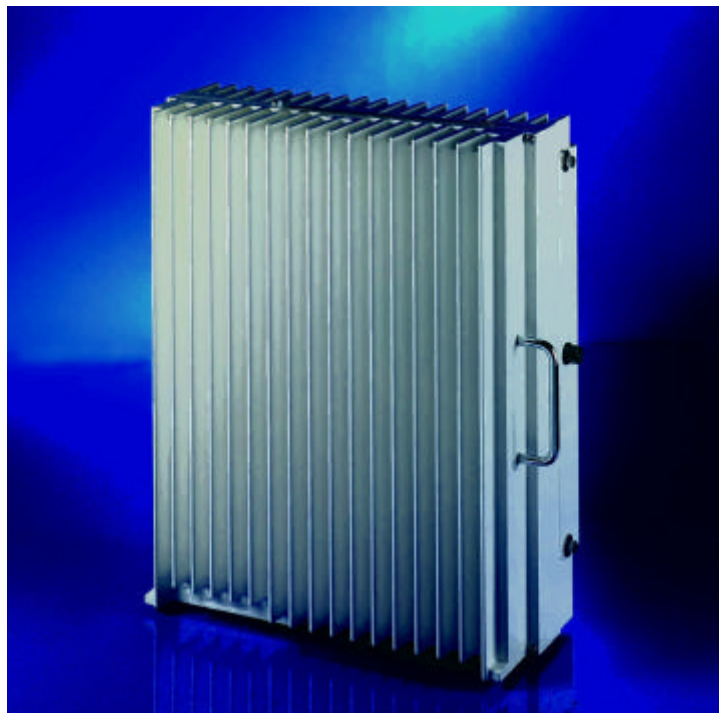


**User's manual for
band or channel selective Repeater
MRx01B Power**



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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
Id.-No.	Ident Number
I ² 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 ² C-Bus
SCL	Serial Clock Line of I ² C-Bus
UL	Uplink
UPS	Uninterruptable Power Supply
VSWR	Voltage Standing Wave Ratio

CONTENTS OF DELIVERY

Qty	1	Repeater MRx01B Power
Qty	1	User's manual for Repeater MRx01B Power
Qty	1	Software manual
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
Qty	1	Wall mounting kit

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

The MRx01B Power manual (Ordering number Id.-No. 151775) includes the following parts:

Chapter 1: Introduction
Chapter 2: Functional description
Chapter 3: Functions and features
Chapter 4: Optional equipment
Chapter 5: Installation
Chapter 6: Setting to work
Chapter 7: Trouble shooting
Chapter 8: Maintenance
Chapter 9: Appendices
Chapter 10: Index

Any intervention has to be performed by authorized persons only. If you need technical assistance with the Repeater MRx01B Power approach your local sales office or Mikom directly.

MIKOM GmbH Industriering 10 86675 Buchdorf Germany Tel: +49 (0) 9099 6 90 Fax: +49 (0) 9099 69 31 email: sales@mikom.com http://www.mikom.com
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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

Allen Telecom Inc. 30500 Bruce Industrial Parkway Cleveland, Ohio 44 139-3996 USA Phone: +1 (440) 349-8400 FAX: +1 (440) 349-8407	Allen Telecom Pty Ltd 6 Stuart Street Padstow NSW 2211 Australia Phone: +61 (2) 9774-4200 FAX: +61 (2) 9774-4500	Forem France Z.I. des Ebisoires 78370 Plaisir France Phone: +33 (1) 30-79-15-30 FAX: +33 (1) 30-55-55-37
FOREM S.p.A. Via Archimede N. 22/24 20041, Agrate Brianza Milan Italy Phone: +39 (039) 605-41 FAX: +39 (039) 605-4477	AT Singapore 80 Marine Parade Road #19-1 Parkway Parade Singapore 449269 Phone: +65 (345) 8022 FAX: +65 (345) 8033	AT China CITIC Building, # 11-04 19 Jianguomenwai Avenue Beijing China 100004 Phone: +86 (10) 6508-3088 FAX: +86 (10) 6508-3066
AT Canada 1815 Ironstone Manor, # 12 Pickering, Ontario L1W 3W9 Canada Phone: +1 (905) 839-3474 FAX: +1 (905) 839-4663	FOREM UK Unit D Castle Industrial Park Pear Tree Lane Newbury, Berkshire U.K. RG 14 2EZ Phone: +44 (1635) 569-695 FAX: +44 (1635) 569-463	AT Hong Kong 1603 Remington Center, 23 Hung To road, Kwun Tong, Kowloon Hong Kong Phone: +852 (2389) 1844 FAX: +852 (2389) 4864
AT India B-256 Ground Floor. Chittaranjan Park New Delhi 110019 Phone: +91 (11) 696-3918 FAX: +91 (11) 652-1648	MIKOM Switzerland Tiergartenweg 1 4710 Balzthal Switzerland Phone: +41 (6238) 61260 FAX: +41 (6238) 61261	MIKOM Austria Himbergerstr. 7/3/1 2320Schwechat Austria Phone: +43 (1) 706 - 3999 FAX: +43 (1) 706 - 39999

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 MRx01B Power*

This repeater bi-directionally amplifies signals between multiple mobiles and a single base station in the 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 frequency band.

MRx01B 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 AMPS800 bands are available. When different modules are combined a common antenna and control interface are available.

The MRx01B 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.

1.3 *Modular design*

The MRx01B repeater's modular design provides the flexibility in addressing present and future system needs. Each repeater is custom configured. The main unit includes equipment common to all systems (cabinet, control module, power supply, mother board). To this main unit hardware modules are added as needed. In addition to different duplexers, a wide range of conversion modules can be selected depending on the used network system.

1.4 Applications

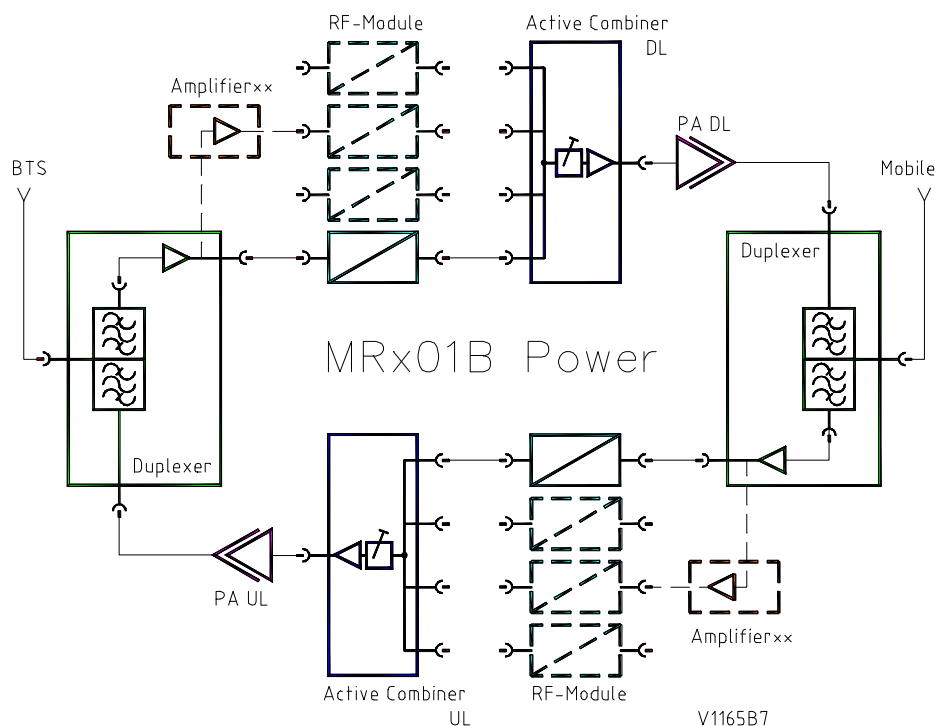
The ability to customise the equipment in this way makes it possible to target the MRx01B to specific needs. For example, the following are some of the application options available with the MRx01B.

- Channel selective or band selective
- CDMA or TDMA
- iDEN and analog networks
- GSM900 or GSM1800
- PCS1900

2 Functional description

The Repeater MRx01B Power can be equipped from one to four bands or channels depending on the used technology.

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



*: one physical module contains UL and DL

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

figure 2-1 Block diagram of MRx01B 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 a conversion module (see chapter 2.2). Then the signals are combined by the active combiner (see chapter 2.6) and afterwards amplified by the feedforward amplifier (see chapter 2.8), which provides the required output power.

In the feedforward 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 antenna.

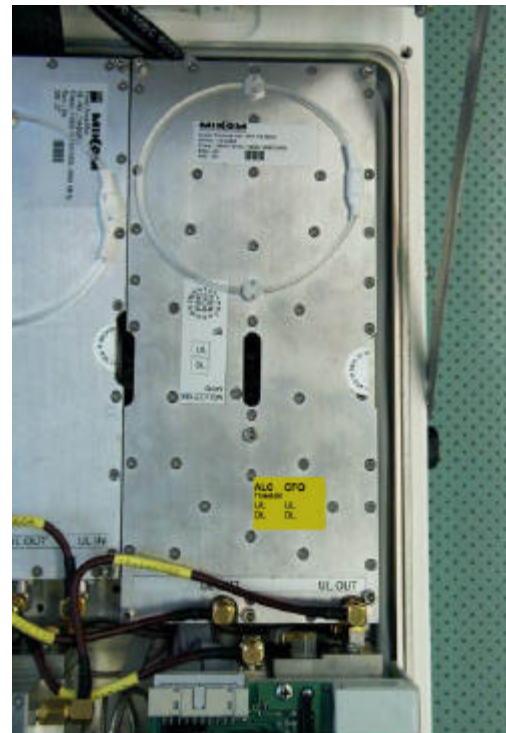
2.2 Conversion modules

The task of the conversion 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 I²C-Bus. In case of a breakdown in mains, gain or frequency data are non-volatile stored in an EEPROM on board.

The yellow label on the top shows the current ALC and CFO values related to the module.

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



B0018A1B

figure 2-2 Top view of a conversion module

2.3 Mother board

The function of the mother board is the communication between the conversion modules and the control module via the I²C-Bus.

In the three and four channel configuration there is a mother board implemented on the left-hand side and on the right-hand side of the Repeater.

In the one and two channel configuration of the Repeater there is only one mother board mounted on the right-hand side (see figure 9-2 and figure 9-3).

Mother boards are located underneath the conversion modules.

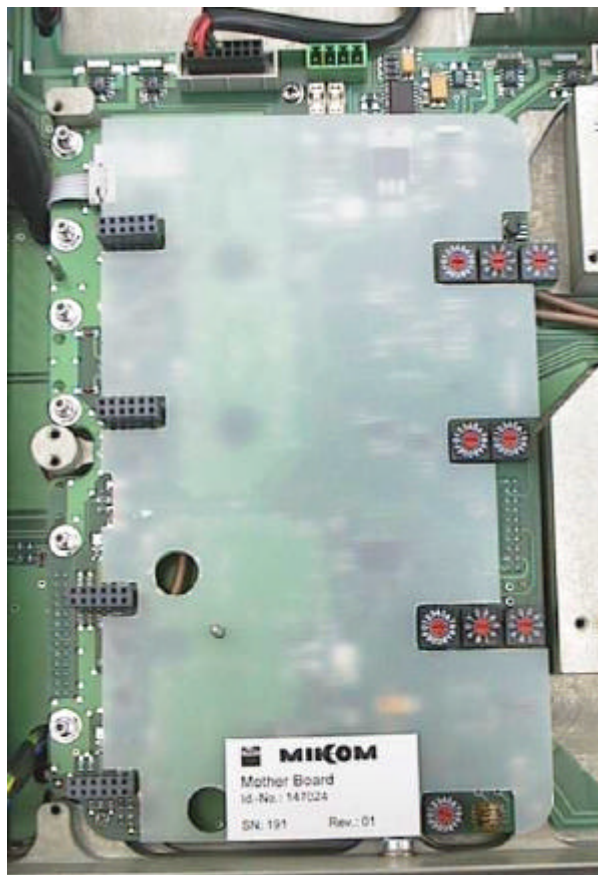


figure 2-3 Top view of a mother board

2.4 Control module SM 2009 (Rev. 07 and higher)

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 by the operator.

The data transfer between the control module SM 2009 and the mother board is realized by the I²C-Bus system.

The I²C-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. The MRx01B Power I²C-Bus concept is working with a bit rate of 1.5 kbit/s.

All MRx01B Power configuration parameters are stored in an EEPROM on the control module if a power supply failure occurs.

Functional description:

- Second RS-232 port (Not working yet, do not use it) (01)
- Configurable for MR or MOR (Master Unit) by DIP-Switches (02)
- External alarms or PSTN modem selection by DIP-Switches
(= replacement of the external alarm cable) (03)
- 8 additional TTL inputs (opto-coupled)) (04) (Not supported by software)
- 8 additional TTL outputs (O.C. or VCC by 1K-pull-up resistor) (05) (Not supported by software)
- Connector for external temperature sensor (06) (Not supported by software)
- Integrated Battery Backup Dummy Board incl. M1 Reset (Id.-No. 143750).
The switch is required to activate the battery backup. If a battery backup module is used,
the switch must be set to 'BBU' position, otherwise there is no backup possible (07).
- Soldering point for the PC/MODEM-switch in a Master Unit (08)
- Reset jumper (09)
- Fixed location for labels for control module ID (Mikom), repeater software (Mikom),
board serial number, modem-driver licence (10)
- RS232 interface for the connection of a PC or terminal (local mode) (11).

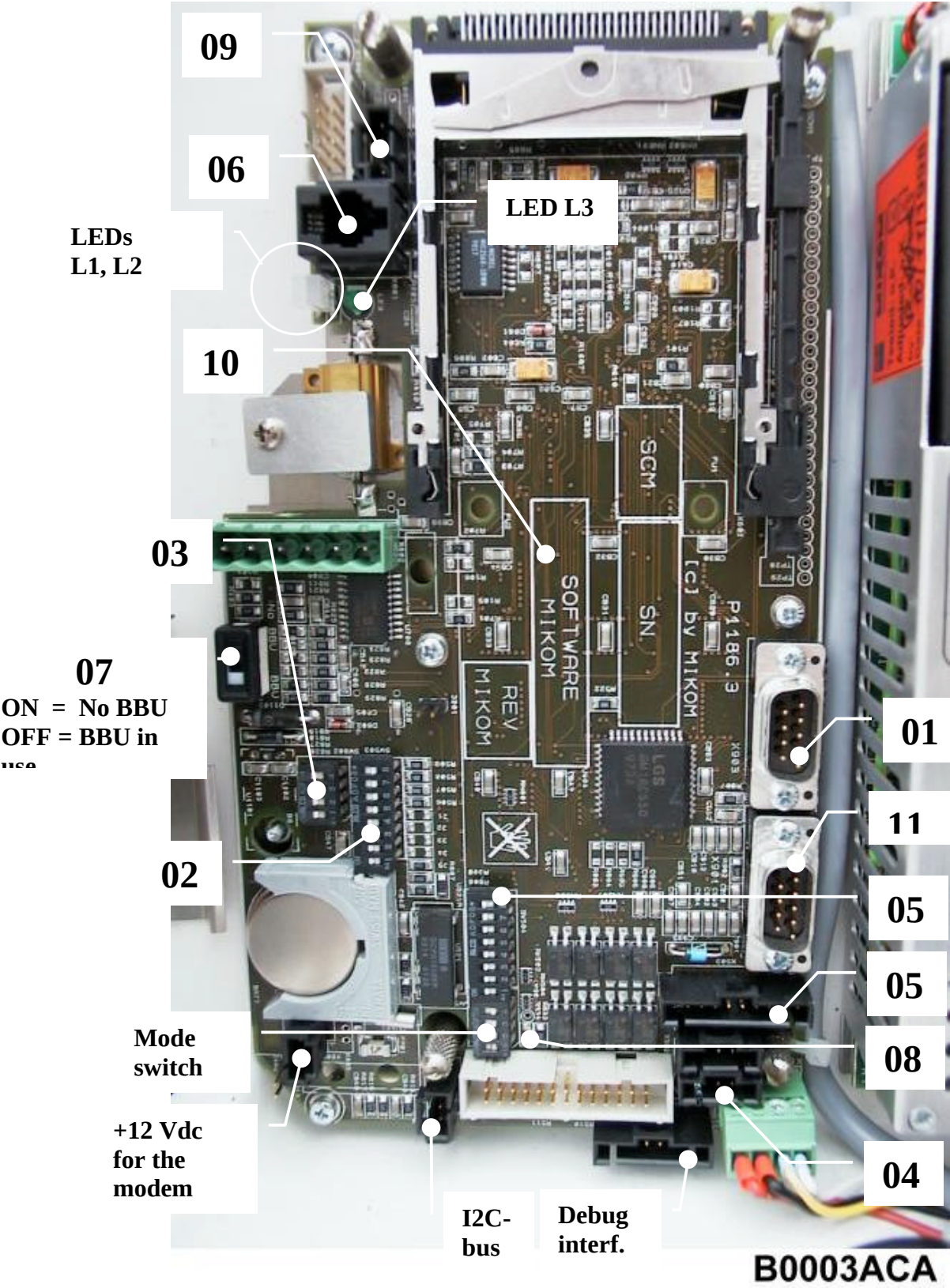
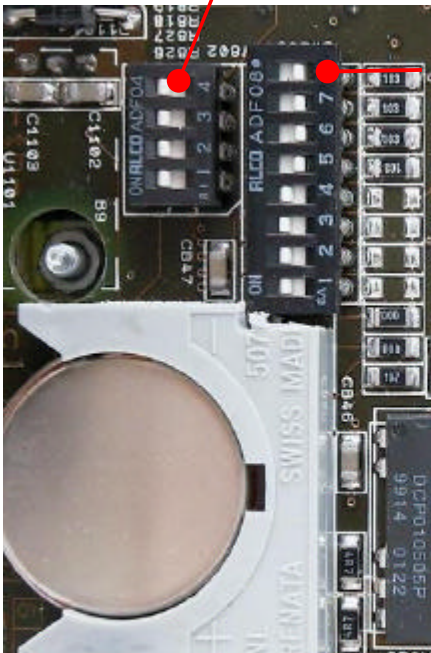


figure 2-4 Configuration of the control module (Rev.07 and higher)

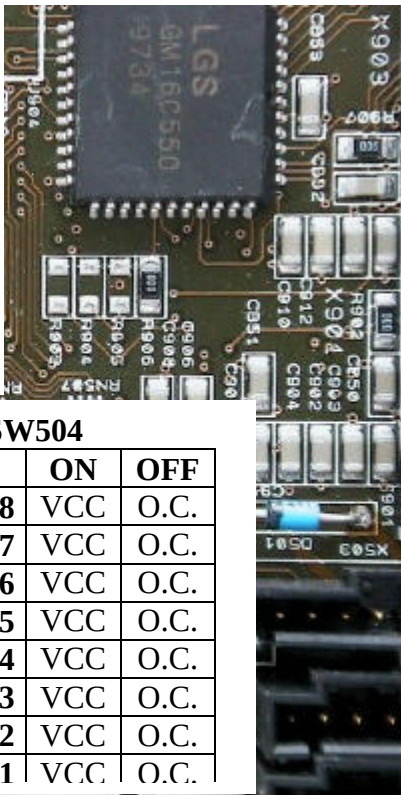
SW802

	ON	OFF
4	Ext. Alarm 1	PSTN (a)
3	Ext. Alarm 2	PSTN (b)
2	Ext. Alarm 3	PSTN (c)
1	Ext. Alarm 4	PSTN (d)



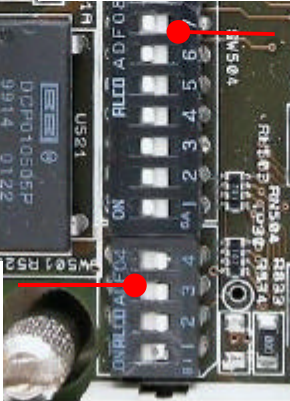
SW503

	ON	OFF
8	MOR	MR
7	MOR	MR
6	MOR	MR
5	MOR	MR
4	MR	MOR
3	MR	MOR
2	MR	MOR
1	MR	MOR



SW501

	ON	OFF
4	SW Download	---
3	---	---
2	Modem mode	Local mode
1	Manual mode	SW mode



SW504

	ON	OFF
8	VCC	O.C.
7	VCC	O.C.
6	VCC	O.C.
5	VCC	O.C.
4	VCC	O.C.
3	VCC	O.C.
2	VCC	O.C.
1	VCC	O.C.

B0003ADA

DIP-Switches are at position OFF

figure 2-5 Configuration of the DIP-Switches

2.5 Duplexer

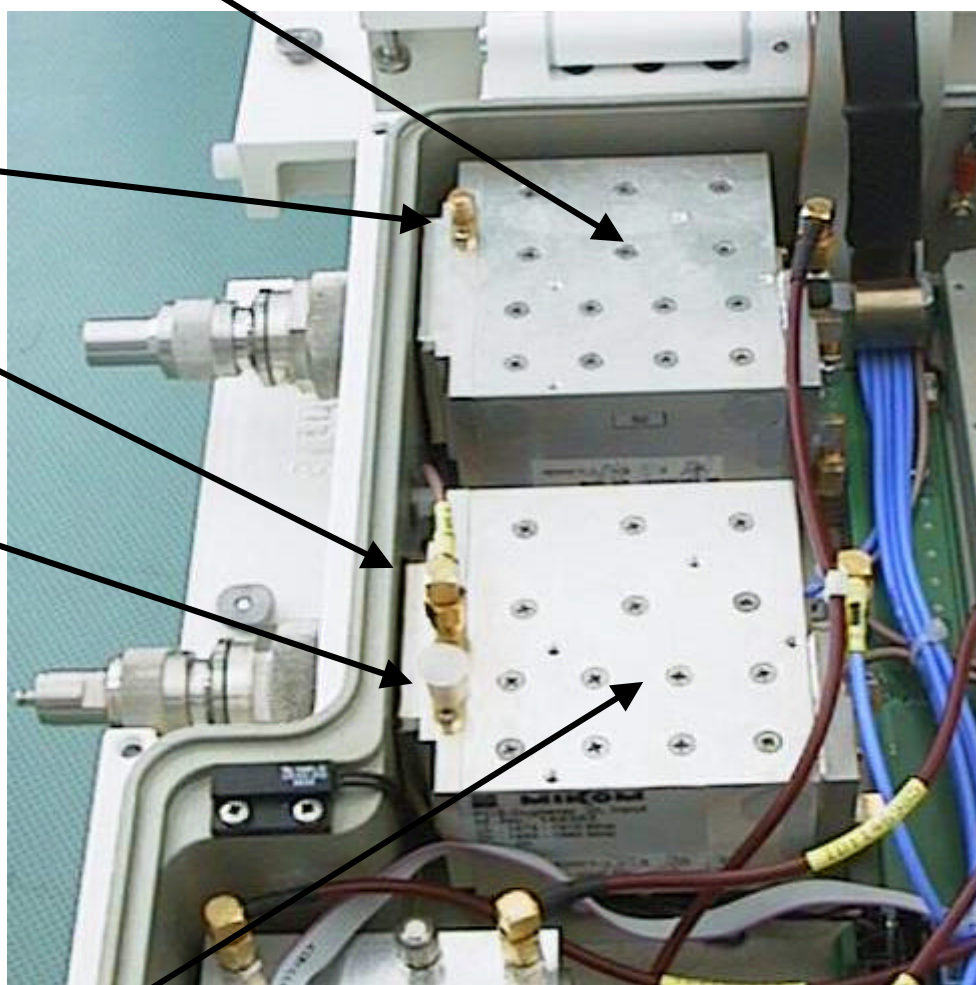
The task of the duplexer is to isolate uplink from downlink, i.e. isolate transmit path from receive path. The pass bandwidth of the duplexer is the entire width of the uplink band and the downlink band.

Duplexer with connector to mobile side

30 dB
coupler

20 dB
coupler

30 dB
coupler



Duplexer with connector to BTS side

figure 2-6 Top view of the duplexers

2.6 Active combiner

After passing through the conversion 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 feedforward amplifier.

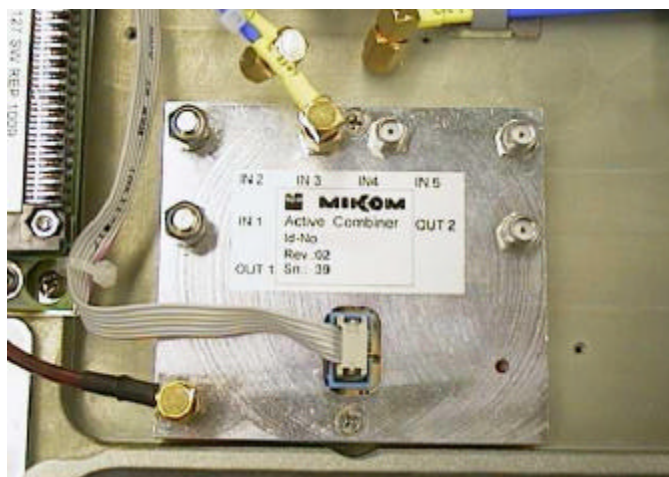


figure 2-7 Top view of the active combiner module

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 2-6 Top view of the duplexers.

2.8 Feedforward amplifier

The feedforward amplifier is the final stage which enables high output power as well as a high ICP3. One amplifier has to be installed for the uplink and one for the downlink.

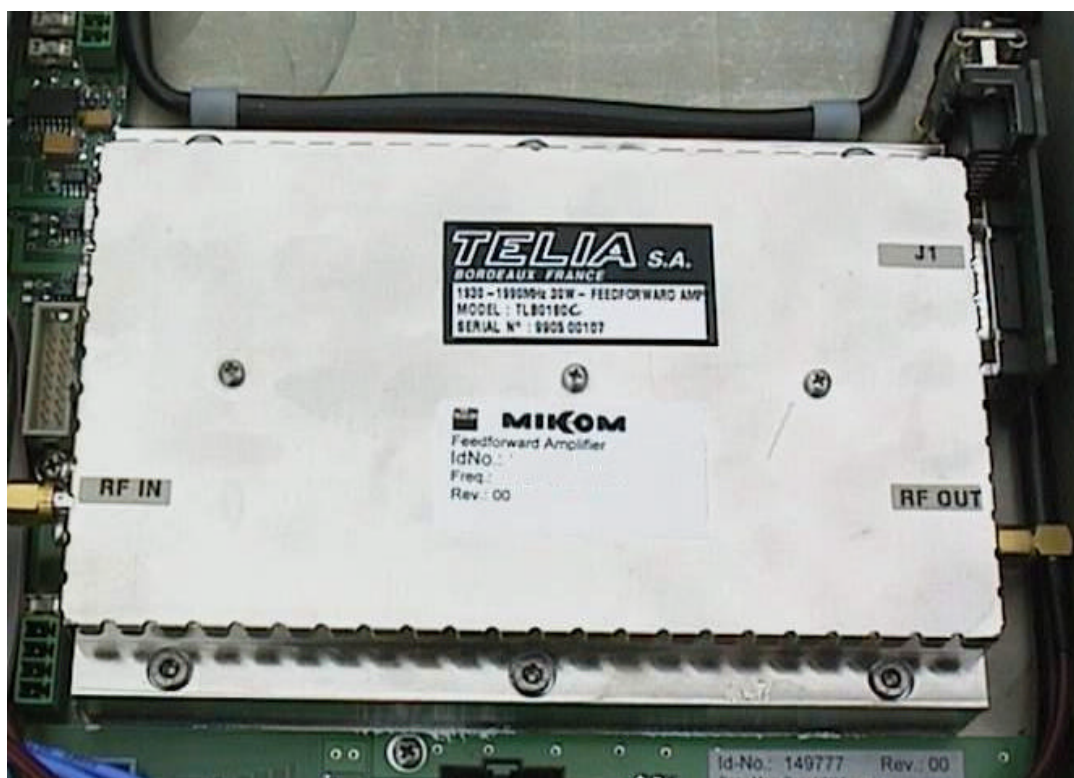


figure 2-8 Top view of the feedforward amplifier

2.9 Power supply

For the MRx01B Power 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 MRx01B Power cabinet.

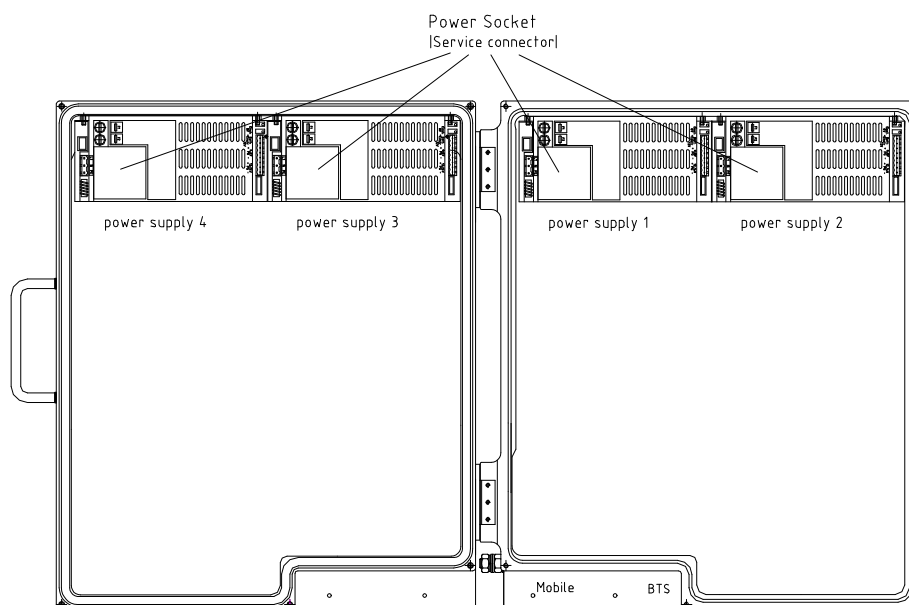


figure 2-9 Mounting position of power supplies

Power supplies can be 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.

Note: The service connector must not be used for anything else but service devices with low power consumption, e.g. a Laptop.

See figure 2-10 ON / OFF position of external switch.

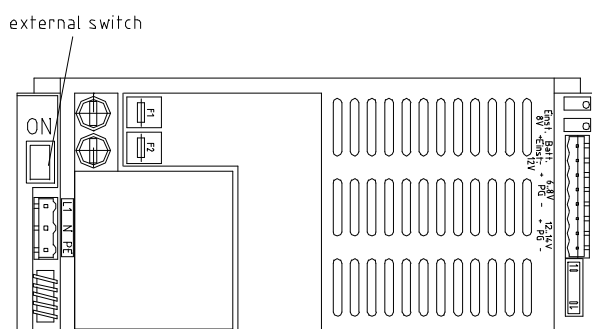


figure 2-10 ON / OFF position of external switch

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 and should not be changed.

STYLEREFSEQARABIC**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 conversion modules (see figure 3-1 Position of rotary switches). They can be adjusted easily by means of a small screwdriver.

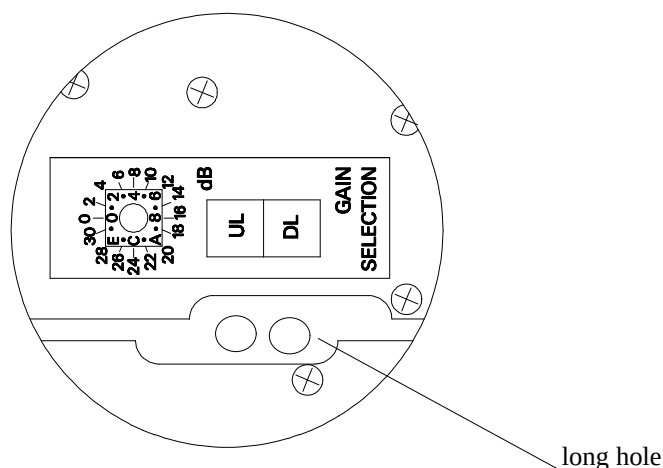


figure 3-1 Position of rotary switches

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 6.2, 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.

 **Note:** **The ALC protects the feedforward 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 CFO

Each conversion module has got a different offset of the set center frequency. This offset is compensated by software settings (see software manuals). These settings are already factory set and should only be changed when necessary. The CFO (center frequency offset) is noted on the label on top of the conversion module.

3.5 BITE and alarms

The Built-In Test concept comprises the monitoring of the power supplies, the operational currents in the conversion 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.

For the position of the LEDs on the control module see figure 2-4 Configuration of the control module (Rev.07 and higher).

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

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 or temperature

(...) Optional alarms

table 3-2 List of all available alarms

3.5.1 Handling of alarms

As soon as the software recognises a valid alarm, a message is transmitted to the OMC.

If the repeater is operating in **modem mode** the alarm message 'MIKOM> REPEATER REQUIRES OPERATOR ATTENTION' will be sent via modem to the terminal or the OMC. 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. Default setting is 10 minutes. The repetition cycle can be set by software.

The alarm check routine is searching every 10 seconds for alarms (polling principal). To decide whether an alarm is a valid alarm it must remain for 5 polling cycles, only then it will be recognized and entered in the alarm history. As soon as the alarm is valid the contacts of the alarm relay at the mother board are set. Additionally two summary error LEDs are set to red light to indicate an alarm. These LEDs are mounted on the control module (see figure2-4).

The entry in the alarm history describes the alarm type, the time and the date when it occurred. It is not possible to locate the defect module, only the reason.

Entered alarms in the alarm list can be acknowledged by simply ringing back and typing a software command. It is also possible to acknowledge alarms in local mode. Acknowledged alarms will be indicated with '-ACK'. As soon as the alarms have been acknowledged the alarm relay will be reset and the summary LEDs switch back to green light again. To switch off external alarm indication devices can only be done by acknowledging the alarms.

If the same alarm cause occurs again, it will be entered in the alarm list (not acknowledged) after 5 polling cycles. An already acknowledged alarm must have an interruption of at least 5 polling cycles to be detected by the software as a new alarm. Only then the alarm will be entered again in the alarm history (not acknowledged).

All data of the alarm history are lost, if the repeater will be booted by software or if the repeater was disconnected from mains. There exists no command to delete the alarm history, to boot the repeater is the only way to clear the alarm history.

The alarm list has a capacity of about 50 alarm entries. If more alarms occur the oldest message will be deleted first (FIFO principal).

In the software exists no alarm clear message, i.e., the repeater sends no message to the terminal or the OMC if an alarm has disappeared by itself.

3.5.2 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.

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.

3.5.3 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-hand side of the Repeater).

The electrical connection has to be as follows:

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

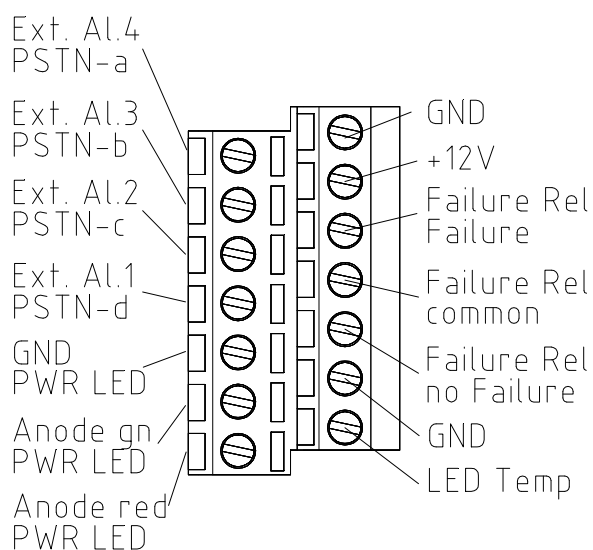


figure 4-1 Clamps for external alarms

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 an 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

If the optional external alarms are part of the delivery, they will be switched on by a software release, i.e. they are distributed via the software.

4.3 Modem

The Repeater can be equipped with a modem for the remote control of the repeater. This allows the operator to change settings and query information of the Repeater remotely.

See figure 4-2 for the optional modem kit. This kit is available with and without modem.

For information referring to the optional modem see chapter 4.4 and chapter 6.2.4.

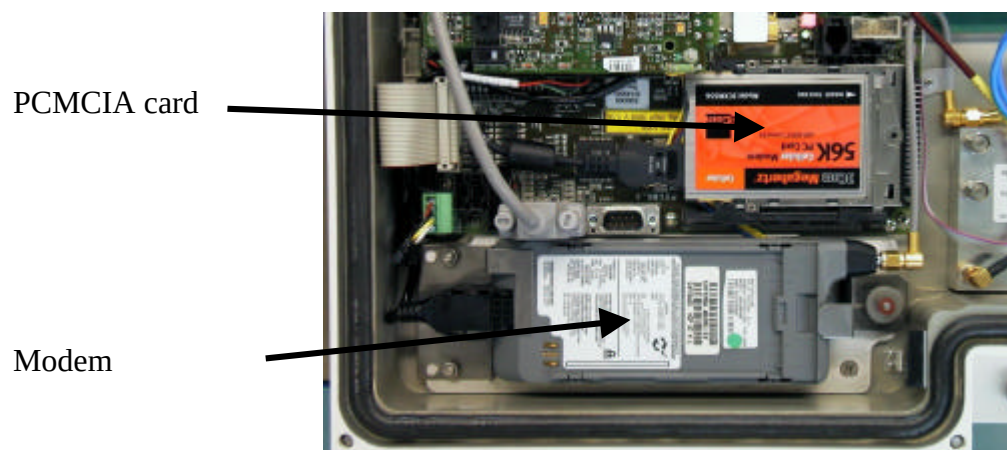


figure 4-2 Modem kit

4.4 External RF output

An external output is available at the outside of the housing as an option. This enables e.g. the connection of an integrated modem or mobile to an additional external antenna or it might be used for UL diversity. The connector type is N female.

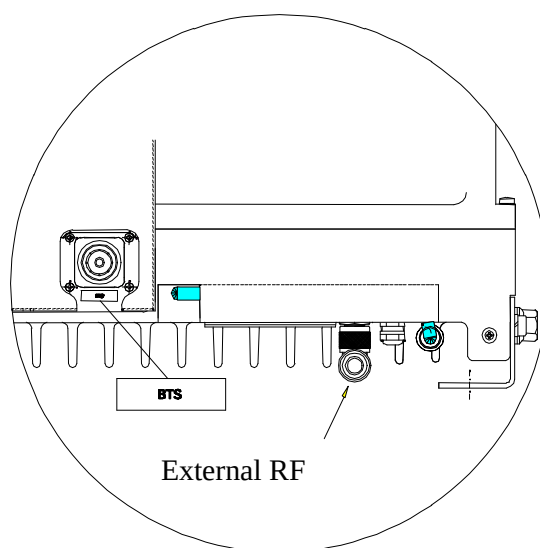


figure 4-3 Position of external RF output

4.5 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).

Batteries

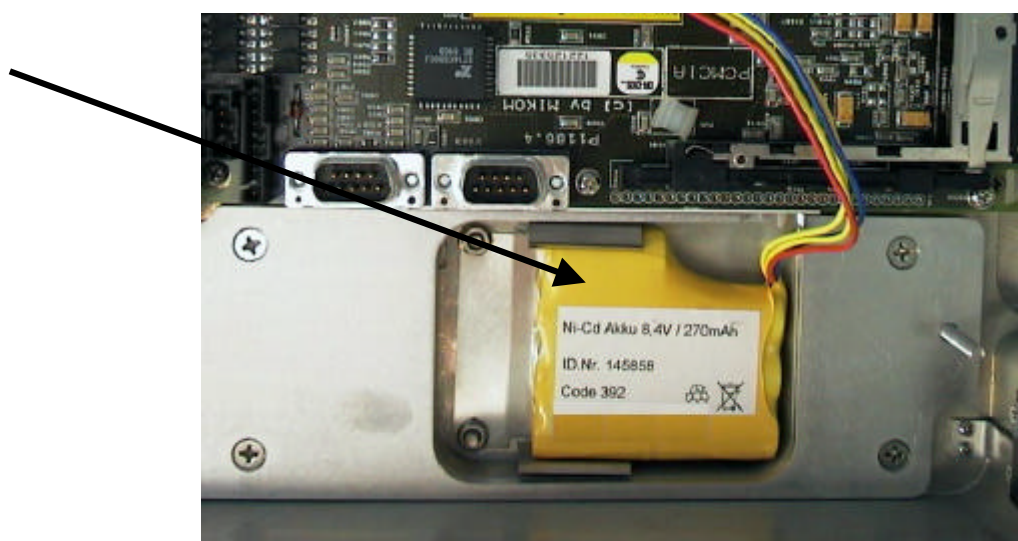


figure 4-4 Mounting position of batteries

5 Installation

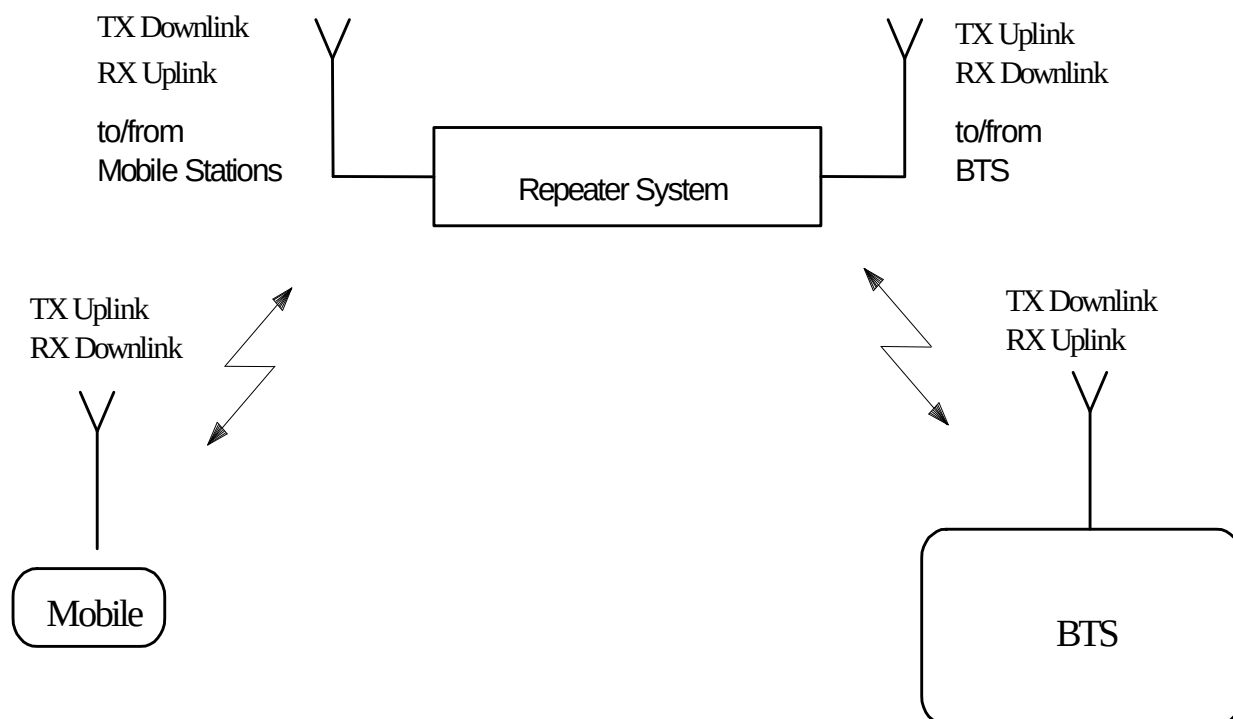


figure 5-1 System description

5.1 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.

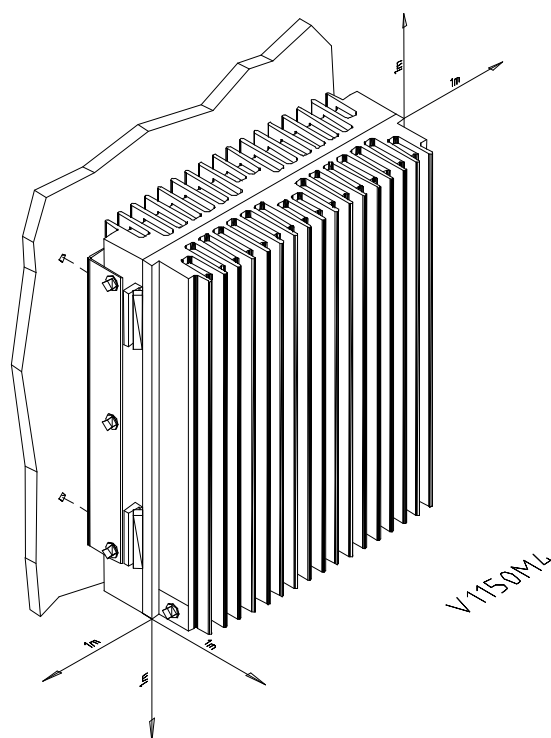


figure 5-2 Top view and clearance distance

Note: The weight of the MRx01B 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.

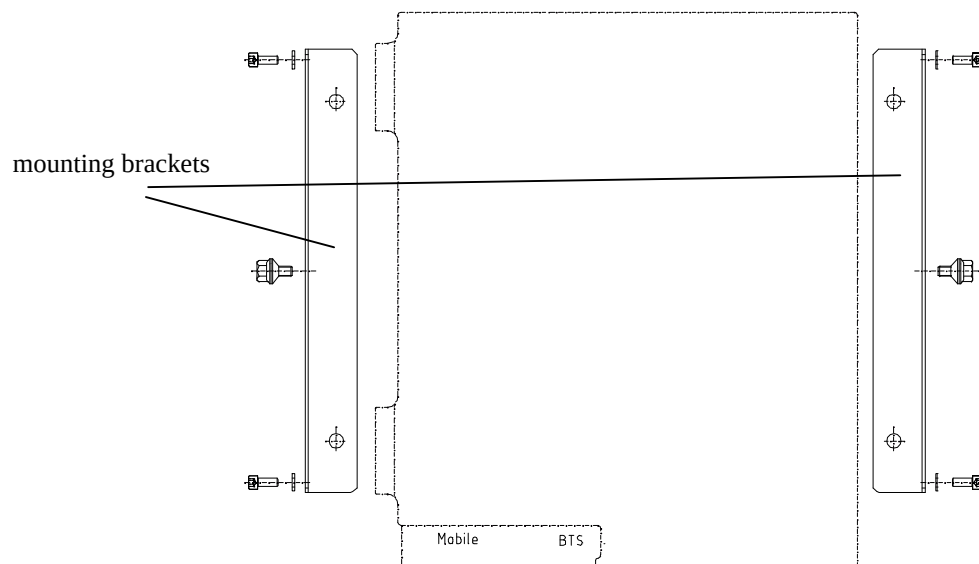


figure 5-3 Wall mounting brackets

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 9-1 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, on top and below the unit.

See figure 5-2 Top view and clearance distance.

5.2 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

5.2.1 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 5-4 Grounding kit.

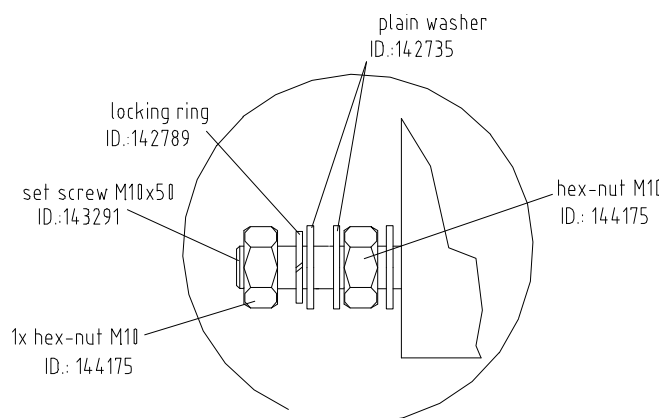


figure 5-4 Grounding kit

5.2.2 Power connection

A firmly installed mains cable 3 x 1.5 mm² 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 5-5 Screw terminal for the position of the two 8 A fuses.

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 mm². 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.

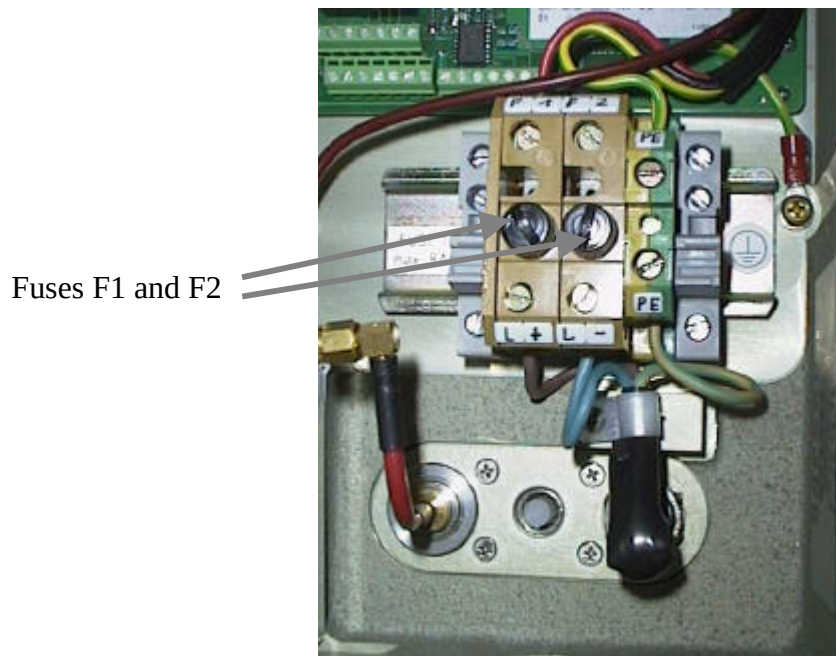


figure 5-5 Screw terminal

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

5.2.3 Connection of the antenna cables

The Repeater has two female antenna connectors 7/16 (optionally N). 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.

There are two 7/16 female antenna connectors at the outside of the housing accessible on the connector panel (see following figure).

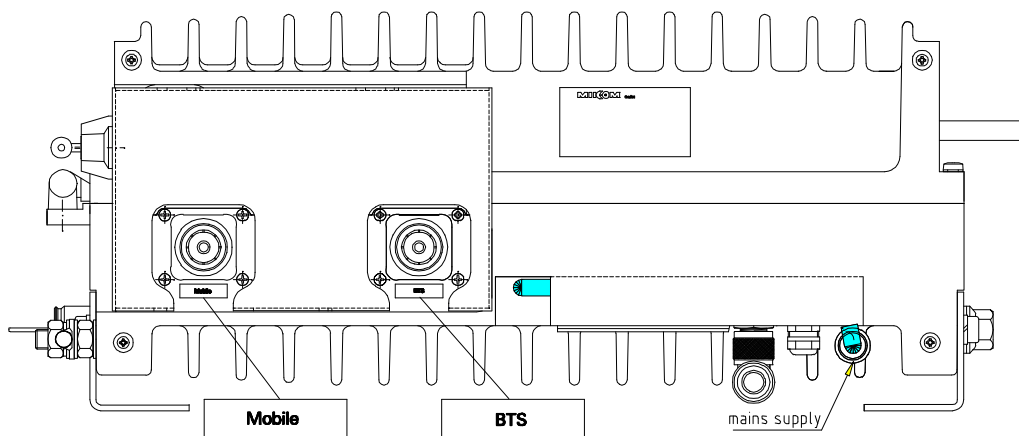


figure 5-6 Connector panel layout

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

Mobile

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

BTS

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

6 Setting to work

6.1 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 conversion 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, Software boot starts
	Flashes red short time		Flashes red short time		Software boot starts
					Software is running

table 6-1 LED indication

6.2 Setting of operational parameters

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

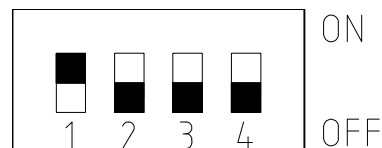
There are three different possibilities to set the operational parameters:

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

6.2.1 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 conversion 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.

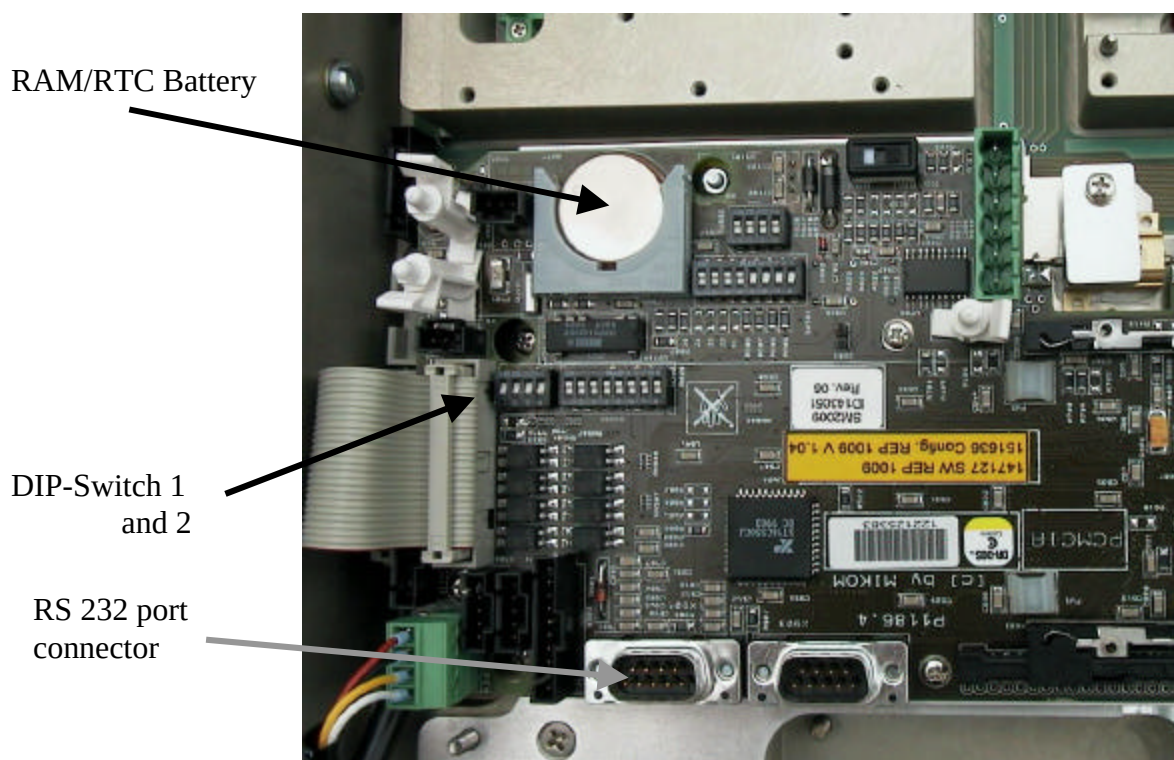


figure 6-2 Position of the DIP-Switch 1 and 2 and RAM/RTC battery

6.2.2 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 conversion modules (see figure 6-3 Position of the rotary switches). They can be adjusted easily by means of a small screwdriver.

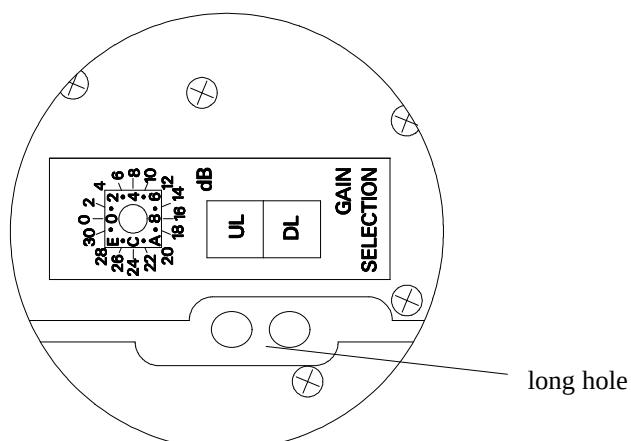


figure 6-3 Position of the rotary switches

A label on the conversion module, located next to the rotary switch, illustrates the usage of the rotary switch.

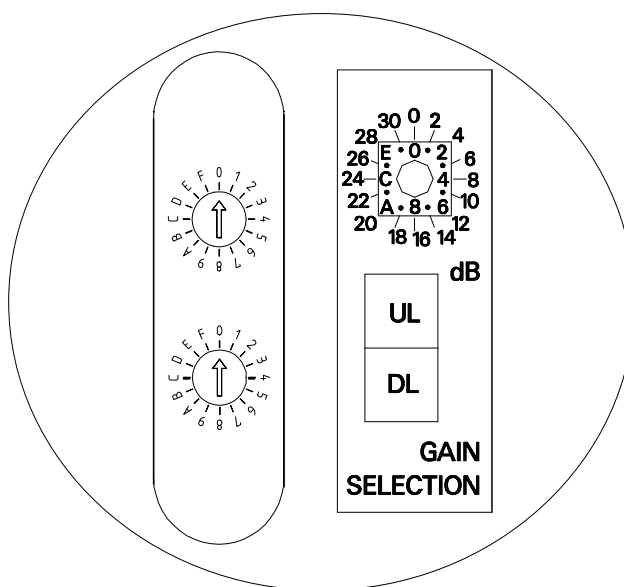


figure 6-4 Rotary switches and label

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

DIP-Switch configuration:

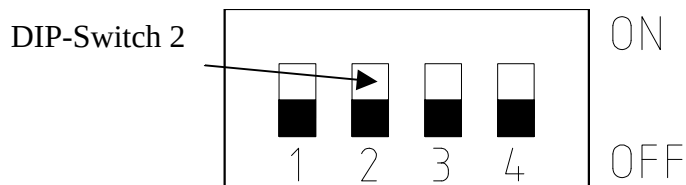
DIP-Switch	ON	OFF (default values)
1	manual	auto
2	remote mode	local mode
3	n.c.	n.c.
4	software download manually controlled	software download controlled by software

table 6-5 DIP-switch configuration

6.2.3 Settings via personal computer as terminal

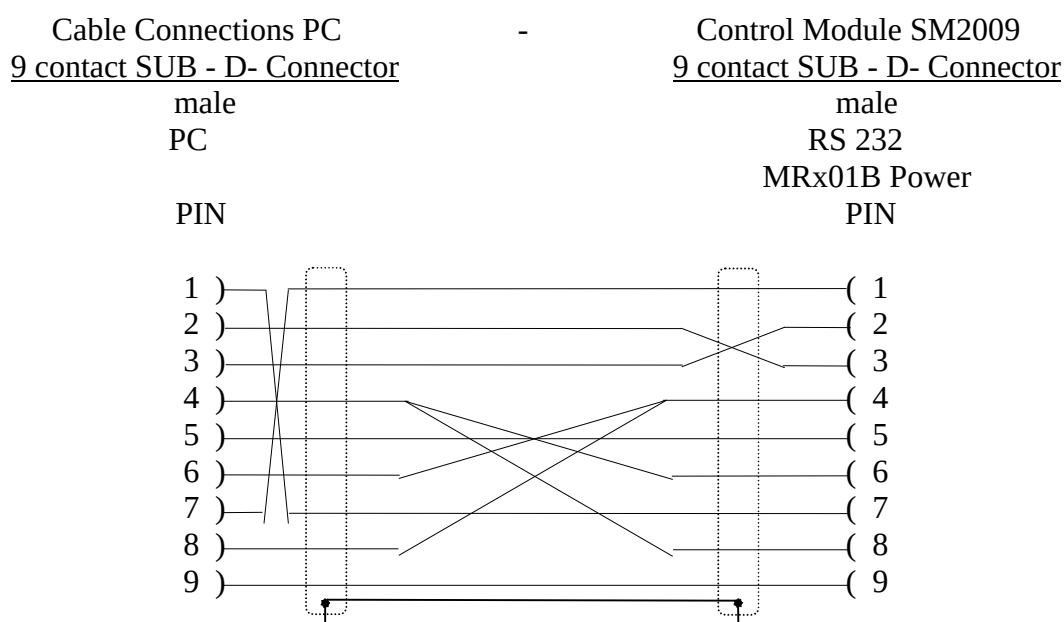
Instead of manually setting operational parameters via rotary switches it is also possible to use the functions of the control module. The local mode for settings via PC has to be set. Therefore the DIP-Switch 2 has to be at position OFF.

See figure 6-2 for position of DIP switch 2



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.

See figure 6-2 for position of the RS 232 connector.



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.

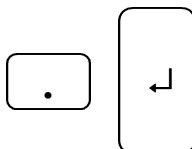
 **Note:** **Settings on the Repeater can be performed after the following procedure only.**

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

MIKOM REPEATER MRx01B Power - 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.**

6.2.4 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 6-6 List of AT commands

7 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'll find a detailed description in the software manual.)

7.1 Error indication

= LED on

- = LED off

Internal LED L1		Internal LED L2		Internal LED L3	Cause
green	red	green	red	green	
-	-	-	-	-	No power. Check presence of power at the input; replace fuse according to chapter 8.3, check battery backup module
					Indicates a summary failure

7.2 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 3-2 List of all available alarms

7.3 Power supply

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

7.4 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
 - CFO
- If an ALC or AMPBIAS alarm occurs during installation or commissioning an user error might be the cause, due to wrong measurements.

8 Maintenance

8.1 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.

 **Note:** **Defect parts should be replaced by original parts from MIKOM only.**
 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.

8.2 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 5-5 Screw terminal for position of the 8A fuses.

8.3 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. (see following figure)

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

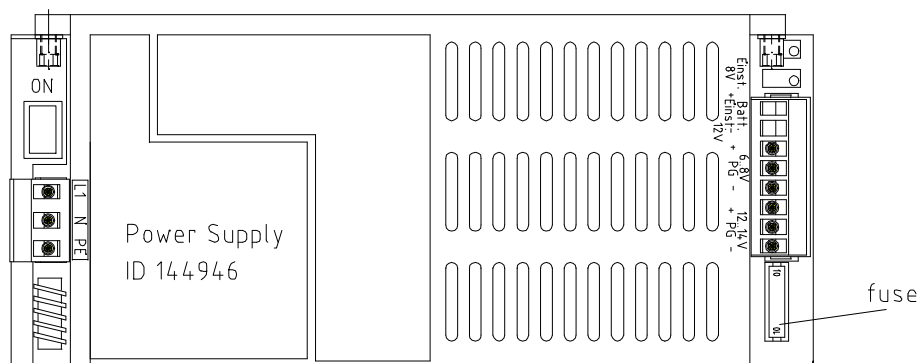


figure 8-1 Position of power supply fuse

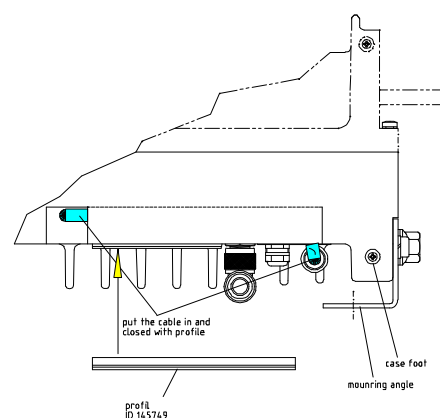
8.4 Replacement of the mains cable

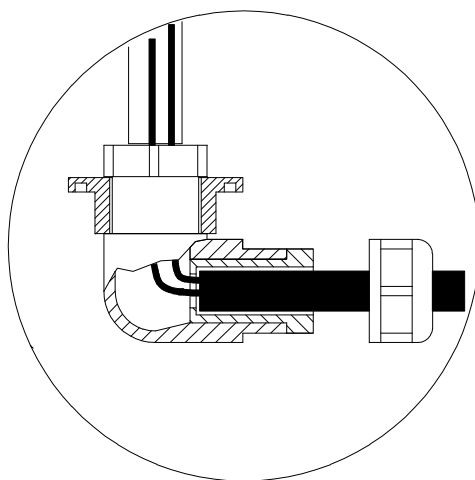
The Repeater will be delivered with a firmly connected mains cable.

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.

8.5 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 on the control module.

REIf the optional battery backup module and the optional mobile kit are installed, the battery backup board and the modem-reset board, which are plugged into the control module have to be removed first.

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.

For position of the RAM/RTC battery see figure 6-2

EMBED

 **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

8.6 Replacement of the 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 feedforward amplifier by loosening the SMA connectors. Use a torque wrench. Then remove the semi-rigid cables from the conversion 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.

Unscrew the four counter sunk screws M3 at the connector panel of the Repeater. See figure 5-6 Connector panel layout.

For mounting the duplexers proceed in reverse order.

The cables have to be connected like shown in figure 9-4 Cabling of one channel Repeater.

8.7 Replacement of conversion modules

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

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

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

Socket head cap screw

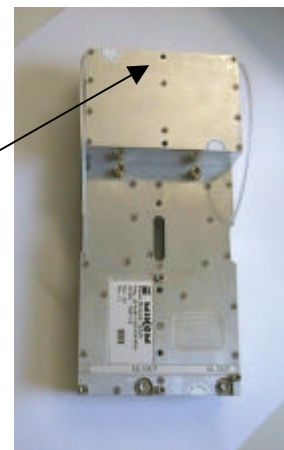


figure 8-2 External filter at iDEN module

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 and take off the modules.

Socket head cap screws

Mounting strap *

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



figure 8-3 Top view of a conversion module

*: iDEN modules are equipped with mounting straps on the left and on the right side.

For the exchange of a conversion module or the installation of a new conversion 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

Hex-coded rotary switch for UL

Hex-coded rotary switch for DL

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

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

table 8-5 Address of synthesizer

Conversion modules with variable bandwidth have four rotary switches. The synthesizer address must be set like shown in the following table:

	Filter 1		Filter 2	
	UL	DL	UL	DL
Channel one	0	1	0	1
Channel two	2	3	2	3
Channel three	4	5	4	5
Channel four	6	7	6	7

table 8-6 Address of synthesizer, conversion modules with variable bandwidth

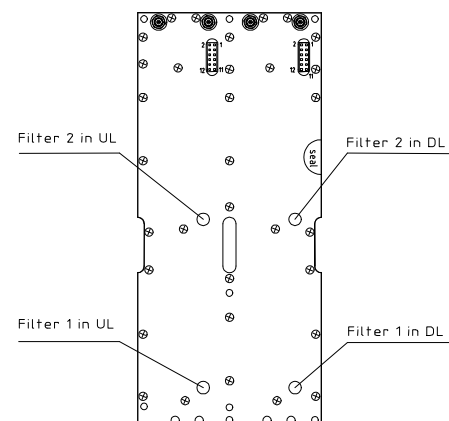


figure 8-7 Position of hex-coded rotary switches at variable bandwidth module

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

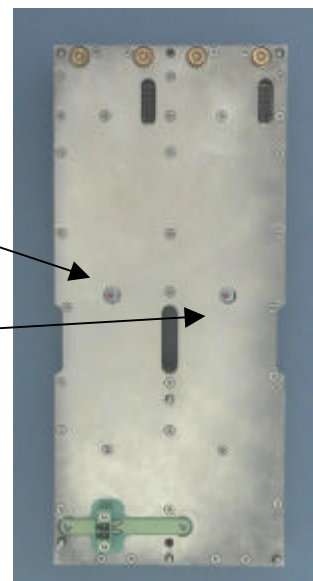


figure 8-4 Position of hex-coded rotary switches

8.8 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 Tyrap which is fixed to the control module.

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

Dismount the battery backup board, if the battery backup module is installed.

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 REFthe following figure.

Control module

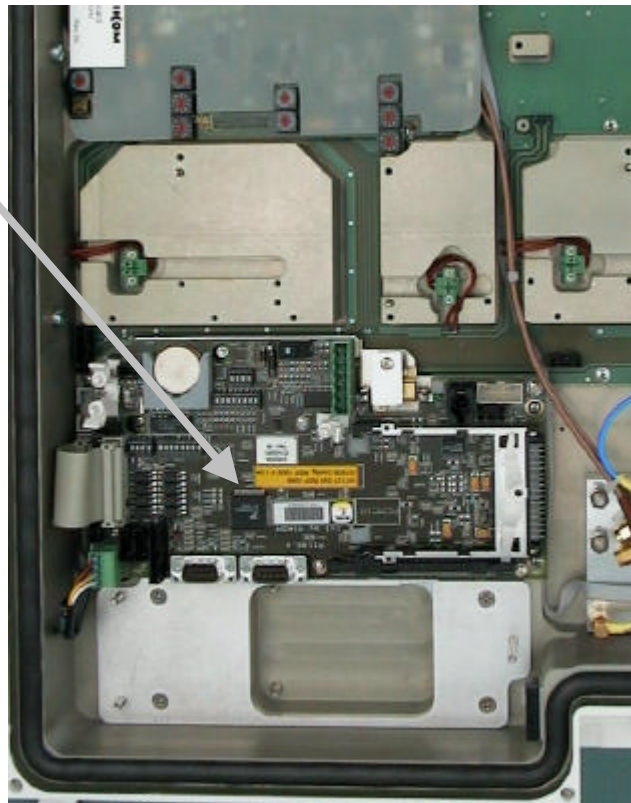


figure 8-8 Position of control module

8.9 Replacement of power supplies

Note: Ensure that mains are disconnected.

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.

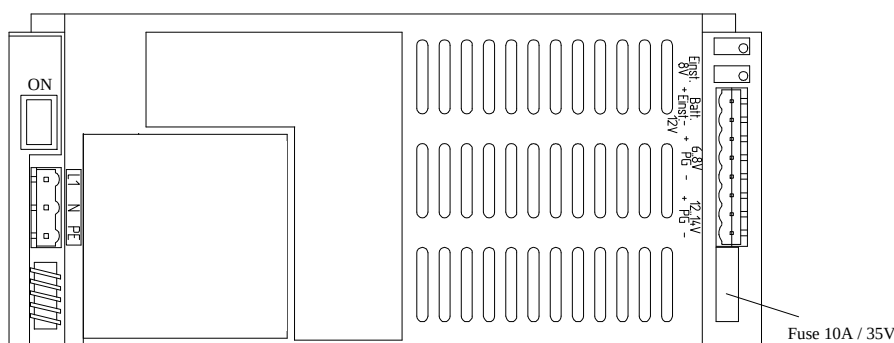


figure 8-9 Power supply

The power supply is fixed to the Repeater housing by means of two special nuts M4. After loosen 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.

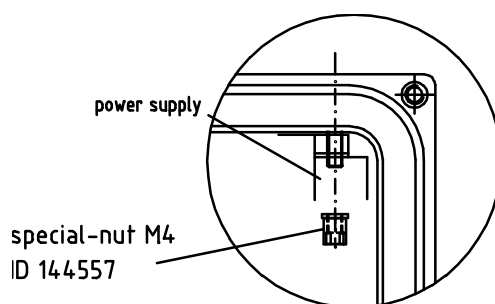


figure 8-10 Position of special-nut M4

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.

8.10 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.

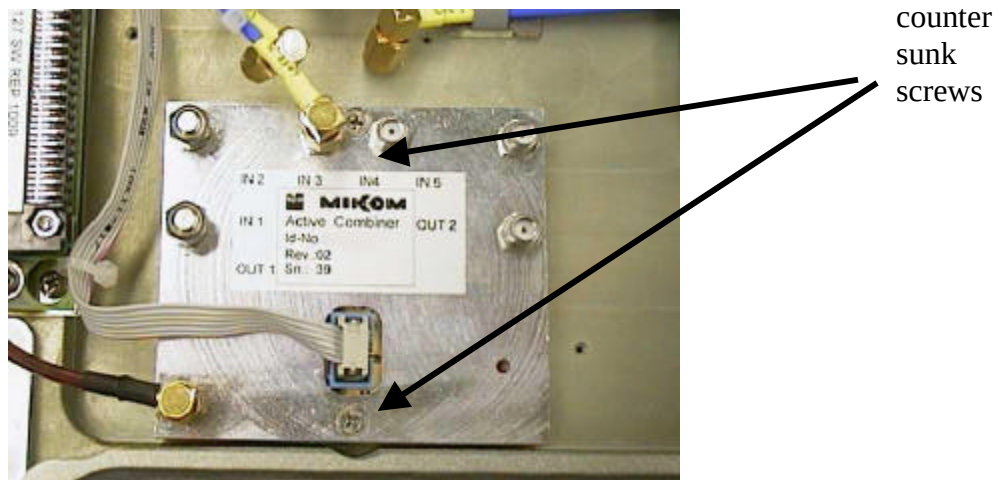


figure 8-11 Position of counter sunk screws on active combiner

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

8.11 Replacement of feedforward amplifier

There is one feedforward amplifier mounted on each side of the Repeater.

A special reset board is connected to the 15 pole SUB-D connector. (See figure 8-12 Position of feedforward amplifier reset board)

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

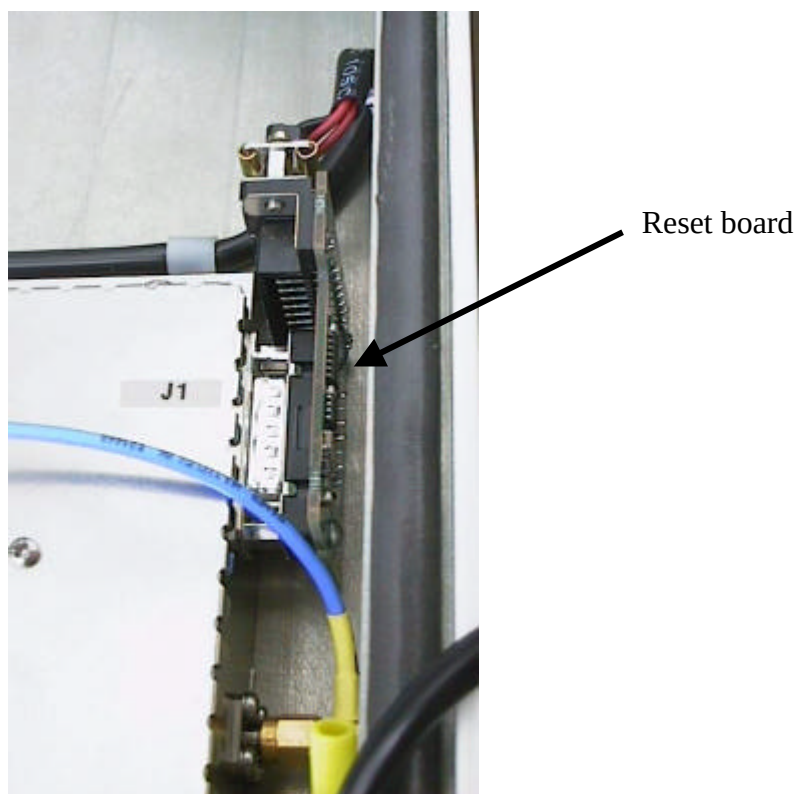


figure 8-12 Position of feedforward amplifier reset board

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

Unscrew the 6 socket head cap screws.

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

The position of the feedforward amplifiers is illustrated in figure 8-13 Position of feedforward amplifiers.

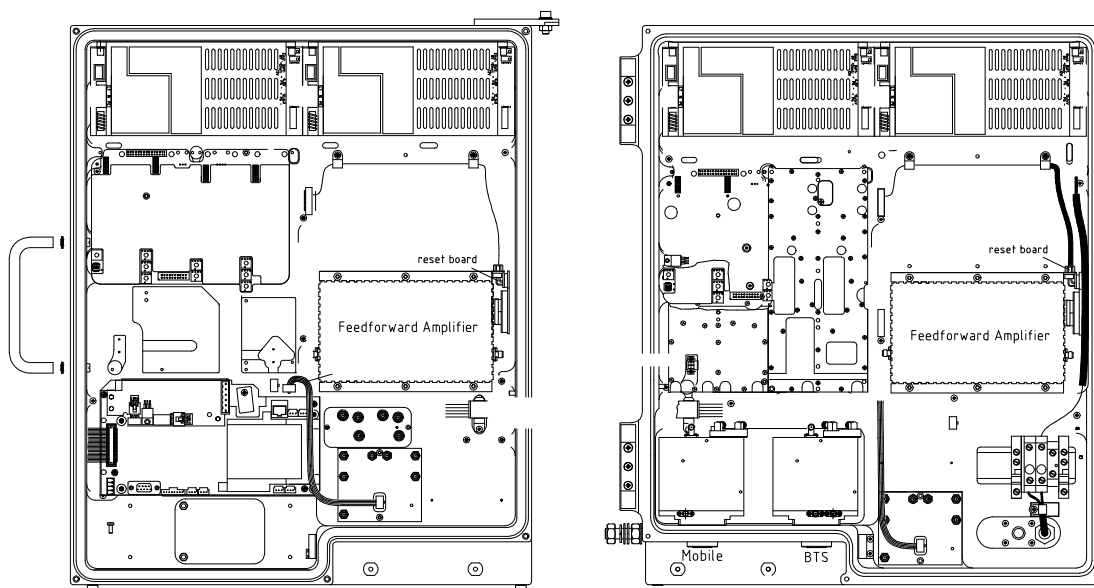


figure 8-13 Position of feedforward amplifiers

9 Appendices

9.1 Repeater specifications

ELECTRICAL SPECIFICATIONS

MR301B Power

Id-No:	150047
Frequency range & bandwidth	Up to 25 MHz in GSM900
Frequency selectivity; Gain outside operating band	± 400 kHz: 50 dB max.; ± 600 kHz: 40 dB max. ± 1000 kHz: 35 dB max.; ± 5000 kHz: 25 dB max.
Gain (nominal)	85 dB
Gain adjust	0 to 30 dB in steps of 2 dB
Gain variation over frequ. and temp.	± 2.5 dB (± 3.5 dB at extreme temperature range)*
Tolerance per step	± 0.5 dB from 0 to 6 dB attenuation ± 2.0 dB from 8 to 30 dB attenuation
Delay	6 μ sec.max.
Delayripple	150 ns
Output power ALC limit (test case) at 2 equal carriers	30 dBm (@ 25° C) +27 dBm / +27 dBm*
ICP3	58 dBm @ max. gain
ALC limit tolerance of frequency and temperature	± 3 dB
ALC overload reaction time delay	3 msec. (others available on request)
Noise figure	6 dB @ max. gain; 8 dB @ 75 dB gain;
Test coupler	30 dB
Return loss (@ 25° C amb. temp.)	15 dB
Power Supply	230 Vac $\pm 15\%$ / 40.-65 Hz; Option: 24 Vdc or 42 - 60 Vdc or 80 – 130 Vdc, 115 Vac $\pm 15\%$ / 40.-65 Hz or 185 – 320 Vac / 40 - 65 Hz
Power consumption (1 module)	160 Watts
Remote control interface	SM 2009
Connectors	7/16 female; N as an option
Environmental and Safety	see Environmental and Safety leaflet for MIKOM outdoor cell enhancers
Built in test equipment	Current monitor • synthesizer lock monitor • temperature • ALC active
Alarm forwarding	Potential free relay contact and automatic alarm call via RS232 or PCMCIA interface
Control functions	Gain • Center frequency • ALC threshold

* Normal temp.range + 5° C to + 40° C
 Extreme temp.range- 33° C to + 50° C

ELECTRICAL SPECIFICATIONS

MR401B Power

Frequency range Id-No:150043	UL:1710-1740 MHz; DL:1805-1835 MHz
150044	UL:1721,7-1751,7MHz; DL:1816,7-1846,7 MHz
150045	UL:1730-1760 MHz; DL:1825-1855 MHz
150046	UL:1751,5-1784,9 MHz; DL:1846,5-1879,9 MHz
Bandwith	Up to 35 MHz
Frequency selectivity;	± 400 kHz: 50 dB max.; ± 600 kHz: 40 dB max.
Gain outside operating band	± 1000 kHz: 35 dB max.; ± 5000 kHz: 25 dB max.
Gain (nominal)	85 dB
Gain adjust	0 to 30 dB in steps of 2 dB
Gain variation over frequ. and temp.	± 2.5 dB (± 3.5 dB at extreme temperature range)*
Tolerance per step	± 0.5 dB from 0 to 6 dB attenuation ± 2.0 dB from 8 to 30 dB attenuation
Delay	6 µsec.max.
Delayripple	150 ns
Output power ALC limit (test case)	30 dBm (@ 25° C)
at 2 equal carriers	+27,5 dBm / +27,5 dBm*
ICP3	57 dBm @ max. gain
ALC limit tolerance of frequency and temperature	±3 dB
ALC overload reaction time delay	3 msec. (others available on request)
Noise figure	6 dB @ max. gain; 8 dB @ 75 dB gain;
Test coupler	30 dB
Return loss (@ 25° C amb. temp.)	15 dB
Power Supply	230 Vac ± 15% / 40.-65 Hz; Option: 24 Vdc or 42 - 60 Vdc or 80 – 130 Vdc, 115 Vac ± 15% / 40.-65 Hz or 185 – 320 Vac / 40 - 65 Hz
Power consumption (1 module)	160 Watts
Remote control interface	SM 2009
Connectors	7/16 female; N as an option
Environmental and Safety	see Environmental and Safety leaflet for MIKOM outdoor cell enhancers
Built in test equipment	Current monitor • synthesizer lock monitor • temperature • ALC active
Alarm forwarding	Potential free relay contact and automatic alarm call via RS232 or PCMCIA interface
Control functions	Gain • Center frequency • ALC threshold

* Normal temp.range + 5° C to + 40°C
 Extreme temp.range- 33° C to + 50° C

ELECTRICAL SPECIFICATIONS**MR701B Power**

Frequency range

Id.No.	UL frequency [MHz]	DL frequency [MHz]
148604	1850 – 1885	1930 – 1965
151075	1865 – 1890	1945 - 1970
148605	1875 – 1910	1955 - 1990

Useable bandwidth

35 MHz (25 MHz in 151075) in the upper or lower PCS band

Gain

90 dB

Gain variation over frequency and temperature*

 ± 2.5 dB (± 3.5 dB at extreme temperatures)

Gain adjust range

30 dB in 2 dB steps

Gain adjust range tolerance

 ± 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

 100-130 VAC / 40-60 Hz
Option: 15-24 VDC or 36-72 VDC
Option: 220-250 VAC / 40-60 Hz

RF connector

 7/16 female
Option: N female

Environmental and safety

See separate leaflet

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

AVAILABLE POWER PER TECHNOLOGY

	CDMA	TDMA	GSM
Pout at 1 channel	37.0 dBm	40.0 dBm	40.0 dBm
Pout/channel at 2 channels	31.0 dBm	34.0 dBm	37.0 dBm
Pout/channel at 4 channels	28.0 dBm	29.0 dBm	33.0 dBm
Pout/channel at 8 channels	25.0 dBm	26.0 dBm	29.0 dBm
ALC threshold	Adjustable		

BAND AND CHANNEL SPECIFICATIONS

	Option I (fixed bw)	Option II (fixed bw)	Option III (variable bw)	Channel	
				CDMA	TDMA
3 dB bandwidth	5 MHz	15 MHz	0.1 to 15 MHz	1.23 MHz	30 kHz
Slope 3 dB to 30 dB	1 MHz	2 MHz	2 MHz	-	-
30 dB bandwidth	-	-	-	$f_c \pm 900\text{kHz}$	$f_c \pm 60\text{ kHz}$
50 dB bandwidth	-	-	-	$f_c \pm 1.5\text{ MHz}$	$f_c \pm 120\text{ kHz}$
Delay	6 μs	3 μs	6 μs	< 6 μs	20 μs
Delay variation (typical)	$\pm 150\text{ ns}$	$\pm 150\text{ ns}$	$\pm 150\text{ ns}$	$\pm 500\text{ ns}$	$\pm 500\text{ ns}$
Far off selectivity	40 dB	40 dB	40 dB	60 dB	55 dB
NF at Gmax	6 dB	6 dB	8 dB	6 dB	6 dB
NF at Gmax-30 dB	12 dB	12 dB	13 dB	12 dB	12 dB
OICP-3 at Gmax	59.0 dBm	59.0 dBm	59.0 dBm	59.0 dBm	59.0 dBm
OICP-3 at Gmax - 10 dB	58.6 dBm	58.5 dBm	58.5 dBm	58.5 dBm	59.0 dBm
OICP-3 at Gmax - 20 dB	58.0 dBm	58.0 dBm	57.5 dBm	58.0 dBm	58.5 dBm
OICP-3 at Gmax - 30 dB	56.0 dBm	56.0 dBm	53.0 dBm	55.0 dBm	57.0 dBm
Output noise in band at Gmax	-78 dBm/Hz	-78 dBm/Hz	-76 dBm/Hz	-	-
Output noise out of band at Gmax	-98 dBm/Hz	-98 dBm/Hz	-96 dBm/Hz	-	-
Power consumption standby/max power					
1 module (typ.cons)	130/220W	130/220W	145/220W	130/210W	130/210W
4 modules (typ.cons)	160/250W	160/250W	180/270W	160/240W	160/240W

ELECTRICAL SPECIFICATIONS**MR801B Power**

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*	±2.5 dB (±3.5 dB at extreme temperatures)
Gain adjust range	30 dB in 2 dB steps
Gain adjust range tolerance	±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 ± 15% / 40 - 65 Hz Option: 230 VAC ± 15% / 40 - 65 Hz Option: 185 - 320 VAC / 40 - 65 Hz Option: 24 VDC Option: 42 to 60 VDC
RF connector	7/16 female Option: N female
Environmental and safety	See separate leaflet

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

AVAILABLE POWER PER TECHNOLOGY

	CDMA	TDMA	Analog
Pout at 1 channel	37.0 dBm	40.0 dBm	40.0 dBm
Pout/channel at 2 channels	31.0 dBm	34.0 dBm	37.0 dBm
Pout/channel at 4 channels	28.0 dBm	29.0 dBm	33.0 dBm
Pout/channel at 8 channels	25.0 dBm	26.0 dBm	29.0 dBm
ALC threshold	Adjustable		

BAND AND CHANNEL SPECIFICATIONS

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

ELECTRICAL SPECIFICATIONS**MR801Bi Power**

Frequency range	Uplink 806-824 MHz; Downlink 851-869 MHz
Useable bandwidth	18 MHz in the upper or lower iDEN band
Gain	90 dB
Gain variation over frequency and temperature*	± 2.5 dB (± 3.5 dB at extreme temperatures)
Gain adjust range	30 dB in 2 dB steps
Gain adjust range tolerance	± 0.5 dB
Return loss	15 dB @ 25°C ambient temperature
Spurious/intermodulation	-13 dBm max.
Power supply	100 to 130 VAC / 40 - 60 Hz Option: 220 to 250 VAC / 40 - 60 Hz Option: 185 to 320Vac, 40 - 65Hz Option: 24 VDC Option: ± 42 to ± 60 VDC Option: ± 80 to ± 130 VDC
RF connector	7/16 female Option: N female
Environmental and safety	See separate leaflet

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

AVAILABLE POWER PER TECHNOLOGY

	iDEN	Analog
Pout at 1 channel	37.0 dBm	40.0 dBm
Pout/channel at 2 channels	31.0 dBm	37.0 dBm
Pout/channel at 4 channels	28.0 dBm	33.0 dBm
Pout/channel at 8 channels	25.0 dBm	29.0 dBm
ALC threshold	Adjustable	

BAND AND CHANNEL SPECIFICATIONS

	Variable Bandwidth	Channel Selective
3 dB bandwidth	0.1* to 15.0 MHz	25 kHz
Slope 3 dB to 30 dB	2 MHz	-
30 dB bandwidth	-	$f_c \pm 60$ kHz
50 dB bandwidth	-	$f_c \pm 120$ kHz
Delay	6 μ s	20 μ s
Delay variation (typical)	± 150 ns	± 500 ns
Far off selectivity	40 dB	50 dB
NF at Gmax	8 dB	6 dB
NF at Gmax-30 dB	13 dB	12 dB
OICP-3 at Gmax	48 dBm	48 dBm
OICP-3 at Gmax -10 dB	48 dBm	48 dBm
OICP-3 at Gmax -20 dB	47 dBm	47 dBm
OICP-3 at Gmax -30 dB	45 dBm	45 dBm
Output noise in band at Gmax	-81 dBm/Hz	-
Output noise out of band at Gmax	-101 dBm/Hz	-
Power consumption (standby/max power)		
1 module (typ.cons)	155/220 W	150/210 W
4 modules (typ.cons)	200/265 W	175/240 W

1.5 dB gain degradation at 100 kHz

MECHANICAL SPECIFICATIONS**MRx01B Power**

The MRx01B Power is available in the **G-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 provides the dimensions and the view of the layout.

ENVIRONMENTAL AND SAFETY**MRx01B Power**

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 %

All data is subject to change without notice !

9.2 Spare parts lists for MRx01B Power

The following list contains all parts available for the MRx01B Power. The configuration of the delivered unit meets the requirements of the customer and can differ depending on the state of delivery.

9.2.1 Spare parts list for MR301B Power

Designation	Id.-No.:
MR301B Power	150047
Assembly drawing	149952
Assembly drawing (RF-cable plan)	150563
Mounting material	150521
Duplexer UL Input	150302
Duplexer DL Input	150303
Bas.Mod.Fix.BW 25,0 MHz	150125
Bas.Mod.Fix.BW 15,0 MHz	151347
Bas.Mod.Fix.BW 12,5 MHz	149642
Bas.Mod.Fix.BW 8,2 MHz	149187
Bas.Mod.Fix.BW 6,0 MHz	149178
Bas.Mod.Var.BW 25,0 MHz	150135
Bas.Mod.Var.BW 10,0 MHz	148281
Ext.Mod.Var.BW 10,0 MHz	150136
Power Amplifierkit 4W	151647
Power Supply, GER plug	138305
Power Supply, UK plug	142832
Power Supply, no plug	148812
Power Supply, no plug	144306
Power Supply, USA plug	141230
Power Supply, no plug	145524
Power Supply, no plug	144946
Power Supply, no plug	145504
M1 Kit 900 MHz	146999
VSWR Kit GSM + EGSM	143437
Ext. Alarms SW-Option	145067
Battery Backup Module	143052
RF Gland / SMA to N	150615
Adapter 7 / 16 male - N female	112425
SW MOB100 V1.10	143055
SW REP1009 V1.11	147127
Modification Kit 1 channel band selective	149917
Modification Kit 2 channels band selective	149918
Modification Kit 3 channels band selective	150529
Modification Kit 4 channels band selective	149920

Main Board 12V version	149780
Main Board 12V version	149779
Control Unit SM2009	143051
Wall mounting kit	146179
Sparepart kit	146200
Termination Resistor	33167
Ready-made cable AC	143032
Manual MRx01B Power	151775
Manual REP1009V1.xx	148964
Additional information	148222
Assembly guide MRx01B Power	151045

9.2.2 Spare parts list for MR401B Power

Designation	Id.-No.:			
MR401B Power	150043	150044	150045	150046
Assembly drawing	149952			
Assembly drawing (RF-cable plan)	150563			
Mounting material	150521			
Duplexer UL Input	150304	150306	150308	150300
Duplexer DL Input	150305	150307	150309	150301
Bas.Mod.Fix.BW 25,0 MHz	150141			
Power Amplifierkit 4W	151648			
Power Supply, GER plug	138305			
Power Supply, UK plug	142832			
Power Supply, no plug	148812			
Power Supply, no plug	144306			
Power Supply, USA plug	141230			
Power Supply, no plug	145524			
Power Supply, no plug	144946			
Power Supply, no plug	145504			
Ext. Alarms SW-Option	145067			
Battery Backup Module	143052			
RF Gland / SMA to N	150615			
Adapter 7 / 16 male - N female	112425			
SW MOB100 V1.10	143055			
SW REP1009 V1.11	147127			
Modification Kit 1 channel band selective	149917			
Modification Kit 2 channels band selective	149918			
Modification Kit 3 channels band selective	149919			
Modification Kit 4 channels band selective	149920			
Main Board 12V version	149780			
Main Board 12V version	149779			
Control Unit SM2009	143051			
Wall mounting kit	146179			
Sparepart kit	146200			
Termination Resistor	33167			
Ready-made cable AC	143032			
Manual MRx01B Power	151775			
Manual REP1009V1.xx	148964			
Assembly guide MRx01B Power	151045			

9.2.3 Spare parts list for MR701B Power

Designation	Id.-No.:		
MR701B Power	148604	148605	151075
Assembly drawing	149952		
Assembly drawing RF	151102		
Assembly drawing (RF-cable plan)	150563		
Mounting material	150521		
PCS-Duplexer UL Input	144382	144384	151072
PCS-Duplexer DL Input	144381	144383	151073
Active Combiner UL	148686		
Active Combiner DL	148685		
Bas.Mod.Fix.BW 15,0 MHz	148717		
Bas.Mod.Fix.BW 5,0 MHz	148716		
Bas.Mod.Var.BW 15,0 MHz	151463		
Ext.Mod.Fix.BW 15,0 MHz	151464		
Basic Module	148702		
Extension Module	148705		
Basic Module TDMA	148703		
Extension Module TDMA	148706		
Basic Module CDMA	148704		
Extension Module CDMA	148707		
Feedforward Amplifier UL	148627		
Feedforward Amplifier DL	148628		
Power Supply, GER plug	138305		
Power Supply, UK plug	142832		
Power Supply, no plug	148812		
Power Supply, no plug	144306		
Power Supply, USA plug	141230		
Power Supply, no plug	145524		
Power Supply, no plug	144946		
Power Supply, no plug	145504		
Mobile kit PCS	150405		
Ext. Alarms SW-Option	147710		
Battery Backup Module	143052		
Battery Backup Module, Dummy without Accu	143750		
RF Gland / SMA to N	150615		
Adapter 7 / 16 male - N female	112425		
SW MOB100 V1.10	143055		
SW REP1007 V1.12	145488		
SW REP1009 V1.11	147127		
Modification Kit 1 channel band selective	149917		
Modification Kit 2 channels band selective	149918		
Modification Kit 3 channels band selective	149919		

Modification Kit 4 channels band selective	149920
Modification kit TDMA for 1+2 channel	151135
Modification kit TDMA for 3+4 channel	151136
Main Board 26V version	149778
Main Board 26V version	149777
Control Unit SM2009	143051
Wall mounting kit	146179
Sparepart kit	146200
Termination Resistor	33167
Ready-made cable DC	149648
Ready-made cable DC act. Com.	150753
Ready-made cable AC	152024
Manual MRx01B Power	151775
Manual REP1007V1.11	145956
Manual REP1009V1.xx	148964
Assembly guide MRx01B Power	151045

9.2.4 Spare parts list for MR801B Power and MR801Bi Power

Designation	Id.-No.:	
MR801B Power / MR801Bi Power	148613	151270
Assembly drawing	149952	
Assembly drawing RF	151102	
Assembly drawing (RF-cable plan)	150563	
Mounting material	150521	
Duplexer UL Input	148334	148335
Duplexer DL Input	148333	148336
Active Combiner UL	148688	148960
Active Combiner DL	148687	148959
Bas.Mod.Var.BW 15,0 MHz	148715	150150
Ext.Mod.Var.BW 15,0 MHz	148944	150151
Basic Module TDMA	148712	
Extension Module TDMA	148710	
Basic Module CDMA	148713	
Extension Module CDMA	148709	
Basic Module CDMA f1/f2	152228	
Basic Module		150152
Extension Module		150153
Feedforward Amplifier UL	148629	151232
Feedforward Amplifier DL	148630	151233
Power Supply, GER plug	138305	
Power Supply, UK plug	142832	
Power Supply, no plug	148812	
Power Supply, no plug	144306	
Power Supply, USA plug	141230	
Power Supply, no plug	145524	
Power Supply, no plug	144946	
Power Supply, no plug	145504	
Mobile kit PCS, without mobile	150404	
Mobile kit PCS, with mobile	150407	
Ext. Alarms SW-Option	147710	
Battery Backup Module	143052	
Battery Backup Module, Dummy without Accu	143750	
RF Gland / SMA to N	150615	
Adapter 7 / 16 male - N female	112425	
SW MOB100 V1.10	143055	
SW REP1007 V1.12	145488	
SW REP1009 V1.11	147127	
Modification Kit 1 channel band selective	149917	
Modification Kit 2 channels band selective	149918	
Modification Kit 3 channels band selective	150529	

Modification Kit 4 channels band selective	149920
Modification kit TDMA for 1+2 channel	151135
Modification kit TDMA for 3+4 channel	151671
Main Board 26V version	149778
Main Board 26V version	149777
Control Unit SM2009	143051
Wall mounting kit	146179
Sparepart kit	146200
Termination Resistor	33167
Ready-made cable DC	149648
Ready-made cable DC act. Com.	150753
Ready-made cable AC	152024
Manual MRx01B Power	151775
Manual REP1007V1.11	145956
Manual REP1009V1.xx	148964
Assembly guide MRx01B Power	151045

9.3 Installation drawing of the Repeater

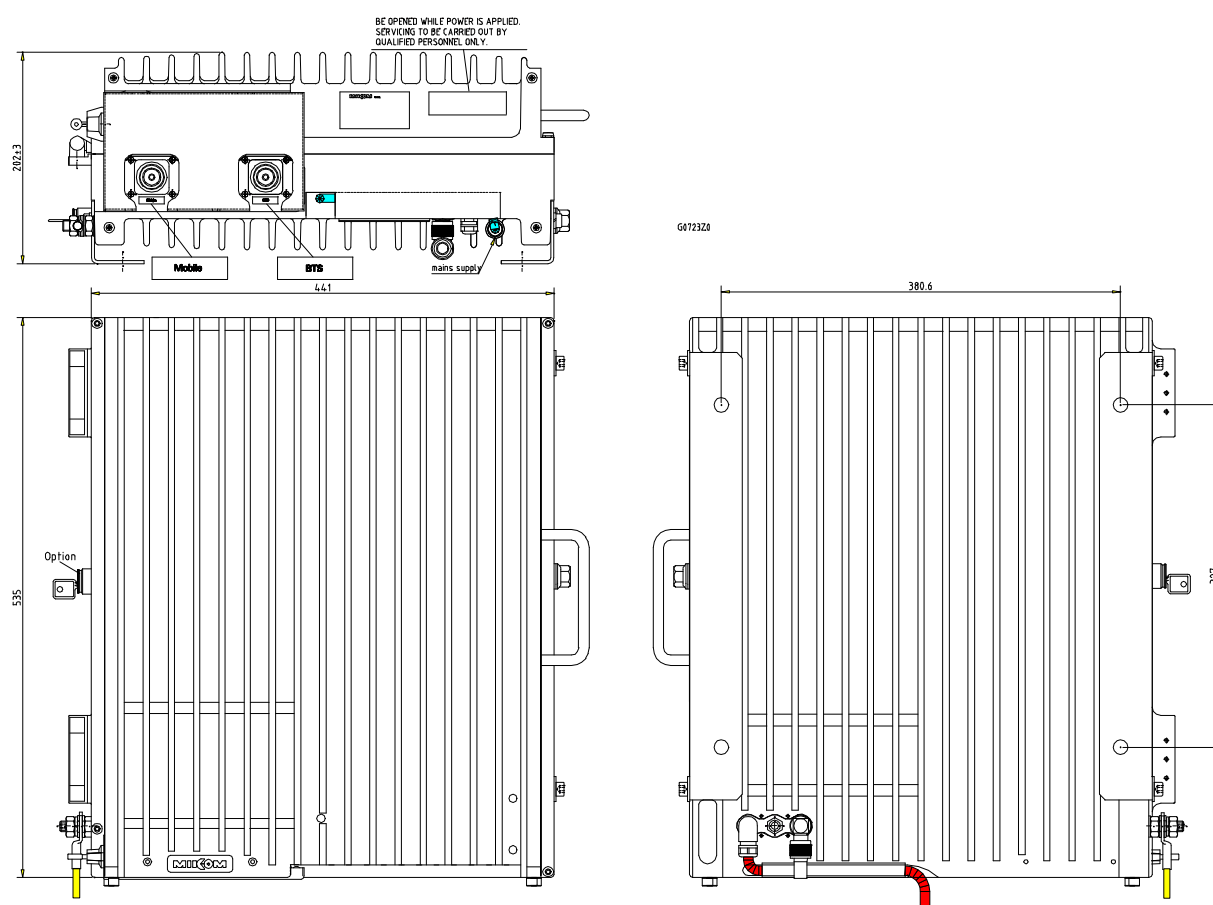


figure 9-1 Installation drawing of the Repeater

9.4 Top view of the Repeater (left side , exemplary configuration)

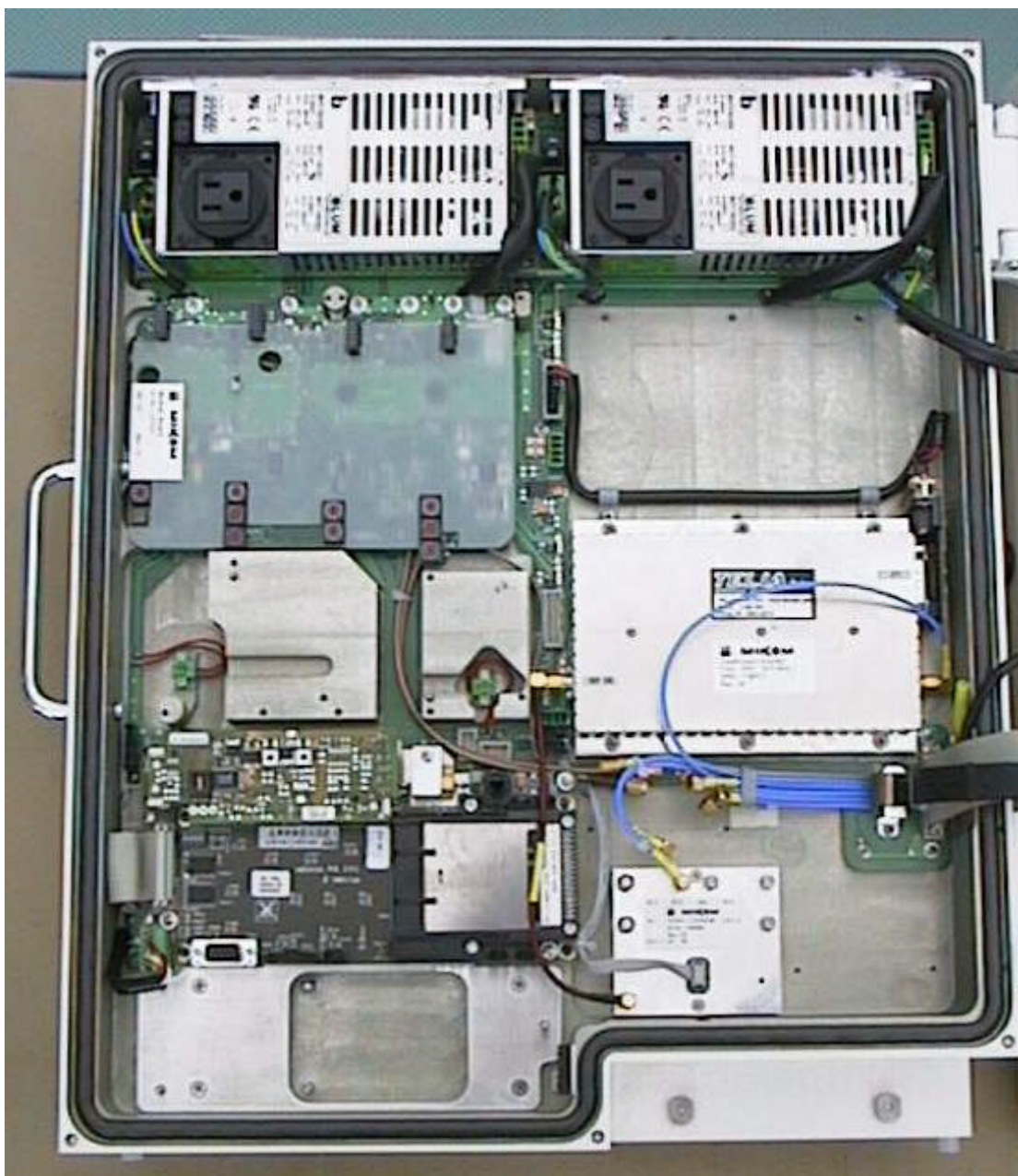


figure 9-2 Top view of the Repeater (left side, exemplary configuration)

9.5 Top view of the Repeater (right side, exemplary configuration)



figure 9-3 Top view of the Repeater (right side, exemplary configuration)

9.6 One channel configuration – cabling and block diagram

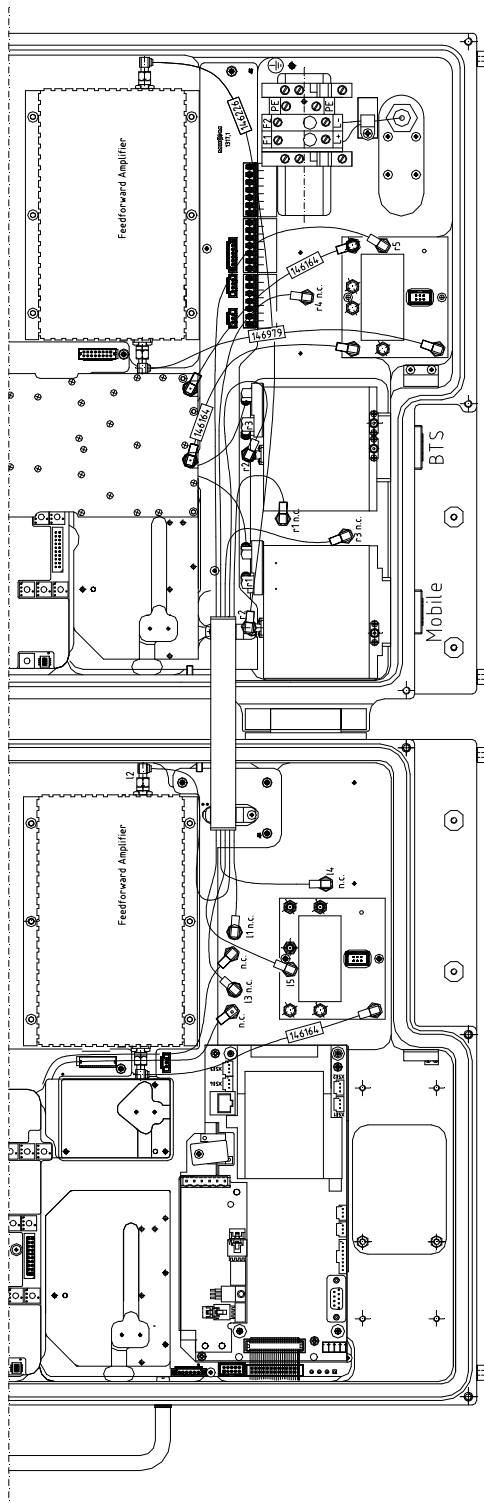


figure 9-4 Cabling of one channel Repeater

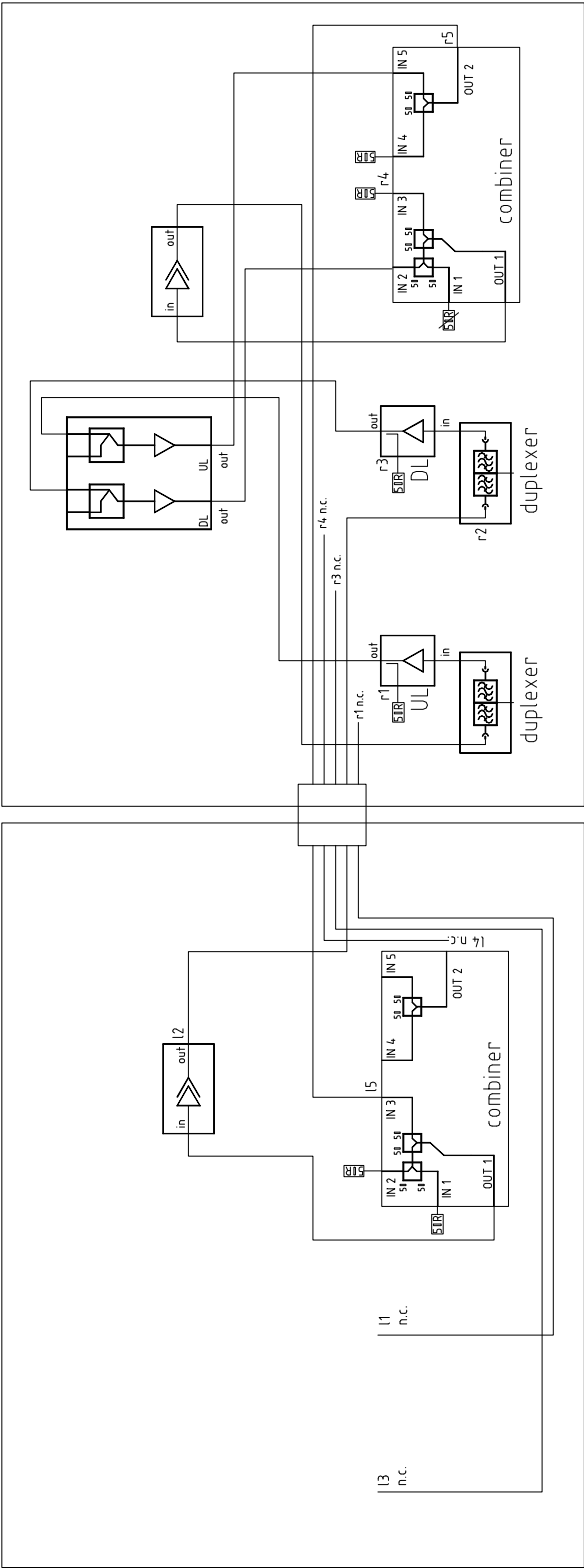


figure 9-5 Block diagram of one channel Repeater

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