



**User's manual for  
band or channel selective Repeater  
MR801B Power**

**(Id.-No. 148613)**

Author:

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QA:

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## LIST OF UNIT SPECIFIC ABBREVIATIONS

|                      |                                                                 |
|----------------------|-----------------------------------------------------------------|
| ALC                  | Automatic Level Control                                         |
| BCCH                 | Broadcast Control Channel                                       |
| BITE                 | Built In Test Equipment                                         |
| BTS                  | Base Transceiver Station                                        |
| DL                   | Downlink                                                        |
| ETS                  | European Telecommunication Standard                             |
| FFwd                 | Feed Forward Amplifier                                          |
| Id.-No.              | Ident Number                                                    |
| I <sup>2</sup> C-Bus | Inter Integrated Circuit Bus ( Philips )                        |
| LMT                  | Local Maintenance Timeout                                       |
| MR                   | MIKOM Repeater                                                  |
| OMC                  | Operation and Maintenance Centre                                |
| PABX                 | Private Automatic Branch Exchange                               |
| PCMCIA               | Personal Computer Modem Communication International Association |
| PSTN                 | Public Switched Telephone Network                               |
| Rev                  | Revision                                                        |
| RF                   | Radio Frequency                                                 |
| RLP                  | Radio Link Protocol                                             |
| RSSI                 | Receive Signal Strength Indication                              |
| RTC                  | Real Time Clock                                                 |
| SDA                  | Serial Data Line of I <sup>2</sup> C-Bus                        |
| SCL                  | Serial Clock Line of I <sup>2</sup> C-Bus                       |
| UL                   | Uplink                                                          |
| UPS                  | Uninterruptable Power Supply                                    |
| VSWR                 | Voltage Standing Wave Ratio                                     |

## CONTENTS OF DELIVERY

|     |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Qty | 1 | Repeater MR801B Power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Qty | 1 | User's manual for Repeater MR801B Power ( Id.-No. 151111 )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Qty | 1 | Assembly guide for modification kits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Qty | 1 | Set of test protocols consisting of an electrical acceptance test protocol and a safety test protocol applying to the power supply                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Qty | 1 | Spare parts kit containing: <ul style="list-style-type: none"><li>- 1 control cable RS232,</li><li>- 1 hex socket key, size 2.5</li><li>- 1 Torx key</li><li>- 5 socket head cap screws M3.0 x 30</li><li>- 2 tallow-drop screws TRX M5.0x25</li><li>- 2 tallow-drop screws M2.0x6</li><li>- 2 tallow-drop screws M3.0x5</li><li>- 4 straight pins 3.0 x 25</li><li>- 3 captive washers for M5</li><li>- 4 Tyraps</li><li>- 3x5g Silicon heat conducting paste</li><li>- 1 hex socket screw key , size 4, long</li><li>- 4 nuts</li><li>- 2 fuses 8 A type MT</li><li>- 5 socket head cap screws M3.0x20</li><li>- 2 countersunk head screw M3.0x20</li><li>- 4 special nuts M4</li></ul> |
| Qty | 1 | Wall mounting kit <ul style="list-style-type: none"><li>- 2 mounting brackets</li><li>- 4 washers for M8</li><li>- 4 socket head cap screws M8.0x16</li><li>- 2 tire bolts</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Qty | 1 | Wall mounting sheet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## HEALTH AND SAFETY WARNINGS

-  **Note:** The electrical installation has to be performed in accordance with the safety regulations of the local authorities. Due to safety reasons the electrical installation must be performed by qualified personnel. The cover of this unit should not be opened while power is applied. Subsequent installation, commissioning and maintenance activities that require the unit to be powered with the cover open shall only be carried out by suitably qualified personnel.
  
-  **Note:** The grounding of the Unit has to be performed by all means. A grounding bolt is provided at the cabinet in order to connect the earth bonding cable.
  
-  **Note:** The Unit is heavy-weight. Make sure that a suitable mounting surface is used. Only adequate manpower is allowed to handle the system.
  
-  **Note:** ESD precautions have to be observed! Before maintenance work use the available grounding system to connect ESD protection measures.
  
-  **Note:** Due to power dissipation the Repeater may heat up the air volume inside the cabinet and reach a very high temperature. Therefore the Repeater must be mounted in the vertical plane to a wall or a mast without additional enclosure to provide sufficient ventilation. Between the housing and the wall a minimum distance must be kept in order to provide air circulation.

## **PREAMBLE**

In cellular systems, Repeaters are used to enhance the influence of a base station in regions where, due to topological conditions, poor field strengths disable communication. MIKOM is a leading manufacturer of Repeaters. They provide excellent electrical characteristics, they are light-weight and easy to install. Hence, the MIKOM Repeater is the preferred solution.

Your Repeater has been built using high reliable materials. A comprehensive quality assurance has been applied to all fabrication steps. This secures constant quality of the product. Every Repeater leaves the factory only after a thorough final acceptance test, accompanied by a test certificate, which warrants perfect function. The acceptance test certificate is subject of the delivery, and it is fixed to the Repeater lid in order to provide a quick reference for the user.

Any intervention has to be performed by authorized persons only. If you need technical assistance with the Repeater MR801B Power contact your local sales office ( see table 1-1 List of international sales offices ) or MIKOM directly at the following address:

|                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>MIKOM GmbH</b><br/><b>Industriering 10</b><br/><b>86675 Buchdorf</b><br/><b>Germany</b><br/><b>Tel: +49 (0) 9099 6 90</b><br/><b>Fax: +49 (0) 9099 69 31</b><br/><b>email: <a href="mailto:sales@mikom.com">sales@mikom.com</a></b><br/><b><a href="http://www.mikom.com">http://www.mikom.com</a></b></p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Under consideration of all references given in this manual, the Repeater should be taken into service without any complications and should operate trouble-free for a long time.

## LIST OF INTERNATIONAL SALES OFFICES

|                                                                                                                                                                |                                                                                                                                                                           |                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Allen Telecom</b><br><br>30500 Bruce Industrial Parkway<br>Cleveland, Ohio 44 139-3996<br>USA<br><br>Phone: +1 ( 216 ) 349-8657<br>FAX: +1 ( 216 ) 349-8408 | <b>Allen Telecom ( Australia ) P/L</b><br><br>PO Box 903<br>Bankstown NSW 2200<br>Australia<br><br>Phone: +61 ( 2 ) 9793-9644<br>FAX: +61 ( 2 ) 9793-9747                 | <b>Forem France</b><br><br>Z.I. des Ebisoires<br>78370 Plaisir<br>France<br><br>Phone: +33-1-30-79-15-30<br>FAX: +33-1-30-55-55-37                            |
| <b>FOREM S.p.A.</b><br><br>Via Archimede N. 22/24<br>20041, Agrate Brianza<br>Milan<br>Italy<br><br>Phone: +39-39-605-41<br>FAX: +39-39-605-4477               | <b>AT Singapore</b><br><br>80 Marine Parade Road<br>#19-1 Parkway Parade<br>Singapore 449269<br><br>Phone: +65-345-8022<br>FAX: +65-345-8033                              | <b>AT China</b><br><br>CITIC Building, # 11-05<br>19 Jiangguomenwai Avenue<br>Beijing<br>China 100004<br><br>Phone: +86-10-6508-3088<br>FAX: +86-10-6508-3066 |
| <b>AT Canada</b><br><br>1815 Ironstone Manor, # 12<br>Pickering, Ontario L1W 3W9<br>Canada<br><br>Phone: +1 ( 905 ) 839-3474<br>FAX: +1 ( 905 ) 839-4663       | <b>FOREM UK</b><br><br>Unit D<br>Castle Industrial Park<br>Pear Tree Lane<br>Newbury, Berkshire<br>U.K. RG 14 2EZ<br><br>Phone: +44-1635-569-695<br>FAX: +44-1635-569-463 | <b>AT Hong Kong</b><br><br>1603 Remington Certer,<br>23 Hung to road,<br>Kwun Tong, Kow Loon<br>Hong Kong<br><br>Phone: +852-2389-1844<br>FAX: +852-2389-4864 |
| <b>AT India</b><br><br>B-256 Ground Floor.<br>Chittaranjan Park<br>New Delhi 110019<br><br>Phone: +91-11-696-3918<br>FAX: +91-11-652-1648                      |                                                                                                                                                                           |                                                                                                                                                               |

table 1-1 List of international sales offices

## **1 Introduction**

### ***1.1 Intended purpose***

Cellular telephone systems transmit signals in two directions between base stations and mobile telephones within the signal coverage area.

If weak signal transmissions occur within the coverage area because of indoor applications, topological conditions or distance from the transmitter, a Repeater is used to extend transmission range. In the downlink path the Repeater picks up the signal from a donor antenna of an existing cell, amplifies and re-transmits it into the desired dark spot. In the uplink direction the Repeater receives signals from mobile stations present in its coverage area and re-transmits them to the corresponding base station.

### ***1.2 About the MR801B POWER***

MIKOM's MR801B POWER is available as a band or channel selective repeater for CDMA, TDMA and analog networks.

This repeater bi-directionally amplifies signals between multiple mobiles and a single base station in the AMPS 800 frequency band. It is employed where poor topological conditions cause weak field strengths. It can provide highly selective amplification of band segments or channels in the AMPS 800 band.

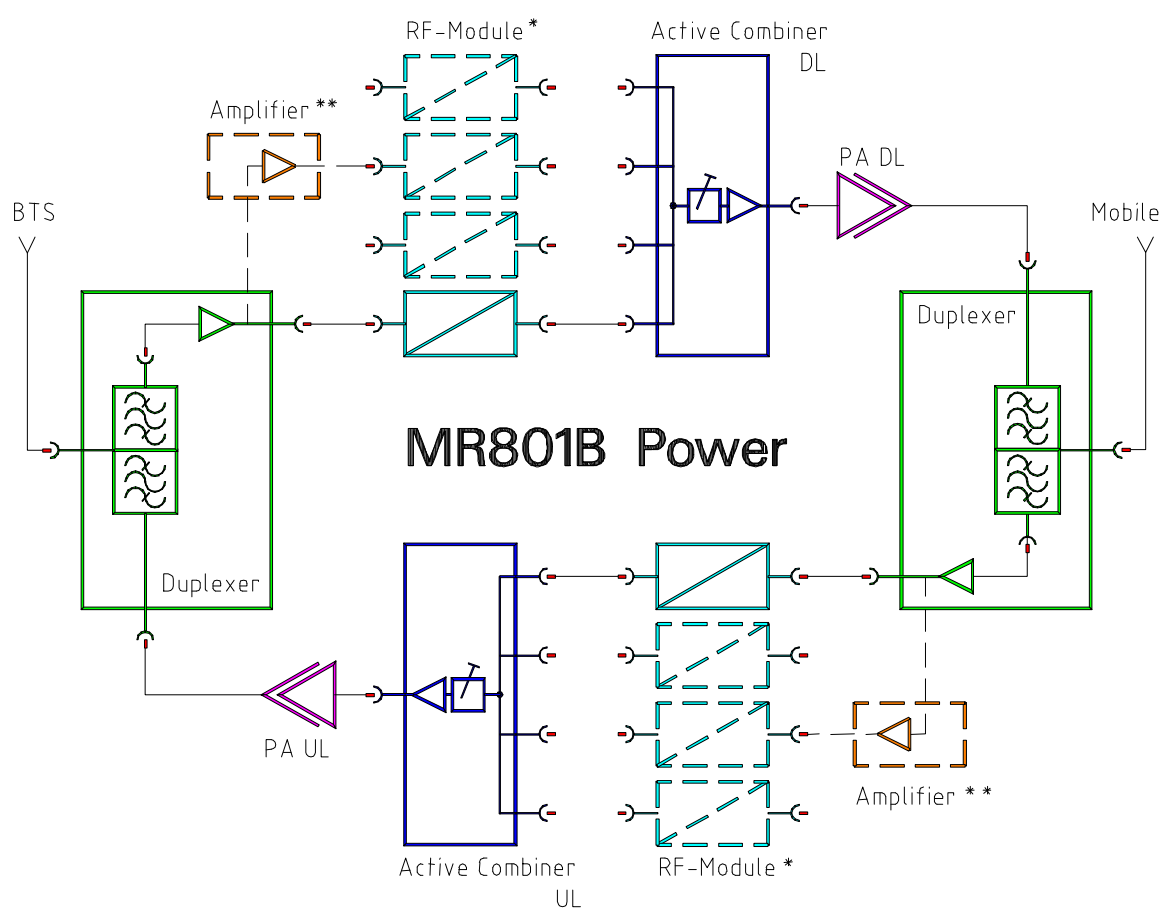
MR801B POWER modules can be combined with other repeater modules in order to create a multi-band repeater system. Modules operating in PCS1900, GSM1800, GSM900, or iDEN bands are available. When different modules are combined a common antenna and control interface are available.

The MR801B POWER can be set-up locally or remotely. A PCMCIA slot for modem operation is an available option. The repeater has a large number of functions that can be monitored and changed by the operators via a terminal emulation program or the MIKOM OMC software platform. An easy to understand and simple to learn communication language is available to help the operator query status reports from the repeater or to change settings.

## 2 Functional description

The Repeater MR801B Power can be equipped from one to four bands or channels.

The following block diagram shall illustrate the configuration of the system.



\*: one physical module contains UL and DL

\*\*: with more than two channels, the amplifiers are included; both are in one housing

figure 2-1 Block diagram of MR801B Power

## **2.1 General**

The Repeater consists of two amplifier chains, which are connected antiparallel. The receive path of one direction is connected to the transmit path of the other direction by a frequency separation unit, in the following denominated as a duplexer, which combines both signals to an antenna (See chapter 2.5).

After the duplexer the signals get to a pre-amplifier and afterwards to an RF module (See chapter 2.2). Then the signals are combined by the active combiner (See chapter 2.6) and afterwards amplified by the feed forward amplifier (See chapter 2.9), which provides the required output power.

After the final amplifier a power detection measures the output power and controls the gain. This is called Automatic Level Control (ALC) and keeps intermodulations below an adjustable value. Finally, the signals are fed to the built-in antenna of the Repeater.

## **2.2 RF modules**

The task of the RF modules is to amplify the receive signals and to convert them into an intermediate frequency. The signals, then, proceed a filter stage comprising of highly selective filters, and run through a digital controllable attenuator. The attenuation can be set in steps of 2 dB, locally or remotely. By using the same synthesizer frequency, that was used to convert the signals down to intermediate frequency, the intermediate frequency is mixed up to the original frequency.

The synthesizer is controlled via an I<sup>2</sup>C-Bus. In case of a breakdown in mains, gain and frequency data are non-volatile stored in an EEPROM on board.

See figure 2-2 Top view of an RF module for an exemplary channel or band module.

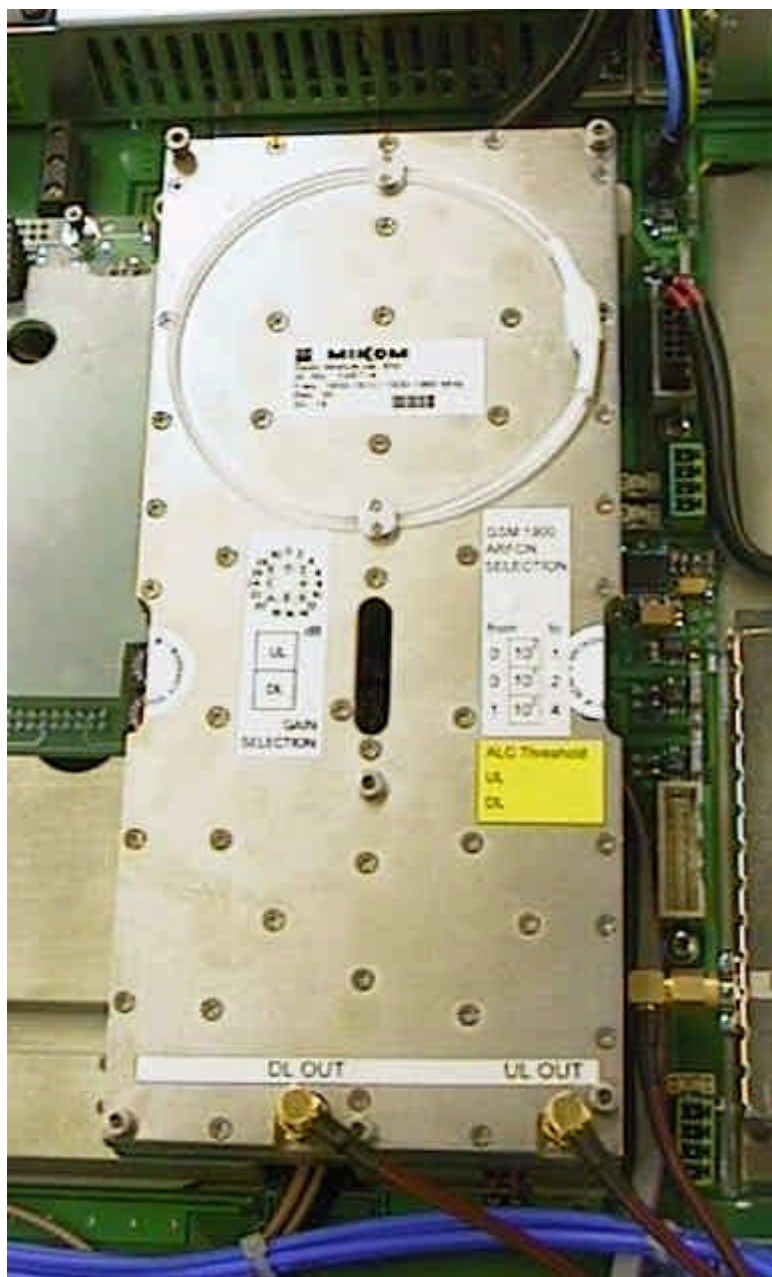


figure 2-2 Top view of an RF module

### **2.3 Mother board**

The function of the mother board is the communication between the RF modules and the control module via the I<sup>2</sup>C-Bus.

In the three and four channel configuration of the Repeater there is a mother board on the left and on the right side, whereas in the one and two channel configuration there is only one mother board implemented on the right side of the Repeater.

Mother boards are located underneath the RF modules.

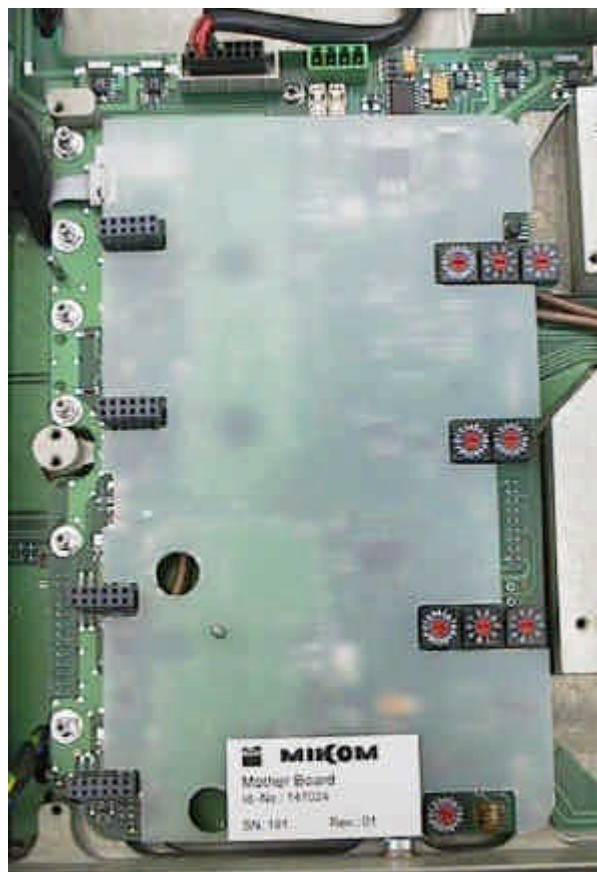


figure 2-3 Top view of a mother board

## 2.4 Control module SM 2009

The control module SM 2009 is a DOS compatible micro computer. The whole communication between the operator and the Repeater can be done via the control module. By using either the RS232 interface in connection with a modem card and a mobile the Repeater can be controlled remotely or locally by using a VT100 terminal, i.e. a PC emulating the VT100 terminal.

Frequency and gain, power down of RF stages and ALC can be controlled and status messages can be received remotely. In case a modem or a mobile is connected, automatic alarm messages can be received.

The data transfer between the control module SM 2009 and the mother board is realized by the I<sup>2</sup>C-Bus system.

The I<sup>2</sup>C-Bus concept was developed by Philips for the serial connection of integrated circuits within one device. Two wires, SDA - serial data and SCL - serial clock, carry information between the devices connected to the bus. Each device is recognized by a unique address and can operate either as transmitter or receiver.

All MR801B Power configuration parameters are stored in an EEPROM on the control module if a power supply failure occurs.

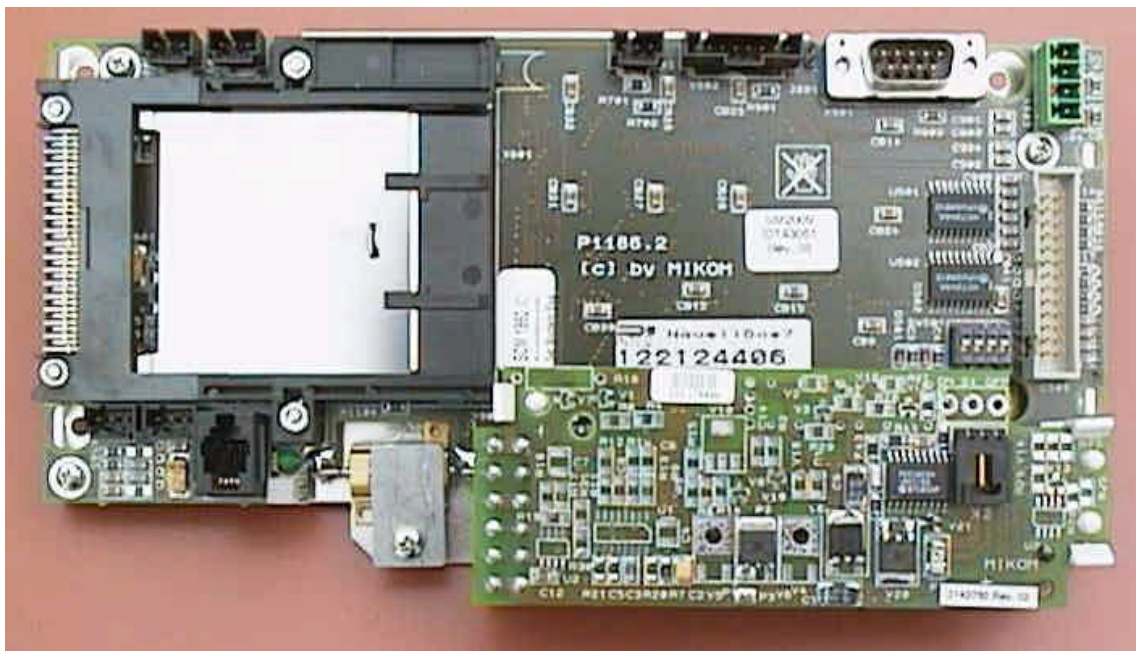


figure 2-4 Top view of the control module

## 2.5 Duplexer

The task of the duplexer is to isolate uplink from downlink, i.e. isolate transmit path from receive path. The pass bandwidth of the duplexer is the entire width of the uplink band and the downlink band.

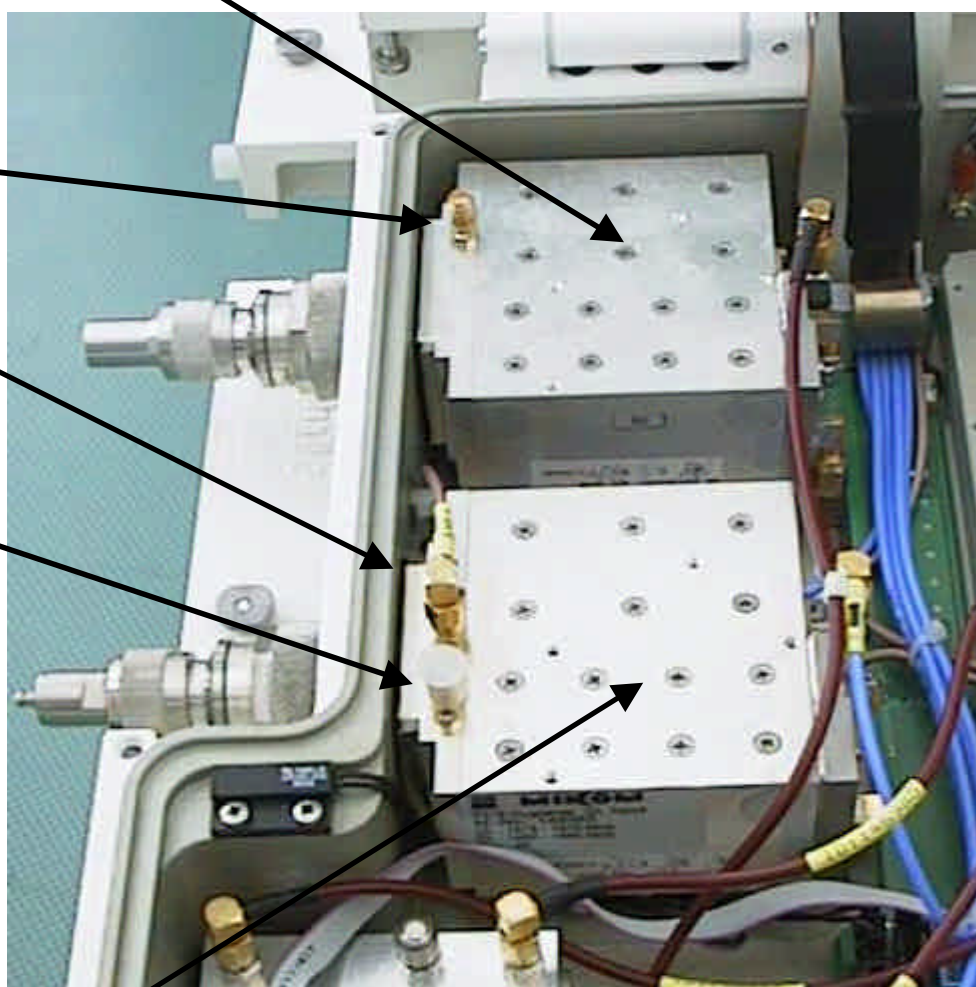
| UL frequency  | DL frequency  |
|---------------|---------------|
| 824 - 849 MHz | 869 - 894 MHz |

Duplexer with connector to mobile side

30 dB  
coupler

20 dB  
coupler

30 dB  
coupler



Duplexer with connector to BTS side

figure 2-5 Top view of the duplexers

## 2.6 Active combiner

After passing through the RF modules, the signals will be combined by the active combiner module in the UL and in the DL path. The active combiner will be followed by the feed forward amplifier.

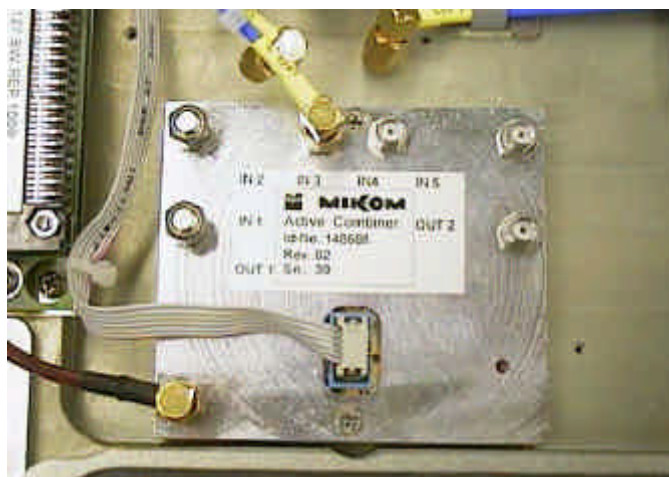


figure 2-6 Top view of the active combiner module

## 2.7 Measuring aids

With built-in RF probes test signals can be applied or detected. The probes provide a coupling factor of 30 dB respectively 20 dB. Each duplexer (uplink and downlink) is equipped with one 30 dB coupler, the UL Input duplexer additionally with a 20 dB coupler for a modem or mobile (See chapter 4 Optional equipment). This facilitates measurements under all operational conditions, while an antenna or a dummy load may be connected.

The position of the couplers on the duplexers is shown in figure 2-5 Top view of the duplexers.

## 2.8 Power supply

For the MR801B Power four power supplies are necessary.

Power supplies are available with different mains power. See list below for available power supplies.

- 115 VAC  $\pm$  15% / 40 - 65 Hz
- 230 VAC  $\pm$  15% / 40 - 65 Hz
- 185 - 320 VAC / 40 - 65 Hz
- 24 VDC
- 42 to 60 VDC
- 80 to 130 VDC

The following figure shows the mounting position of the power supplies in the MR801B Power cabinet.

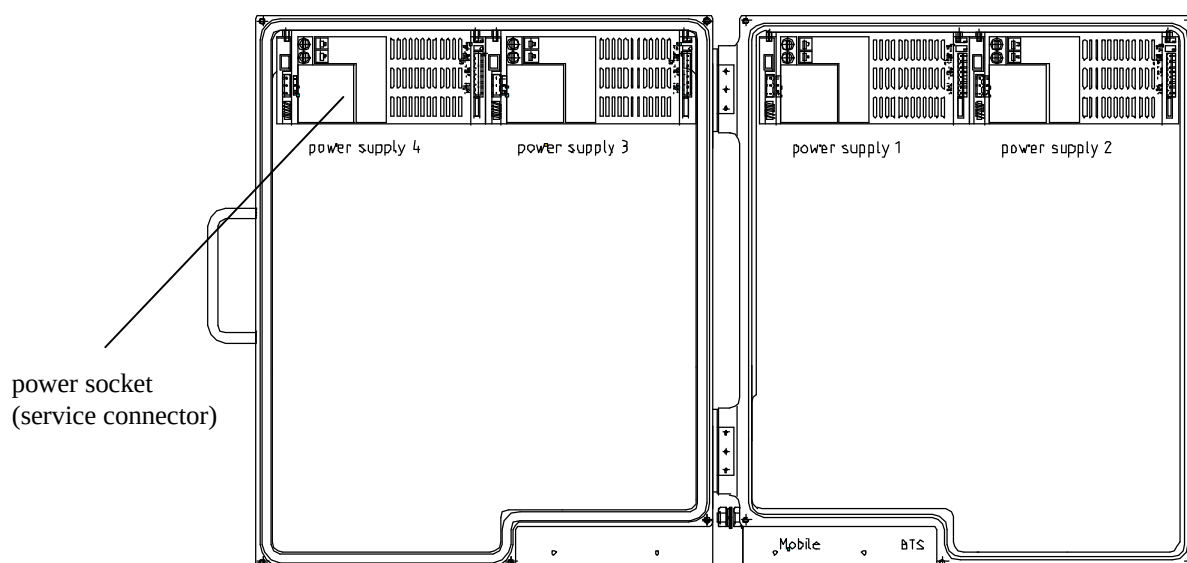


figure 2-7 Mounting position of power supplies

Each power supply is equipped with a power socket, protected with two fuses. Each power supply can be switched on or off by means of an external switch. The modules of the Repeater are voltage free if all power supplies are switched off. The power socket, however, is still provided with mains power.

See figure 2-8 ON / OFF position of external switch.

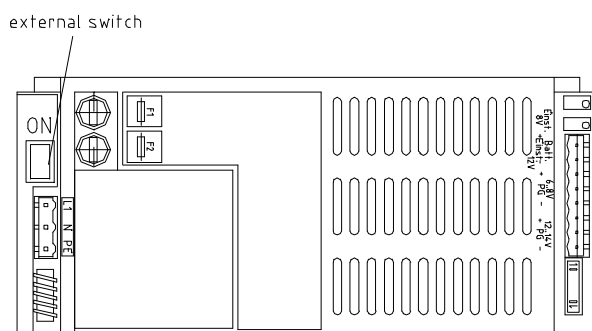


figure 2-8 ON / OFF position of external switch

**Note:** To switch the whole Repeater voltage free, you have to remove the fuses F1 and F2 on the screw terminal.

The power supply is factory-set.

## 2.9 Feed forward amplifier

The feed forward amplifier is the final stage which enables high output power as well as a high ICP3. One amplifier has to be installed for each path, the uplink and downlink.



figure 2-9 Top view of the feed forward amplifier

### 3 Functions and features

#### 3.1 Band and channel selectivity

The selectivity is achieved by highly selective filters in the IF part of the band / channel modules.

#### 3.2 Gain setting

The gain can be changed by introducing attenuation into the amplifier chain. By using a rotary switch the attenuation can be adjusted locally in the range from 0 dB to 30 dB maximum in steps of 2 dB. The attenuation can be set for the UL and DL path separately.

The rotary switches are mounted on the mother board. These switches are accessible through the long hole between the two RF modules (see figure 3-1 Position of rotary switches). They can be adjusted easily by means of a small screwdriver.

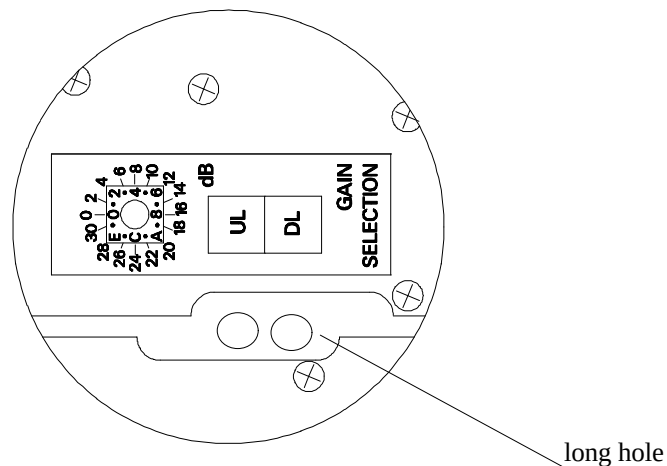


figure 3-1 Position of rotary switches

For remote control an RS232 interface can be used to set the gain.

The functions of the control module may be used locally by means of a VT100 terminal or a personal computer emulating the VT100 terminal. See also chapter 7.2, which deals with settings of operational parameters.

### 3.3 ALC

In order to protect the amplifiers from overload and to prevent the system to generate spurious emission, the amplifiers have an Automatic Level Control, designed to limit the output power to a defined level. A part of the output power is rectified, amplified and used to control an attenuator network. In order to avoid oscillation, the control amplifier has an integrating characteristic, so that a step function response obtains a delayed rise and decay.

**Note:** The ALC protects the final amplifier. To keep spurious emissions below certain limits, the input power into the Repeater and the attenuation settings of the repeater have to be considered properly.

### 3.4 BITE and alarms

The Built-In Test concept comprises the monitoring of the power supplies, the operational currents in the RF modules, the mother board and the remote control interface. Furthermore, the synthesizer lock and the temperature of the Repeater are monitored.

There are three multicoloured LEDs mounted on the control module. The LED L3 indicates the presence of electrical power of +12VDC in the Repeater. Every alarm is indicated by the failure LEDs, L1 and L2.

Position of the LEDs on the control module is shown in the following figure.

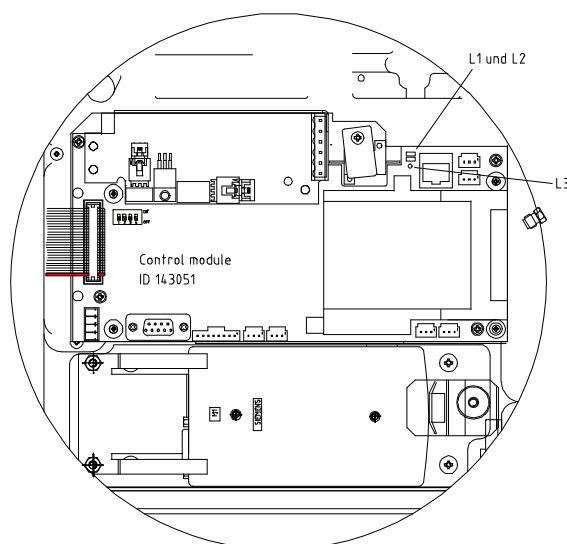


figure 3-2 Position of failure LEDs

All alarms can be checked by typing the 'STATUS HIST' command. Minor alarms with no influence on the system can be cancelled by typing the 'ALARMACKN' command, e.g. ALC active, VSWR or door open. The following print screen illustrates a possible 'STATUS HIST' report

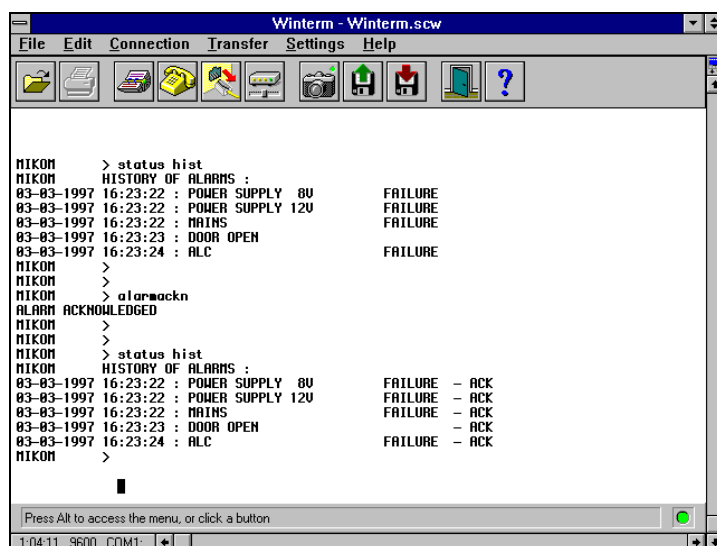


figure 3-3 Status hist report

In case a hardware failure is detected the concerning hardware module has to be replaced. An alarm can be acknowledged manually by software command. If all alarms have been acknowledged the summary error LEDs are set back to green indication.

In case of mains power failure all data of the STATUS HIST list are lost.

The alarm can also be sent to the OMC.

If monitored via a modem automatic dialling will generate a summary alarm message. The operator can acknowledge the alarm message by a simple ring back and after that he is able to request a detailed status report.

The following list comprises all available alarms in the Repeater. These alarms may occur in the STATUS HIST list.

| NO.    | ALARM NAME              | ALARM ACTIVE STATUS |
|--------|-------------------------|---------------------|
| 1      | AMPLIFIER BIAS          | FAILURE             |
| 2      | POWER SUPPLY 8 V        | FAILURE             |
| 3      | POWER SUPPLY 12 V       | FAILURE             |
| 4      | MAINS                   | FAILURE             |
| 5      | SYNTH                   | FAILURE             |
| 6      | DOOR                    | OPEN                |
| (7)    | VSWR                    | ALARM               |
| 8      | ALC                     | FAILURE             |
| 9      | LITHIUM BATTERY VOLTAGE | LOW                 |
| 10     | OVERTEMP                |                     |
| 11     | INVALID LOGIN ATTEMPT   |                     |
| 12     | I2C BUS                 | FAILURE             |
| (13*)  | EXT. ALARM 1            | FAILURE             |
| (14*)  | EXT. ALARM 2            | FAILURE             |
| (15*)  | EXT. ALARM 3            | FAILURE             |
| (16*)  | EXT. ALARM 4            | FAILURE             |
| (17**) | EXT. BATTERY            | OVERTEMP.           |

\* Alarm default settings changeable by software instruction SET ALIAS.

\*\* This alarm may be activated together with the external alarms, for instance UPS temperature

(...) Optional alarms

table 3-4 List of all available alarms

### 3.4.1 Handling of alarms

As soon as the software recognizes a valid alarm, a message is transmitted to the terminal.

In remote mode via modem, the first of two stored telephone numbers will be dialled. In case a connection cannot be established the second telephone number will be dialled. If this should be unsuccessful as well, the call will be repeated after a pre-set delay. The delay time can be set by software.

If the connection can be established the alarm message will be sent including date, time and Repeater Id.-number.

In remote mode the alarm can be acknowledged by simply ringing back and typing ALARMACKN.

If the reason for the alarm has been cleared or if the alarm should continue, a new alarm message will not be repeated. If there was an interruption of at least one second after acknowledgement, a new alarm message will be generated.

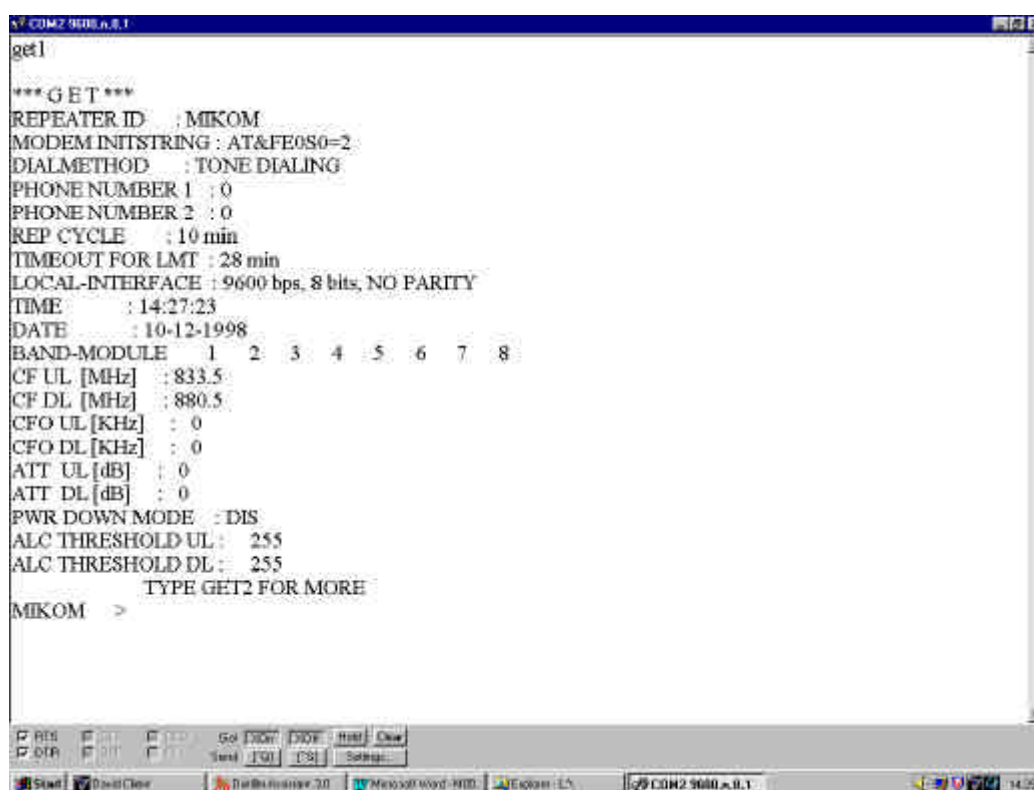
### 3.4.2 Status report

Two instructions enable the operator to gain knowledge of the system status. Typing the GET command will be responded by a listing of all settings of the Repeater. STATUS will be responded by a listing of all individual status information.

An examples is listed below for a GET1\* (REP1009V1.xx) and STATUS report. The listing contains random data to demonstrate in which way these messages appear.

\*: Due to the fact that the report is very long, the GET report can be split in two parts. You have to type GET1 to see the first and GET2 to see the second part.

The complete listing of the dialogue language with the processor of the control module including the instructions to and the messages from the system is available as a separate manual.



```
COM2 9600.n.1
get1
***GET***
REPEATER ID : MIKOM
MODEM INITSTRING : AT&FE0S0=2
DIALMETHOD : TONE DIALING
PHONE NUMBER 1 : 0
PHONE NUMBER 2 : 0
REP CYCLE : 10 min
TIMEOUT FOR LMT : 28 min
LOCAL-INTERFACE : 9600 bps, 8 bits, NO PARITY
TIME : 14:27:23
DATE : 10-12-1998
BAND-MODULE 1 2 3 4 5 6 7 8
CF UL [MHz] : 833.5
CF DL [MHz] : 880.5
CFO UL [KHz] : 0
CFO DL [KHz] : 0
ATT UL [dB] : 0
ATT DL [dB] : 0
PWR DOWN MODE : DIS
ALC THRESHOLD UL : 255
ALC THRESHOLD DL : 255
TYPE GET2 FOR MORE
MIKOM >
```

figure 3-5 Example of a GET1 report

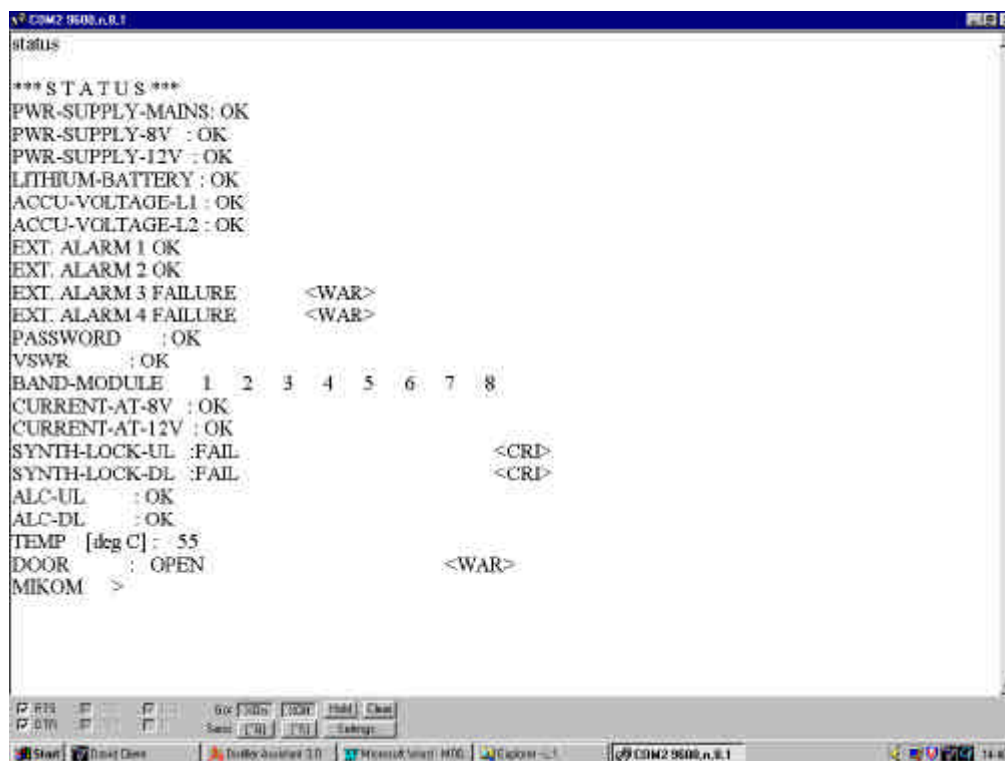


figure 3-6 Example of a STATUS report

### 3.4.3 Severity levels

This parameter defines five severity levels for an alarm and can be set in the alarm mask (detailed description in the software manual). The severity levels indicate how the capability of the managed object has been affected.

The levels are described below and are ordered from most severe to least severe:

- Critical: The critical severity level indicates that a service affecting condition has occurred and an immediate corrective action is required to restore the capability of the managed object.
- Major: The major severity level indicates that a service affecting condition has developed and an urgent corrective action is required. Such a severity can be reported, for example, when there is a severe degradation in the capability of the managed object and its full capability must be restored.
- Minor: The minor severity level indicates the existence of a non-service affecting fault condition and that corrective actions should be taken in order to prevent a more serious failure. Such a severity can be reported, for example, when the detected alarm condition is not currently degrading the capability of the managed object.



- Warning: The warning severity level indicates the detection of a potential or impending service affecting failure before any significant effect has been caused. Action should be taken to further diagnose and correction of the problem shall prevent a more serious service affecting failure.
- Disable: The disable severity level indicates that the detected failure has no influence on the system and shall not be sent to the terminal.

## 4 Optional equipment

The following modules can be integrated as an option.

### 4.1 VSWR module

VSWR signal is continually measured by a special VSWR module. An alarm can be given for VSWR < 10 dB.

### 4.2 External alarms

With the following option it is possible to monitor 4 external alarms via the Repeater software. Hence the status of the connected device, e.g. UPS, can be monitored.

The contacts of the alarms can be accessed at clamps on the main board (right side of the Repeater).

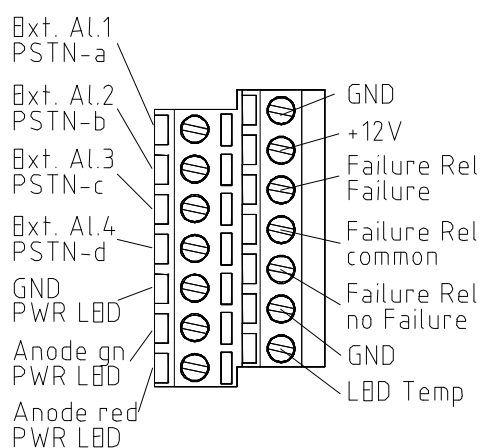


figure 4-1 Clamps for external alarms

The electrical connection has to be as follows.

- External alarm 1 (low active)
- External alarm 2 (low active)
- External alarm 3 (high active)
- External alarm 4 (high active)
- Ground

Configuration: 5 V / 0.5 mA max. for open collector applications.

All external alarms are normally high without connection. Due to the fact that the external alarms 3 and 4 are high active, they have to be connected to ground to prevent an alarm message.

The factory-set response after typing the software command STATUS EXTALARM is for instance „EXT. ALARM 1 OK“, if the alarm is not active and „EXT. ALARM 1 FAILURE“, if the alarm is active.

The name for each external alarm and the name for the alarm message can be defined by the customer with the corresponding software command.

The following example describes the response for the external alarms to control a UPS.

Example:                      External alarms if the UPS is active

```
EXTERNAL ALARM STATUS
UPS alarm active
Battery low !
UPS door open
Battery door open
```

or                      External alarms if the UPS is not active

```
EXTERNAL ALARM STATUS
UPS not active
Battery OK
UPS door closed
Battery door closed
```

For the DC wiring an additional cable bridge has to be installed on the control module (see figure 4-2 Cable configuration and installation position).

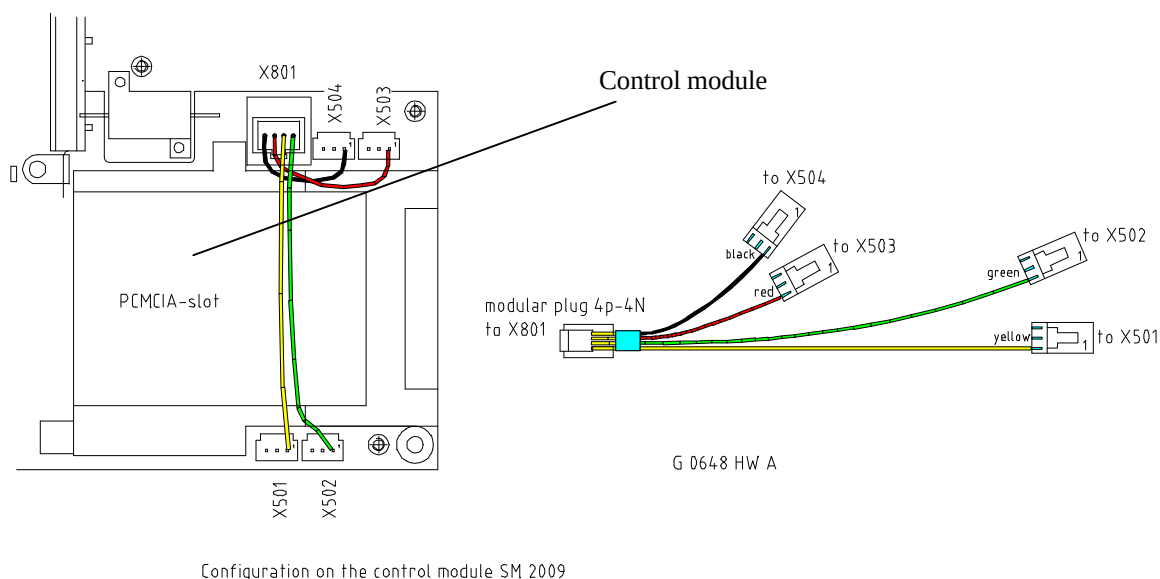


figure 4-2 Cable configuration and installation position

### 4.3 Modem

The Repeater can be equipped with a modem for the operation of the Repeater via modem connection. This allows the operator to change settings and query information of the Repeater remotely.

See chapter 5.5 External RF output and chapter 7.2.3 Settings via modem for further information about the optional modem.

### 4.4 Battery backup module

If backup is required only for the control module and the modem, low capacity batteries are available to operate controller and modem for at least ten minutes under normal environmental conditions.

Battery backup is provided for the control module to transmit alarm information in case of power failure. The battery type is a NiCd 8.4V/300 mAh. The battery backup is sufficient enough to support multiple dial out attempts via modem in case of 'system engaged' or other communication problems for at least ten minutes under normal environmental conditions.

**Note:** This battery backup module is provided for the control module only.

The batteries are protected from deep discharge by use of a low voltage disconnect circuit. A local switch is provided to disconnect the battery backup system during maintenance to ensure that all circuits are voltage-free.

The switch is located on the battery backup module.

| Switch | ON ( default )        | OFF                       |
|--------|-----------------------|---------------------------|
|        | Battery backup active | Battery backup not active |

The module is directly plugged into the control module. During the charging process a green LED V7 on the module indicates, that the battery is charged at the moment. After finishing the process the LED V7 will be switched off.

The batteries are mounted underneath the modem mounting plate (see following figure).

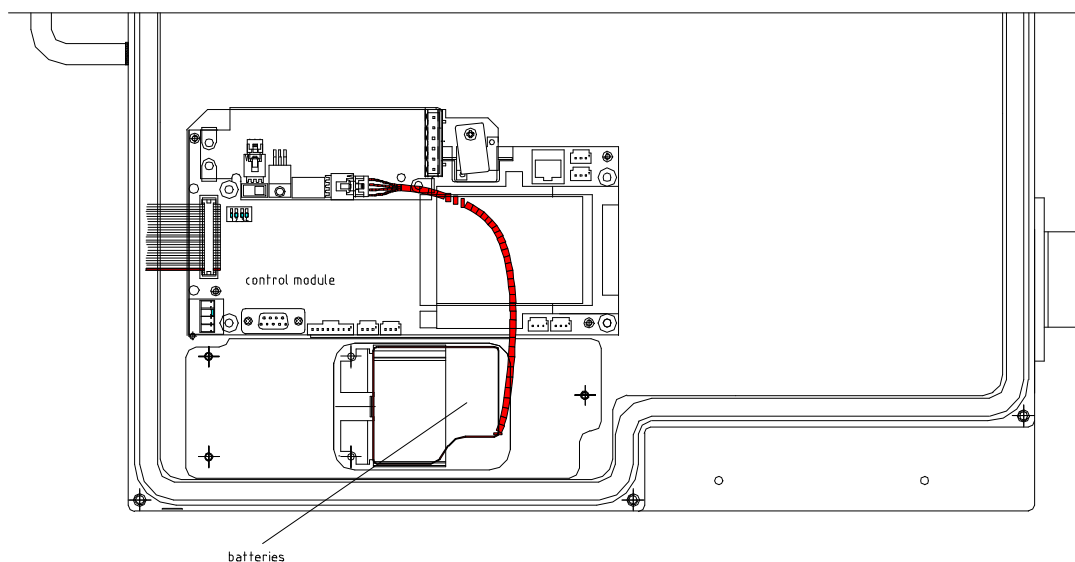


figure 4-3 Mounting position of batteries

## 5 Specification

### 5.1 Electrical specification

|                                                |                                                                                                                                                                                        |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Frequency range                                | Uplink 824-849 MHz; Downlink 869-894 MHz                                                                                                                                               |
| Useable bandwidth                              | 25 MHz in the upper or lower AMPS 800 band                                                                                                                                             |
| Gain                                           | 90 dB                                                                                                                                                                                  |
| Gain variation over frequency and temperature* | $\pm 2.5$ dB ( $\pm 3.5$ dB at extreme temperatures)                                                                                                                                   |
| Gain adjust range                              | 30 dB in 2 dB steps                                                                                                                                                                    |
| Gain adjust range tolerance                    | $\pm 0.5$ dB                                                                                                                                                                           |
| Return loss                                    | 15 dB @ 25°C ambient temperature                                                                                                                                                       |
| Spurious/intermodulation                       | -13 dBm max                                                                                                                                                                            |
| Spectral re-growth (CDMA only)                 | -45 dBc (J-STD-008)                                                                                                                                                                    |
| Power supply                                   | 115 VAC $\pm 15\%$ / 40 - 65 Hz<br><i>Option:</i> 230 VAC $\pm 15\%$ / 40 - 65 Hz<br><i>Option:</i> 185 - 320 VAC / 40 - 65 Hz<br><i>Option:</i> 24 VDC<br><i>Option:</i> 42 to 60 VDC |
| RF connector                                   | 7/16 female<br><i>Option:</i> N female                                                                                                                                                 |
| Environmental and safety                       | See separate leaflet                                                                                                                                                                   |

\*: Normal temperature range +5° to +40°C; Extreme temperature range -33° to +50°C

**BAND AND CHANNEL SPECIFICATIONS**

|                                                                          | Variable Bandwidth   | Channel                   |                           |
|--------------------------------------------------------------------------|----------------------|---------------------------|---------------------------|
|                                                                          |                      | CDMA                      | TDMA                      |
| <b>3 dB bandwidth</b>                                                    | 0.1 to 15.0 MHz      | 1.23 MHz                  | 30 kHz                    |
| <b>Slope 3 dB to 30 dB</b>                                               | 2 MHz                | -                         | -                         |
| <b>30 dB bandwidth</b>                                                   | -                    | $f_c \pm 900 \text{ kHz}$ | $f_c \pm 60 \text{ kHz}$  |
| <b>50 dB bandwidth</b>                                                   | -                    | $f_c \pm 1.5 \text{ MHz}$ | $f_c \pm 120 \text{ kHz}$ |
| <b>Delay</b>                                                             | 6 $\mu\text{s}$      | < 6 $\mu\text{s}$         | 20 $\mu\text{s}$          |
| <b>Delay variation (typical)</b>                                         | $\pm 150 \text{ ns}$ | $\pm 500 \text{ ns}$      | $\pm 500 \text{ ns}$      |
| <b>Far off selectivity</b>                                               | 40 dB                | 60 dB                     | 55 dB                     |
| <b>NF at Gmax</b>                                                        | 8 dB                 | 6 dB                      | 6 dB                      |
| <b>NF at Gmax-30 dB</b>                                                  | 13 dB                | 12 dB                     | 12 dB                     |
| <b>OICP-3 at Gmax</b>                                                    | 59.0 dBm             | 59.0 dBm                  | 59.0 dBm                  |
| <b>OICP-3 at Gmax -10 dB</b>                                             | 58.5 dBm             | 58.5 dBm                  | 59.0 dBm                  |
| <b>OICP-3 at Gmax -20 dB</b>                                             | 57.5 dBm             | 58.0 dBm                  | 58.5 dBm                  |
| <b>OICP-3 at Gmax -30 dB</b>                                             | 53.0 dBm             | 55.0 dBm                  | 57.0 dBm                  |
| <b>Output noise<br/>in band at Gmax</b>                                  | -76 dBm/Hz           | -                         | -                         |
| <b>Output noise out of band<br/>at Gmax</b>                              | -96 dBm/Hz           | -                         | -                         |
| <b>Power consumption<br/>(standby/max power)<br/>1 module (typ.cons)</b> | 145/220 W            | 130/210 W                 | 130/210 W                 |
| <b>4 modules (typ.cons)</b>                                              | 180/270 W            | 160/240 W                 | 160/240 W                 |

All data is subject to change without notice !

## **5.2 Mechanical specification**

### **Standard cabinet**

Max. Height x Width x Depth: 21.1 x 18.2 x 7.9 inches  
535 x 462.5 x 200 mm

Volume: approximately 45 litres

Weight: approximately 103 lbs (47 kg per unit in standard configuration)

The illustration of chapter 11.1 provides the dimensions and the view of the layout.

## **5.3 Environmental and safety**

For detailed information refer to the environmental and safety specification leaflet for MIKOM indoor / outdoor cell enhancers, related to ETS 300019 (European Telecommunication Standard).

Operating temperature (normal temperature range): + 5° C ... + 40° C  
(extreme temperature range): - 33° C ... + 50° C

Humidity: + 30° C/ 93 %

## **5.4 External electrical interfaces**

### **5.4.1 Electrical power**

The Repeater MR801B Power can be supplied with the following power supplies (mains):

- 115 Vac  $\pm$  15% 40 - 65 Hz
- 230 V ac  $\pm$  15% 40 - 65 Hz
- 185 - 320 Vac 40 - 65 Hz
- 24 Vdc
- $\pm$ 42 to  $\pm$ 60 Vdc
- $\pm$ 80 to  $\pm$ 130 Vdc

A firmly installed mains cable 3x1.5 mm<sup>2</sup> is used, which is fed into the housing through a watertight cable gland. Due to safety reasons the power supply lead has to be protected by two 8 A fuses. Inside the Repeater, mains are connected to a screw terminal.

See figure 5-1 Screw terminal for mains cable for the position of the two 8 A fuses.

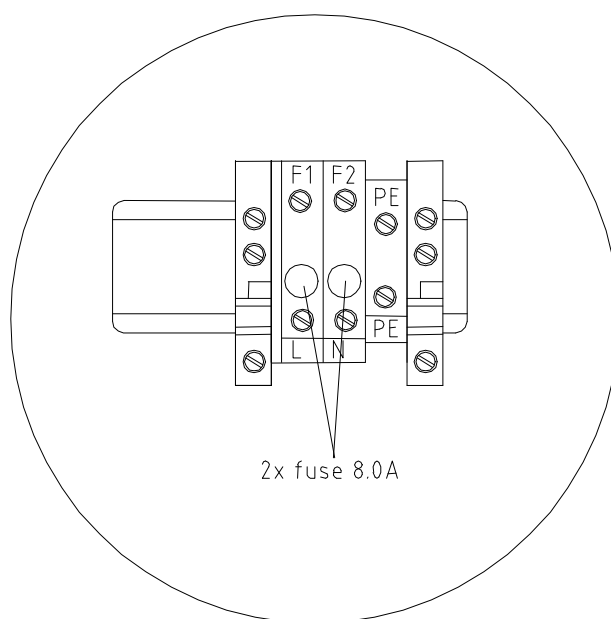


figure 5-1 Screw terminal for mains cable

#### 5.4.2 RF connections

There are two 7/16 female antenna connectors at the outside of the housing accessible on the connector panel (see figure 5-2 Connector panel layout).

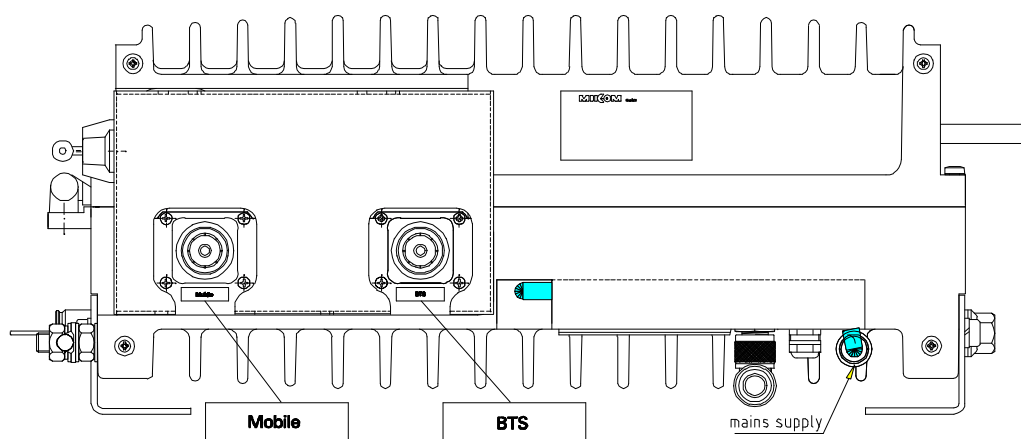


figure 5-2 Connector panel layout

The 7/16 TX-downlink connector should be connected to the antenna system for the communication with the mobile units.

A diagram showing a rounded rectangular box with the word "Mobile" centered inside, representing the connection point for mobile units.

Mobile

The 7/16 TX-uplink connector should be connected to the antenna system for the communication with the Base Transceiver Station.

A diagram showing a rounded rectangular box with the letters "BTS" centered inside, representing the connection point for the Base Transceiver Station.

BTS

As an option a 7/16 - N adapter is available.

### 5.5 External RF output

An external output in the downlink path is available at the outside of the housing as an option. This enables the connection of an integrated modem to an additional antenna. The connector type is N female.

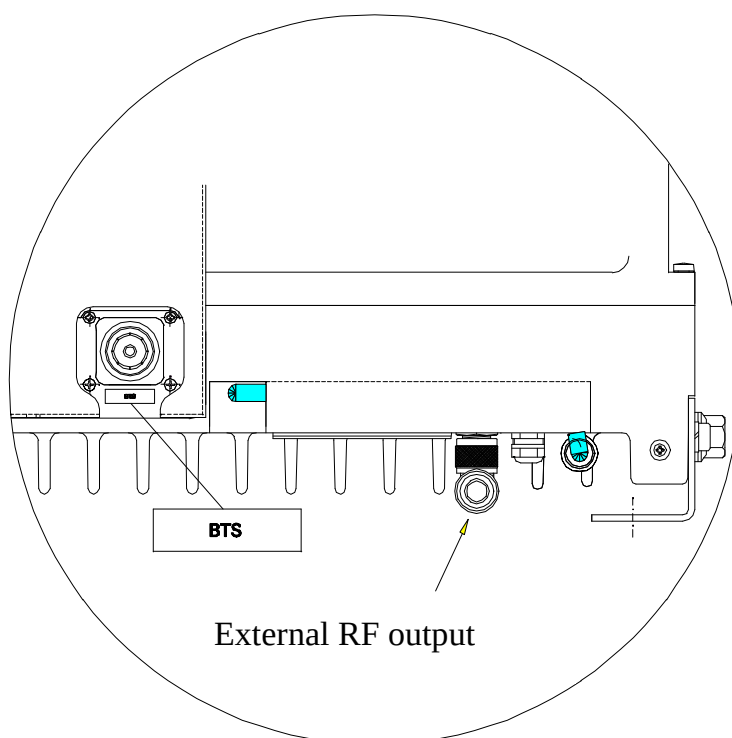


figure 5-3 Position of external RF output

## 6 Installation

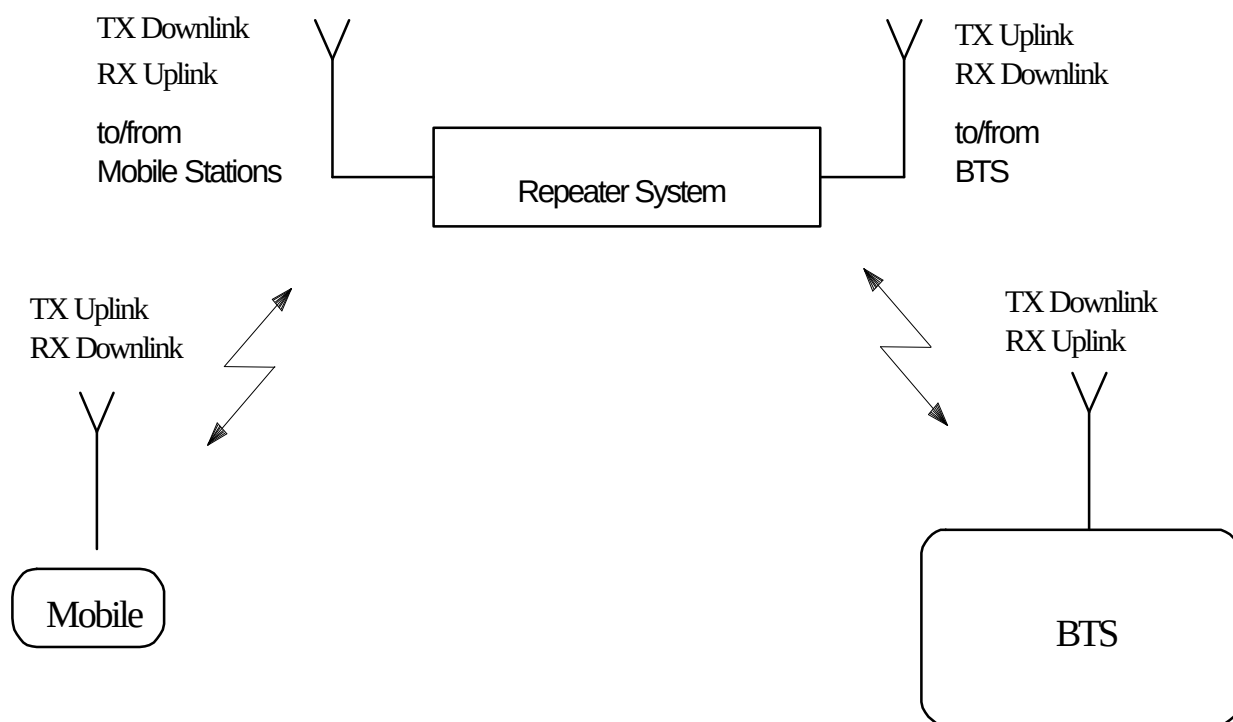


figure 6-1 System description

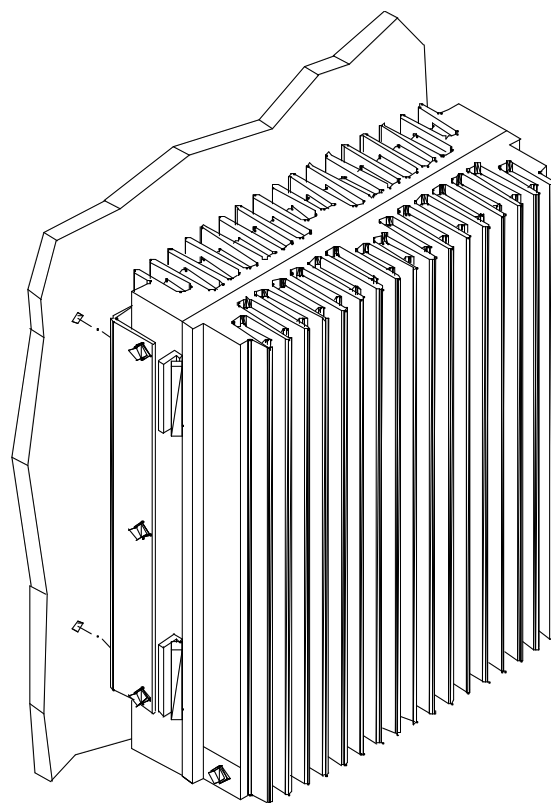
## 6.1 Mechanical installation

**Note:** Due to power dissipation the Repeater may heat up the air volume inside the cabinet and reach a very high temperature. Therefore it is necessary to mount the Repeater in the vertical plane to a wall or a mast without additional enclosure to provide sufficient ventilation. Between the housing and the wall a minimum distance must be kept in order to provide air circulation.

The Repeater must be mounted in the vertical plane to a wall or a mast, which means the connectors have to be located at the bottom.

Use the mounting brackets, which are part of the delivery. This will guarantee a minimum distance between the wall and the Repeater housing. The cabinet must be fixed to the wall (brackets) with four screws.

Check the correspondence of the wall mounting kit and the wall.



**Note:** The weight of the MR801B Power is approximately 47 kg in standard configuration.

Mounting procedure:

Dismount the mounting brackets first. They are screwed tight to the housing with four socket head cap screws M8.0x16 (see figure below) and two tire bolts.

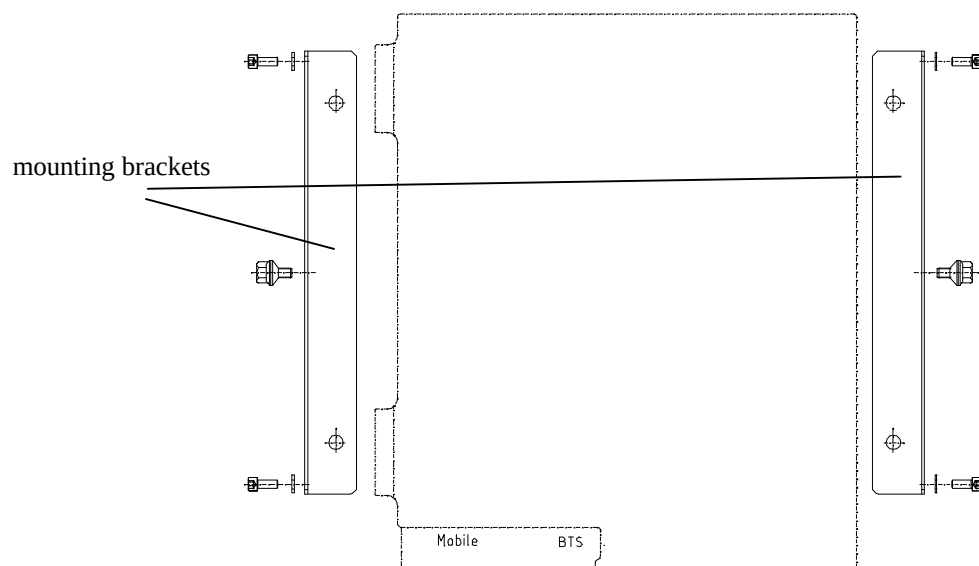


figure 6-2 Wall mounting brackets

Use the wall mounting sheet to mark the position of the drilling holes. Drill 4 holes and screw the mounting brackets to the wall. Attach the upper two socket head cap screws M8.0x16 to the Repeater housing. Now it is possible to hang the Repeater into the mounting brackets. Fix then the lower two socket head cap screws M8.0x16 and the 2 tire bolts.

**Note:** The unit is heavy-weight. Make sure that a suitable mounting surface is used. Only adequate manpower is allowed to handle the system.

The installation position of the Repeater follows from the installation drawing see figure 11-1 Installation drawing of the Repeater. Make sure that there is free access to the electrical connections. The allowed bending radius of the connected cables must not be exceeded.

Furthermore the Repeater shall be mounted in a way that there is free access to the individual units inside the cabinet, while the door of the Repeater is open.

**Therefore keep a clearance distance of 1 m on each side and 2 m below the unit.**

See following figure 6-3 Clearance distance.

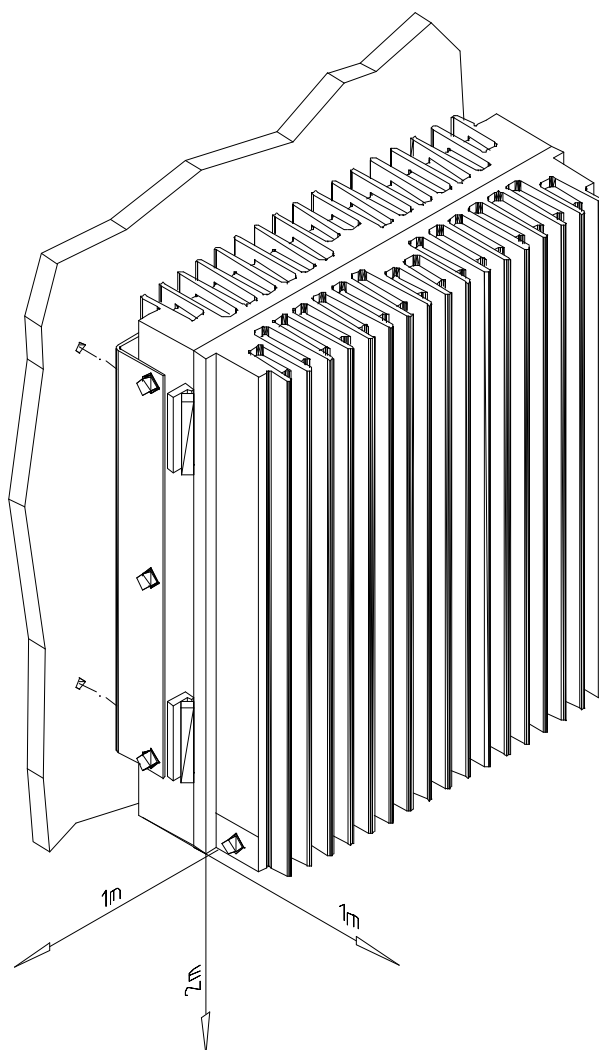


figure 6-3 Clearance distance

## 6.2 Electrical installation

**Note:**

ESD precautions have to be observed! Before working inside the cabinet use the available grounding system to connect ESD protection measures. The electrical installation has to be performed in accordance with the safety regulations of the local authorities. Due to safety reasons the electrical installation must be performed by qualified personnel. The cover of this unit should not be opened while power is applied. Subsequent installation, commissioning and maintenance activities that require the unit to be powered with the cover open shall only be carried out by suitably qualified personnel

### 6.2.1 Grounding

Grounding has to be performed by all means. Therefore a grounding bolt is provided at the cabinet. An earth bonding cable will be mounted in the factory and will be delivered with the unit. Don't use the grounding screw for connecting external devices.

The complete grounding kit is part of the delivery schedule, see figure 6-4 Grounding kit.

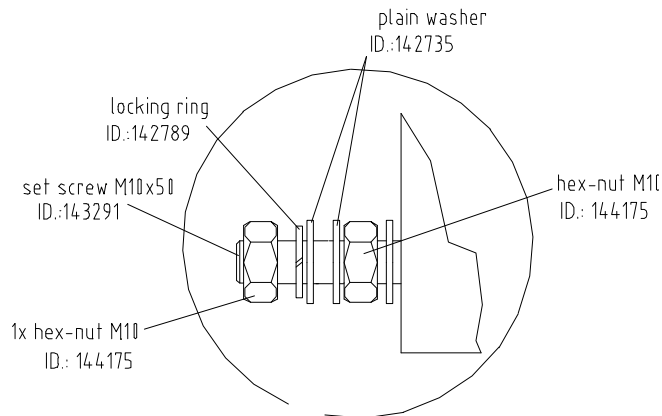


figure 6-4 Grounding kit

### 6.2.2 Power connection

Before connecting electrical power to the Repeater grounding has to be performed. The Repeater is equipped with a firmly connected power cord 3 x 1.5 mm<sup>2</sup>. Due to safety reasons the power supply lead of the Repeater has to be protected with two 8 A fuses, type MT. In the event the length of the power cord should not be sufficient it can be replaced by a longer cable.

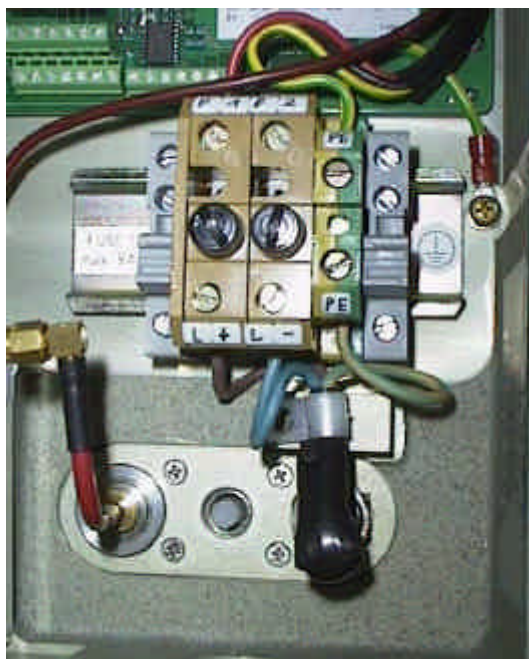


figure 6-5 Screw terminal

**Note:** If the power supply lead has to be replaced use a cable of the same quality.

### 6.2.3 Connection of the antenna cables

The Repeater has two female antenna connectors 7/16. For mounting the corresponding cable connectors we recommend to refer to the applicable documentation of the respective connector manufacturer. The bending radius of the antenna cables must remain within its specification. This will warrant proper operation of the system; otherwise changes in the electrical behaviour of the cable might occur which could cause malfunction of the Repeater system.

**Note:** It is sufficient to fix the 7/16 antenna connectors hand-screwed. Any use of a tool (like tongs) might cause damage to the connectors and thus lead to malfunctioning of the Repeater.

## 7 Setting to work

### 7.1 Preparation

**Note:** It is not allowed to operate the Repeater without termination of the antenna connections! The termination can be performed by the antenna connection as well as a dummy load or the 50-Ohm-terminated connection of a measuring instrument.

Before bringing the Repeater system into service it is necessary to measure the antenna isolation. The Repeater system has its maximum available gain when the attenuation is set to zero. On site the maximum allowed gain is 15 dB less than the value of the antenna isolation. In order to check the function of the Repeater system on site it is advisable to operate the Repeater system with 50 Ohm termination. This makes it possible to set the necessary gain and to test the set value without the necessity of transmitting on air.

In order to perform settings the Repeater has to be opened. Please, ensure not to damage the seals, which are on the modules situated on the RF modules inside of the Repeater, because this would lead to risk the success of warranty claims.

After taking the Repeater into service following signals occur during the boot process.

| Internal LED L1 |                              | Internal LED L2 |                           | Internal LED L3 | Cause                                   |
|-----------------|------------------------------|-----------------|---------------------------|-----------------|-----------------------------------------|
| green           | red                          | green           | red                       | green           |                                         |
| -               | -                            | -               | -                         |                 | Power on state,<br>Software boot starts |
|                 | Flashes<br>red short<br>time |                 | Flashes red<br>short time |                 | Software boot starts                    |
|                 |                              |                 |                           |                 | Software is running                     |

table 7-1 LED indication

## 7.2 Setting of operational parameters

Attenuation of the Repeater can be set manually by means of rotary switches, frequency can be set locally or remotely.

There are three different possibilities to set the operational parameters:

- manual settings by means of rotary switches
- local control via RS232 interface and PC
- remote control via modem

### 7.2.1 Manual settings by means of rotary switches

The manual mode allows the user to set the required channels and attenuation by means of rotary switches. With a small screwdriver, which fits through the long holes of the RF modules, the values can be adjusted by turning the switch carefully to the desired position.

**Note:** To enable manual settings of parameters the mode switch (DIP-Switch 1) has to be changed from OFF to ON.

The DIP-Switch is mounted on the control module, located on the left side of the Repeater.

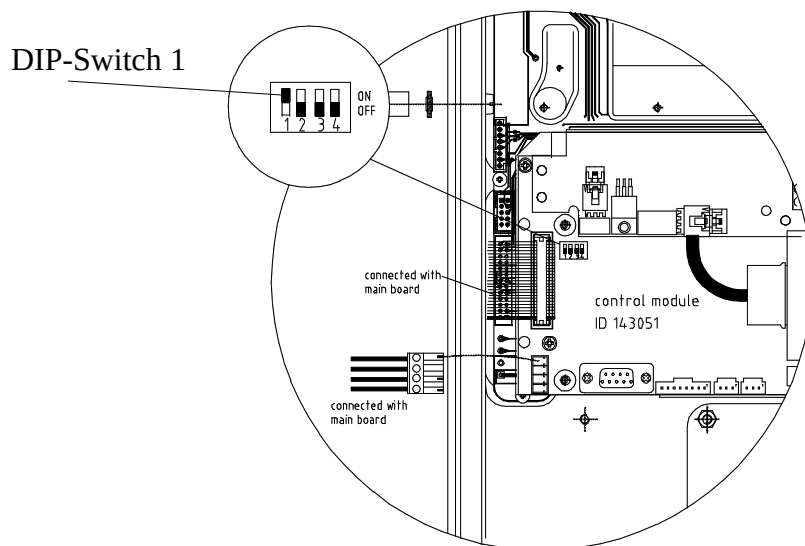


figure 7-2 Position of the DIP-Switch 1

### 7.2.1.1 Setting of the attenuation

The gain can be set by introducing attenuation into the amplifier chain. By using a rotary switch the attenuation can be adjusted locally in the range from 0 dB to 30 dB maximum in steps of 2 dB. The attenuation can be set for the UL and DL path separately.

The rotary switches are mounted on the mother board. These switches are accessible through the long hole between the two RF modules ( see figure 7-3 Position of the rotary switches). They can be adjusted easily by means of a small screwdriver.

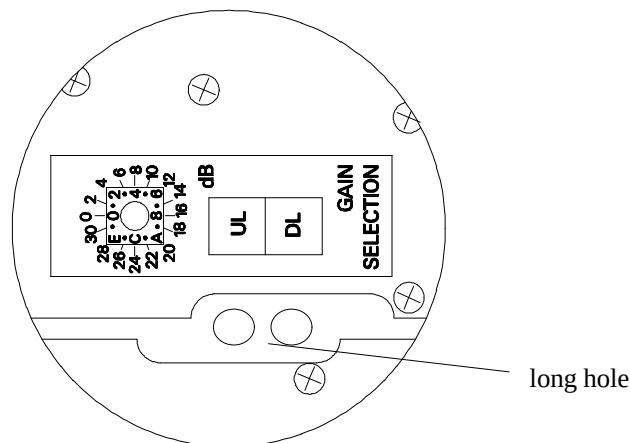


figure 7-3 Position of the rotary switches

A label on the RF module, located next to the rotary switch, illustrates the usage of the rotary switch (see figure 7-4 Rotary switches and label).

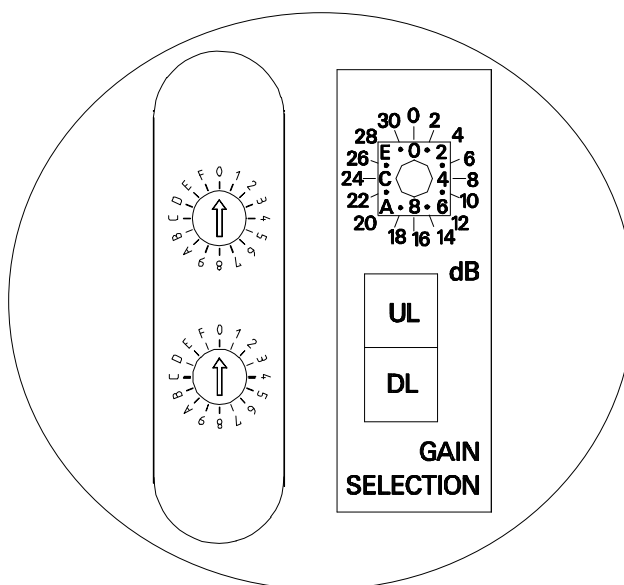


figure 7-4 Rotary switches and label

 **Note:** Gain can be changed independently for the uplink and downlink path.

DIP-Switch configuration:

| DIP-Switch | ON                                       | OFF (default values)                        |
|------------|------------------------------------------|---------------------------------------------|
| 1          | manual                                   | auto                                        |
| 2          | remote mode                              | local mode                                  |
| 3          | n.c.                                     | n.c.                                        |
| 4          | software download<br>manually controlled | software download<br>controlled by software |

table 7-5 DIP-switch configuration

### 7.2.2 Settings via personal computer as terminal

Instead of manually setting operational parameters via rotary switches it is also possible to use the functions of the control module. The local mode for settings via PC has to be set. Therefore the DIP-Switch 2 has to be at position OFF.

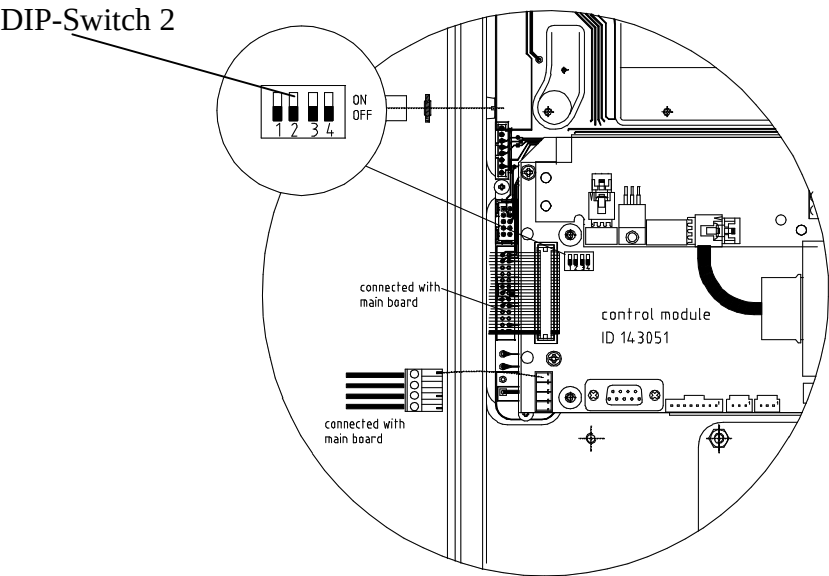
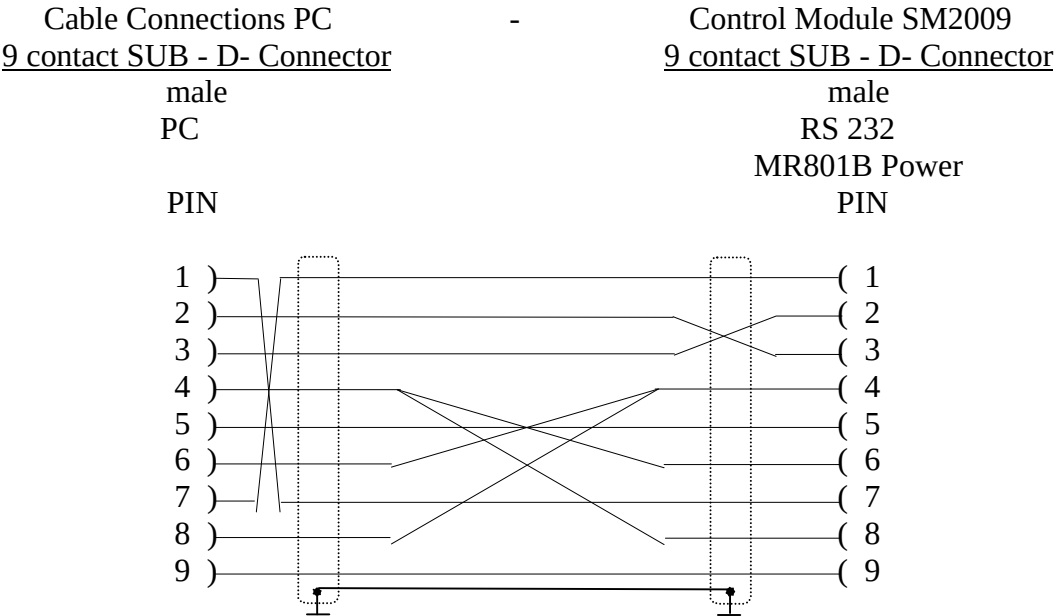


figure 7-6 DIP-switch 2 for local mode

A VT100 terminal or a PC with VT100 emulation can be connected to the control module SM2009 by a standard RS232 cable, if necessary in connection with an adapter 9 to 25.



The following communication mode between control module and VT100 is set initially.

**9600 baud - 8 bit - no parity -1 stopbit**

These settings can only be changed after connection of the terminal. If all wanted settings have been initialized and a modem has to be used it will be recommended to check whether the settings comply with the capabilities of the modem and the line. Modifications are possible by software commands.

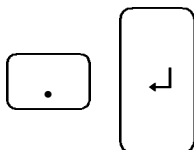
 **Note:**     **Settings on the Repeater can be performed after the following procedure only.**

After connecting the PC to the Repeater, following procedure is necessary to get access to the program.

MIKOM REPEATER MR801B - SM2009 - SW: REP1007V1.11  
ENTER <.> <CR> TO LOGIN

1. Step:            Type the two keys ( . ) FULLSTOP and (↵) ENTER

You have to type the keys:



2. Step:            ENTER USER ID

You have to enter:     **UserID1 ↵**

 **Note:**     **The input is case sensitive, no blanks. After three mistrial follows disconnection.**

3. Step:            ENTER PASSWORD

You have to enter:     **P-word1 ↵**

 **Note:**     **The input is case sensitive, no blanks. After three mistrials follows disconnection.**

### 7.2.3 Settings via modem

The Repeater can be equipped with a modem. If so, the repeater will be delivered with a preset init string. This init string was used for internal tests. In case no connection can be established check the local conditions and change the init string if necessary.

The following list contains the description of the AT commands:

|             |                                                                                         |
|-------------|-----------------------------------------------------------------------------------------|
| &F          | Sets modem to factory configuration                                                     |
| E0          | Echo OFF                                                                                |
| S0=1        | Auto answer ON; the GSM module / M1 modem goes off-hook after the first ringing signal. |
| S7=60       | Waiting time for connection after dialing; permissible values are from 0 ... 60.        |
| B13         | Setting to 9600 bps asynchronous mode                                                   |
| \ N6        | Auto reliable operation                                                                 |
| \ N0        | Standard operation, no error correction                                                 |
| +CBST=7,0,1 | Set bearer service type to 9600 bps. Non-transparent connection (uses RLP)              |
| X3          | Not waiting for dial tone; usually used at PABX.                                        |
| *P1         | Switch ON phone                                                                         |
| &K4         | Enables XON / XOFF flow control                                                         |

table 7-7 List of AT commands

## 8 Trouble shooting

All Repeaters are factory-set to „Power down disabled“ status, this means the channel group is active. To switch off the channel group use the software command „PWRDOWN enabled“. (You find a detailed description in the software manual.)

### 8.1 Error indication

= LED on

- = LED off

| Internal LED L1 |     | Internal LED L2 |     | Internal LED L3 | Cause                                                                                                                 |
|-----------------|-----|-----------------|-----|-----------------|-----------------------------------------------------------------------------------------------------------------------|
| green           | red | green           | red | green           |                                                                                                                       |
| -               | -   | -               | -   | -               | No power.<br>Check presence of power at the input; replace fuse according to chapter 9.3, check battery backup module |
|                 |     |                 |     |                 | Indicates a summary failure                                                                                           |

### 8.2 Boot process

Following signals occur during boot process.

| Internal LED L1 |                        | Internal LED L2 |                        | Internal LED L3 | Cause                                |
|-----------------|------------------------|-----------------|------------------------|-----------------|--------------------------------------|
| green           | red                    | green           | red                    | green           |                                      |
| -               | -                      | -               | -                      |                 | Power on state, Software boot starts |
|                 | Flashes red short time |                 | Flashes red short time |                 | Software boot starts                 |
|                 |                        |                 |                        |                 | Software is running                  |

### **8.3 Alarm monitoring with the STATUS HIST command**

Check alarms with 'status hist' command.

1. If a hardware module is damaged, replace corresponding hardware module.
2. Minor alarms with no influence on the system can be cancelled by confirming the alarm with the 'alarmackn' command, e.g., ALC active, VSWR, RSSI or DOOR OPEN.
3. If all alarms have been acknowledged the summary error LEDs will be set back to green indication.
4. In case of mains power failure the contents of the actual STATUS HIST list is lost.

For a complete list of available alarms, see table 3-4 List of all available alarms

### **8.4 Power supply**

The output voltage is factory set and should not be changed.

### **8.5 General remarks**

- After a software download previous user settings ( data default values ) might be overwritten. Before you start a software download save the set values for:
  - centre frequency
  - attenuation
  - ALC threshold
- If an ALC or AMPBIAS alarm occurs during installation or commissioning an user error might be the cause, due to wrong measurements.

## 9 Maintenance

### 9.1 General

**Note:** The Repeater does not require preventative maintenance measures.

It is only recommended to replace the RAM/RTC battery after three years usage as a prophylactic measure. The nominal lifetime of these batteries is five years under normal environmental conditions.

In the event of a malfunction it is advantageous to check the status of the antenna systems as well as the continuity of the entire cabling including connectors, before replacing the modules.

Maintenance on the Repeater shall be performed only by replacing modules. Soldering on printed circuit boards shall be avoided. In order to sustain warranty take care not to damage unintentionally the seals on the modules.

The spare part list, consequently, contains only units, which can be replaced without tuning or complex soldering work.

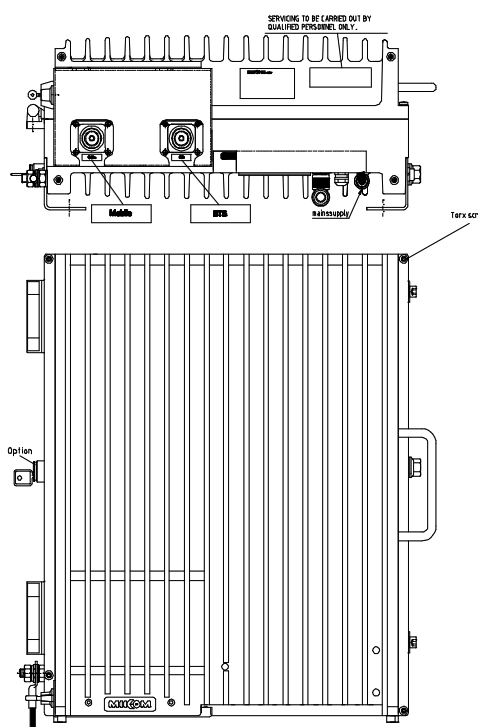


figure 9-1 Top view of the Repeater

**Note:** Defect parts should only be replaced by original parts from MIKOM. All interventions inside the housing are at one's own risk. During maintenance ensure that the Repeater has been disconnected from mains.

Open the lock at the connector panel and remove the cover plate. To open the housing use a Torx key and unscrew the four Torx screws.

### 9.2 Replacement of the fuses (mains)

The mains cable is protected with two fuses F1 and F2 8A type MT. They are accessible inside of the Repeater at the fuse terminal on the right side. Open the screw plug for the fuse and take out the fuse.

**Note:** Use only fuses of the same type and the same rating when replacing!

See figure 9-2 Fuse terminal for position of the 8A fuses.

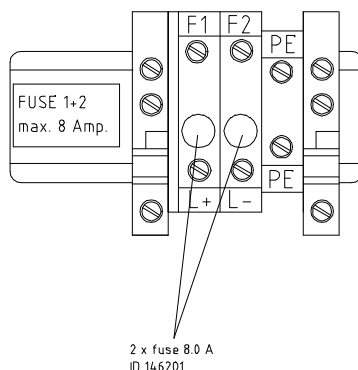


figure 9-2 Fuse terminal

### 9.3 Replacement of the power supply fuse

Each power supply is protected with a fuse 10 A / 35 V. The fuse is mounted outside of the power supply housing.

**Note:** Use only fuses of the same type and the same rating when replacing!

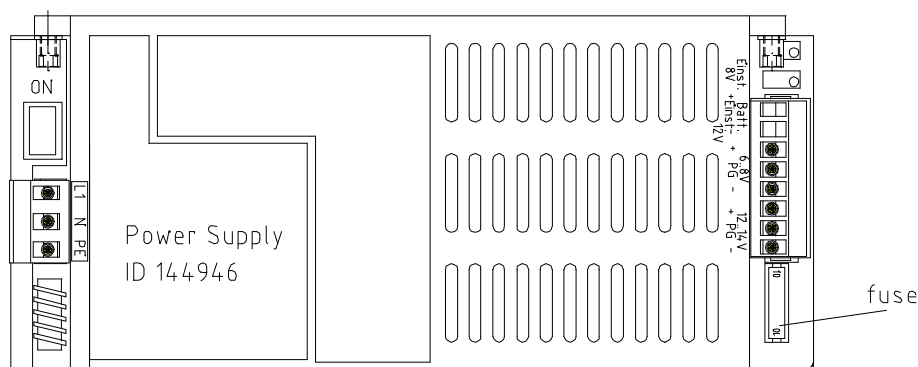


figure 9-3 Position of power supply fuse

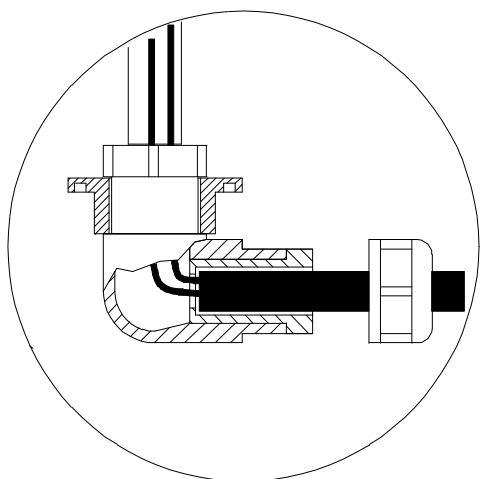
### 9.4 Replacement of the mains cable

The Repeater will be delivered with a firmly connected mains cable.

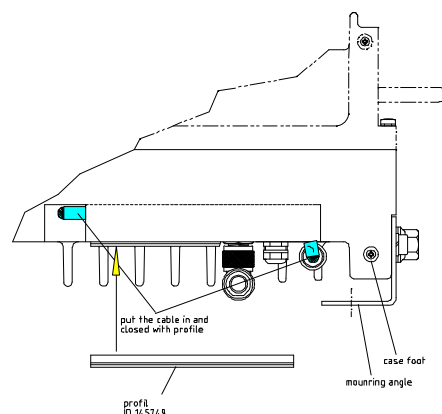
In case the length of the delivered mains cable should not be sufficient or in case of a defect, the mains cable can be replaced.

**Note:** Disconnect Repeater from mains first.

Remove the clamping profile at the outside of the housing by pulling at the mains cable. Open the PG9 threaded joint with a spanner size 17. Inside the housing remove the plastic cable clip by unscrewing the tallow-drop screw. Then use a small screwdriver and open the screws of the fuse terminal.



Now the mains cable can be removed by pulling at the cable. For the installation of a new cable strip the isolation of a new cable to the length of 18 cm. Put the screw of the cable gland over the cable then use the joint rubber and **pull it over the cable**. This will guarantee a tight connection. Now insert the cable. Inside the housing pull an insulated tube with the length of 8 cm over the wires. Now close the PG9 threaded joint. Screw the wires to the fuse terminal. Fix the cable with the plastic cable clip.



Put the cable in the guide shaft and close it with the clamping profile.

### 9.5 Replacement of the RAM / RTC battery

The RAM / RTC battery of the control module has to be replaced in case of memory loss or as a preventive measure after approximately three years usage. The RAM / RTC battery is mounted on the left-hand side of the Repeater underneath the dummy battery backup module. First remove the whole dummy battery backup module ( see figure 9-5 Position of dummy battery backup module ), which is plugged into the control module. Take off the Lithium battery by means of a small screwdriver, placed between the battery and the battery socket.

The type of the battery is CR 2450 Lithium 3 V / 500mAh, manufacturer is RENATA.

After replacement of the RAM battery, the control module has its basic settings, date and time have to be set to the actual value.

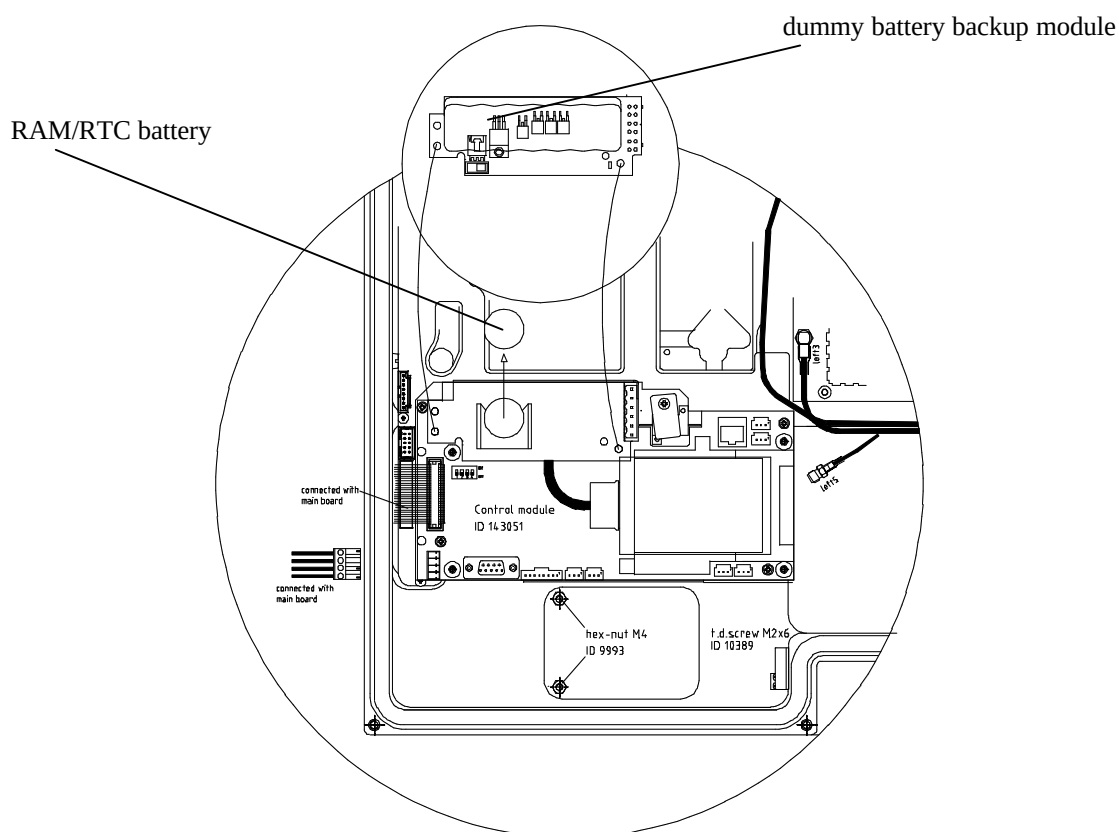


figure 9-4 Position of RAM/RTC battery

**Note:** Before replacing the battery, disconnect the Repeater from mains. Observe the rules for changing Lithium batteries. Wrong connection or treatment may result in bursting of the battery and dissemination of hazardous substances.

Don't try to charge this battery.

## 9.6 Replacement of the dummy battery backup module

The dummy battery backup module is accessible after opening the housing on the left-hand side. (If a modem is implemented, you have to disconnect the cable from the modem which is connected with the battery backup module.)

Before you are able to remove the module from the socket, release the three snap-in lockings.

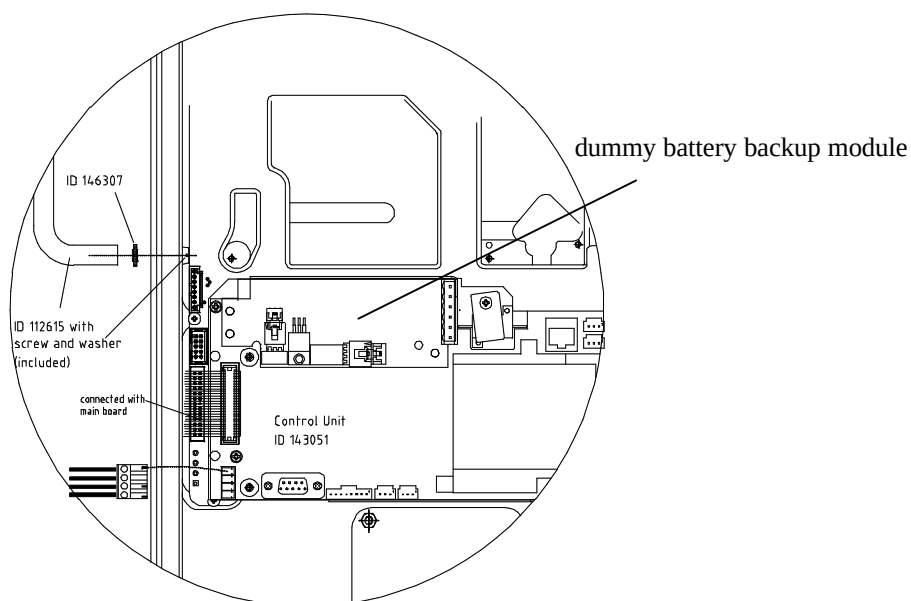


figure 9-5 Position of dummy battery backup module

### 9.7 Replacement of duplexers

This description is valid for the one channel configuration of the Repeater only. For different configurations refer to the assembly guide for the Repeater.

Remove the semi-rigid cables which connect the UL output and the DL output with the feed forward amplifier by loosening the SMA connectors. Use a torque wrench. Then remove the semi-rigid cables from the RF modules. (BTS side marked with a red spot).

It is recommended not to remove the amplifier which is mounted on the backside of the duplexer. A new duplexer will be delivered with a premounted amplifier.

The cables have to be connected like shown below.

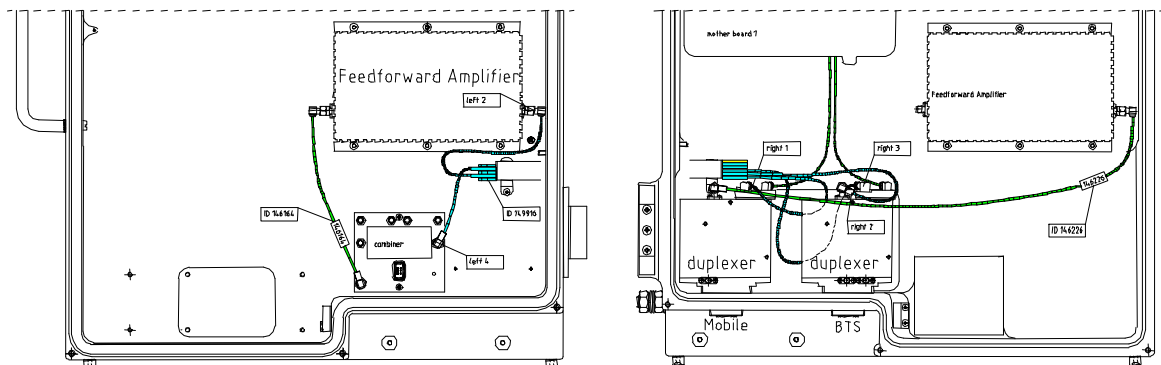


figure 9-6 Cable configuration of the duplexers

Unscrew the four counter sunk screws M3 at the connector panel of the Repeater. See figure 9-7 Connector panel layout.

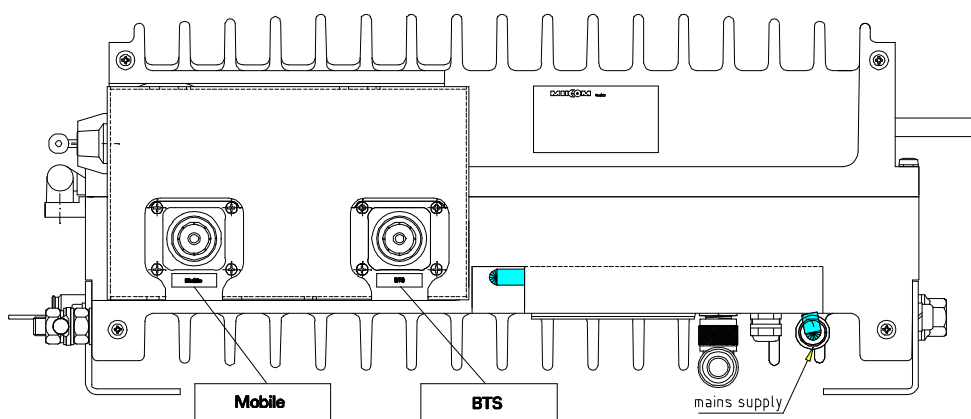


figure 9-7 Connector panel layout

## 9.8 Replacement of RF modules

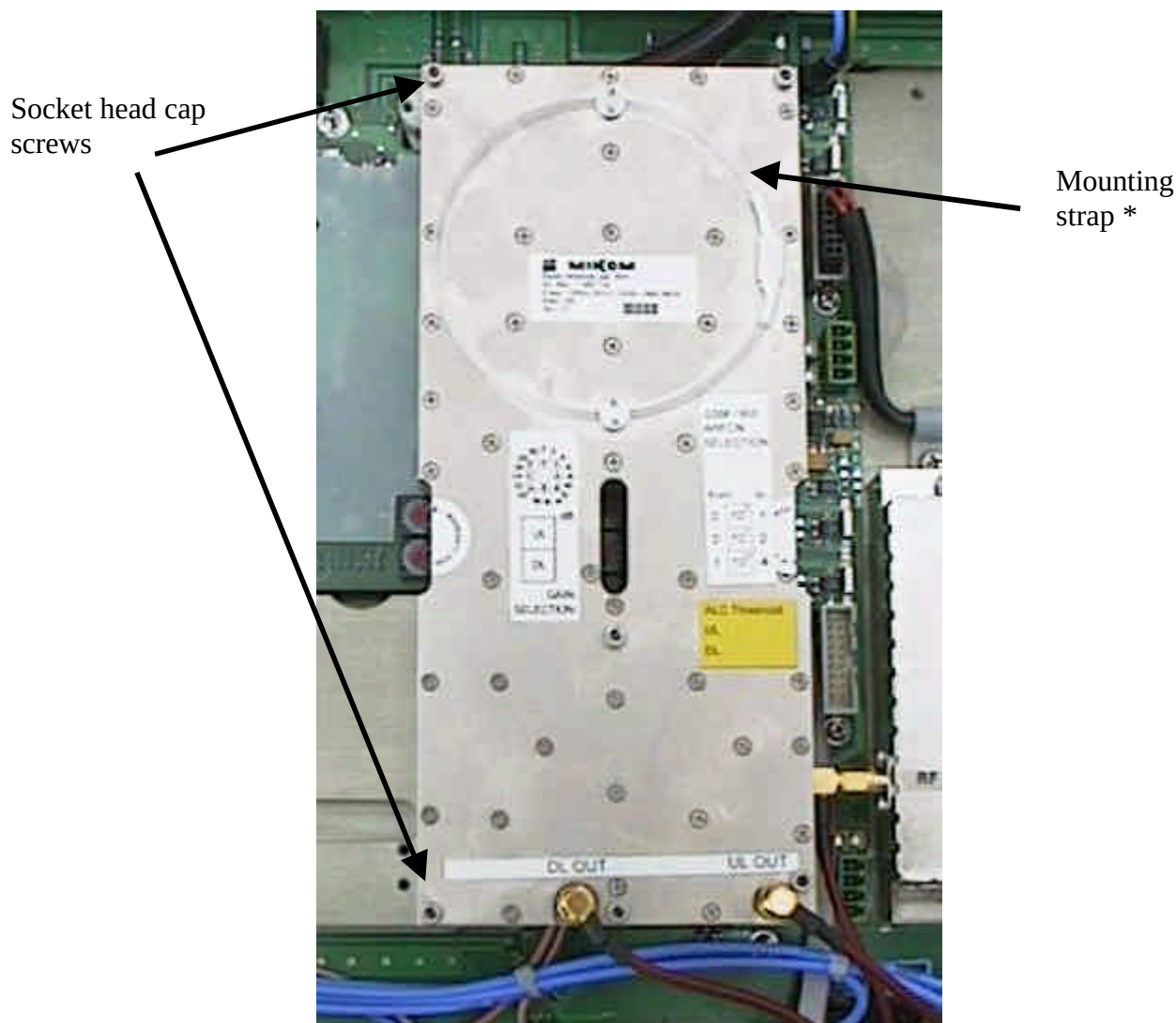
To remove the RF modules, disconnect the SMA connectors by means of a torque wrench.

If the Repeater is equipped with TDMA modules, the external filter on top of the modules must be dismounted beforehand. The external filter box covers two of the socket head cap screws the TDMA module is fixed with.

Unscrew the socket head cap screw on top of the external filter box, pull the box carefully off and continue the dismounting procedure like described below.

Unscrew six socket head cap screws by means of a hex socket key.

Pull carefully by means of the mounting strap, fixed on the module (see figure 9-8 Top view of an RF module) and take off the modules.



\*: TDMA and CDMA modules are equipped with mounting straps on the left and on the right side.

figure 9-8 Top view of an RF module

Connecting the RF modules depends on the number of channels your Repeater is equipped with, i.e. with one up to four channels. Each configuration has got a different cabling. See assembly guide of the channel modification kits for the cabling and functional description of the RF modules dependent on the configuration of the Repeater.

For the exchange of an RF module or the installation of a new RF module, the slave address of the synthesizer has to be set. This can be done by means of hex-coded rotary switches mounted on the lower side of the modules (figure 9-9 Position of hex coded rotary switches).

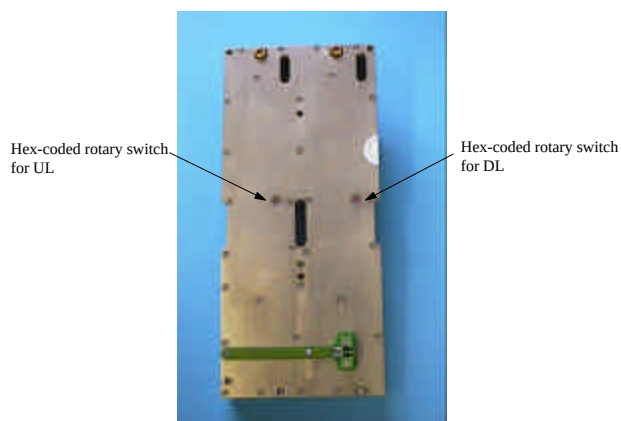


figure 9-9 Position of hex coded rotary switches

The synthesizer address must be set like shown in the following table:

| RF module     | Address |    |
|---------------|---------|----|
|               | UL      | DL |
| Channel one   | 0       | 1  |
| Channel two   | 2       | 3  |
| Channel three | 4       | 5  |
| Channel four  | 6       | 7  |

table 9-10 Address of synthesizer

Instructions for band selective modules with variable bandwidth can be found in a separate document.

### 9.9 Replacement of the control module SM 2009

The control module is a Printed Circuit Board situated on the left-hand side of the Repeater.

Disconnect the DC cable from power supply.

Disconnect the flat cable.

Remove the battery backup module and remove the Tyrap which is fixed to the control module.

Disconnect the RS232 cable from the M1 modem if the Repeater is equipped with a modem.

Take off the whole control module completely with mounting plate by unscrewing four tallow drop screws M4.

For mounting proceed in reverse order.

Position of the control module in the Repeater is illustrated in figure 9-11 Position of control module.

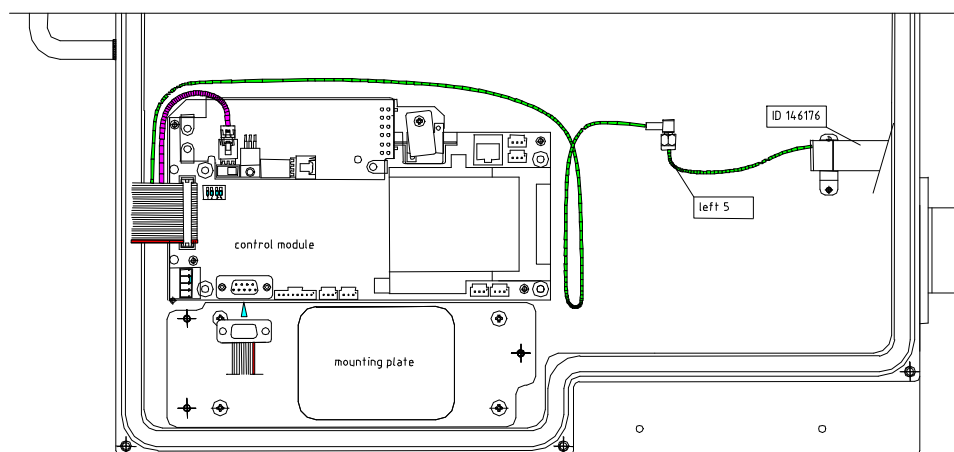


figure 9-11 Position of control module

## 9.10 Replacement of power supplies

 **Note:** Ensure that mains are disconnected.

There are four power supplies mounted in the Repeater housing, two on each side. Open the Repeater to get access to the devices.

Remove all connected cables from the clamps of the power supply. Try to loose the plug by means of a small screwdriver placed between the plug and socket.

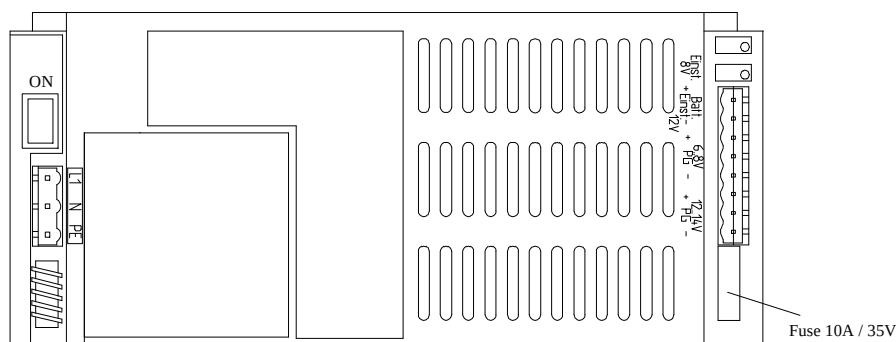


figure 9-12 Power supply

The power supply is fixed to the Repeater housing by means of two special nuts M4. After loosening the screws the power supply can be removed. To open these screws a special key with a spherical head is required. Place a small screwdriver between the Repeater housing and the power supply to loose the device.

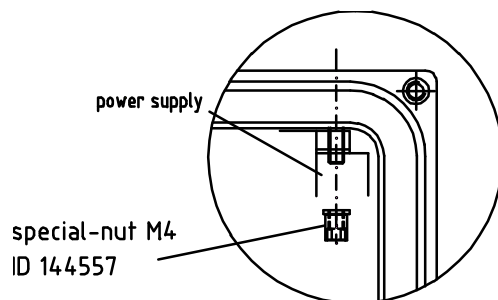


figure 9-13 Position of special-nut M4

**Note:** Don't forget to put heat conducting paste on the mounting side for installation of a new power supply. Use the conducting paste, which is included in the spare parts kit.

### 9.11 Replacement of active combiner modules

The active combiner modules are mounted on both sides of the Repeater.

Disconnect all SMA connectors by means of a torque wrench.

Unscrew two counter sunk screws M3x20mm. See figure 9-14 Position of counter sunk screws on active combiner

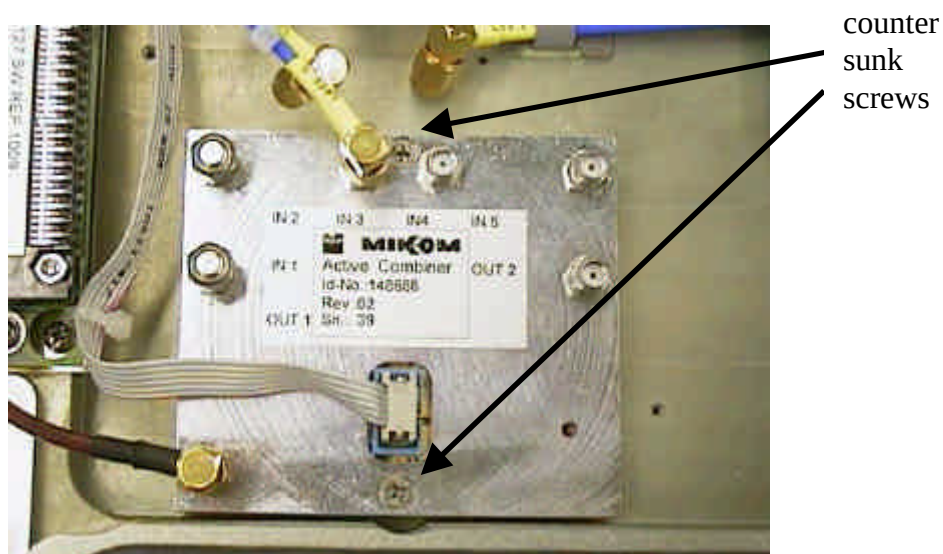


figure 9-14 Position of counter sunk screws on active combiner

The cabling of the active combiners depends on the configuration of the Repeater. For correct connections see assembly guide for the channel modification kits

### 9.12 Replacement of feed forward amplifiers

There is one amplifier mounted on each side of the Repeater. They are fixed to the housing by means of 6 socket head cap screws M4x25.

A special reset board is connected to the 15 pole SUB-D connector. (See figure 9-15 Position of the feed forward amplifier reset board)

This reset board is part of the feed forward amplifier. A new feed forward amplifier will be delivered with a premounted reset board.

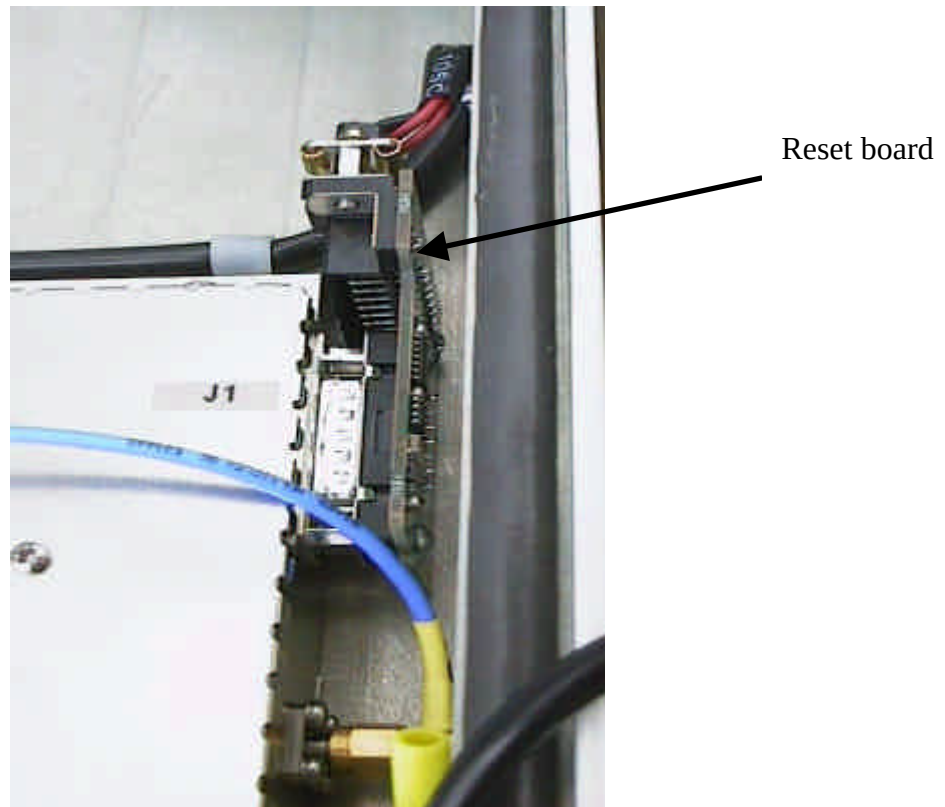


figure 9-15 Position of the feed forward amplifier reset board

Remove the ready made cable which is plugged to the 15 pole SUB-D connector of the reset board. Unscrew the screw clip first.

The SMA connectors can be removed only **after** dismounting the amplifier.

Position of the feed forward amplifiers are illustrated in figure 9-16 Position of feed forward amplifiers (4-channel Repeater)

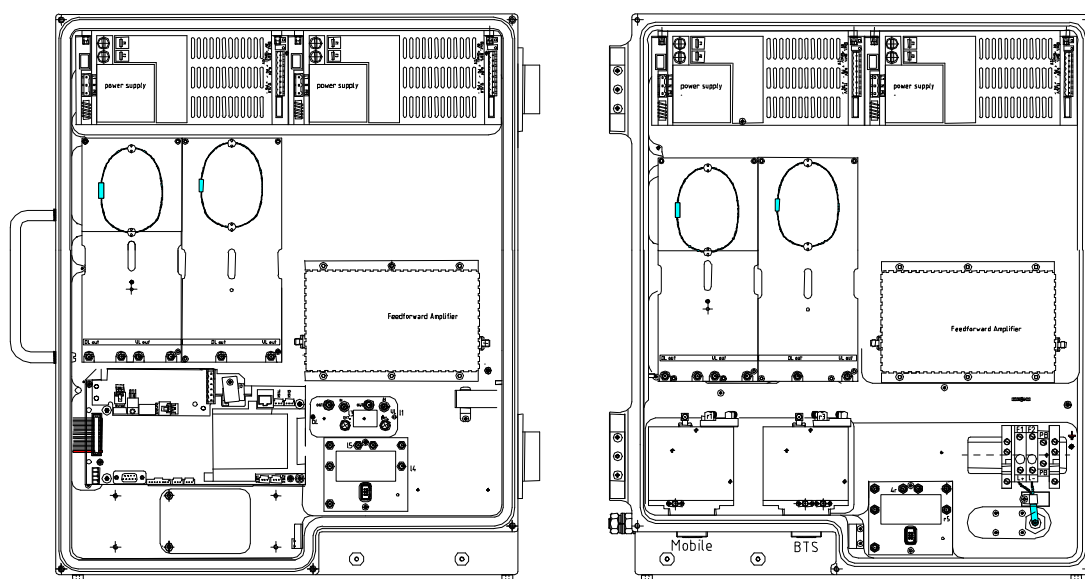


figure 9-16 Position of feed forward amplifiers (4-channel Repeater)

## 10 Spare parts list

The following list contains all parts available for the MR801B Power . The configuration of the delivered unit meets the requirements of the customer and can differ depending on the state of delivery.

| Designation                                         | Id.-No. |
|-----------------------------------------------------|---------|
| Assembly drawing                                    | 149952  |
| Assembly drawing RF - cable plan                    | 150563  |
| Mounting material                                   | 150521  |
| Basic Module TDMA                                   | 148712  |
| Extension Module TDMA                               | 148710  |
| Basic Module CDMA                                   | 148713  |
| Extension Module CDMA                               | 148709  |
| Basic Module var. BW                                | 148715  |
| Extension Mod. var. BW                              | 148944  |
| PCS-Duplexer DL Input 824.04 - 848.97 MHz *         | 148333  |
| PCS-Duplexer UL Input 824.04 - 848.97 MHz *         | 148334  |
| Feedforward Amplifier 824 - 849 MHz                 | 148629  |
| Feedforward Amplifier 869 - 894 MHz                 | 148630  |
| Power Supply 230 Vac $\pm 15\%$ 14 - 65 Hz Ger plug | 138305  |
| Power Supply 230 Vac $\pm 15\%$ 14 - 65 Hz UK plug  | 142832  |
| Power Supply 230 Vac $\pm 15\%$ 14 - 65 Hz no plug  | 144306  |
| Power Supply 24Vdc no plug                          | 145504  |
| Power Supply 185 - 320 Vac 40 - 65 Hz no plug       | 148812  |
| Power Supply 115 Vac $\pm 15\%$ 40 - 65 Hz USA plug | 141230  |
| Power Supply $\pm 42$ - $\pm 60$ Vdc no plug        | 144946  |
| Power Supply $\pm 80$ - $\pm 130$ Vdc no plug       | 145524  |
| SW MOB100 V1.10                                     | 143055  |
| Control Unit SM2009                                 | 143051  |
| SW REP1007 V1.12                                    | 145488  |
| SW REP1009 V1.04                                    | 147127  |
| Manual REP1007 V1.11                                | 145956  |
| Manual REP1009 V1.xx                                | 148964  |
| Dummy Battery Backup Module                         | 143750  |
| Battery Backup Module                               | 143052  |
| Sparepart Kit                                       | 146200  |
| Wall mounting Kit                                   | 146179  |
| Main Board 26V version                              | 149778  |
| Main Board 26V version                              | 149777  |
| Active Combiner DL 869 - 894 MHz                    | 148687  |
| Active Combiner UL 824 - 849 MHz                    | 148688  |
| Termination Resistor                                | 33167   |
| Ready-made cable AC                                 | 143606  |

|                                               |        |
|-----------------------------------------------|--------|
| Ready-made cable DC                           | 149648 |
| Ready-made cable DC female headers 6 contacts | 150753 |
| 4 External Alarms option Kit                  | 147710 |
| Adapter 7/16 male N female                    | 112425 |
| RF Gland / SMA to N                           | 150615 |
| Mother board                                  | 147024 |
| Manual for MR801B Power                       | 151111 |
| Assembly guide for modification kits          | 151045 |
| Modification Kit for one channel              | 149917 |
| Modification Kit for two channels             | 149918 |
| Modification Kit for three channels           | 150529 |
| Modification Kit for four channels            | 149920 |

\*: Duplexers are labeled referring to the UL frequency

table 10-1 Spare parts list

## 11 Appendix

### 11.1 Installation drawing of the Repeater

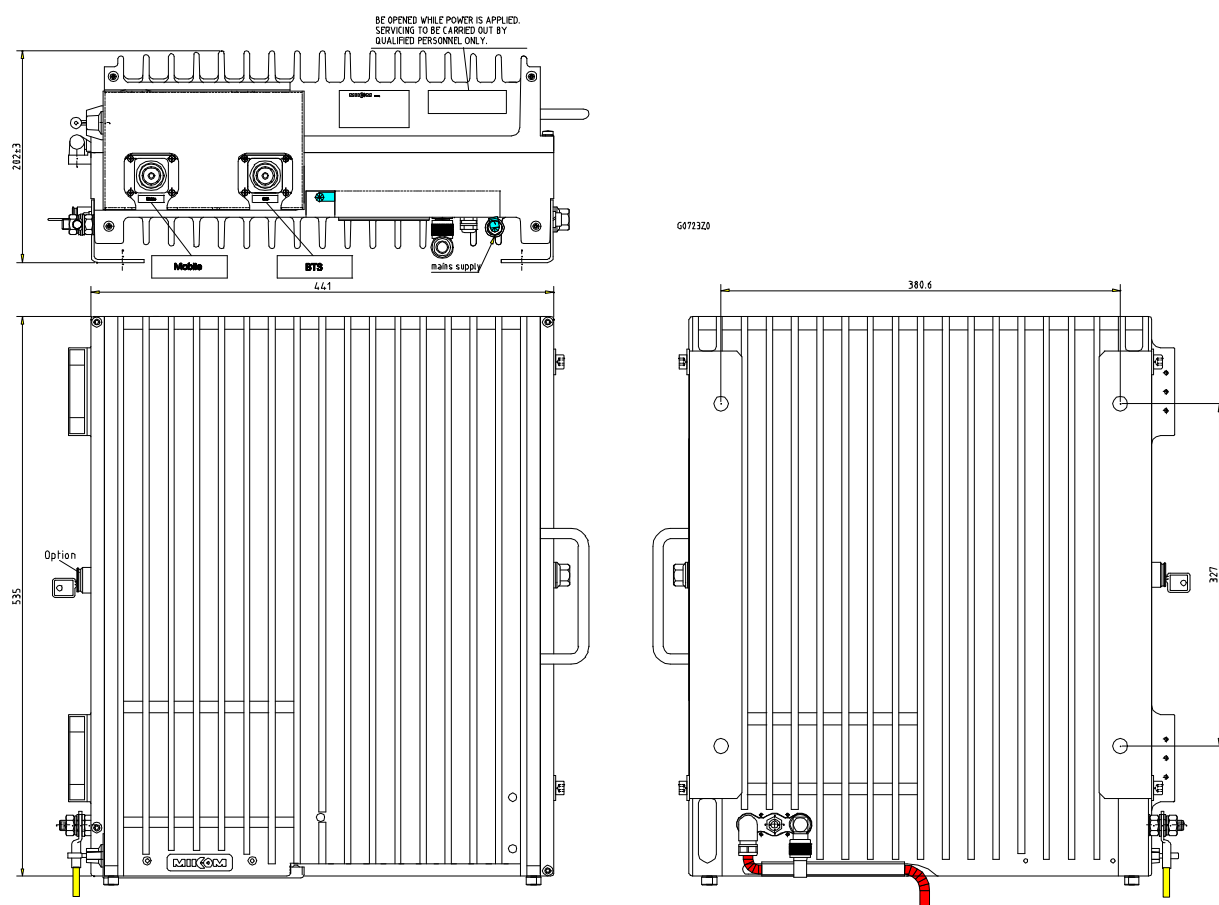


figure 11-1 Installation drawing of the Repeater

### ***11.2 Top view of the Repeater (left side , one channel configuration)***

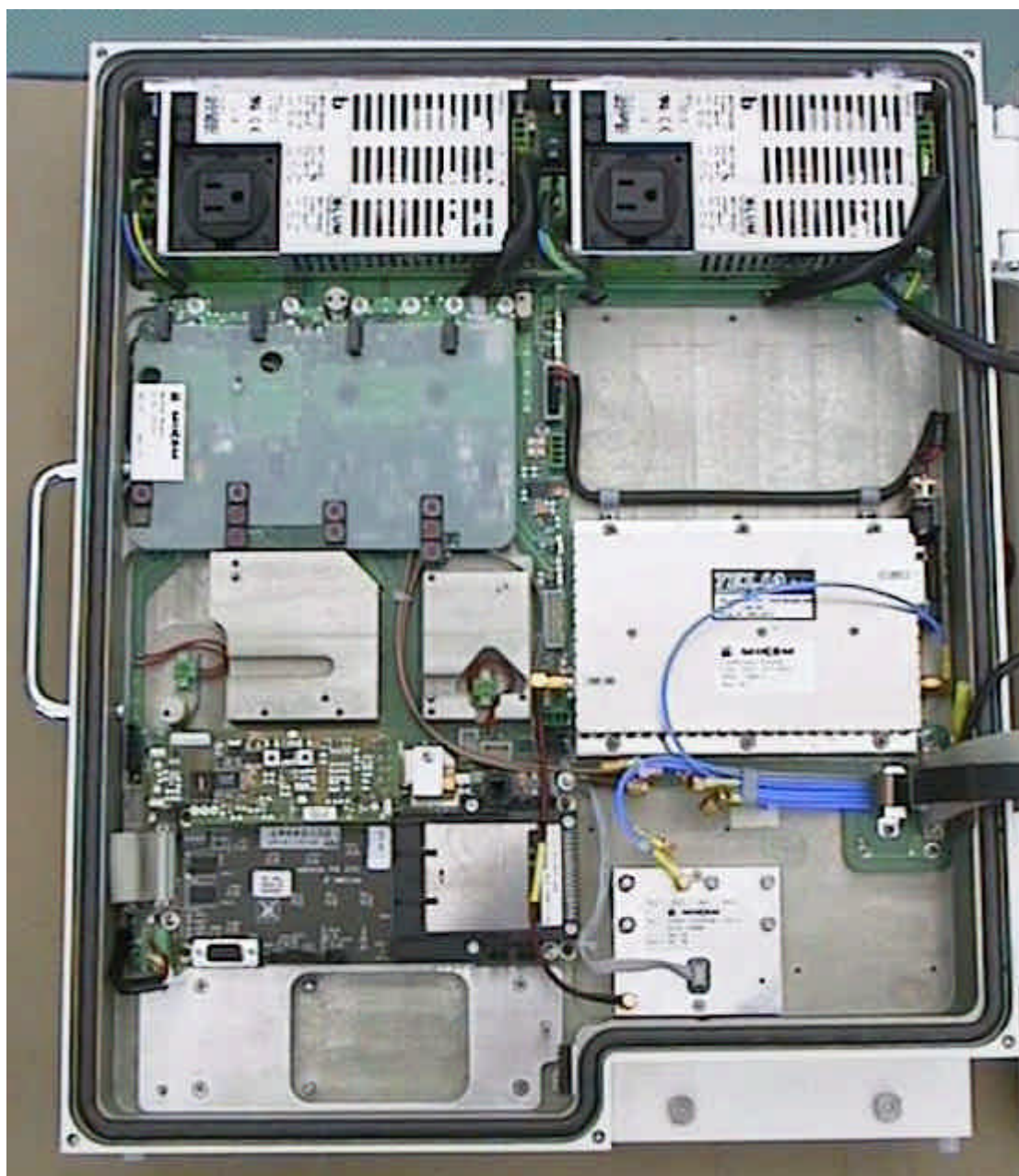


figure 11-2 Top view of the Repeater (left side, one channel configuration)

### ***11.3 Top view of the Repeater (right side, one channel configuration)***

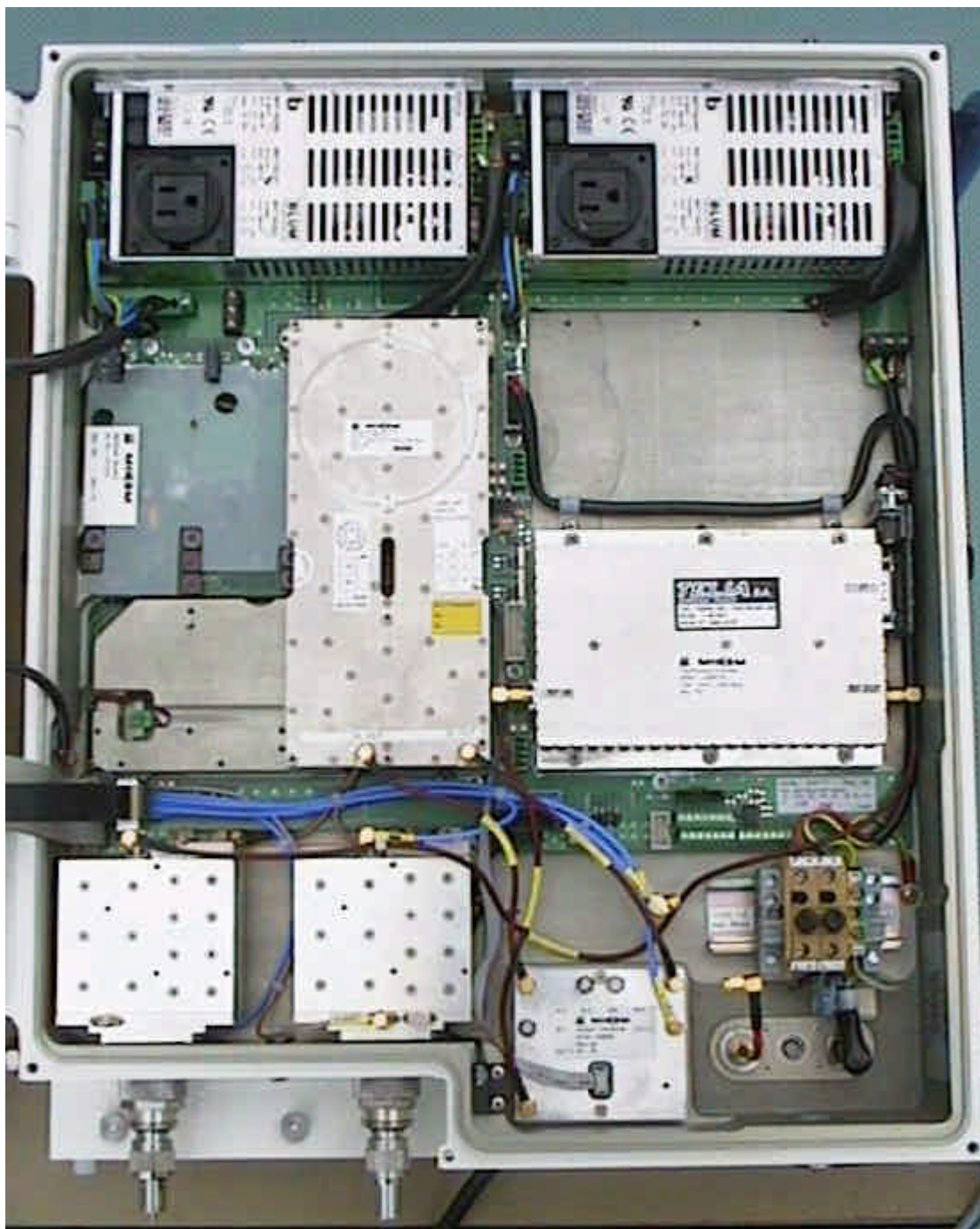


figure 11-3 Top view of the Repeater (right side, one channel configuration)

### 11.4 One channel configuration – cabling and block diagram

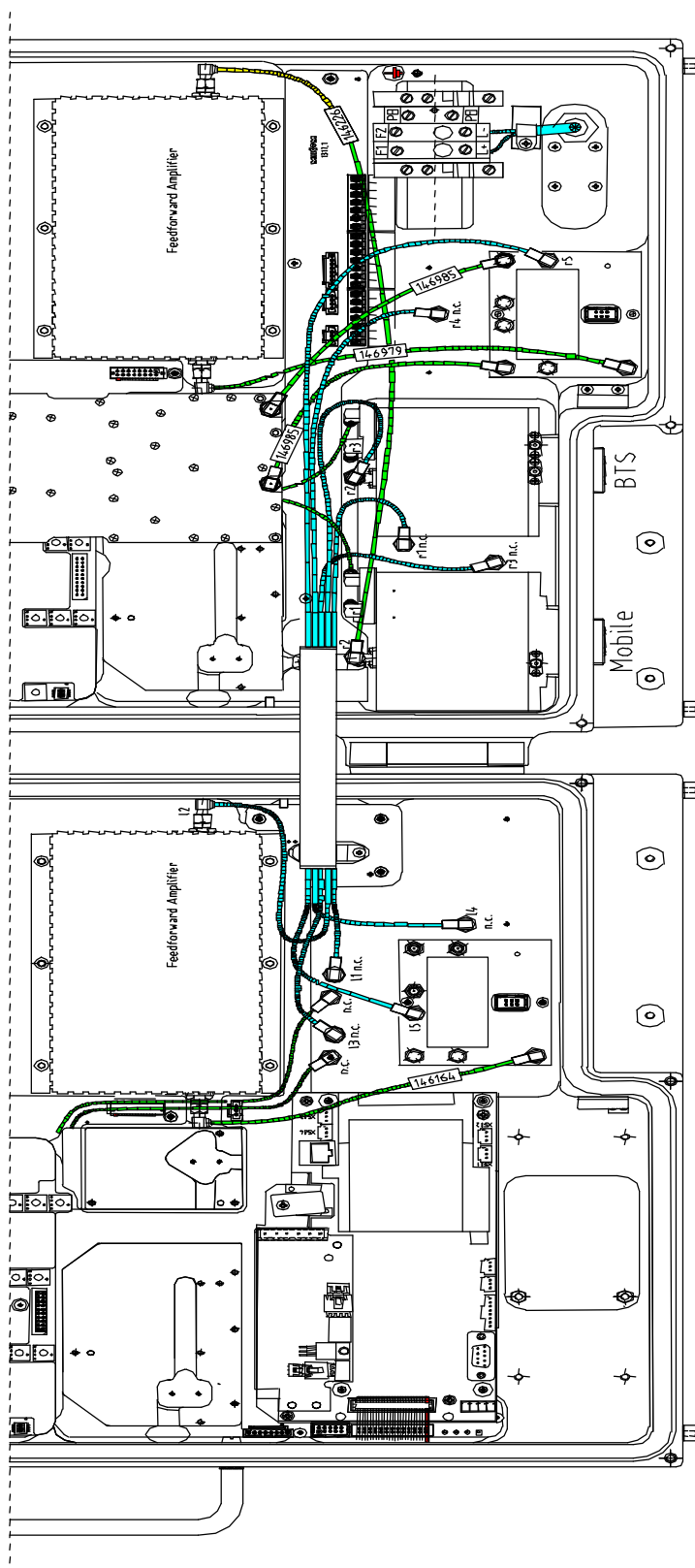


figure 11-4 Cabling of one channel Repeater

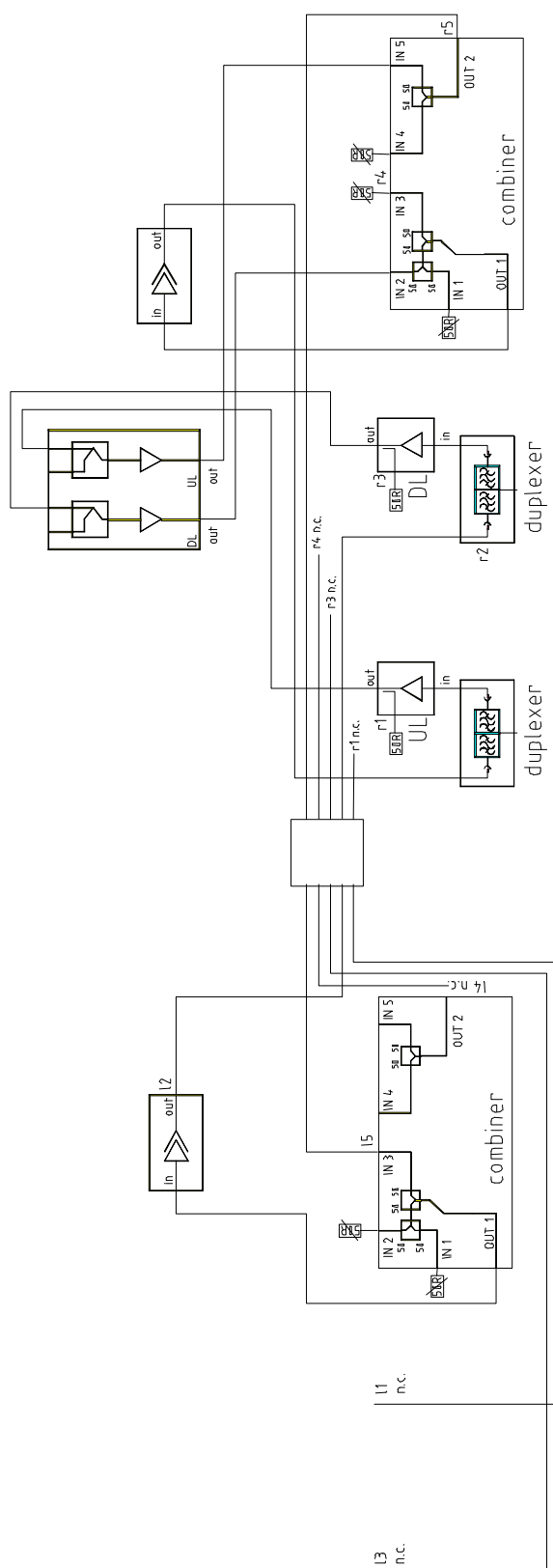


figure 11-5 Block diagram of one channel Repeater

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