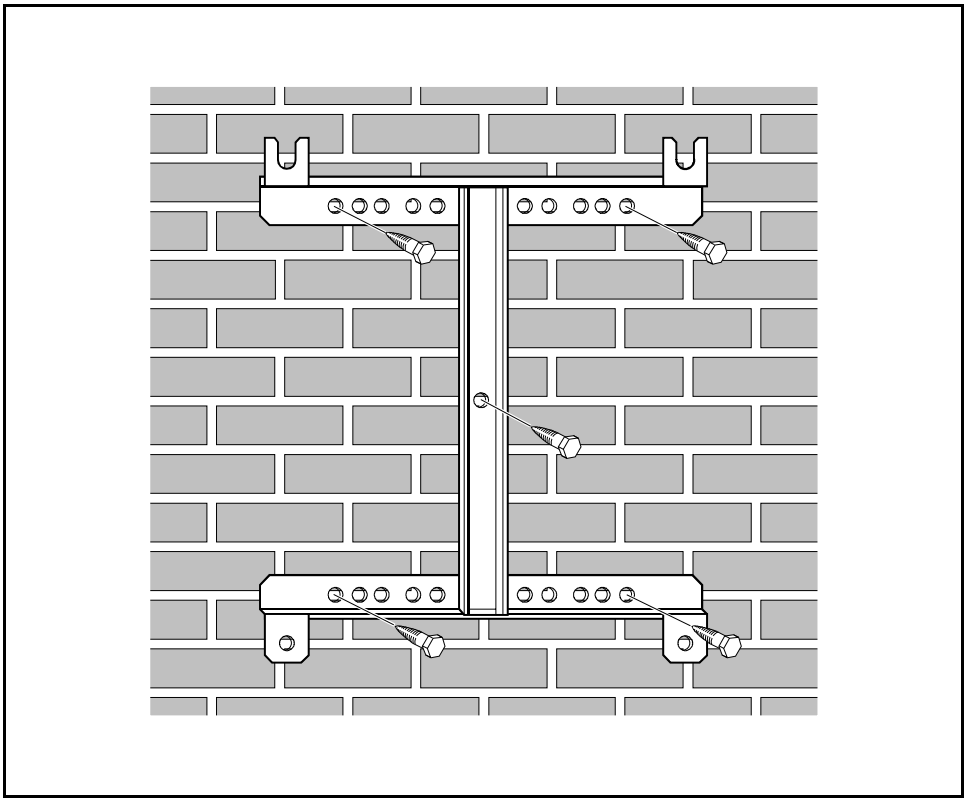


Figure 3-3. Attaching the bracket to a wall

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

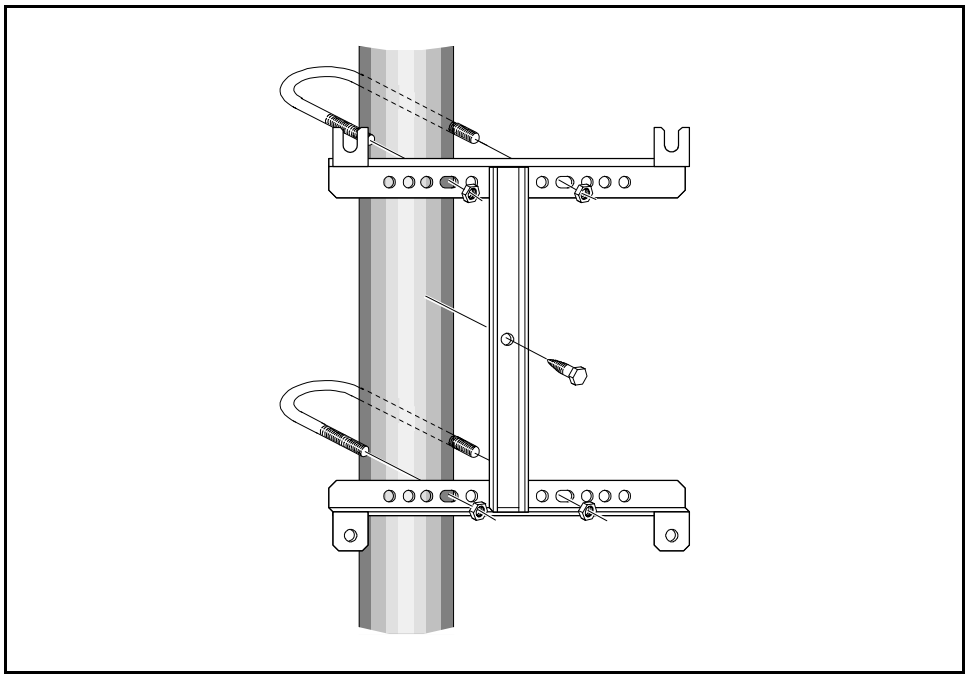


Figure 3-4. Attaching the bracket to a pole

Figure 3-4 shows a bracket attachment to a pole using two 144mm (5.7") U-shaped clamps and a locking screw.

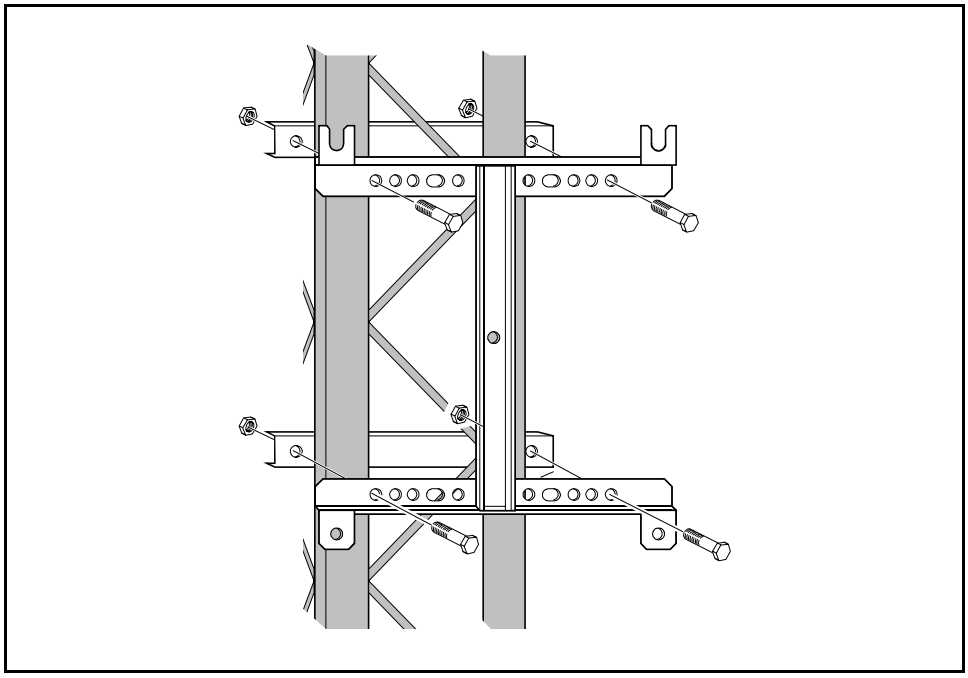


Figure 3-5. Attaching the bracket to a mast

Figure 3-5 shows a bracket attachment to a mast using two 300mm (11.8") bar-shaped clamps and no locking screw.

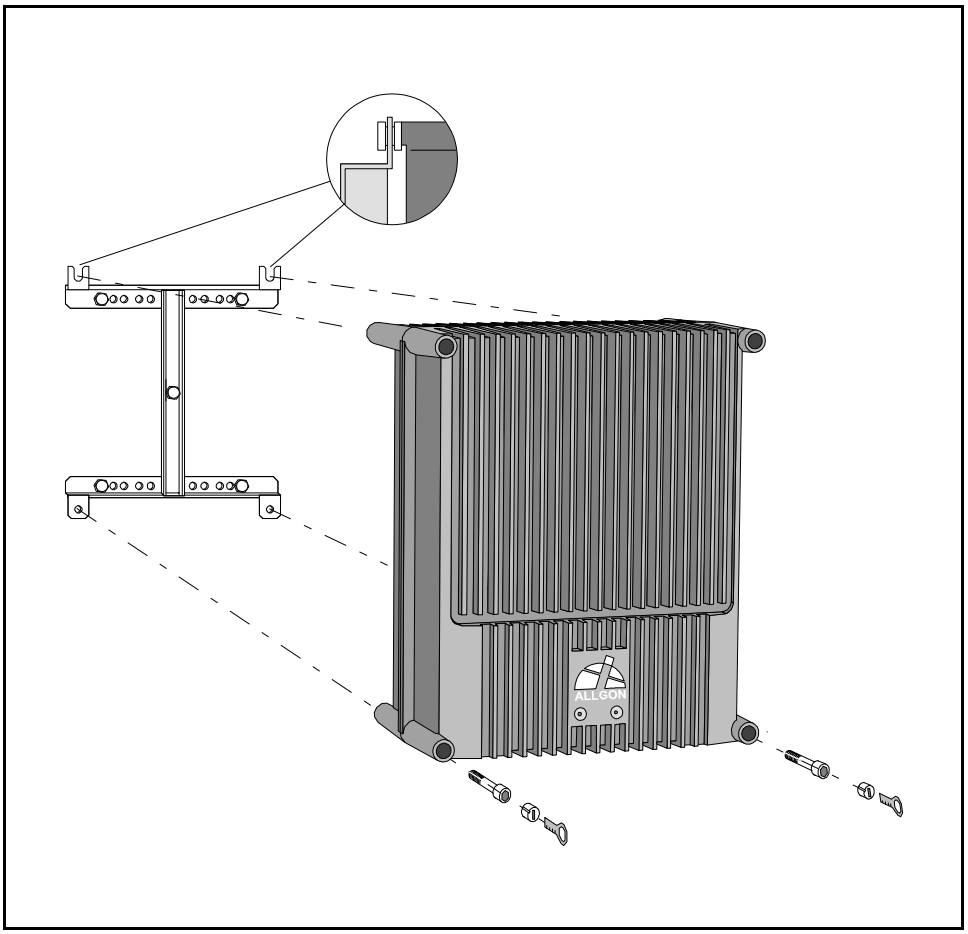


Figure 3-6. Attaching the repeater to the bracket

2. After attaching the bracket, hang the repeater on the upper supports (see Figure 3-6) 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 3-6). These prevents from unauthorized removal of the repeater.

3. Mount the donor antenna directed towards the base station antenna. This antenna is marked 'BS' in the repeater.

4. Mount the service antenna directed towards the area to be covered by the repeater. This antenna is marked 'MS' in the repeater.

Connection

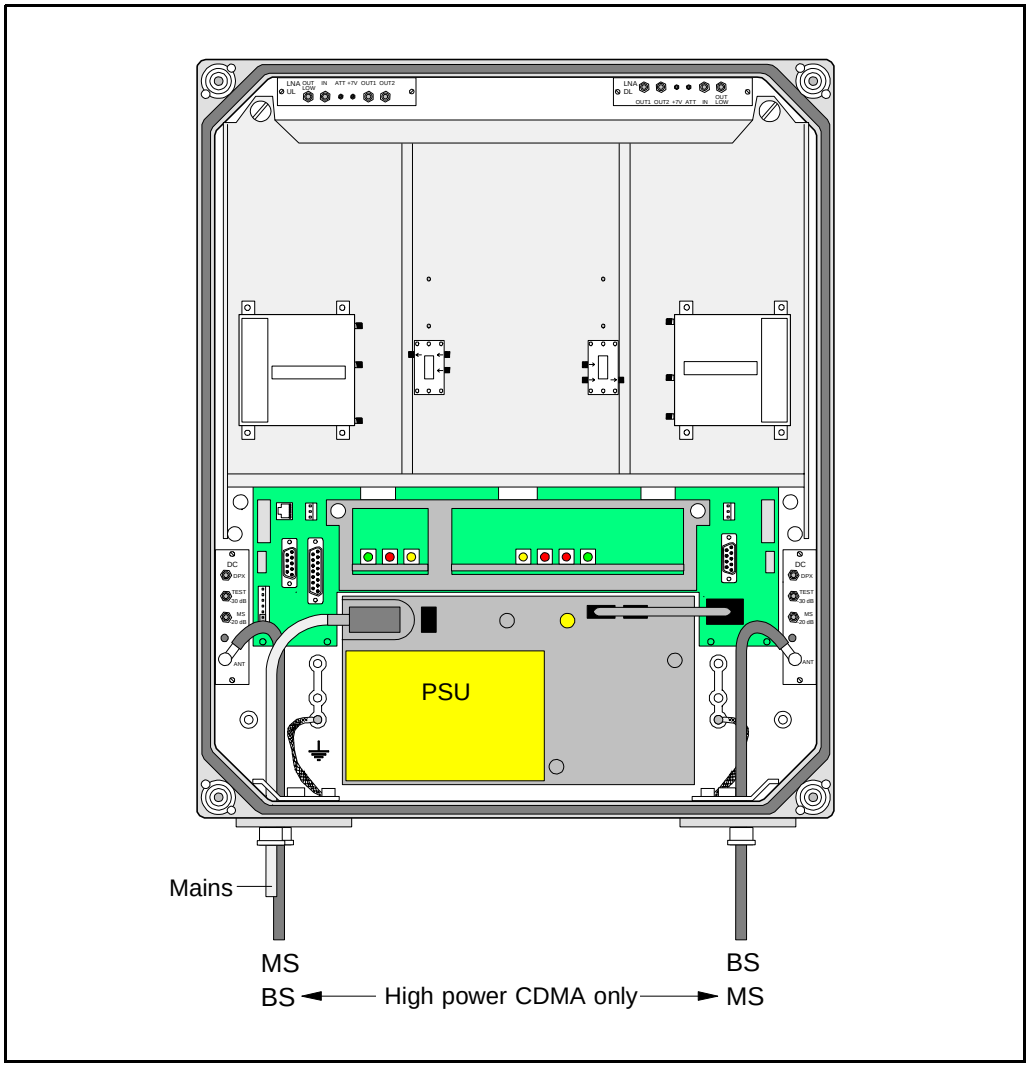


Figure 3-7. MS and BS antenna connections

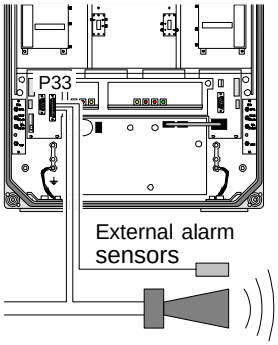
1. Connect the service and donor antenna coaxial cables (see Figure 3-7). N type female connectors are used in the repeater.

The donor antenna (BS) is connected to the right in the cabinet, except for the high power CDMA repeater for which the donor antenna is connected to the left in the cabinet (see Figure 3-7).

The service antenna (MS) is connected to the left in cabinet, except for the high power CDMA repeater for which the service antenna is connected to the right in the cabinet (see Figure 3-7).

2. Mount the mains plug and connect the power supply unit, PSU.

For repeaters supplied from the mains, the mains outlet must be grounded. Both the mains plugs of repeaters equipped with two power supply units must be connected to outlets supplied from the same fuse.

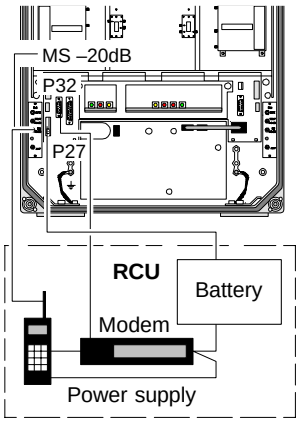


3. Connect external alarm sensors (burglary, fire, etc.) and other external alarm equipment (optical or acoustic signal, etc.), if any.

External alarm is connected to the P33 alarm port located to the left in the cabinet (see Figure 3-8 on page 3-10). Use a 15 pole D-sub male connector.

The P33 port is described on page 3-12.

Cables for this installation is taken through strain relief bushings or connectors at the bottom of the repeater.



This is a schematic figure. The various RCU parts can be integrated or configured differently.

4. Connect the internal phone/modem unit for remote control of the repeater, if any.

The modem and a power backup unit are integrated in an RCU, Remote Control Unit, which is mounted downmost inside the cabinet, in front of the PSU. The RCU is available in different types for various systems, which is further detailed in the *Optionals* section in Chapter 6.

The modem is connected to the P32 modem port (RS-232, V.24 interface) on the repeater located to the left in the cabinet (see Figure 3-8 on page 3-10).

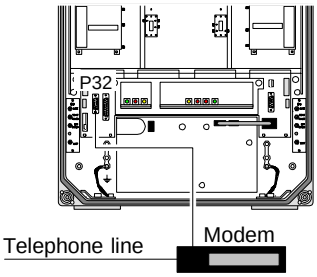
The P32 port is described on page 3-12.

The mobile phone antenna is connected to the MS –20dB port on the BS directional coupler (DC) in the cabinet (DC/BS), provided that the phone and the repeater operate in the same system.

If an RCU is used, this is powered by the P27 auxiliary port located to the left in the cabinet (see Figure 3-8 on page 3-10). Pin 2 and 3 of the P27 port are interconnected with a jumper if not used. This jumper must be removed before plugging the RCU connector to P27.

The P27 port is described on page 3-11.

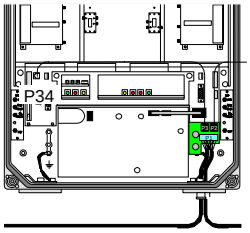
If the RCU is removed, the jumper between pin 2 and 3 on the P27 port must be reconnected. Otherwise, the CU and ALI boards will have no voltage supply. Do not connect the jumper to another position than between pin 2 and 3 on the P27 port.



5. Connect a telephone line for remote control of the repeater, if any. The telephone line is connected to a modem, which is connected to the P32 modem port on the repeater.

The P32 port is described on page 3-12.

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

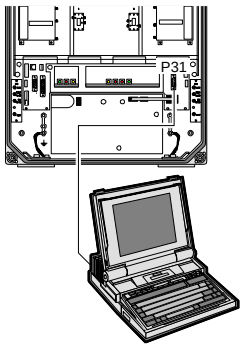


6. Connect the *Repeater to Repeater Link* cable, if this optional feature is to be used. The R2R net cable is connected to the P34 Repeater to Repeater Link port via the P1 terminal on the R2R connector board to the right in the repeater.

The P34 Repeater to Repeater Link port is described on page 3-14.

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

Required information for a *Repeater to Repeater Link* installation is found in the VD202 91/EN, *R2R, Repeater to Repeater Link Kit, Installation Guide*.



7. Connect a PC for controlling the repeater. A COM port on the PC is connected to the P31 PC port (RS-232) located to the right in the cabinet (see Figure 3-8 on page 3-10). Use the provided serial cable.

Port P31 is described on page 3-11.

Now, you can use OMT32 to set up and control the repeater. The OMT32 program is described in the *OMT32, User's Manual*.

But first, check the connections made and commission the repeater as described in Chapter 4.

Connection Ports and Station Ground

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 the *Board and Unit Descriptions* section in Chapter 5.

Station ground is detailed below as well.

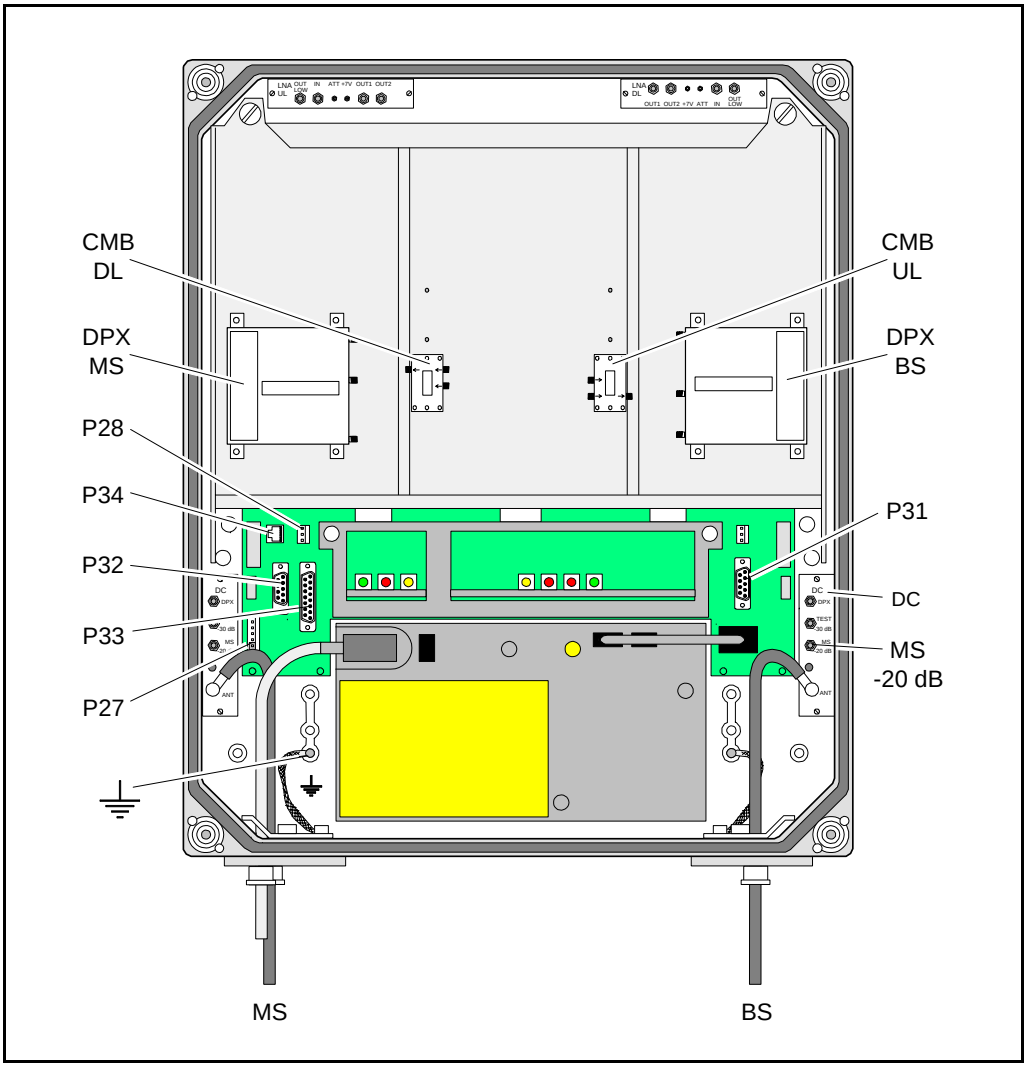
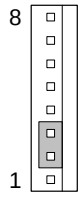


Figure 3-8. Connection ports and station ground

Station Ground

There is a ground screw (M8) in the repeater that is intended for station ground (see Figure 3-8). This screw must be used only for station grounding.

P27 Auxiliary Port



Auxiliary port P27 is used for powering an RCU mobile phone/modem remote control unit. The connector is found on the DIA board to the left in the cabinet (see Figure 3-8).

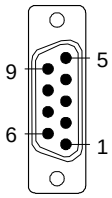
P27 is an 8 pole, 1 line male connector.

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 +10V 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.

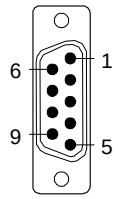
The connector is found on the DIA board to the right in the cabinet (see Figure 3-8).

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 remote control of the repeater.

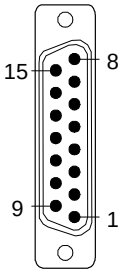
The connector is found on the DIA board to the left in the cabinet (see Figure 3-8).

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 (see Figure 3-8).

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 (signal AI1 - AI4) 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. See the *Alarm Configuration* section in Chapter 11.

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

Vin_{max} = 5.5V
Vin_{min} = –0.5V

The alarm inputs are defined as follows:

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 location of the connector in the cabinet is shown in Figure 3-8.

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

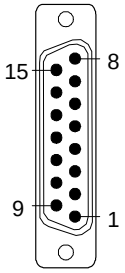
Two alarm outputs

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 *Repeater to Repeater Link* (R2R net), which is an optional feature for the AR repeaters.

The connector is found on the DIA board to the left in the cabinet (see Figure 3-8).

P34 is an 8 pole RJ45 modular female connector.

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*.

Mains Breakdown Relay

To be able to distinguish PSU faults from power failure, a mains breakdown relay must be used on the repeater mains supply.

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

- Connect a currentless closed relay contact to pin AI1 and AIC on the P33 alarm connector see Figure 3-9. Alarm is initiated by short circuiting pin AI1 and AIC in the P33 connector. The P33 alarm connector is detailed on page 3-12.

- Connect the relay coil. It must be supplied from the same fuse as the repeater.

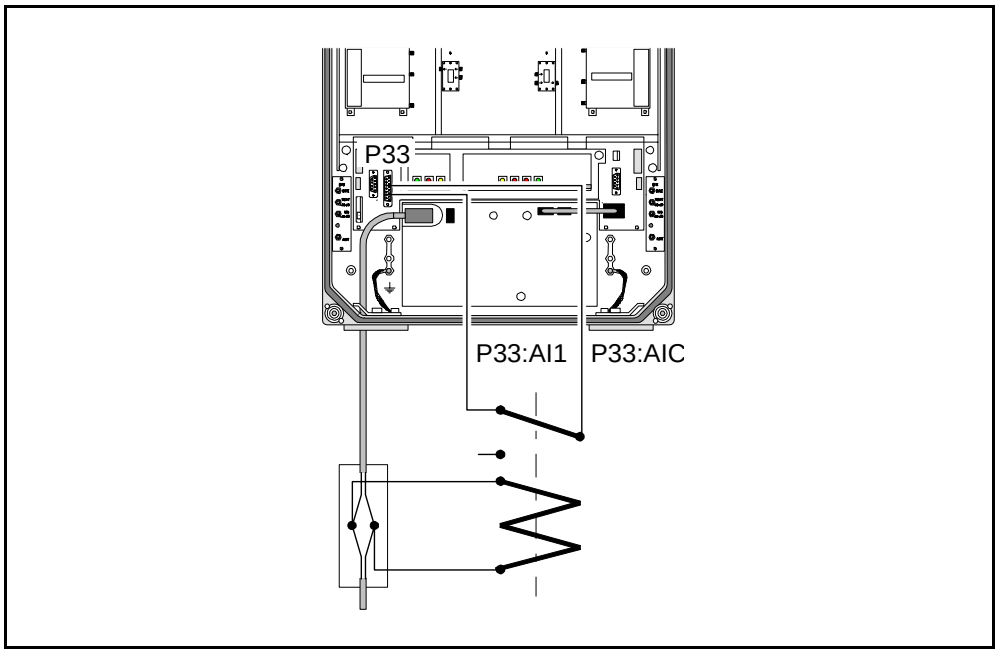


Figure 3-9. Mains breakdown relay connection

- After commissioning, select the *Mains breakdown* option in the *Alarm Configuration* dialog box described in the *Alarm Configuration* section in Chapter 11.

Installing 24 Volt or 48 Volt DC Power Supply Unit

You can replace the 220V AC PSU with a 24 Volt or 48 Volt DC PSU as follows:

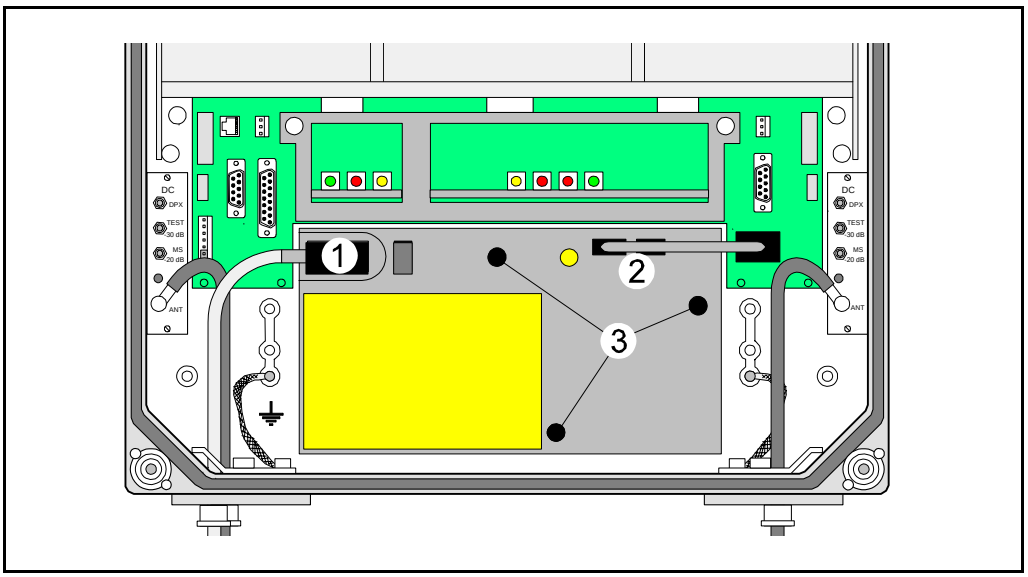
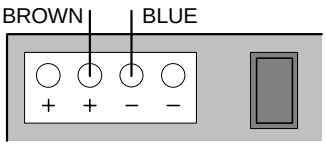


Figure 3-10. Replacing the PSU

1. Switch the repeater off and remove the mains plug from the PSU ('1' in Figure 3-10).
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.

4. Commissioning

Read carefully Chapter 1 *Safety* before commissioning the repeater.

Check all connections made during the installation. Also, ensure that both the mains plugs for repeaters equipped with two power supply units are connected to outlets supplied from the same fuse.

To fulfill the IP65 weather protective requirements, ensure that the cable strain relief bushings are properly tightened. Also, ensure that the gaskets at the cable inlets and on the cabinet are properly fitted and not damaged.

When the installation is checked, commission the repeater as described below.

Starting the Repeater

1. Turn the mains switch on (marked 'S' in Figure 4-1).
2. Check the LED on the power supply unit (V). It must be lit with a steady yellow light.
3. Check the four **CU board** LEDs (see Figure 4-1). A correct power up is indicated as follows:

   PWR
   Yellow LED which is lit with a steady light after the mains is switched on. Indicates present power.

   BOOT
   Red LED that is lit with a steady light when the system boots, i.e. for 10 - 15 seconds after the mains is switched on. Then, it flashes for the next 5 - 10 seconds. After that, if no error is detected, the LED is off.

   ALARM
   Red LED that flashes 15 - 20 seconds after the mains is switched on. Then, it flashes for less serious alarms (ERROR) and is lit with a steady light for fatal alarms (CRITICAL).

   OPER
   Green LED that lights up approx. 15 seconds after the mains is switched on. It shows, with a steady light, that the repeater is ready for operation.

4. Check the three **ALI board** LEDs (see Figure 4-1). The LEDs follow the alarm relays. A correct power up is indicated as follows:

   OPER
   Green LED that has the same indication as the green LED on the CU board (see above).

   ALARM
   Red LED that is lit with a steady light for ERROR and CRITICAL alarms.

   PWR
   Yellow LED that has the same indication as the yellow LED on the CU board (see above).

External indicators on the repeater front

Yellow
Operation LED that lights up approx. 15 seconds after the mains is switched on. At steady light the repeater is ready for operation.

Red
Alarm LED that indicates ERROR alarms with flashing light and CRITICAL alarms with steady light.

When the indicators show operational mode, the repeater can be configured for operation by using a computer running OMT32. This is further detailed in the *OMT32, User's Manual*.

Indicators

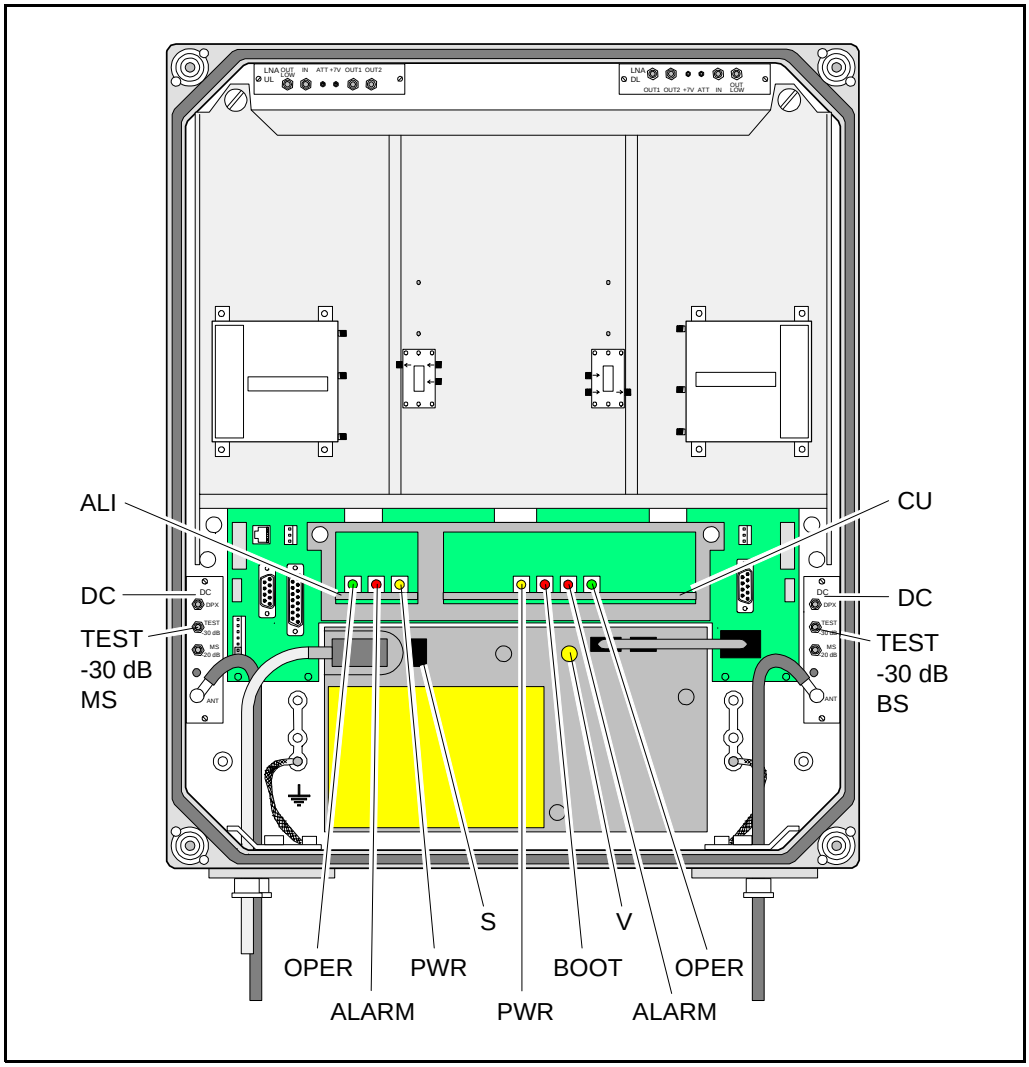


Figure 4-1. Indicators and mains switch

Figure 4-1 shows the repeater indicators and the mains switch. There are also two external indicators on the repeater front cover.

Repeater to Repeater Link indicators

Additional indicators are found in the repeater, if equipped with the *Repeater to Repeater Link* feature. For information about these indicators, refer to the VD202 91/EN *R2R, Repeater to Repeater Link Kit, Installation Guide*.

Measuring the Output Power Level

Uplink and downlink output power test ports are found on the directional couplers (DC) at the MS and BS antenna connectors. These test ports are marked TEST –30dB (see Figure 4-1) and are intended for measuring using e.g. a spectrum analyzer.

The coupling is –30dB approximately. There is no directivity in these test ports, i.e. both uplink and downlink signal can be measured.

Voltage Supply Testpoints

A number of voltage supply testpoints are available in the repeater. These testpoints are named U7A - U7F for the 7V supply voltages and U26 for 26V, 13V or 10V supply voltage (depending on the repeater type).

A standard multi-meter can be used on these testpoints.

The testpoints are found on the DIA board in the repeater cabinet. The testpoint positions on the DIA board is detailed in the *Board and Unit Descriptions* section in Chapter 5.

If the repeater is equipped with a second PSU, e.g. for combined channel/band selective operation, the same set of testpoints are also found on the cover DIA board.

Repeater Configuration

The repeater is now ready to be configured in accordance with the site conditions and system performance requirements. Pay especial attention to the antenna isolation described in the *OMT32, User's Manual*.

5. Functional Description

Allgon repeaters work as bi-directional on-frequency amplifiers.

A repeater receives, amplifies, and retransmits signals downlink and uplink simultaneously, i.e. from the base station via the repeater to the mobile stations and from the mobile stations via the repeater to the base station.

The repeater is connected to a BS antenna, directed towards the base station, and to a MS antenna directed towards the area to be covered. These antennas are connected to the repeater with N type male connectors.

To prevent instability due to poor antenna isolation, a built-in antenna isolation supervision feature reduces the gain level automatically when poor antenna isolation is detected.

The Allgon repeaters are controlled by powerful microprocessors.

Alarm and operational LEDs are visible on the repeater front.

The repeater works with convection cooling without fan.

Operational parameters such as gain, channel number, power levels, etc. are set using a desktop or notebook and the Allgon OMT32, which communicate, locally or remotely via modem, with the repeater. Remote operation is performed using a telephone line or a built-in mobile phone equipped with a data interface.

Repeater Design

The repeater is housed in a cast aluminium chassis that is waterproof, class NEMA4/IP65, for outdoor use. The chassis has a design suited for outdoor use as well as indoor use.

The chassis consists of a cabinet and a cover joined with hinges. The cabinet contains the repeater circuitry. The cover can either be a thin cover or a large cover. The latter consists of another cabinet which can be used as an empty cover or be equipped as an independent repeater unit.

The cover has two external LEDs for operation and alarm indication.

The cabinet as well as a large cover can be equipped for channel selective operation or band selective operation. A combined repeater is normally equipped for channel selective operation in the cabinet and band selective operation in the cover.

Different amplifier boards are used to get the various operations (see below). The amplifier boards are individually shielded and located under metal cover sheets which can be folded out.

CHA, Channel selective GSM amplifier board

Channel selective GSM repeaters can handle up to eight repeater channels (four if the CU part number is K103/1). For every even number of repeater channels, two CHA amplifier boards are required in the repeater, one CHA board for uplink signaling and one board for downlink signaling. Each repeater channel is allocated to a radio channel or switched off. In a GSM type TDMA system (GSM, EGSM, DCS1800 or PCS1900), one repeater channel can handle eight calls (sixteen if half-rate encoding is used).

CSA, Channel selective CDMA amplifier board

Current CDMA repeaters can handle two CDMA repeater channels. For every even number of repeater channels, two CSA amplifier boards and two PA amplifier boards are required in the repeater, one pair of CSA/PA boards for uplink signaling and one pair for downlink signaling. Each repeater channel is allocated to a radio channel or switched off.

BSA, Band selective amplifier board

Band selective repeaters can handle one wide band repeater channel. The band width is either fixed or adjustable (fixed for 900MHz repeaters only). A band selective repeater channel requires two BSA boards and two PA amplifier boards in the repeater. One pair of BSA/PA boards for uplink signaling and one pair for downlink signaling.

BA, High power CDMA booster amplifier board

CDMA repeaters can be equipped with a high power booster amplifier board that boosts the output gain with typically 6dB. A high power CDMA repeater can operate with maximum 2 channels.

Other units

In addition to the channel/band selective boards, the repeater contains:

- DIA Distribution board, which is a board on which all other boards and units are connected to.

  On the DIA board, there is a shielded metal frame in which the CU and ALI boards are located.

  There is a DIA board in the cabinet, and another board in the cover, if equipped.

- CU Control Unit board, located in the frame on the DIA board.

  There is one CU board in the cabinet, which controls the entire repeater.

- ALI Alarm Interface board, located in the frame on the DIA board.

  There is one ALI board in the cabinet which handles alarm and alarm communication.

- DC Directional Coupler, located in shielded boxes which are formed as recesses in the cabinet.

  Two DC units in the cabinet are used as antenna signal directional coupler.

- LNA Low Noise Amplifier, located in shielded boxes which are formed as recesses in the cabinet.

  Two LNA units in the cabinet are used as downlink and uplink low noise amplifiers, and additional two LNA are used in the cover, if equipped.

- DPX Duplex filter, located on the cover plate over the channel/band selective boards.

- CMB Combiner unit, located on the cover plate over the channel/band selective boards in channel selective repeaters with more than two channels, and in combined repeaters.

- RCU unit (optional), see Chapter 6, *Optionals*.

- PSU Power Supply Unit, located downmost in the cabinet, and in the cover, if equipped.

If the repeater is equipped with an optional *Repeater to Repeater Link* feature, the following board is also included in the repeater (not valid to channel selective CDMA repeaters):

- RIA Repeater to Repeater Interface Adapter, located in the frame on the DIA board.

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

Channel Selective GSM Repeater

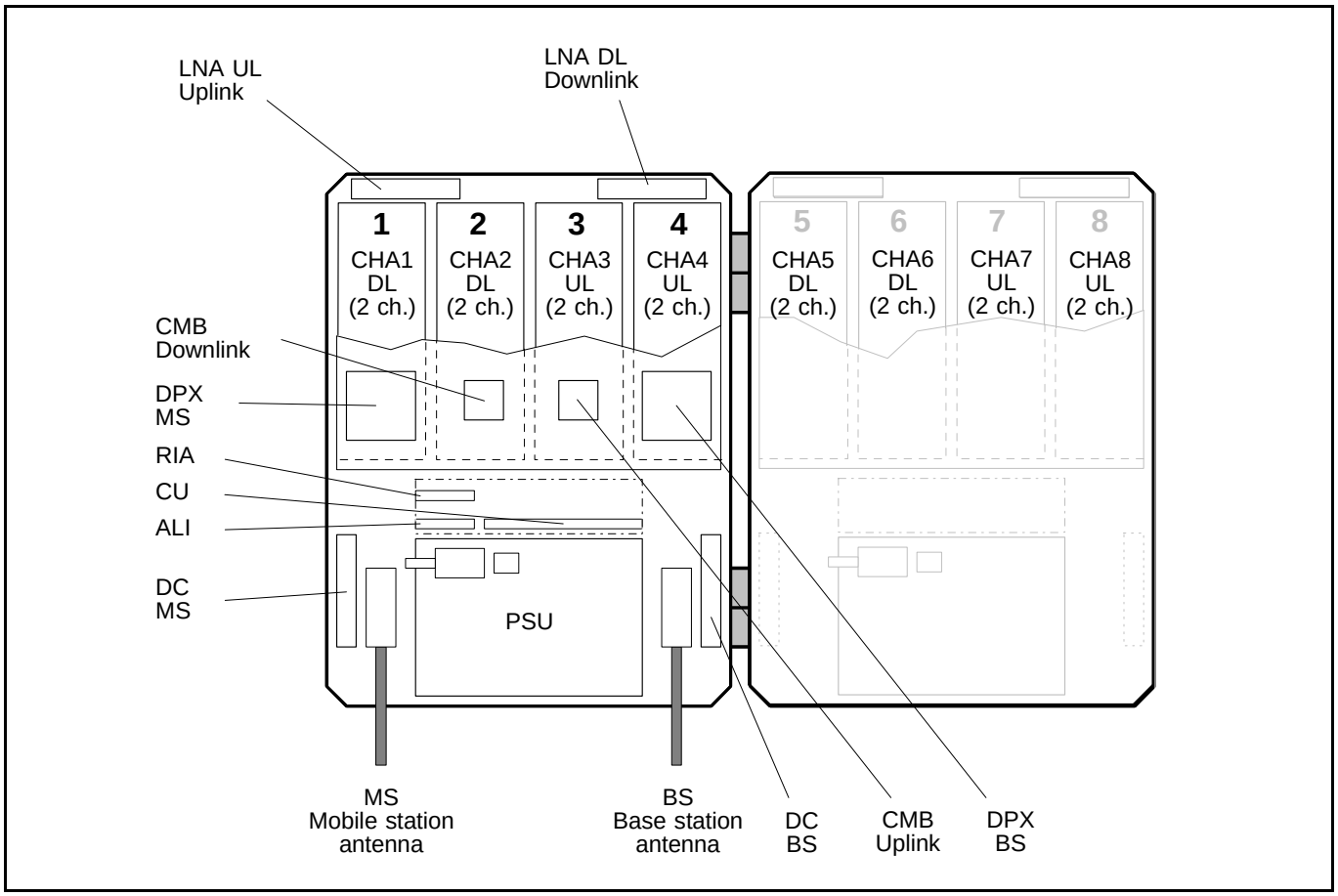


Figure 5-1. Channel selective GSM repeater

A cabinet (the left part in Figure 5-1) for a channel selective GSM repeater can be equipped with four CHA channel boards, two downlink boards (DL) with two internal channels each and two uplink boards (UL) with two internal channels each. The described cabinet has a capacity of four bi-directional GSM channels.

The cover (the right part in Figure 5-1) can be equipped as well, which gives up to eight GSM channels. The cover board positions are shown in the figure.

Channel selective GSM repeaters are used for GSM, DCS and PCS types of TDMA systems.

Main units:

ALI	Alarm Interface board
CHA	Channel Selective Amplifier board, GSM type
CMB	Combiner unit
CU	Control Unit board
DC	Directional Coupler
DPX	Duplex filter
LNA	Low Noise Amplifier
PSU	Power Supply Unit
RIA	Repeater to Repeater Interface Adapter (optional)

Channel Selective CDMA Repeater

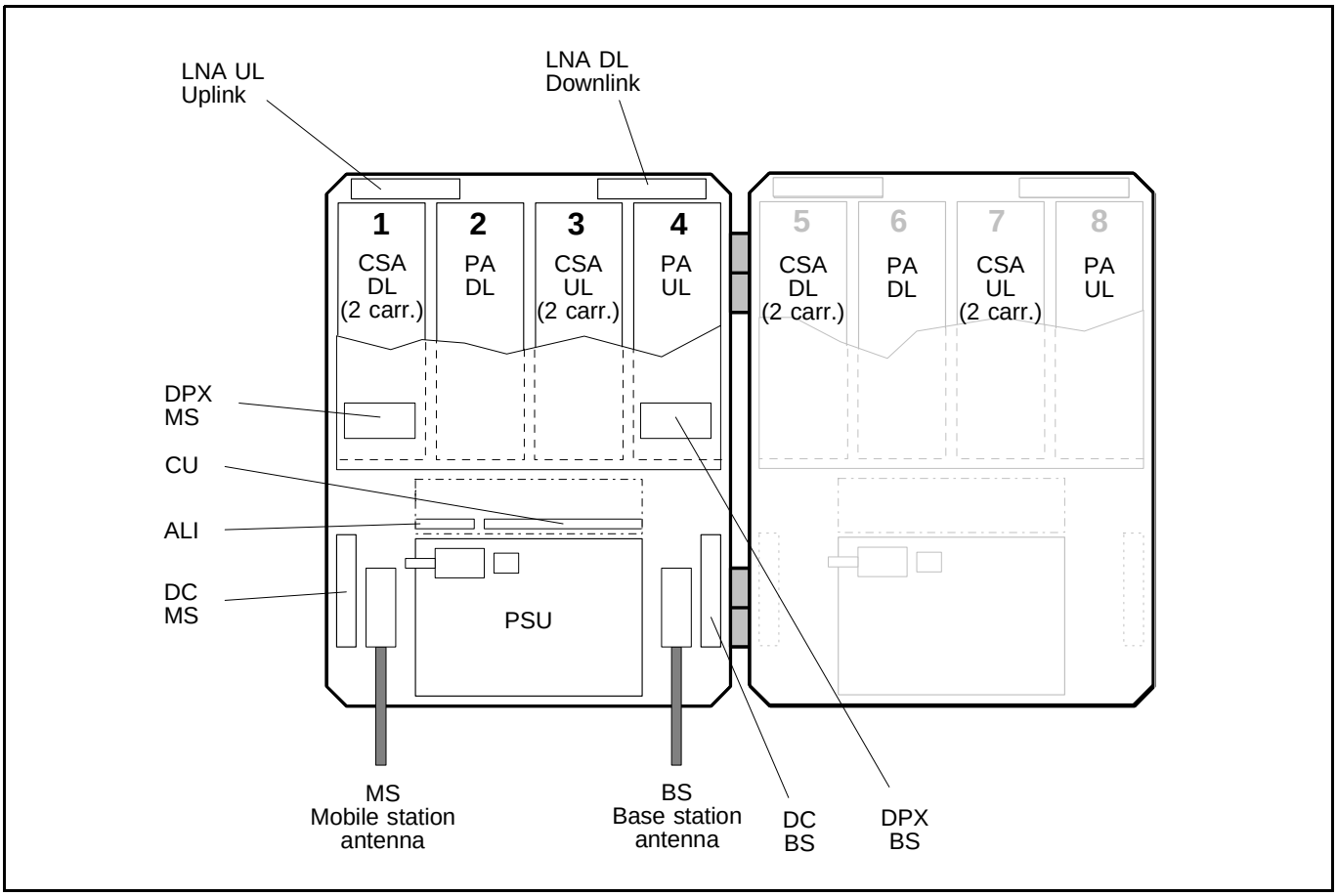


Figure 5-2. Channel selective CDMA repeater

A cabinet (the left part in Figure 5-2) for a channel selective CDMA repeater can be equipped with two pair of CSA and PA boards, one pair for downlink (DL) and one pair for uplink (UL). The described cabinet has a capacity of two bi-directional CDMA carriers.

The cover (the right part in Figure 5-2) can be equipped as well. The cover board positions are shown in the figure.

CSA boards are used for IS-95 or J-STD-008 types of CDMA systems.

Main units:

ALI	Alarm Interface board
CSA	Channel Selective Amplifier board, CDMA type
CU	Control Unit board
DC	Directional Coupler
DPX	Duplex filter
LNA	Low Noise Amplifier
PA	Power Amplifier board
PSU	Power Supply Unit

Channel Selective High Power CDMA Repeater

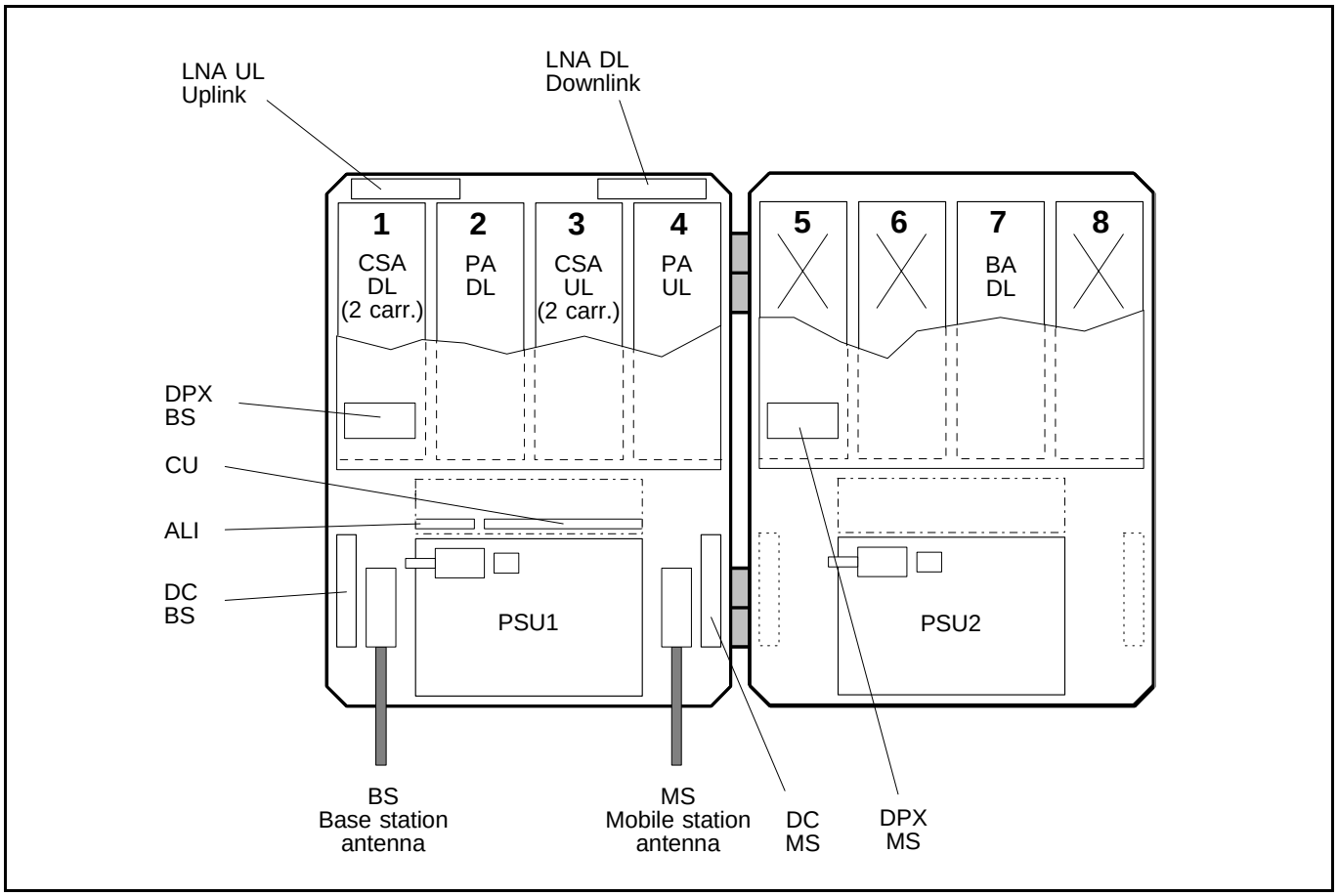


Figure 5-3. High power CDMA repeater

A cabinet (the left part in Figure 5-3) for a channel selective high power CDMA repeater can be equipped with two pair of CSA and PA boards, one pair for downlink (DL) and one pair for uplink (UL). The described cabinet has a capacity of two bi-directional CDMA carriers.

The cover (the right part in Figure 5-3) is equipped with the BA board. There is also a heat sink element on the outside of the cover, not shown in Figure 5-3.

Note that this repeater type has opposed positions of the BS and MS antenna inputs and DC units compared to all the other repeater types.

CSA boards are used for IS-95 or J-STD-008 types of CDMA systems.

Main units:

ALI	Alarm Interface board
BA	Booster Amplifier board
CSA	Channel Selective Amplifier board, CDMA type
CU	Control Unit board
DC	Directional Coupler
DPX	Duplex filter
LNA	Low Noise Amplifier
PA	Power Amplifier board
PSU1,2	Power Supply Unit 1 and 2

Band Selective Repeater

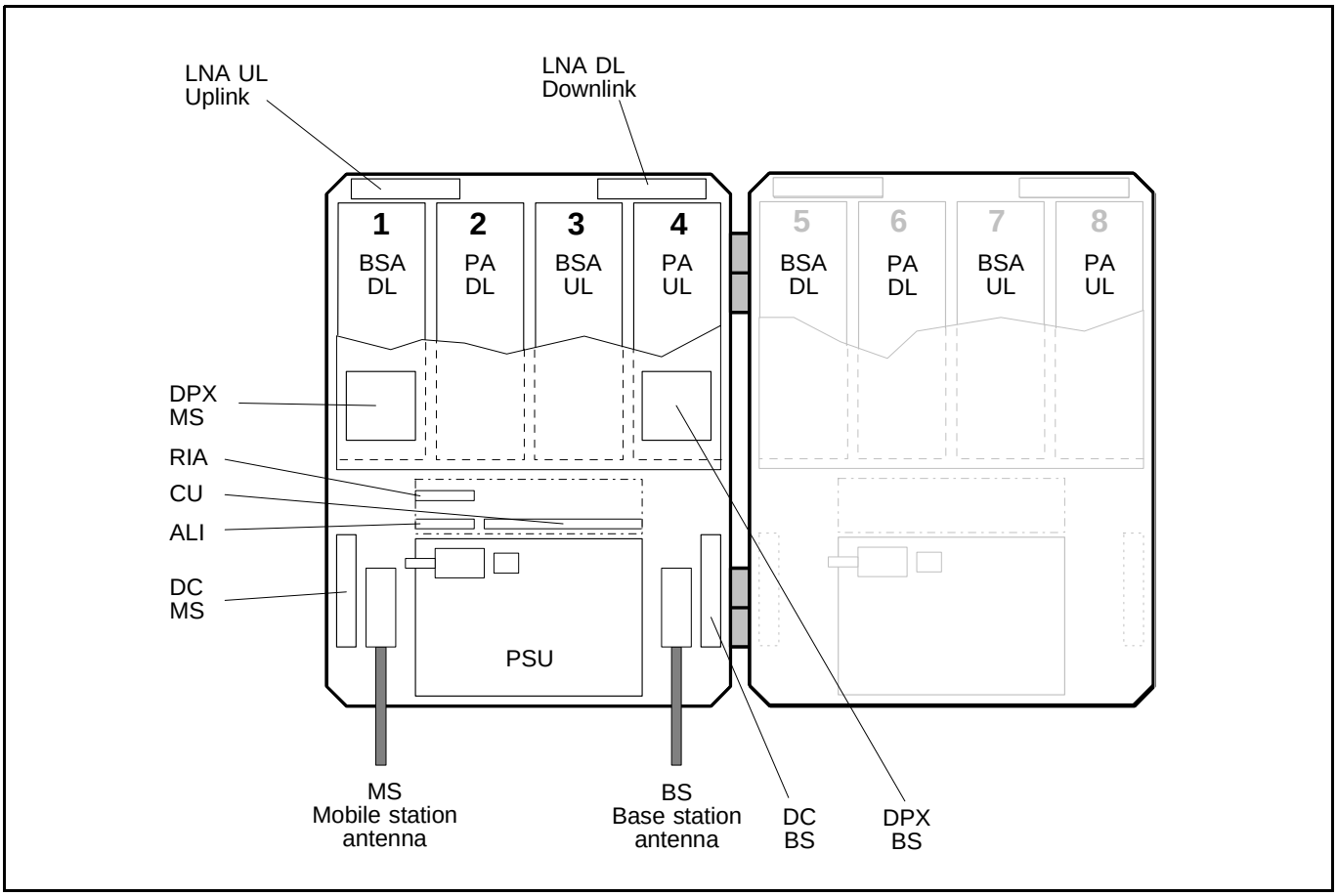


Figure 5-4. Band selective repeater

A cabinet (the left part in Figure 5-4) for a band selective repeater is equipped with two pair of BSA and PA boards, one pair for downlink (DL) and one pair for uplink (ULS). The described cabinet is equipped for bi-directional band selective operation.

The cover (the right part in Figure 5-4) can be equipped as well. The cover board positions are shown in the figure.

BSA boards are used for band selective systems either with a fixed band width of 900MHz or an adjustable band width.

Main units:

ALI	Alarm Interface board
BSA	Band Selective Amplifier board, fixed or adjustable band width
CU	Control Unit board
DC	Directional Coupler
DPX	Duplex filter
LNA	Low Noise Amplifier
PA	Power Amplifier board
PSU	Power Supply Unit
RIA	Repeater to Repeater Interface Adapter (optional)

Combined Repeater

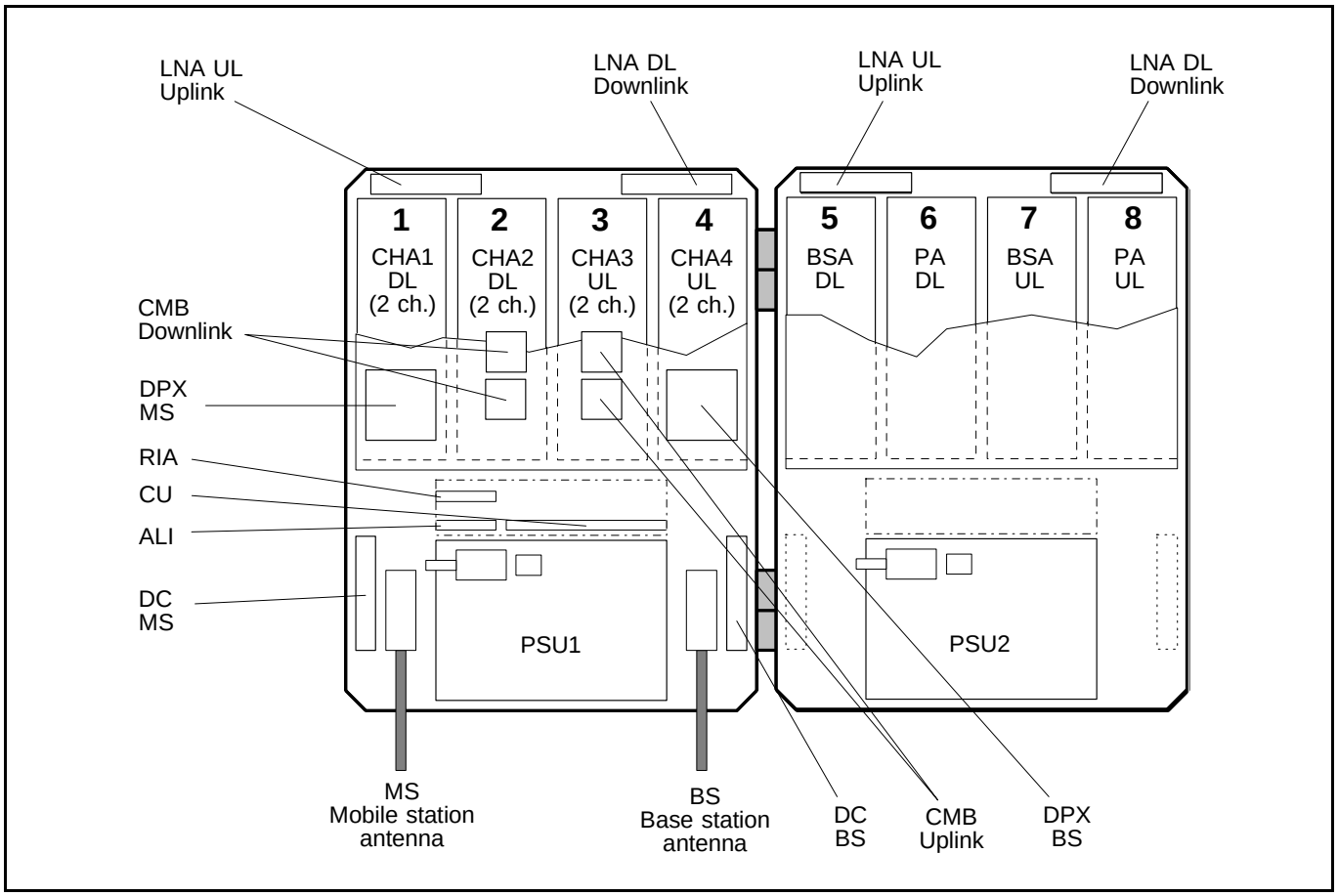


Figure 5-5. Combined repeater

Figure 5-5 shows an example of a combined channel selective and band selective repeater. The channel selective part is located in the cabinet and the band selective part in the cover.

This example has four bi-directional GSM channels and band selective operation.

Any combinations of channel selective GSM part (page 5-4), channel selective CDMA part (page 5-5) and band selective part (page 5-7) can be mixed.

Main units:

ALI	Alarm Interface board
BSA	Band Selective Amplifier board, fixed or adjustable band width
CHA	Channel Selective Amplifier board, GSM type
CMB	Combiner unit
CU	Control Unit board
DC	Directional Coupler
DPX	Duplex filter
LNA	Low Noise Amplifier
PA	Power Amplifier board
PSU1,2	Power Supply Unit 1 and 2
RIA	Repeater to Repeater Interface Adapter (optional)

Block Diagram

The following block diagrams are found in this section:

- Channel selective GSM repeater, Figure 5-6 on page 5-10.
- Channel selective CDMA repeater, Figure 5-7 on page 5-12.
- Band selective repeater, Figure 5-8 on page 5-14.

The main signal paths for the repeater types are described under the block diagrams.

Before the block diagrams are shown, the downlink and uplink signal paths are described below.

Alarm is described on page 5-16.

Repeater setup is described on page 5-16.

Downlink Signal Path

The downlink signal path, i.e. from the base station through the repeater to the mobile station, is described for channel selective GSM operation, channel selective CDMA operation, and band selective operation under the block diagrams on the following pages.

Uplink Signal Path

The uplink signal path, i.e. from the mobile station through the repeater to the base station, is identical to the downlink path the other way round. Only some levels and component values differ.

The high power CDMA repeater has, however, a booster amplifier in the downlink path only.

Channel Selective GSM Repeater

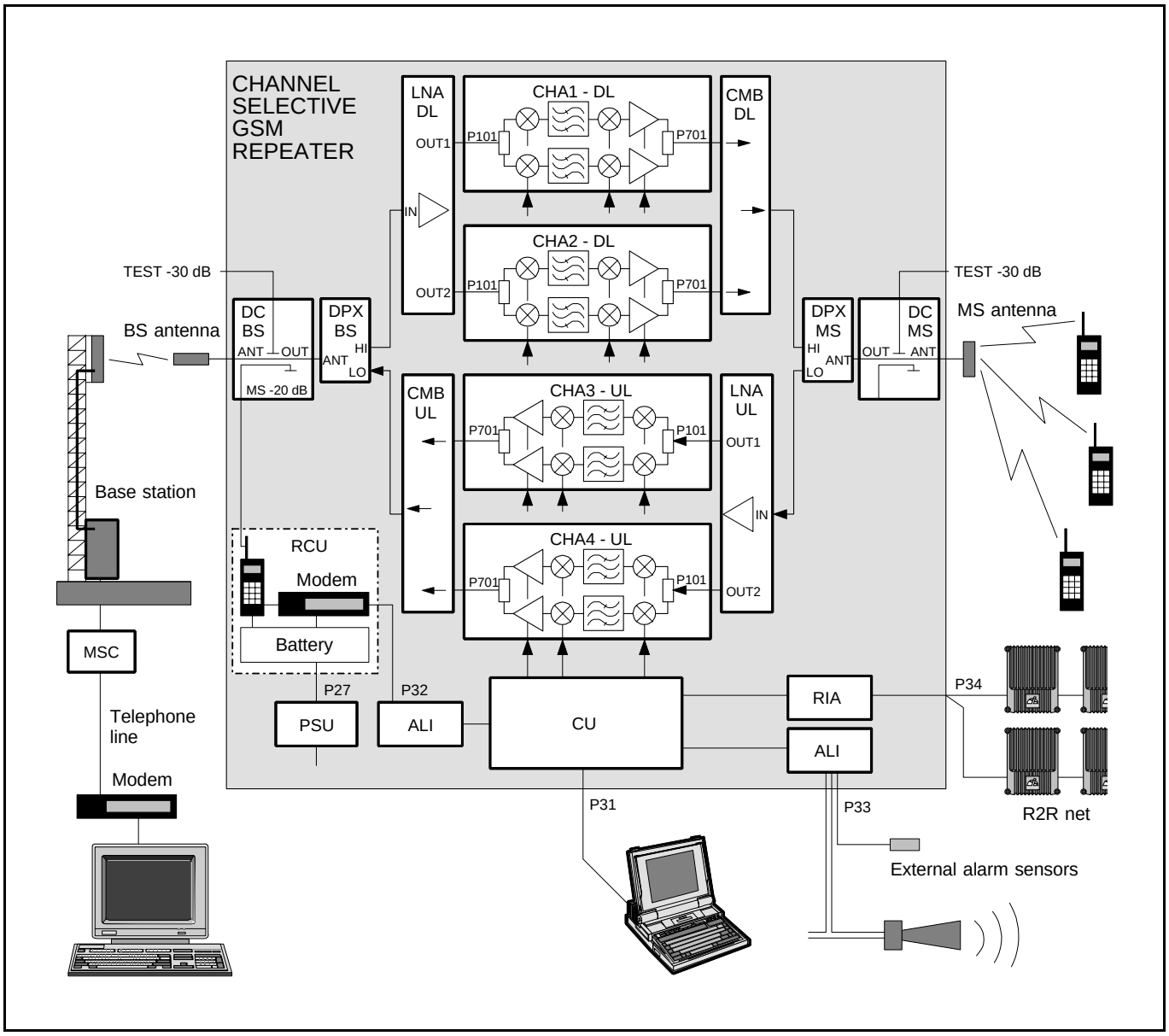


Figure 5-6. Block diagram, channel selective repeater

Figure 5-6 shows a block diagram of a channel selective repeater with four bi-directional channels. This diagram is applicable to repeaters for the GSM, DCS, PCN and GSM 1900 (PCS) systems.

Downlink signal path

The signal from the base station is received via the repeater BS antenna and is then forwarded through a directional coupler (DC). The signal passes a duplex filter (DPX), is amplified in a low noise amplifier (LNA), and enters the channel boards (CHA), which have two parallel channels each.

The first mixer stage on the CHA amplifier board, which is controlled by a synthesizer, converts the received frequency down to the IF frequency. The signal is then filtered by SAW bandpass filters and, not shown in the figure, amplified before it is fed to the second mixer stage for conversion back to the original frequency.

The output signal from the mixer is then amplified in the power amplifier and fed to a combiner, which combines the signals from the two channels on the channel board.

The output signal passes a combiner (CMB), a duplex filter (DPX), and a directional coupler (DC), before it is fed to the repeater MS antenna.

Channel Selective CDMA Repeater

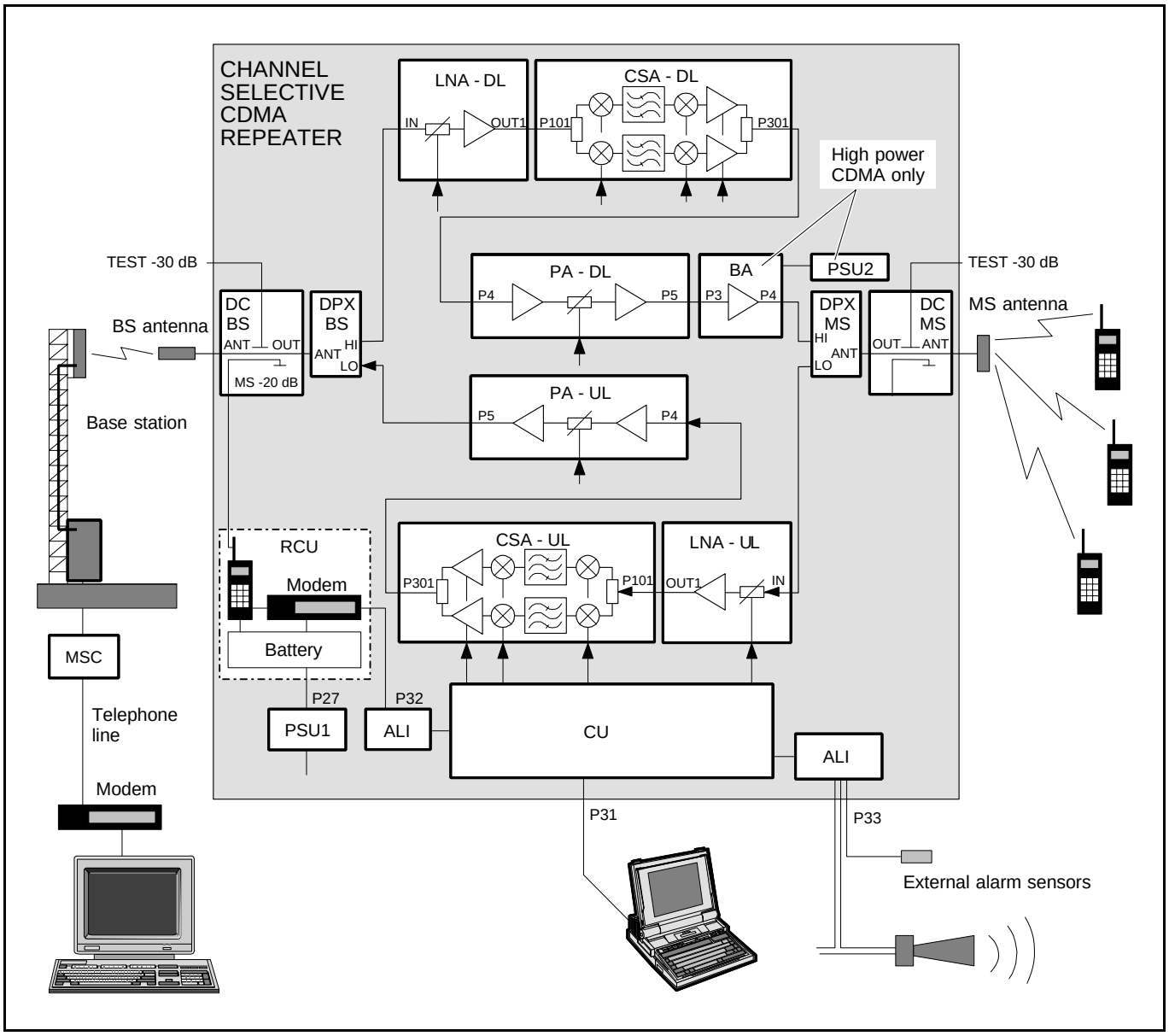


Figure 5-7. Block diagram, CDMA repeater

Figure 5-7 shows a block diagram of a channel selective CDMA repeater. This diagram is applicable only to repeaters for the CDMA system.

Downlink signal path

The signal from the base station is received via the repeater BS antenna and is then forwarded through a directional coupler (DC). The signal passes a duplex filter (DPX), is amplified in a low noise amplifier (LNA), and enters the channel board (CSA), which has two parallel channels.

The first mixer stage on the CSA amplifier board, which is controlled by a synthesizer, converts the received frequency down to the IF frequency. The signal is then filtered by SAW bandpass filters and, not shown in the figure, amplified before it is fed to the second mixer stage for conversion back to the original frequency.

The following power amplifier is controlled by the CU. The output gain can be reduced to avoid instability due to poor antenna isolation.

The output signal from the power amplifier is fed to a combiner, which combines the signals from the two channels on the channel board.

A detector on the PA board measures continuously the output level. The signal from this detector is used by the automatic gain control, AGC, to supervise and, if necessary, reduce the output power to keep it under a maximum level. The AGC gain control affects several of the amplification stages.

BA in high power CDMA repeaters only.

In high power CDMA repeaters, a booster amplifier (BA) boosts the output downlink signal by typically 6dB. The BA amplifier is powered by a high power PSU2. Note that the booster amplifier (BA) is only present in the downlink path, and only in high power CDMA repeaters.

The output signal passes a duplex filter (DPX) and a directional coupler (DC) before it is fed to the repeater MS antenna.

Band Selective Repeater

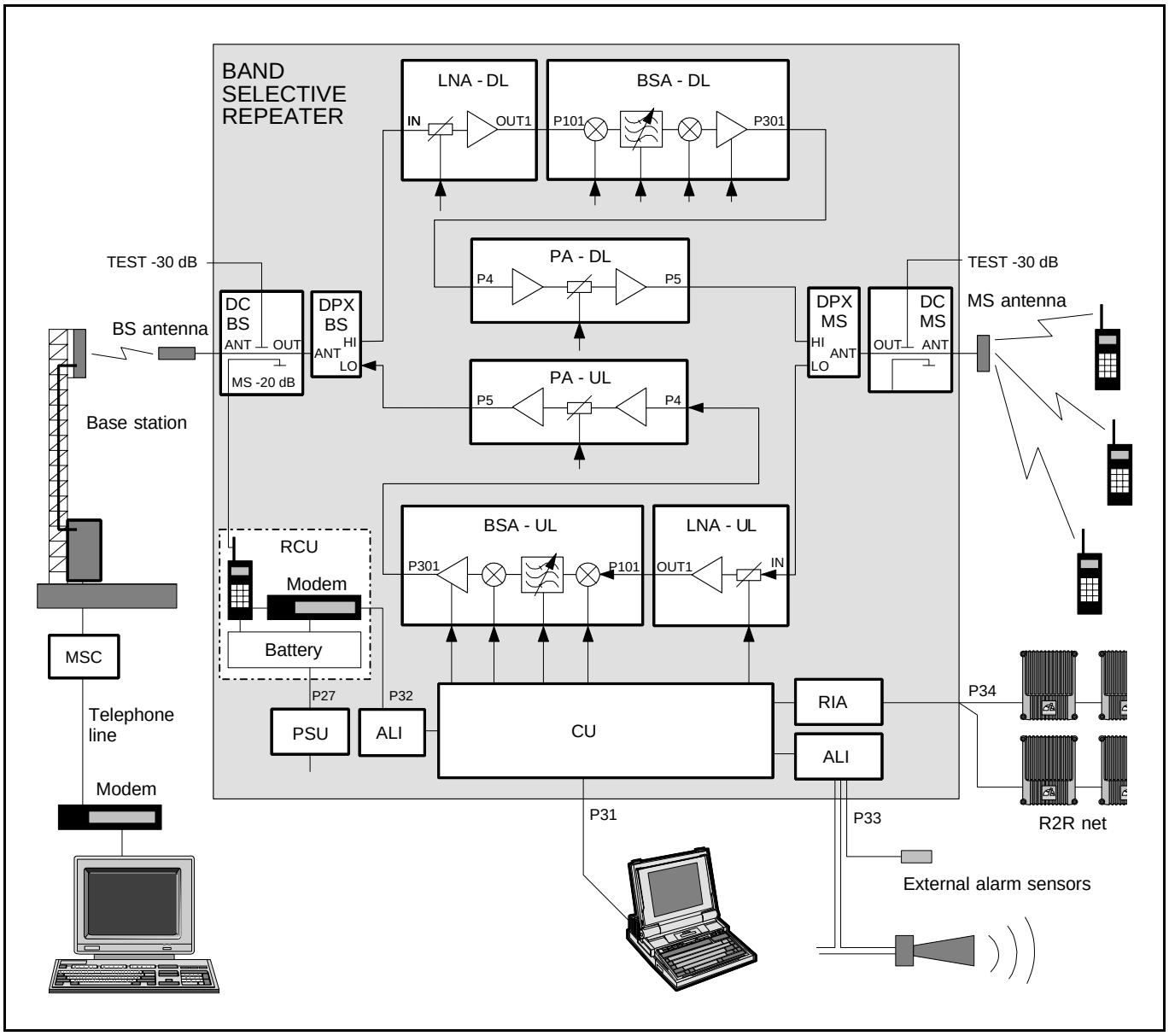


Figure 5-8. Block diagram, band selective repeater

Figure 5-8 shows a block diagram of a band selective repeater. This diagram is applicable to repeaters for e.g. NMT, TACS, ETACS, AMPS, DAMPS and CDMA systems.

Downlink signal path

The signal from the base station is received via the repeater BS antenna and is then forwarded through a directional coupler (DC). The signal passes a duplex filter (DPX), is amplified in a low noise amplifier (LNA), and enters the band selective amplifier board (BSA).

The first mixer stage on the BSA amplifier board, which is controlled by a synthesizer, converts the received frequency down to the IF frequency. The signal is then filtered by SAW bandpass filters and, not shown in the figure, amplified before it is fed to the second mixer stage for conversion back to the original frequency.

The SAW filter can be either fixed or adjustable depending on the BSA board used. If the BSA board has fixed band width, this SAW filter is fixed and selected for the current band width. If the BSA board has adjustable band width, the SAW filter combination can be software changed from within OMT32 (or OMS) to cover various band widths.

The following power amplifier is controlled by the CU. The amplifier gain will be reduced to avoid instability due to poor antenna isolation.

A detector on the PA board measures continuously the output level. The signal from this detector is used by the automatic gain control, AGC, to supervise and, if necessary, reduce the output power to keep it under a maximum level. The AGC gain control affects several of the amplification stages.

The output signal passes duplex filter (DPX) and a directional coupler (DC) before it is fed to the repeater MS antenna.

RCU

The optional RCU Remote Communication Unit is located inside the repeater (described in Chapter 6, *Optionals*).

Communication with the base station is performed by means of a built-in mobile feature that has the antenna connected to the BS directional coupler (DC). Data is transferred between the repeater and the built-in RCU unit via the P32 modem port.

The RCU unit is powered via the P27 auxiliary port and the unit has a battery with capacity to send a number of alarms if a mains power failure occurs.

R2R

The *Repeater to Repeater Link* feature makes it possible to communicate with a number of repeaters via one RCU unit in one of the repeaters in an R2R net. Several RCU units can also be used in the same net.

The repeaters in the R2R net are connected to the P34 port.

The R2R feature is described in Chapter 6, *Optionals*.

Alarm

Alarm signals from external sensors are received by the ALI board, which forwards the alarm signals to the CU board.

The software on the CU board is able to activate acoustic or visual alarm or direct the alarm to the P33 alarm port to be forwarded, via the RCU unit, to OMT32 (or OMS) located in an operation and maintenance central.

Alarms can be configured from OMT32 (or from OMS).

Repeater Setup

The repeater parameters can be set locally by means of a desktop or notebook loaded with the OMT32 software (or the OMS software). The PC or notebook is connected to the CU via the P31 PC port (see Figure 5-6, Figure 5-7 and Figure 5-8).

The repeater parameters can also be set remotely by means of a phone (mobile or via a telephone line) and a modem connected to the CU board via the P32 modem port (see Figure 5-6, Figure 5-7 and Figure 5-8).

Board and Unit Descriptions

Cabling between boards and units is found on page 5-27.

DC - Directional Coupler

The BS and MS directional couplers, see Figure 5-9, are identical for all repeaters except for the high power CDMA repeaters, which has BS and MS directional couplers depiced in Figure 5-10 (BS) and Figure 5-11 (MS).

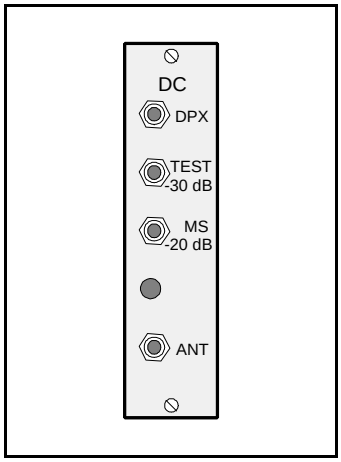


Figure 5-9. MS and BS directional coupler

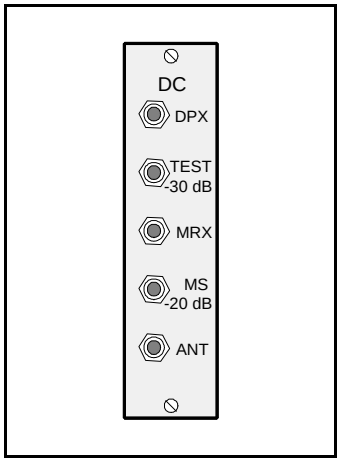


Figure 5-10. BS directional coupler, high power CDMA

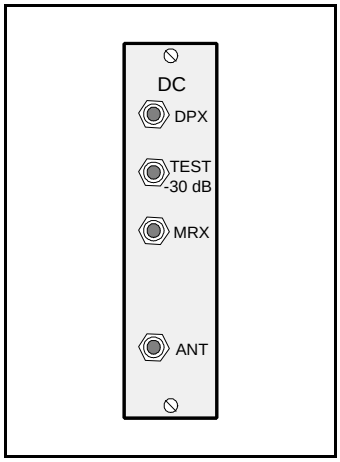


Figure 5-11. MS directional coupler, high power CDMA

Connection

DC/MS:

Port	Connected to
DPX	ANT on the DPX/MS duplex filter.
TEST –30dB	Test port for the downlink output signal. This port has no directivity.
MS –20dB	Not used.
MRX	DC-BS on the MRX unit (high power CDMA only).
ANT	MS antenna.

DC/BS:

Port	Connected to
DPX	ANT on the DPX/BS duplex filter.
TEST –30dB	Test port for the uplink output signal. This port has no directivity.
MS –20dB	Mobile station antenna connection for remote control. This port has at least 20dB directivity towards the antenna.
MRX	DC-MS on the MRX unit (high power CDMA only).
ANT	BS antenna.

DPX - Duplex Filter

The DPX duplex filters on the BS and MS sides are identical.

Connection

DPX/MS:

Port	Connected to
ANT	DPX on the DC/MS directional coupler.
HI	*Channel selective GSM repeater:* Output on the CMB/DL combiner (at 4 channels), P701 on the CHA1/DL channel board (at 2 channels). *Channel selective CDMA repeater:* P5 on the PA/DL board. *Channel selective high power CDMA repeater:* P4 on the BA board in the cover. *Band selective repeater:* P5 on the PA/DL board.
LO	IN on the LNA/UL low noise amplifier.

DPX/BS:

Port	Connected to
ANT	DPX on the DC/BS directional coupler.
HI	IN on the LNA/DL low noise amplifier.
LO	*Channel selective GSM repeater:* Output on the CMB/UL combiner (at 4 channels), P701 on the CHA3/UL channel board (at 2 channels) *Channel selective CDMA repeater:* P5 on the PA/UL board. *Channel selective high power CDMA repeater:* P5 on the PA/UL board. *Band selective repeater:* P5 on the PA/UL board.

LNA - Low Noise Amplifier

The LNA low noise amplifiers are located in the outermost boxes at the top of the cabinet and large cover (see Figure 5-1 to Figure 5-5 on page 5-4 to 5-8). LNA/UL (uplink) is located to the left and LNA/DL (downlink) to the right. All coaxial connectors are SMA type.

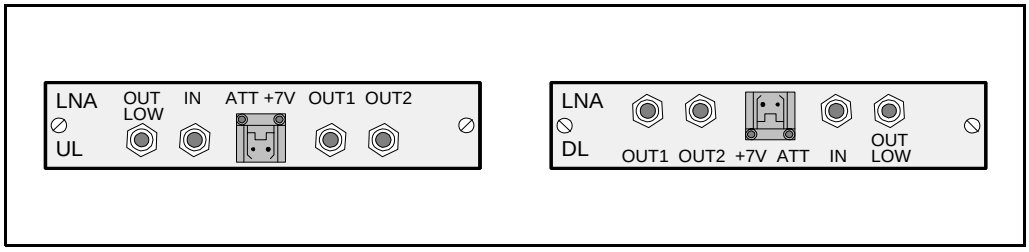


Figure 5-12. LNA low noise amplifier

Signals from the duplex filter output is fed to the LNA input connector IN. Output OUT1 and OUT2 feed the CHA boards of the same signal direction. The signal level in these connectors are +20dB referred to the antenna input. Another output, OUT LOW, is an expansion output for an additional LNA amplifier, if the repeater is equipped in the cover part of the chassis. The gain to this connector is +2dB.

The +7V input is used for 7V supply from the DIA board.

ATT is a control signal for a controllable attenuator in the LNA.

Connection

To the left in the cabinet LNA/UL:

Port	Connected to
OUT LOW	IN on the LNA/UL in the cover if equipped.
IN	LO on the DPX/MS duplex filter.
ATT	P23 on the DIA board.
+7V	P23 on the DIA board.
OUT1	P101 on the CHA3/UL or CSA/UL or BSA/UL board.
OUT2	P101 on the CHA4/UL channel board.

To the right in the cabinet LNA/DL:

Port	Connected to
OUT LOW	IN on the LNA/DL in the cover if equipped.
IN	HI on the DPX/BS duplex filter.
ATT	P24 on the DIA board.
+7V	P24 on the DIA board.
OUT1	P101 on the CHA1/DL or CSA/DL, or BSA/DL board.
OUT2	P101 on the CHA2/DL channel board.

Not used outputs do not need to be terminated.

CHA - Channel Amplifier Board for Channel Selective Operation

The cabinet can be equipped with four CHA Channel Amplifier boards. These are numbered from left to right: CHA1 - CHA4. The board positions CHA1 - CHA2 are used for downlink and CHA3 - CHA4 for uplink (see Figure 5-1 on page 5-4). If the repeater is equipped with two channels only, the board positions 1 and 3 are used.

The two internal channels on each CHA board are located to the left and to the right on the board.

If a board is to be removed, the RFI filter at the board connector and the two coaxial connectors must be removed prior to the board removal. No heat compound is used on the heat sink body or on the chassis.

Coaxial connector P101 is the input of the CHA board fed from the LNA.

Coaxial connector P701 is the output of the board. The output signal is fed to the duplex filter, either directly or via a CMB combiner, depending on the repeater configuration.

Connection

Board #1 from left CHA1/DL:

Port	Connected to
P101	OUT1 on the LNA/DL low noise amplifier.
P701	4 channels: Input on the CMB/DL combiner. 2 channels: HI on the DPX/MS duplex filter.

Board #2 from left CHA2/DL:

Port	Connected to
P101	OUT2 on the LNA/DL low noise amplifier.
P701	Input on the CMB/DL combiner.

Board #3 from left CHA3/DL:

Port	Connected to
P101	OUT1 on the LNA/UL low noise amplifier.
P701	4 channels: Input on the CMB/UL combiner. 2 channels: LO on the DPX/BS duplex filter.

Board #4 from left CHA4/DL:

Port	Connected to
P101	OUT2 on the LNA/UL low noise amplifier.
P701	Input on the CMB/UL combiner.

Caution

BERYLLIUM OXIDE

The CHA Channel Amplifier board power transistors contain beryllium oxide (BeO) that is poisonous. The power transistors are mounted with two screws as opposed to other transistors. See Chapter 1, *Safety*.

CSA and PA Boards for Channel Selective CDMA Operation

For channel selective CDMA operation, the cabinet is normally equipped with two CSA and two PA boards. These are numbered from left to right. Board position 1 is used for CSA downlink board, position 2 for PA downlink board, position 3 for CSA uplink board, and position 4 for PA uplink board (see Figure 5-2 on page 5-5).

If a board is to be removed, the RFI filter at the board connector, the two coaxial connectors, and the flat conductor cable between the CSA board and the PA board must be removed prior to the board removal. No heat compound is used on the heat sink body or on the chassis.

Coaxial connector P101 is the input of the CSA board fed from the LNA.

Coaxial connector P301 is the output of the CSA board. The signal from this output is fed to the PA board input P4. The PA board output P5 is fed to the duplex filter of the same signal direction.

Connection

Board #1 from left CSA/DL:

Port	Connected to
P101	OUT1 on the LNA/DL low noise amplifier.
P301	P4 on the PA/DL board.

Board #2 from left PA/DL:

Port	Connected to
P4	P301 on the CSA/DL board.
P5	*Channel selective high power CDMA repeater:* P3 on the BA board in the cover. *All other repeater types:* HI on the DPX/MS duplex filter.

Board #3 from left CSA/UL:

Port	Connected to
P101	OUT1 on the LNA/UL low noise amplifier.
P301	P4 on the PA/UL board.

Board #4 from left PA/UL:

Port	Connected to
P4	P301 on the CSA/UL board.
P5	LO on the DPX/BS duplex filter.

Caution

BERYLLIUM OXIDE

The PA Power Amplifier board power transistors contain beryllium oxide (BeO) that is poisonous. The power transistors are mounted with two screws as opposed to other transistors. See Chapter 1, *Safety*.

BSA and PA Boards for Band Selective Operation

For band selective operation, the cabinet is equipped with two BSA and two PA boards. These are numbered from left to right. Board position 1 is used for BSA downlink board, position 2 for PA downlink board, position 3 for BSA uplink board, and position 4 for PA downlink board (see Figure 5-4 on page 5-7).

If a board is to be removed, the RFI filter at the board connector, the two coaxial connectors, and the flat conductor cable between the BSA board and the PA board must be removed prior to the board removal. No heat compound is used on the heat sink body or on the chassis.

Coaxial connector P101 is the input of the BSA board fed from the LNA.

Coaxial connector P301 is the output of the BSA board. The signal from this output is fed to the PA board input P4. The PA board output P5 is fed to the duplex filter of the same signal direction.

Connection

Board #1 from left BSA/DL:

Port	Connected to
P101	OUT1 on the LNA/DL low noise amplifier.
P301	P4 on the PA/DL board.

Board #2 from left PA/DL:

Port	Connected to
P4	P301 on the BSA/DL board.
P5	HI on the DPX/MS duplex filter.

Board #3 from left BSA/UL:

Port	Connected to
P101	OUT1 on the LNA/UL low noise amplifier.
P301	P4 on the PA/UL board.

Board #4 from left PA/UL:

Port	Connected to
P4	P301 on the BSA/UL board.
P5	LO on the DPX/BS duplex filter.

Caution

BERYLLIUM OXIDE

The PA Power Amplifier board power transistors contain beryllium oxide (BeO) that is poisonous. The power transistors are mounted with two screws as opposed to other transistors. See Chapter 1, *Safety*.

DIA Board

DIA is a distribution board for most of the boards, units and ports. The DIA board is exclusively equipped with connectors. The connector types are chosen to prevent unintentional mixing up.

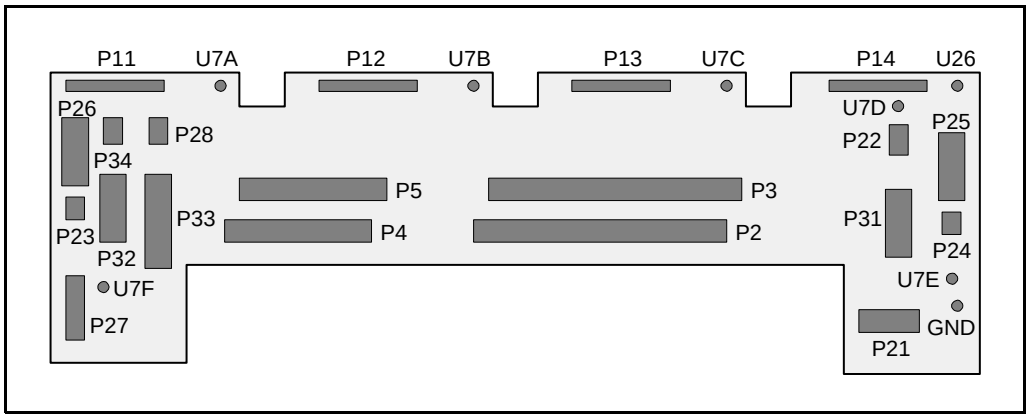


Figure 5-13. DIA board connectors and testpoints

Connection and connector types

Port	Connected to	Connector type
P2	CU board	
P3	Not used	
P4	ALI board	
P5	Not used	
P11	CHA1/DL or CSA/DL or BSA/DL	16 pole 1 line female
P12	CHA2/DL or PA/DL	16 pole 1 line female
P13	CHA3/UL or CSA/UL or BSA/UL	16 pole 1 line female
P14	CHA4/UL or PA/UL	16 pole 1 line female
P21	PSU - Power Supply Unit	10 pole 2 line male
P22	LED board in the cover	4 pole 1 line male
P23	LNA/UL	2 pole 1 line male
P24	LNA/DL	2 pole 1 line male
P25	Expansion output port to cover circuitry if any. Only in cabinets.	16 pole 2 line male
P26	Expansion input port from the cabinet. Used in equipped large covers only.	16 pole 2 line male
*P27	AUX1 auxiliary connector	8 pole 1 line male
P28	Door switch (internal alarm)	3 pole 1 line male
P31	PC (serial RS-232)	9 pole D-sub female
P32	Modem (serial RS-232)	9 pole D-sub male
P33	External alarm	15 pole D-sub female
P34	Repeater to Repeater Link	8 pole RJ45 modular female

*Pin 2 and 3 on the P27 connector must be interconnected with a jumper if the connector is not used.

Testpoints

Testpoint	Voltage	Purpose
U7A	+7V DC	CHA1/DL or CSA/DL or BSA/DL downlink board supply voltage.
U7B	+7V DC	CHA2/DL or PA/DL downlink board supply voltage.
U7C	+7V DC	CHA3/UL or CSA/UL or BSA/UL downlink board supply voltage.
U7D	+7V DC	CHA4/UL or PA/UL downlink board supply voltage.
U7E	+7V DC	LNA/UL and LNA/DL and P27 auxiliary port supply voltage.
U7F	+7V DC	CU board and ALI board and RCU supply voltage via the P27 auxiliary port jumper.
U26	+26V DC or +13V DC or +10V DC	Power amplifiers and P27 auxiliary port supply voltage (26V, 13V or 10V depending on the repeater type).
GND	0	Ground

DIA board part # and version

The DIA board part # is K105/1. Version R2A or higher (containing the P34 connector) is required to use the optional *Repeater to Repeater Link* feature.

CU Control Unit Board

The CU board is the central board in the repeater, located in the repeater cabinet. The CU board contains a microprocessor, main memory, flash memory for the CU software, EEPROM memory for parameters, memory for the event log and statistics, a REFO reference oscillator, ports for local and remote communication, battery powered real-time clock, etc.

The CU board is used to supervise and control operational parameters such as gain control, channel handling, etc. The CU takes care of alarms and the event log, password and logon, and many other procedures.

The CU is also a control interface when using an OMT32/PC or OMS/PC, locally or remotely via modem.

The CU software can be downloaded from an OMT32/PC or OMS/PC, either locally or remotely.

The real-time clock on the CU board is used for alarm and for the event log.

There are currently two CU board variants: K103/1 and K103/2.

CU board and CU software part #s

K103/1 CU board (old)

CU board K103/1 can be run with the SA102 01/2 CU software. This board can store one version of CU software. The repeater will always boot on this software version.

K103/2 CU board (current)

CU board K103/2 can be run with either the old SA102 01/2 CU software or the current SA102 02/1 or SA102 02/2 CU software. This board can store two versions of CU software, located in segment 1 and segment 2 of the flash memory as *Application 1* and *Application 2*. The repeater will boot on that software which is set as *Primary* (description of *Primary* application is found in the *OMT32, User's Manual*).

Compatibility for CU boards and CU software is detailed in the next section.

Connection

The CU board is connected to the DIA board via the P2 port.

Caution

A lithium battery is permanently mounted on the CU board. Due to the risk of explosion, this battery must not be removed from the board. In case of battery malfunction, replace the CU board. The old CU board can be sent to Allgon for repair.

Repeater CU Software and Hardware Compatibility

There are different versions of repeater CU software, which can be combined with boards of various revisions. These have unique part numbers and revision information. Below, you will find a table of repeater software currently available in combination with CU board revisions.

CU Software Part #	**Latest Software Revision**	**Compatible with CU board**	**Comments**
SA102 01/2	R2E	K103/1 or K103/2	For GSM channel selective ≤ 4 channels, band selective 800-900MHz fixed band width only, and combi (800/900MHz). No traffic statistics.
SA102 02/1	R3A	K103/2	For GSM, EGSM, DCS, PCS channel selective ≤ 8 channels, band selective 800-900MHz fixed or adjustable band width, band selective 1800MHz or 1900MHz and combi. Supports R2R link.
SA102 02/2	R2A	K103/2	For 800/1900MHz CDMA ≤ 4 channels.

This information is updated 2000-10-01. As new versions of hardware and software are released without prior noticing, contact your Allgon sales representative if in doubt about the latest revision status.

For detailed information, refer to the release notes for the CU software to be downloaded (normally found in the *readme.txt* file, which is supplied with the program files).

Cabling

On the following pages, you will find cabling information for the various repeater types:

- Channel selective GSM repeater, 2 channels (page 5-28).
- Channel selective GSM repeater, 4 channels (page 5-29).
- Channel selective CDMA repeater (page 5-30).
- Channel selective high power CDMA repeater (page 5-31).
- Band selective repeater (page 5-32).

Channel Selective GSM Repeater, 2 Channels

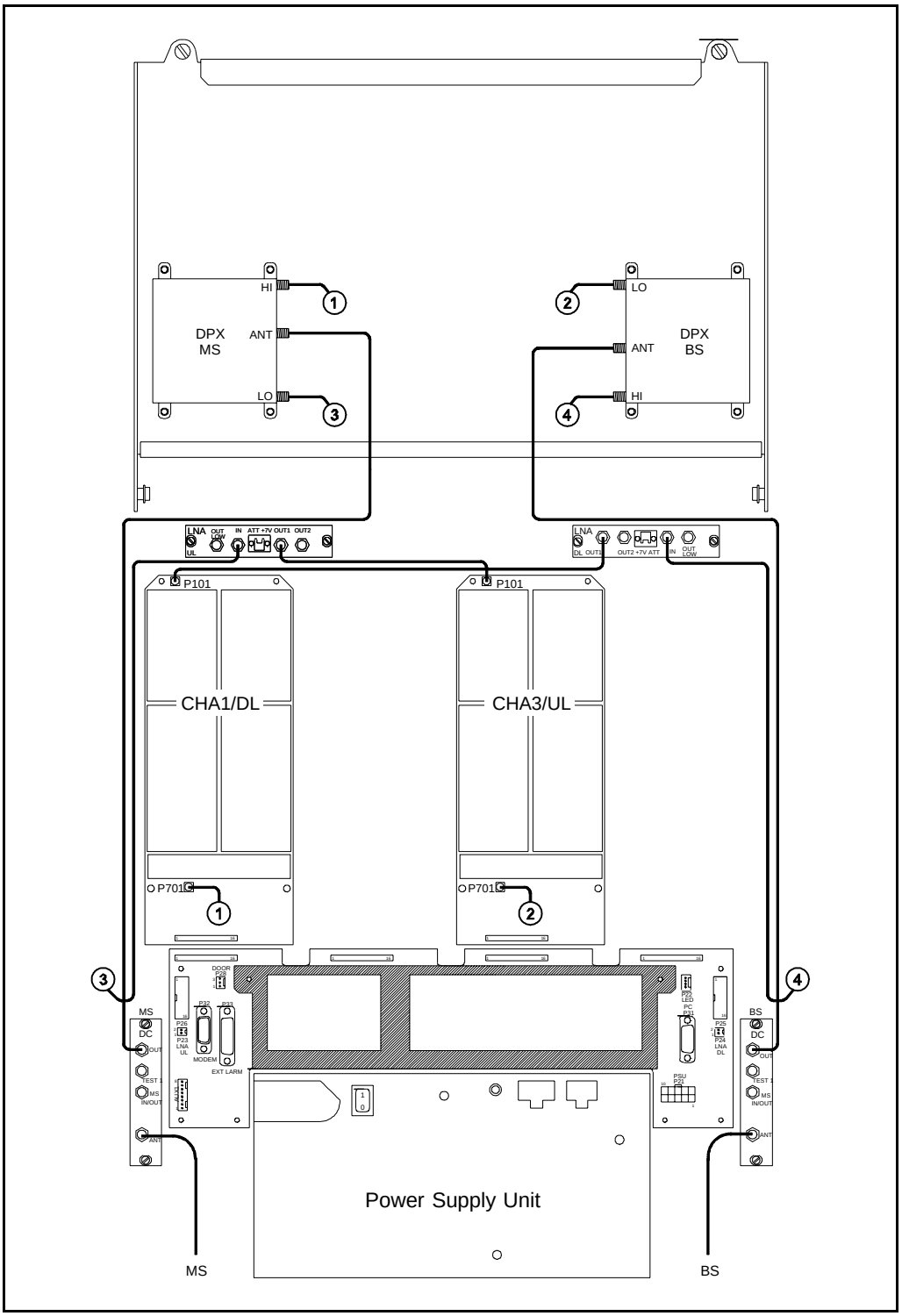


Figure 5-14. Cabling, GSM repeater - 2 ch.

Figure 5-14 shows a repeater equipped with the two channel boards CHA1/DL and CHA3/UL for two bi-directional GSM channels.

Channel Selective GSM Repeater, 4 Channels

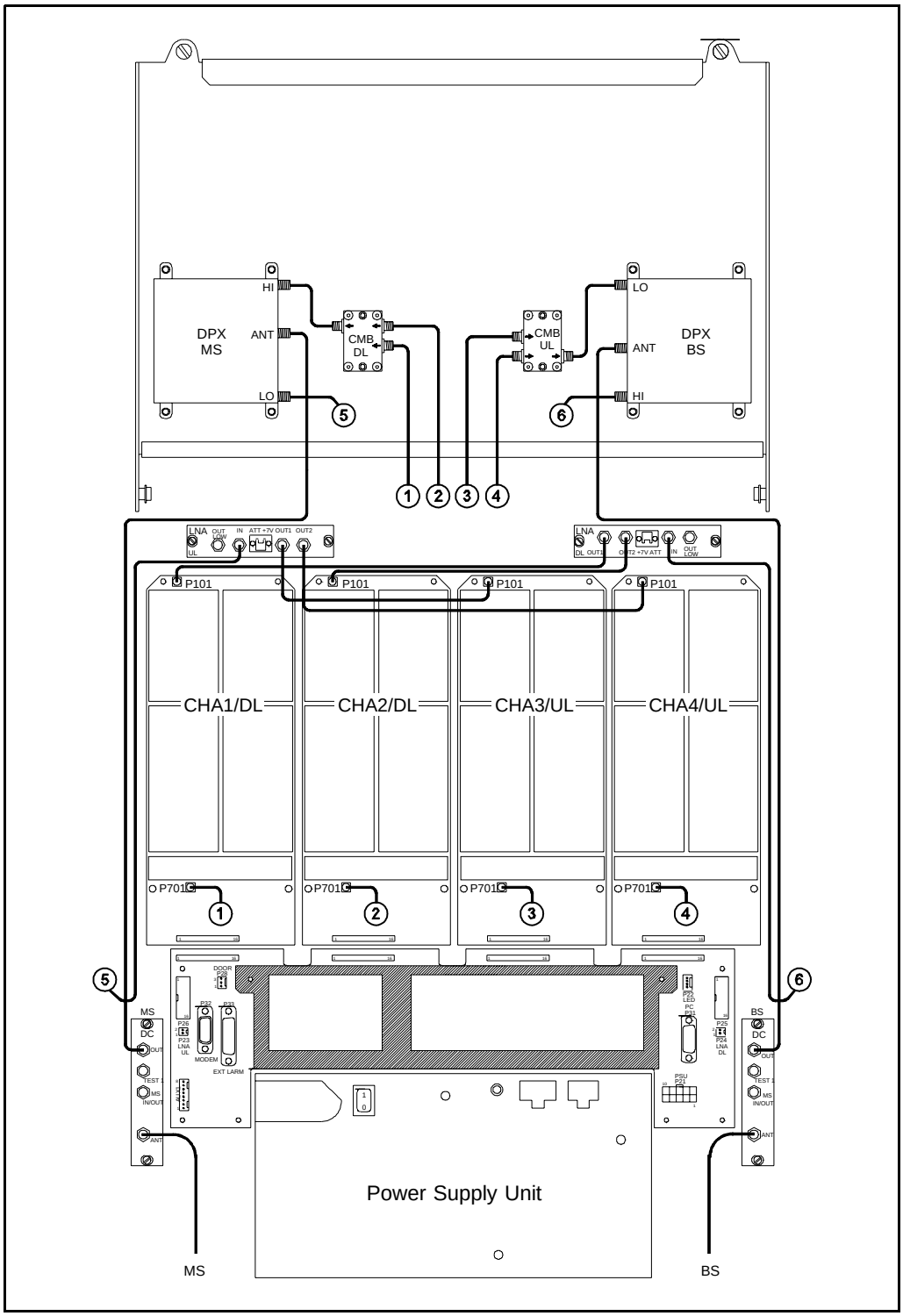


Figure 5-15. Cabling, GSM repeater - 4 ch.

Figure 5-15 shows a channel selective repeater equipped with the channel boards CHA1/DL, CHA2/DL, CHA3/UL, and CHA4/UL for four bi-directional GSM channels.

Channel Selective CDMA Repeater

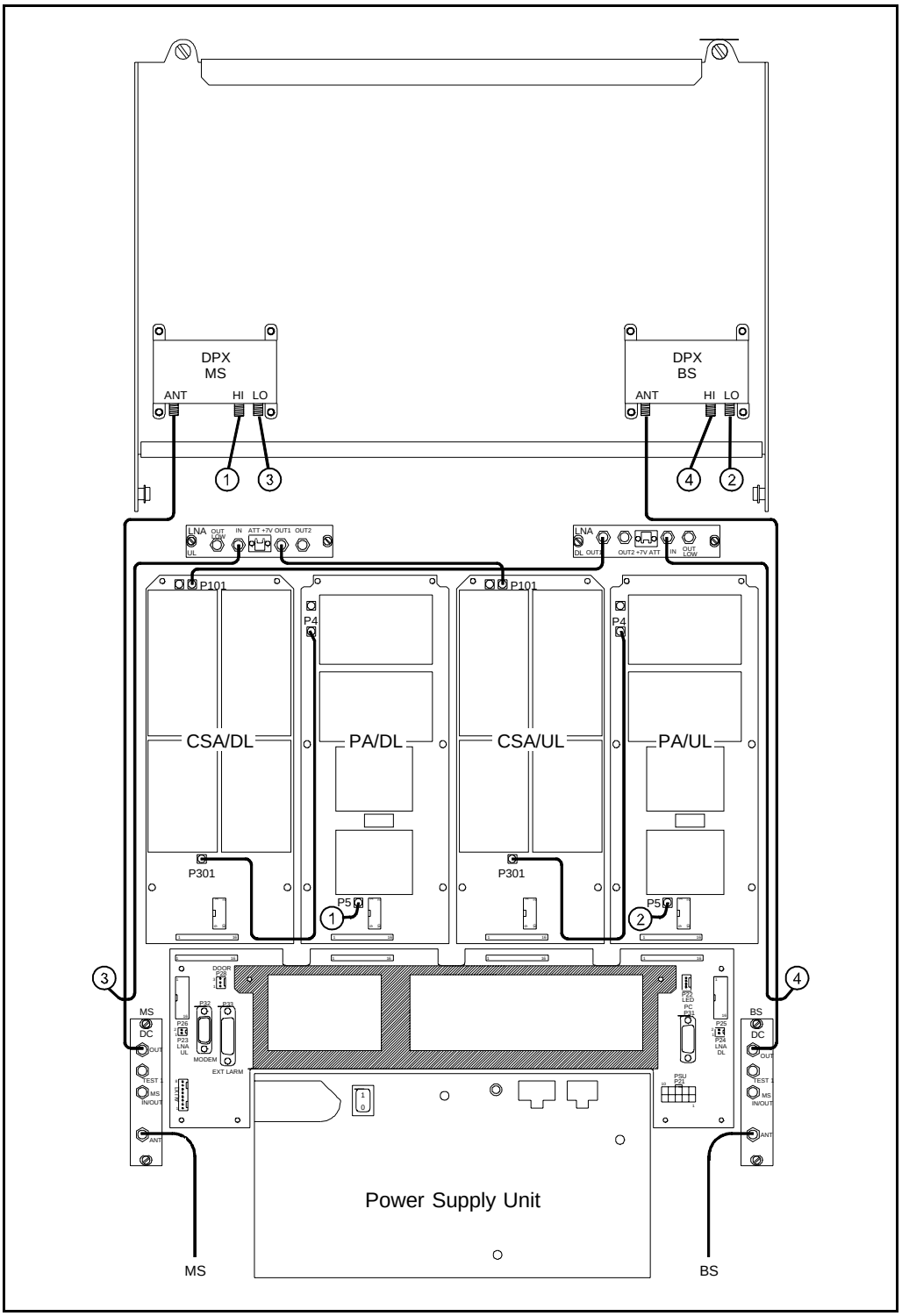


Figure 5-16. Cabling, CDMA repeater - 2 ch.

Figure 5-16 shows a channel selective CDMA repeater equipped with two CSA boards and two PA boards.

Channel Selective High Power CDMA Repeater

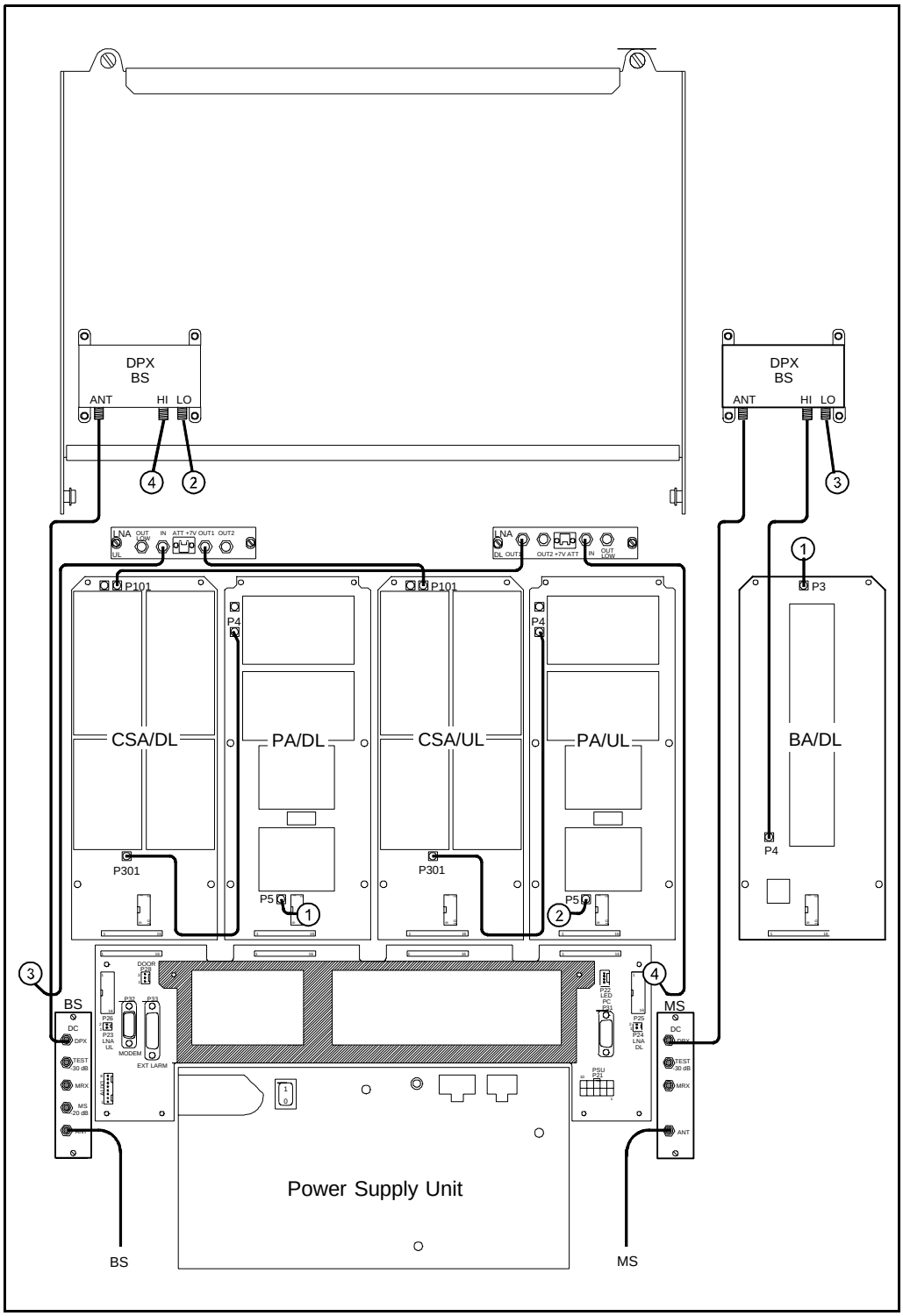


Figure 5-17. Cabling, high power CDMA repeater - 2 ch.

Figure 5-17 shows a channel selective high power CDMA repeater equipped with two CSA boards, two PA boards and a BA board (in the cover).

Band Selective Repeater

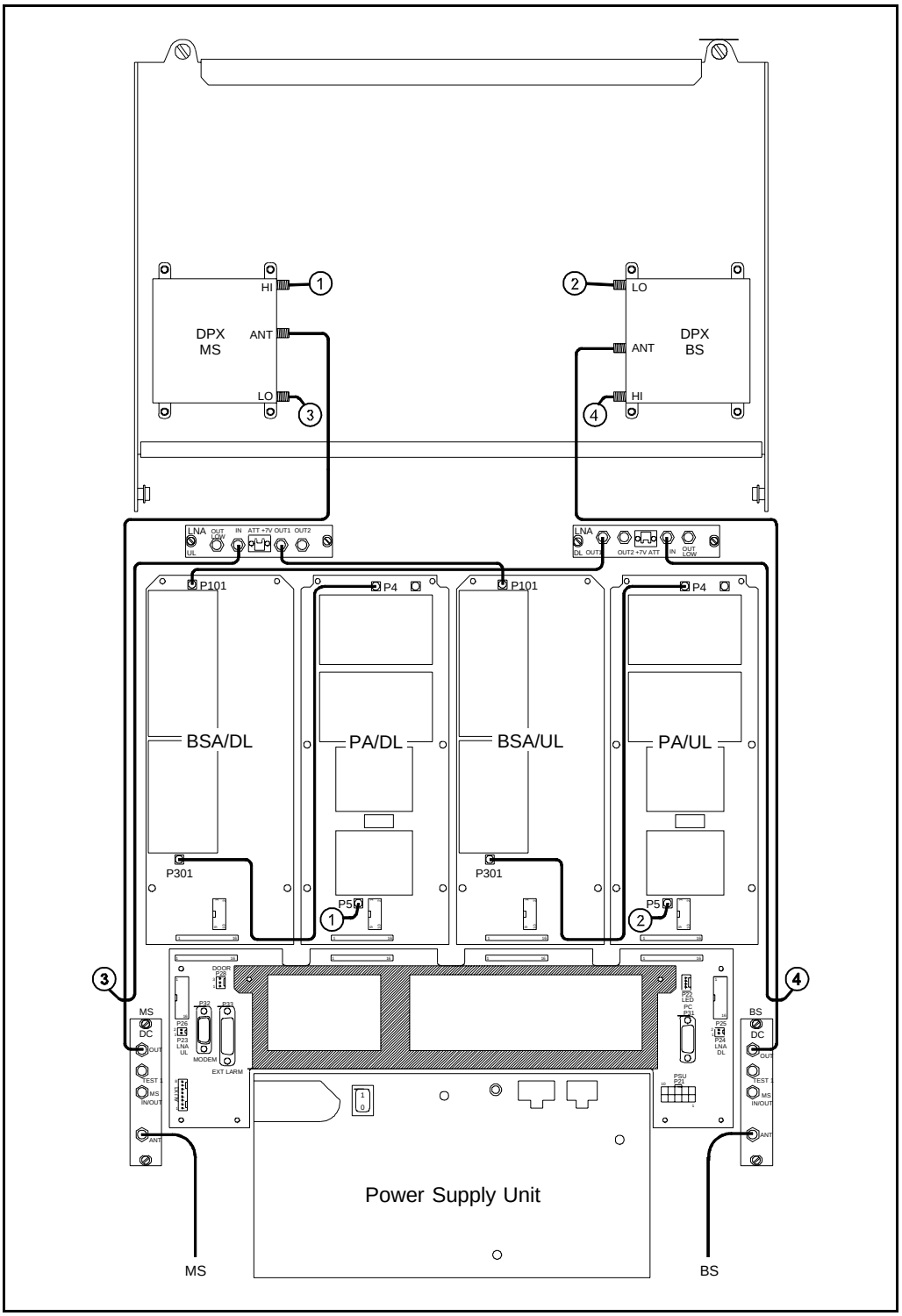


Figure 5-18. Cabling, band selective repeater

Figure 5-18 shows a band selective repeater equipped with two BSA boards and two PA boards.

6. Optionals

This chapter describes the following optional accessories available for the Allgon repeaters:

RCU, Remote Control Unit for GSM 900

As the mobile phone technology is developing very fast, this RCU may be modified after issuing this manual. New types may also have been added. For the latest details, please contact your local Allgon representative.

For remote control of Allgon repeaters in the GSM 900 system an RCU Remote Control Unit is available as a kit. This kit contains an integrated mobile phone/modem, power supply and power supply backup. A detailed installation guide is also included in the RCU kit.

The RCU for the GSM system is mounted inside the repeater cabinet, in front of the PSU (see Figure 6-1).

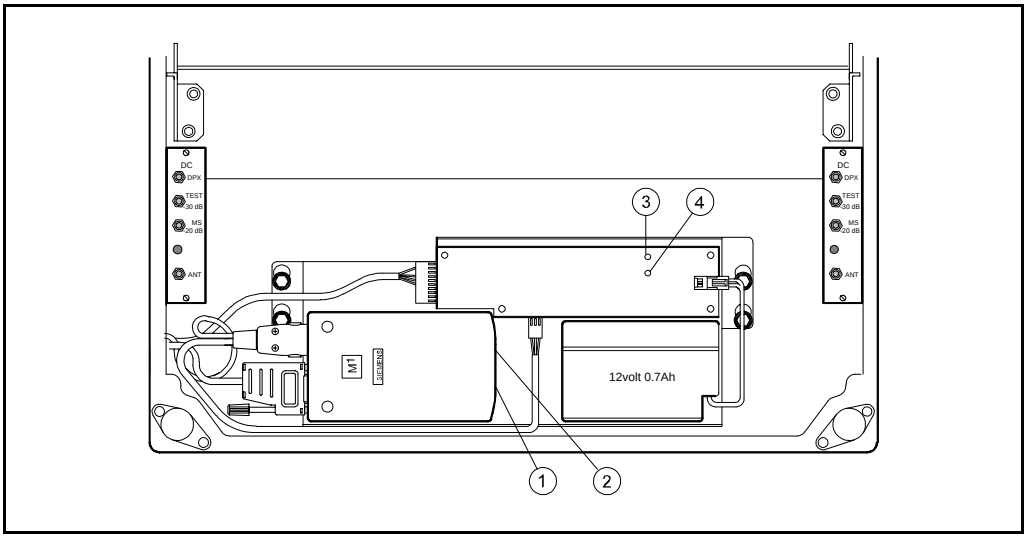


Figure 6-1. RCU - GSM 900 type

The RCU is connected to the P27, P32, and MS -20dB ports as described in the *Connection* section in Chapter 3.

RCU kit items

The item numbers refer to the numbers in Figure 6-1.

1. The GSM board. Press a pencil or similar object on the small button adjacent to the SIM board to release it.
2. LED indicator on the M1 phone/modem unit which shows three operational modes:

   Out: The unit is off

   Slow flashing: Stand by

   Fast flashing: Connection in progress
3. Green LED on the battery charger which is lit with a steady light when the power supply is OK, either from the mains or from the battery.
4. Yellow LED on the battery charger which is lit with a steady light during battery charge from the mains.

☞ *Do not forget to put a jumper between pin 2 and 3 on the P27 connector if you disconnect the RCU.*

GSM subscriber conditions

- Data transmission, 9600 bps (baud)
- Transparent mode
- If the PIN code have to be disabled, use another phone.

If you get problems with the PIN code, please contact Allgon Technical Support.

Power supply backup

If a power failure occurs, the backup battery has capacity to supply the CU, ALI and phone/modem for 30 minutes at room temperature and a limited number of call attempts.

The battery life is 1 - 2 years at normal indoor temperature. If the operational temperature is higher, the battery life is shortened.

Power supply battery type

12V, 0.7A/20h, lead, sealed, including cable and JST VHR-2N connector.

Part #	Allgon:	PM291 09/1
	Hitachi:	HP0.7-12P (VHR-2N)
	Yuasa:	NP0.8-12

RCU, Remote Control Unit with PCMCIA Modem

As the mobile phone technology is developing very fast, this RCU may be modified after issuing this manual. New types may also have been added. For the latest details, please contact your local Allgon representative.

For remote control of Allgon repeaters in various systems, two PCMCIA modem based RCU Remote Control Units are available as kits.

These are:

- RCU Kit for PCMCIA - Fixed Wire Line Connection
- RCU Kit for PCMCIA - Wireless Connection

These RCUs are basically two similars, but the Fixed Wire Line Connection kit does not include accessories for a mobile phone.

Detailed installation guides are included in the RCU kits.

RCU Kit for PCMCIA - Fixed Wire Line Connection

This kit contains a PCMCIA card host, power supply, and power supply backup.

Most Hayes compatible PCMCIA card modems (not included in the kit) can be used.

RCU Kit for PCMCIA - Wireless Connection

This kit contains a PCMCIA card host, power supply, power supply backup, mobile phone bracket, battery charger, charging cable, and mobile phone antenna cable.

The following mobile phones have been tested together with a DC23 type modem and are thus recommended by Allgon:

- Ericsson PH388 in DCS/PCN 1800MHz system
- Ericsson GH388 in GSM 1900MHz system

Power supply backup

If a power failure occurs, the included backup battery has capacity to supply the CU, ALI and the modem. For the Wireless Connection type, this is applicable provided the specified configuration of mobile phone and PCMCIA modem is used.

The battery life is 1 - 2 years at normal indoor temperature. If the operational temperature is higher, the battery life is shortened.

RCU for Fixed Wire Line Connection

The RCU for Fixed Wire Line Connection is mounted inside the repeater cabinet, in front of the PSU (see Figure 6-2).

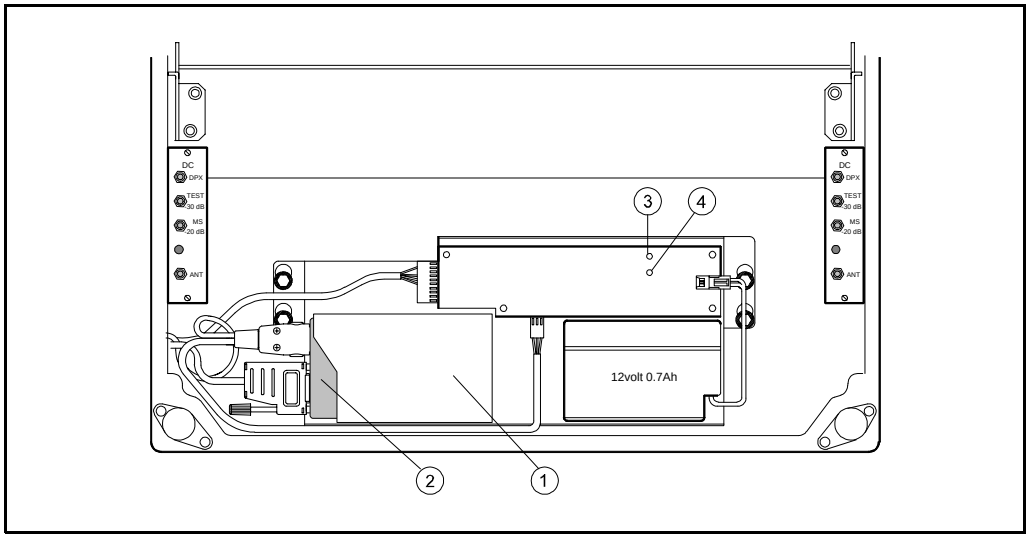


Figure 6-2. RCU - Fixed Wire Line PCMCIA type

The RCU is connected to the P27 and P32 ports as described in the *Connection* section in Chapter 3.

A free strain relief bushing at the bottom of the repeater is used for the external telephone line cable.

RCU kit items - Fixed Wire Line Connection

The item numbers refer to the numbers in Figure 6-2.

1. PCMCIA modem card host.
2. PCMCIA modem card (not included in the kit).
3. Green LED on the battery charger which is lit with a steady light when the power supply is OK, either from the mains or from the battery.
4. Yellow LED on the battery charger which is lit with a steady light during battery charge from the mains.

☞ *Do not forget to put a jumper between pin 2 and 3 on the P27 connector if you disconnect the RCU.*

RCU for Wireless Connection

The RCU base unit for Wireless Connection is mounted inside the repeater cabinet, in front of the PSU (see Figure 6-3).

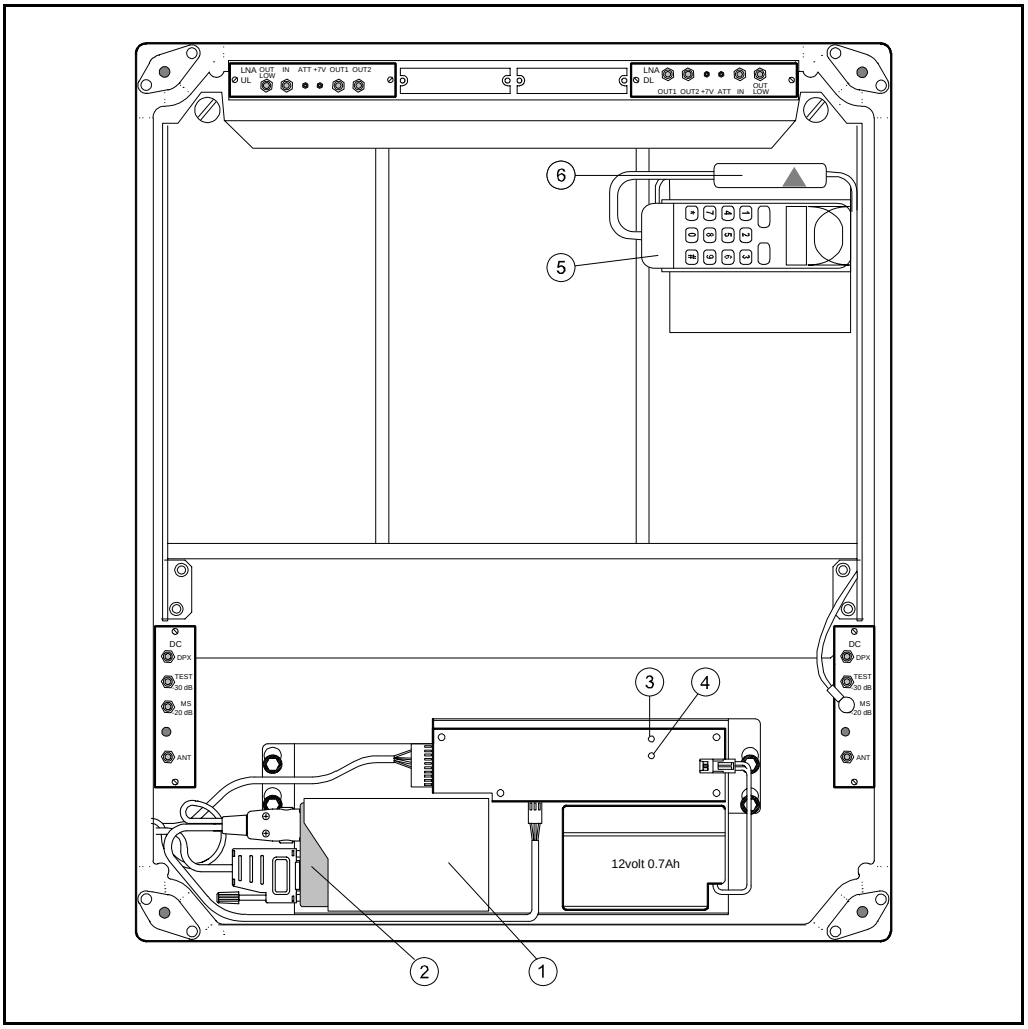


Figure 6-3. RCU - Wireless PCMCIA type

The bracket for the mobile phone is mounted in the upper right corner of the cabinet. The mobile phone is placed in the phone holder.

The RCU is connected to the P27 and P32 ports as described in the *Connection* section in Chapter 3.

The mobile phone antenna is connected to the MS -20dB port on the BS directional coupler (DC) located to the right in the cabinet.

The mobile battery charger is connected to the mobile phone.

RCU kit items - Wireless Connection

The item numbers refer to the numbers in Figure 6-3.

1. PCMCIA modem card host.
2. PCMCIA modem card (not included in the kit).
3. Green LED on the battery charger which is lit with a steady light when the power supply is OK, either from the mains or from the battery.
4. Yellow LED on the battery charger which is lit with a steady light during battery charge from the mains.
5. Mobile phone (not included in the kit) and the phone holder.
6. Battery charger with cable to the mobile phone.

Do not forget to put a jumper between pin 2 and 3 on the P27 connector if you disconnect the RCU.

OMS, Operation and Maintenance System

The *OMS, Operation and Maintenance System* is an Allgon software package for controlling a large repeater fleet by using computers with Windows NT in networks with a common database.

The OMS is capable of operating a large number of repeaters. Multiple modems can be used for several incoming and outgoing parallel activities, such as polling, radio parameter configuration, software downloading, etc.

OMS is an improved OMC, *Operation and Maintenance Center*. The latter is replaced by the OMS and is no longer subject to further development.

Traffic Statistics

Traffic statistics is available for channel selective GSM 900, GSM 1900 and DCS/PCN 1800 repeaters, provided that the repeaters have the latest CU software versions, the latest CU and CHA boards, and that an OMS is used to poll and view the statistics.

Battery Backup

Battery backup can be arranged by completing the repeater with an Allgon UPS (Uninterruptible Power Supply). The Allgon UPS has an exterior similar to the repeater which means that it can preferably be mounted adjacent to the repeater.

Fiber Optic Interface

A *Fiber Optic Interface* that includes transmitter, receiver, alarm board and power supply is available for all the Allgon repeaters. The fiber optic interface can be adapted for separate uplink and downlink fiber as well as for bi-directional one-fiber distribution.

7/16" Antenna Cable Connectors

A 7/16" antenna cable kit is available for all the Allgon repeaters. This kit includes 7/16" antenna connectors for uplink and downlink antennas mounted on two repeater cable inlet flanges, and cables and connectors for connection to the DC directional couplers inside the repeater.

R2R, Repeater To Repeater Link

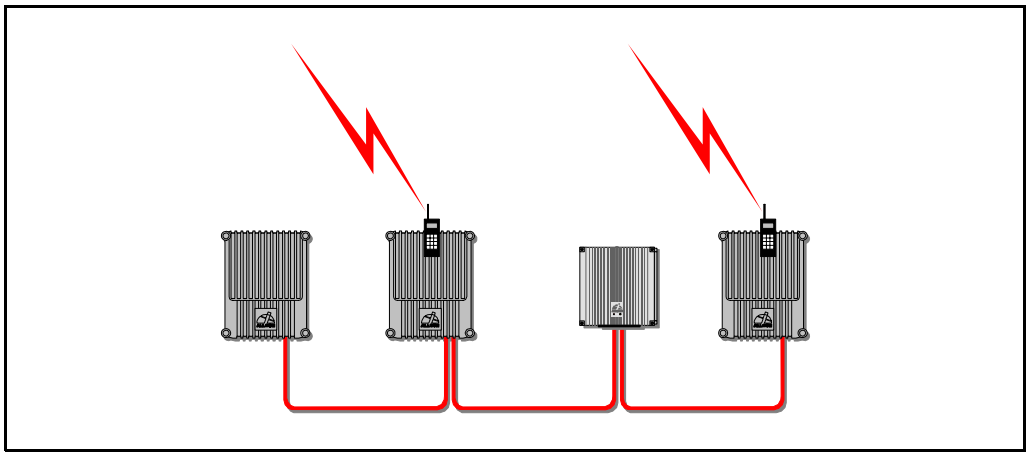


Figure 6-4. Repeater to Repeater Link

The Allgon *Repeater to Repeater Link* can be used in order to establish a repeater network with up to 13 repeaters, one or several of which can contain a phone line for communication with an OMT32 or an OMS.

All Allgon repeaters can be included in a R2R net (see Figure 6-4). Channel selective repeaters, band selective repeaters, and Compact repeaters can be mixed in the same net. For Compact repeaters, the R2R *Repeater to Repeater Link* feature is standard and requires no extra hardware or software.

AR Repeaters can either be equipped with this feature at the delivery from Allgon, or be completed with a *Repeater to Repeater Link Kit*, provided the repeaters meet the below requirements.

Requirements

To be able to use the *Repeater to Repeater Link* feature, the following DIA board, CU board and CU software is required:

DIA board	K105/1 version R2A or higher
CU board	K103/2 version R1A or higher
CU software	SA102 02/1 version R3A or higher

The version of the RIA board can be detected remotely by means of the OMT32, see the *OMT32, User's Manual*.

Further information and requirements are found in the R2R installation document, *R2R, Repeater to Repeater Link Kit, Installation Guide* (part # VD202 91/EN).

Installation

The R2R, *Repeater to Repeater Link* is installed as described in the *R2R, Repeater to Repeater Link Kit, Installation Guide*.

At least one RCU unit (or telephone line with modem) is required for remote communication.

Configuration

Configuration is described in the *OMT32, User's Manual*.

7. Repeater Alarms

This chapter contains a list of those alarms which are initiated in the repeater and generated by the repeater control circuitry.

Critical, *Error* and *Warning* alarms can be sent automatically from a repeater to an OMT32 and OMS and then be stored. These alarms can then be viewed.

The alarm handling and facilities are described in the following manuals:

- *OMT32, User's Manual*
- *Advanced Repeater OMS, User's Manual*

The table starting on the following page contains those alarms that can be generated by a Compact repeater.

Alarm Reference List

The following table contains the internal repeater alarms which can occur and be shown in the OMT32 and OMS alarm window (additional alarms may have been added to the system after issuing this manual).

Alarm Text	**Alarm Unit**	**Alarm Level**	**Description**
Antenna isolation	BSA # UL/DL	*Warning*	Poor antenna isolation
		Error	Poor antenna isolation at lowest gain
		Ceasing	The cause of the alarm has ceased
	Chan. # UL/DL	*Warning*	Poor antenna isolation
		Error	Poor antenna isolation at lowest gain
		Ceasing	The cause of the alarm has ceased
Alarm reset	CU	*None*	Manual alarm reset
Battery backup fault	External	*Error*	Battery backup fault
		Ceasing	The cause of the alarm has ceased
CU battery fault	CU	*Warning*	CU RAM battery fault
		Ceasing	The cause of the alarm has ceased
Door open alarm [1)]	External	Configurable	Door open more than 30 seconds
		Ceasing	Door closed more than 30 seconds or the alarm is disabled
EEPROM error	CU	*Error*	EEPROM read or write error
Ext REFO error	CU	*Warning*	An external reference is lost (e.g. GPS reference)
External alarm 1	External	Configurable	External alarm input 1 active more than 1 second
		Ceasing	External alarm input 1 no longer active
External alarm 2	External	Configurable	External alarm input 2 active more than 1 second
		Ceasing	External alarm input 2 no longer active
External alarm 3	External	Configurable	External alarm input 3 active more than 1 second
		Ceasing	External alarm input 3 no longer active
External alarm 4	External	Configurable	External alarm input 4 active more than 1 second
		Ceasing	External alarm input 4 no longer active
Fiber Optical error	External	Configurable	Fiber optic fault
		Ceasing	The cause of the alarm has ceased
Gain reduction	Chan. # UL/DL	*Warning*	The gain is reduced below the limit
		Ceasing	The cause of the alarm has ceased
High temperature	BSA # CHA # CSA #	*Warning*	The board temperature is higher than 85°C
		Error	The board temperature is higher than 95°C
		Ceasing	The board temperature has fallen below 70°C
	CU	*Warning*	The CU board temperature is higher than 90°C
		Ceasing	The CU board temperature has fallen below 90°C
Local bus error	BSA #	*Error*	Communication bus error on BSA board
	CHA #	*Error*	Communication bus error on CHA board
	CSA #	*Error*	Communication bus error on CSA board
Log cleared	CU	*None*	Log memory has been cleared
Log memory fault	CU	*Error*	Log memory fault
Logon failed	CU	*None*	Invalid repeater password
Low traffic activity	RSSI Statistics	*Warning*	No signal strength was above the limit set
		Ceasing	The cause of the alarm has ceased
Mains breakdown [2)]	External	*Critical*	Power failure
		Ceasing	Mains power is up again
Mains bkd w backup	External	*Error*	Mains breakdown - power from battery backup
		Ceasing	The cause of the alarm has ceased
Modem init failed	Remote ctrl	*None*	Initiation string to modem not OK

Alarm Text	Alarm Unit	Alarm Level	Description
No BCCH detected	RSSI Statistics	*Warning*	Signal strength on the BCCH channel was below the limit set
		Ceasing	The cause of the alarm has ceased
No connection	Remote ctrl	*None*	No connection at callback
		Warning	No connection at alarm calling
No modem found	Remote ctrl	*None*	No modem found
		Ceasing	Modem found
No phone detected	Remote ctrl	*Warning*	When using a PC-card modem together with the MS this alarm indicates contact with the PC-card modem but not with the MS. The MS may be turned off.
		Ceasing	The cause of the alarm has ceased
PA fault	BSA #	*Error*	Low power amplifier gain
	CHA #	*Error*	Low power amplifier gain
	CSA #	*Error*	Low power amplifier gain
Param. R/W error	BSA #	*Error*	EEPROM failure on the BSA board
	CHA #	*Error*	EEPROM failure on the CHA board
	CSA #	*Error*	EEPROM failure on the CSA board
Modem PIN failed	Remote ctrl	*Warning*	The PIN code sent tp MS is incorrect
		Ceasing	The cause of the alarm has ceased
Power supply	PSU1	*Critical*	Power failure in PSU1 (in the cabinet)
		Ceasing	PSU1 works properly again
	PSU2	*Critical*	Power failure in PSU2 (in the cover)
		Ceasing	PSU2 works properly again
PSU overvoltage	BSA #	*Critical*	The PA supply voltage is too high
REFO error	CU	*Error*	Significant REFO drift or error detected by CU
Remote connection	Remote ctrl	*None*	Remote connection to OMT32 via modem
Remote link timeout	Remote ctrl	*Warning*	Time limit of 20 min. exceeded without extending timer
Repeater restart	CU	*None*	Powering up by user or after power failure
		Warning	Software restart error 1^{st} - 7^{th} time
		Error	Software restart error 8^{th} - 10^{th} time
RF blocking	Chan. # UL	*Error*	Constant CW signal >27dBm. PA off.
		Ceasing	The cause of the alarm has ceased
RTC restarted	CU	*None*	The time is changed by the operator
		Warning	Date set to 1994-01-01
RTC error	CU	*Error*	RTC does not operate properly
Startup error	BSA #	*Error*	Hardware error on BSA board
	CHA #	*Error*	Hardware error on CHA board
	CSA #	*Error*	Hardware error on CSA board
SW load error	CU	*Error*	Software load error
Unsupported PA type	CSA #	*Error*	Mounted PA board ID is not expected by the BSA board
Synthesizer fault	BSA #	*Error*	Synthesizer unlocked on the BSA board
	CHA #	*Error*	Synthesizer unlocked on the CHA board
	CSA #	*Error*	Synthesizer unlocked on the CSA board
Volt Reg. fault	BSA #	*Error*	Missing DC voltage on the BSA board
	CHA #	*Error*	Missing DC voltage on the CHA board
	CSA #	*Error*	Missing DC voltage on the CSA board

Remarks

1) The *Door open alarm* requires an optional door switch described in the *P33 Alarm Port* section in Chapter 3.
2) The *Mains breakdown* alarm requires a relay not included in the repeater (see *Mains Breakdown Relay* in Chapter 3).

Chan. #, UL/DL Repeater channel number (1-4) at channel selective operation, uplink or downlink.
BSEL #, UL/DL Repeater channel number at band selective operation, uplink or downlink.
CHA # CHA board number at channel selective operation.
CSA # CSA board number at channel selective CDMA operation.
BSA # BSA board number at band selective operation.

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Questionnaire

The aim of this manual is to guide you when installing and operating the Allgon repeaters, and to answer questions that may turn up. To ensure that we provide appropriate information for these purposes, we would appreciate your views and suggestions on how to improve the manual in this direction. Please, fill out the following questionnaire and send it to us.

1

Have you read entire sections or do you use the manual to look up specific information when needed?

❑ Read entire sections ❑ Look up specific information

Comments: _____

_____

2

Do you think the information is easy to find and understand?

❑ Yes ❑ No

Comments: _____

_____

3

Do you find any function of the Allgon repeater hard to understand, a function which should be subjected to more detailed description?

❑ Yes ❑ No

If yes, which one: _____

_____

4

Do you have any suggestions on how we can improve this manual?

_____

_____

_____

Title (Mr/Ms/Other): _____ Initial: _____

Surname: _____ Job title: _____

Company: _____ Address: _____

City: _____ Country: _____ Phone: _____

Thanks for your kind help. It's very valuable to us.

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