

mini Repeater MRx18/x18 & MRx18/x18/x18 & MRx18/y18/y18 & MRx18/y18



Dual- / Triple-Segment and Dual-Band

User's Manual
M0139ACC

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Andrew Wireless Systems GmbH, 11-November-2009

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1. GENERAL


1.1. USED ABBREVIATIONS

3GPP	3 rd Generation Partnership Project
ALC	Automatic Level Control
AMPS	American Mobile Phone System or Advanced Mobile Phone System
APAC	Automatic Power Adjustment Circuit
BCCH	Broadcast Control Channel
BITE	Built-In Test Equipment
BTS	Base Transceiver Station
CDMA	Code Division Multiple Access
CEPT	Conférence Européenne des Postes et Télécommunications
CF	Center Frequency
CFO	Center Frequency Offset
DL	Downlink
EDGE	Enhanced Data Rates for GSM Evolution
ESD	Electrostatic Discharge
ETACS	Enhanced TACS
ETS	European Telecommunication Standard
ETSI	European Telecommunication Standards Institute
FSK	Frequency Shift Keying
GSM	Global System for Mobile Communication
I ² C-Bus	Inter-Integrated Circuit Bus (Philips)
ID No	Identification Number
IF	Intermediate Frequency
LED	Light Emitting Diode
LMT	Local Maintenance Terminal
LNA	Low Noise Amplifier
MCC	Mobile Country Code
MNC	Mobile Network Code
MOR	Microwave Optical Repeater
MR	Microwave Repeater
MS	Mobile Station
MTBF	Mean Time Between Failure
OIP-3	Output Intercept Point of the 3 rd order
OMC	Operation and Maintenance Center
PA	Power Amplifier
PCMCIA	Personal Computer Modem Communication International Association
PCS	Personal Communication System
PSTN	Public Switched Telephone Network
PSU	Power Supply Unit
Rev	Revision
RF	Radio Frequency
RLP	Radio Link Protocol
RSSI	Receive Signal Strength Indication
RTC	Real-Time Clock
RX	Receiver

SCL	Serial Clock
SDA	Serial Data
SMSC	Short Message Service Center
TACS	Total Access Communication System
TCH	Traffic Channel
TDMA	Time Division Multiple Access
TX	Transmitter
UE	User Equipment
UL	Uplink
UMTS	Universal Mobile Telecommunication System
UPS	Uninterruptable Power Supply
URL	Uniform Resource Locator
VSWR	Voltage Standing Wave Ratio
WCDMA	Wide Code Division Multiple Access
WIG	Wireless Innovations Group

1.2. HEALTH AND SAFETY WARNINGS



1. Only suitably qualified personnel is allowed to work on this unit and only after becoming familiar with all safety notices, installation, operation and maintenance procedures contained in this manual.
2. Read and obey all the warning labels attached to the unit. Make sure that the warning labels are kept in a legible condition and replace any missing or damaged labels.
3. Obey all general and regional installation and safety regulations relating to work on high voltage installations, as well as regulations covering correct use of tools and personal protective equipment.
4. Keep operating instructions within easy reach and make them available to all users.
5. It is the responsibility of the network provider to implement prevention measures to avoid health hazards which may be associated to radiation from the antenna(s) connected to the unit.
6. The antennas of the repeater (integrated and / or external) have to be installed in a way that the regional and national RF exposure compliance requirements are met.
7. Make sure access is restricted to qualified personnel.
8. Only licence holders for the respective frequency range are allowed to operate this unit.
9. Use this equipment only for the purpose specified by the manufacturer. Do not carry out any modifications or fit any spare parts which are not sold or recommended by the manufacturer. This could cause fires, electric shock or other injuries.
10. Before opening the unit, disconnect mains.
-  11. ESD precautions must be observed! Before commencing maintenance work, use the available grounding system to connect ESD protection measures.
12. This unit complies with European standard EN60950.
13. **IMPORTANT NOTE:** To comply with FCC RF exposure compliance requirements, the following antenna installation and device operating configurations must be satisfied: A separation distance of at least 20 cm must be maintained between the antenna of this device and all persons. RF exposure compliance may need to be addressed at the time of licensing, as required by the responsible FCC Bureau(s), including antenna co-location requirements of 1.1307(b)(3). Maximum permissible antenna gain is 12 dBi.
14. Make sure the repeater settings are according to the intended use (see also product information of the manufacturer) and regulatory requirements are met.
15. Although the repeater is internally protected against overvoltage, it is strongly recommended to earth the antenna cables close to the antenna connectors of the repeater for protection against atmospheric discharge.

1.3. ABOUT ANDREW SOLUTIONS

Andrew Wireless Systems GmbH based in Buchdorf/ Germany, is a leading manufacturer of coverage equipment for mobile radio networks, specializing in low cost, high performance, RF and optical repeaters. Our optical distributed networks and RF repeater systems provide coverage for every application: outdoor use, indoor installations, tunnels, subways and many more.

Andrew Wireless Systems GmbH belongs to the *Wireless Innovations Group (WIG)*. Being a part of *Andrew Solutions*, *WIG* has unparalleled experience in providing RF coverage and capacity solution for wireless networks in both indoor and outdoor environment.

Andrew Solutions, a CommScope Company, is the foremost supplier of one-stop, end-to-end radio frequency (RF) solutions. Our products are complete solutions for wireless infrastructure from top-of-the-tower base station antennas to cable systems and cabinets, RF site solutions, signal distribution, and network optimization.

Andrew Solutions has global engineering and manufacturing facilities. In addition, it maintains field engineering offices throughout the world.

We operate a quality management system in compliance with the requirements of ISO 9001. All equipment is manufactured using highly reliable material. In order to ensure constant first-rate quality of the products, comprehensive quality monitoring is conducted at all fabrication stages. Finished products leave the factory only after a thorough final acceptance test, accompanied by a test certificate guaranteeing optimal operation.

The declaration of conformity for the product is available upon request from the local sales offices or from *Andrew Solutions* directly.

To make the utmost from this unit, we recommend you carefully read the instructions in this manual and commission the unit only according to these instructions.

For technical assistance and support, contact the local office or *Andrew Solutions* directly at one of the following addresses listed in the next chapter.

1.4. INTERNATIONAL CONTACT ADDRESSES FOR WIG CUSTOMER SUPPORT

Wireless Innovations Group (WIG)

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table 1-1 List of international contact addresses

2. INTRODUCTION

2.1. PURPOSE

The MRx18 miniRepeater is a bi-directional amplifier used to enhance signals between a mobile and a base station in a mobile network. It has been designed to increase signal strength in small and medium sized areas such as offices, shops, and basements. By boosting the signal level the MRx18 increases indoor coverage and allows high data rate connectivity.

If weak signal transmissions occur within the coverage area due to 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 signals from a donor antenna of a BTS/ Node B, amplifies and re-transmits it into the required dark spot. In the uplink path the signal picks up the signals from a mobile/ User Equipment (UE) and re-transmits it to the BTS/ Node B.

2.2. THE MRx18 miniRepeater

Note: The MRx18/x18(/x18) and MRx18/y18(/y18) is shortly denominated as MRx18 in the following.

Andrew MRx18 miniRepeater gives designers a simple tool to solve their small area coverage and performance issues.

The MRx18 is easy to install. Also a web-based GUI simplifies commissioning and configuring the equipment. The RF link (donor) towards the base station is typically fed from an outdoor antenna while the coverage area is fed by an indoor antenna. The opportunity to adjust the passband of repeater helps to cover any specific segment or frequency band.

Due to modular design, the single-variable version MRx18 may be available as a dual-/triple-variable segment or a dual-band-variable version in one cabinet. The dual-/triple-segment MRx18/x18(/x18) is able to transmit two or three variable segments within one frequency band. The dual-band MRx18/y18(/y18) supports two frequency bands, while one variable segment is amplified in one frequency band and up to two variable segments are dedicated for the other frequency band.

Auto Gain functionality enables automatic gain adjustment in order to maximize the performance, however gain may be set manually if desired.

An alarm interface with a display and LEDs indicates the status of the equipment locally. Moreover, the status and alarms of the MRx18 can be queried via the web-based GUI.

Features at a glance

- Up to three variable segments within one frequency band, or up to three variable segments allocated in two frequency bands
- Easy to install due to light weight, small dimensions and Auto Gain functionality
- Integrated combiner/ crossband coupler, no external devices required, common antenna ports for all bands/ segments equipped
- Easy commissioning via web-based GUI
- Automatic Level Control (ALC)
- Variable bandwidth
- LEDs for local alarm indication
- Compliant with all regulatory agencies (e.g. GSM 05.05, 3GPP and FCC)

3. FUNCTIONAL DESCRIPTION

3.1. DESIGN AND CONNECTORS

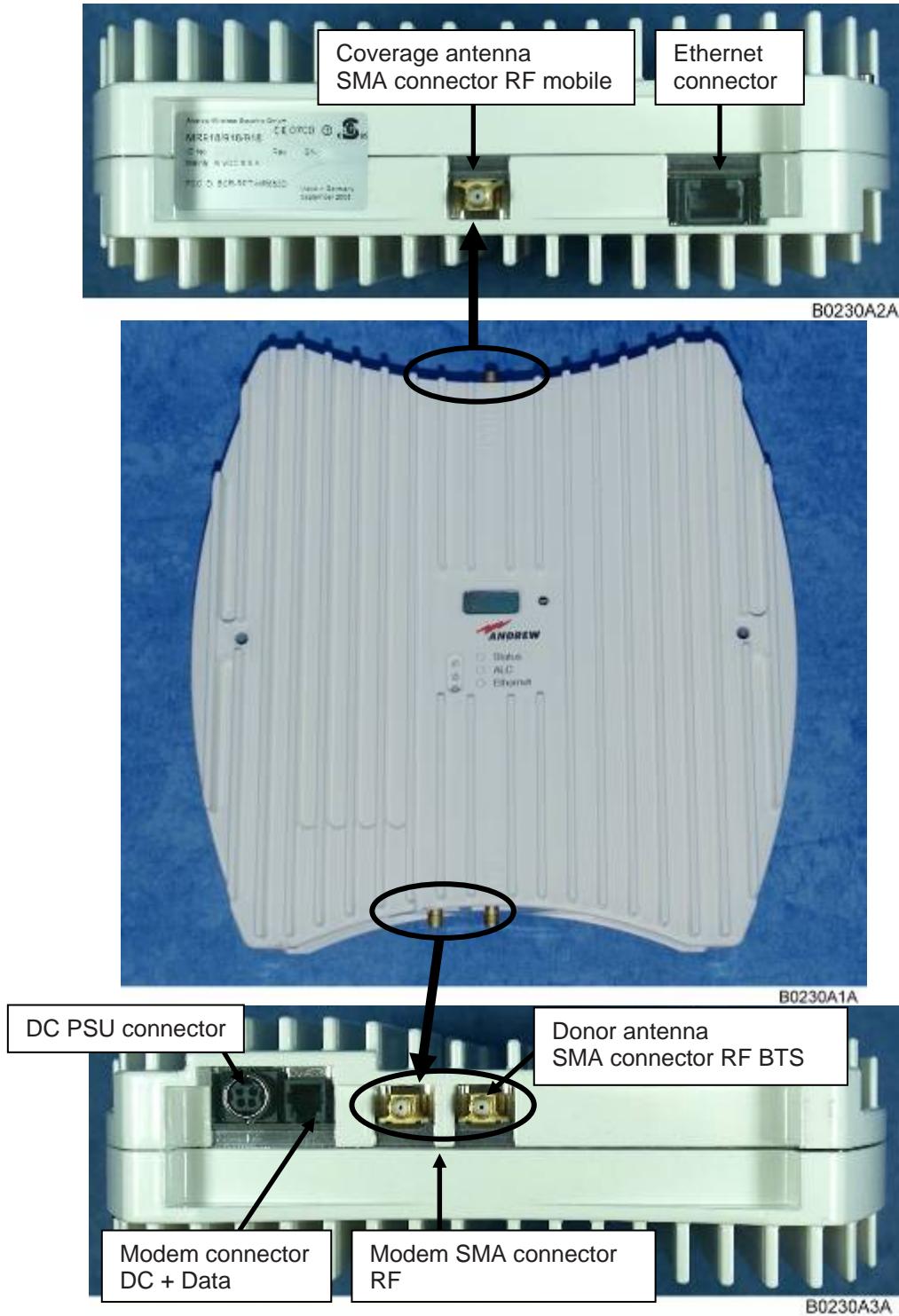


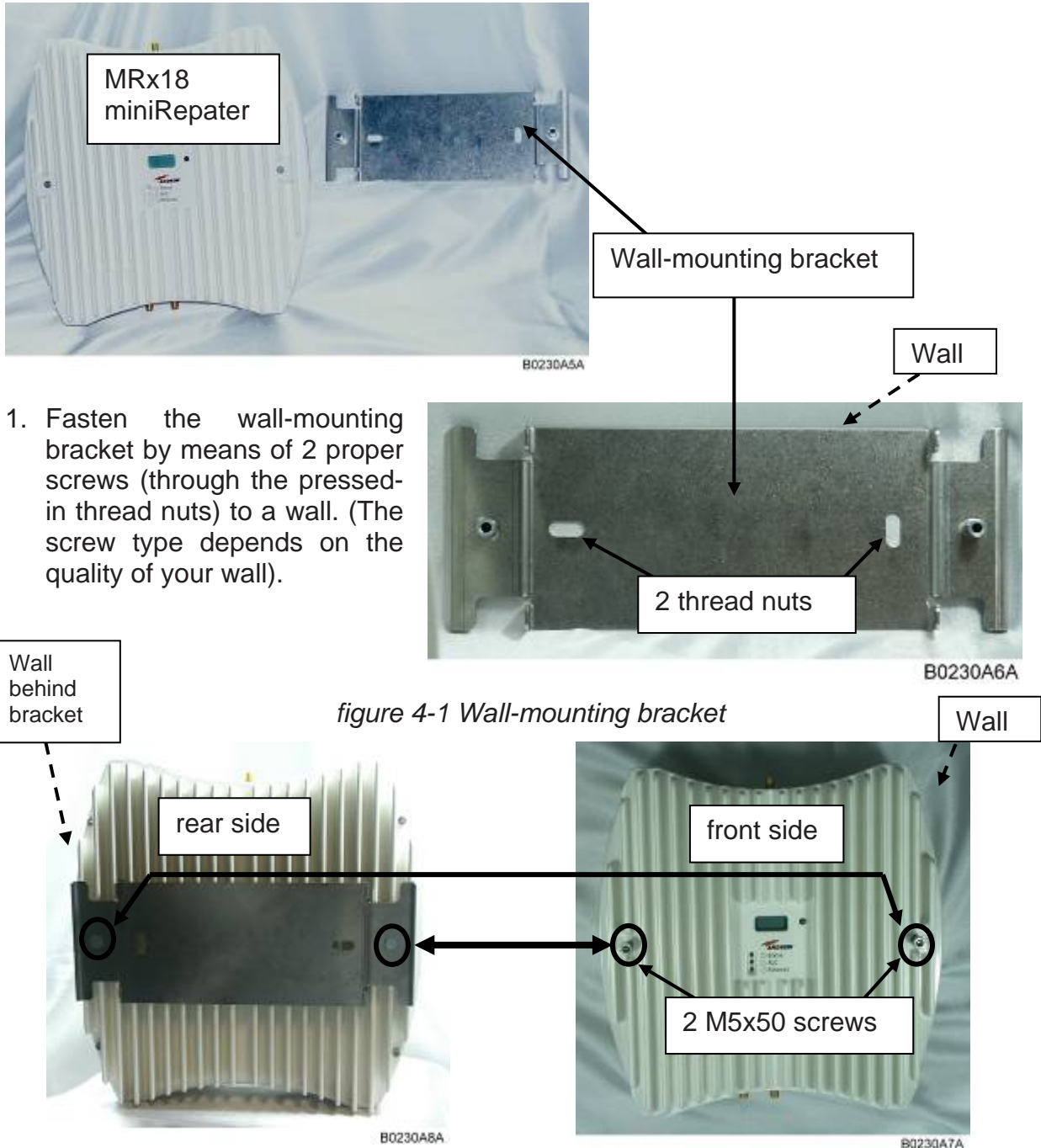
figure 3-1 Connectors of MRx18

For your notes:

4. INST ALLATION AND COMISSIONING

4.1. MECHANICAL INSTALLATION

To mount the MRx18 to a wall, proceed as follows:



1. Fasten the wall-mounting bracket by means of 2 proper screws (through the pressed-in thread nuts) to a wall. (The screw type depends on the quality of your wall).

figure 4-1 Wall-mounting bracket

2. Insert the mRx18 to the wall-mounting bracket.
3. Fasten the MRx18 and wall-mounting bracket by means of 2 metric M5x50 fillister-head screws to the wall.

figure 4-2 Wall mounting procedure

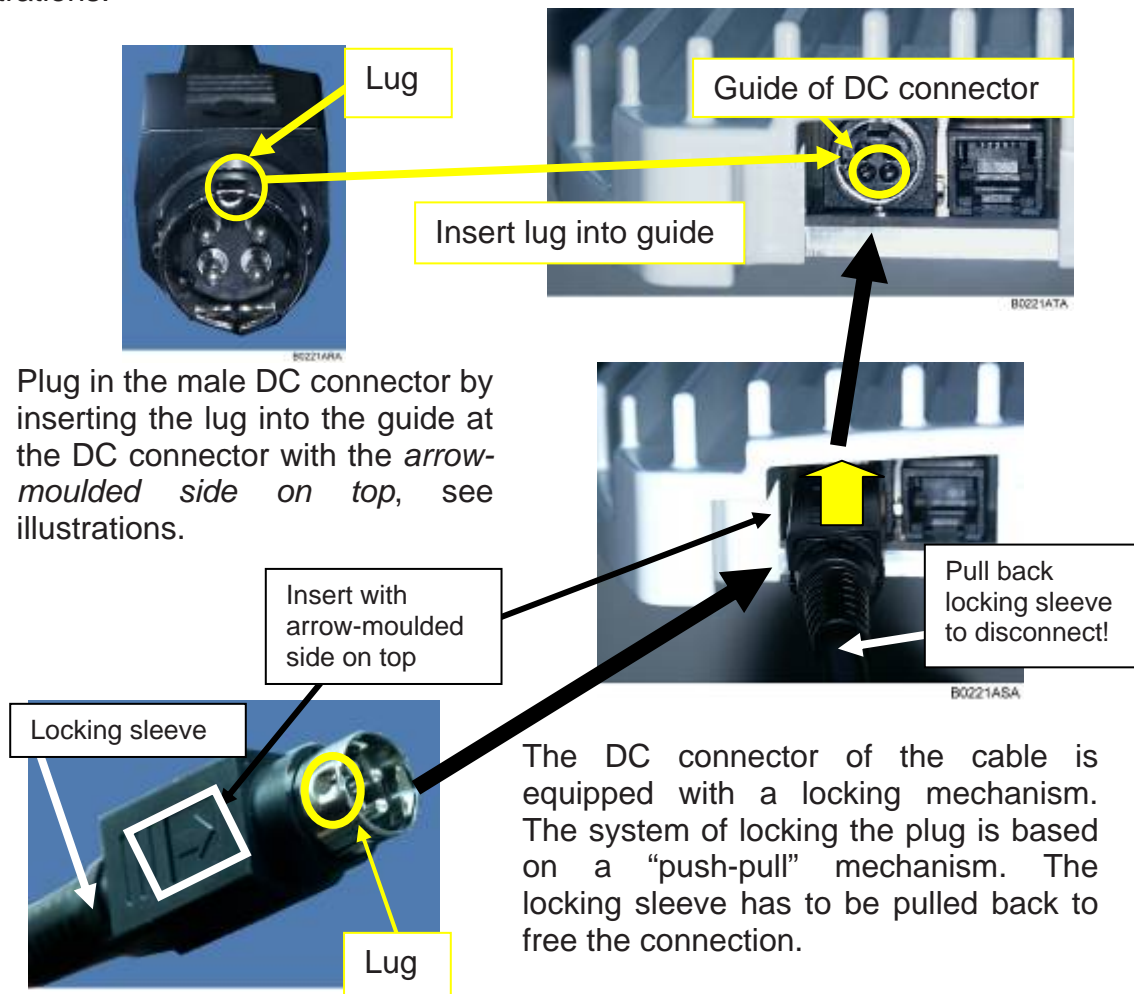
4.2. ELECTRICAL INSTALLATION

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 only. The repeater must not be opened. The maximum antenna height has to be 10 meters above ground.

1. Connect the antenna cables to the antenna connectors and the antennas.
2. Use only the power supply delivered with the unit. Do not modify the power supply unit (PSU) and cable!

Do not mount the PSU to the ceiling!

Connect the DC connector of the power supply and provide mains to the power supply. Ensure the DC connector is plugged in correctly as in the following illustrations.



Plug in the male DC connector by inserting the lug into the guide at the DC connector with the *arrow-moulded side on top*, see illustrations.

The DC connector of the cable is equipped with a locking mechanism. The system of locking the plug is based on a “push-pull” mechanism. The locking sleeve has to be pulled back to free the connection.

figure 4-3 Power connection of DC connector with MRx18

3. Align the donor antenna towards the BTS.
4. Align the coverage antenna.

As the default settings of the repeater are set to Auto Gain enabled, only the frequencies have to be adjusted. Additionally, the repeater can be customized with a laptop or PC via Ethernet connector:

5. For local connection, connect the **straight** CAT 6 patch cable to the Ethernet connector of the MRx18 and the network connector of a laptop or PC.

Start a browser (e.g. Internet Explorer 7 or higher, or Mozilla Firefox) and enter IP address of the repeater

6. Enter user name: and password to login
7. Commission the repeater according to the description in the following chapter and save settings to the repeater.
8. Disconnect CAT 6 patch cable and check LEDs and display of the repeater.

5. SOFTWARE SETUP

5.1. LOGIN

Enter user name and password

If an incorrect username or password has been entered, the following error / attention message

"You have entered the wrong password. Please check the correct usage of upper and lower cases or check the CAPS LOCK key on your console."

appears and prompts to insert your username or password anew. Click key F5 to refresh the login mask.

If an incorrect username or password has been entered for three times, the interface to the repeater is locked for 30 minutes.

5.2. STATUS

In the Status page, which is the **first** tab in the menu bar, actual settings are shown. The values are referenced to the condition when the status page has been opened.

Furthermore, actual alarms of the MRx18 are listed in this page. No values/ alarms are captured in case the RF section is switched off (see chapter 5.3.1 *Settings - Radio Frequency*).

The severity of the alarms can be changed in the Settings page (see chapter 5.3.2 *Settings - Alarms*). The latency time of each alarm is 10 seconds, i.e. the repeater has to be in alarm condition for 10 seconds before an alarm is notified.

5.3. SETTINGS

In the Settings pages - the second tab in the menu bar - current information on settings of all parameters is shown. The settings of parameters can be changed in those pages.

5.3.1. Settings - Radio Frequency

Radio Frequency	
Parameter	Description of Power
Power	To power on, check "Power ON Band MRx18" Uncheck "Power ON Band MRx18" to power down the RF-section of the respective band.

table 5-1 Radio Frequency – Power

Radio Frequency	
Parameter	Description of General
Passband (MHz) DL / UL	Enter the frequency range (start and stop frequency) for both DL and UL to be amplified.
Gain Setting (dB) DL / UL	Select the gain for UL and DL
Auto Gain	With Auto Gain activated, the repeater will automatically set its gain to the maximum value depending on the DL input level.
Maximum Output Power (dBm) DL / UL	The maximum output power can be selected for DL and UL.

table 5-2 Radio Frequency - General

Radio Frequency	
Parameter	Description of Auto Gain *
UL/ DL Inbalance (dB)	When Auto Gain is enabled, the gain is adjusted automatically. With an entry in the Auto Gain imbalance field <i>UL/DL Inbalance (dB)</i> , the UL gain is decreased compared to the DL gain for this value.
Time Interval	Possibility to select between different time intervals for Auto Gain acting.
Mode	With Auto Gain activated, two different behaviours of Auto Gain can be chosen from: Uniform Gain Independent Gain

table 5-3 Radio Frequency - Auto Gain

5.3.2. Settings - Alarms

Each alarm can be assigned by a severity level. It is also possible to disable alarms. The severity of alarms may be:

disabled , warning, minor, major, critical

6. ALAR MING AND SUPERVISION

For alarming and supervision, the MRx18 miniRepeater is provided with an alarming interface represented by three LEDs.

6.1. ALARM LEDS

Denotation of LED	Colour	Function/ Indication
Status	Off	If the LED is off, the respective MRx18 does not receive any DC power.
	Green	A green light indicates the normal operation of the repeater. Power is present and the current consumption of the unit is within the specifications.
	Orange	An orange light indicates a hardware alarm.
	Red	A red light indicates the temperature alarm, which switches to power-down mode once an over-temperature has been reached. As soon as the temperature has returned to normal, the controller will enable the RF-section.
ALC	Off/ red	A red LED indicates that the input power received by the repeater is too high.
	Blinking red	The LED is blinking red for 4 seconds during the boot process.
Ethernet	Off/ green	The LED is green if the repeater is connected via Ethernet. LED is blinking during data transfer via Ethernet connection.

table 6-1 Alarm LEDs

For your notes:

