

# User's Manual for MMR8L L Single Band Remote Unit



B0133A0A

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Mikom GmbH An Andrew Company, 27-January-2005

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## 1. GENERAL

### 1.1. USED ABBREVIATIONS

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
ETS	European Telecommunication Standard
ETSI	European Telecommunication Standards Institute
FSK	Frequency Shift Keying
GSM	Global System for Mobile Communication
I <sup>2</sup> C-Bus	Inter Integrated Circuit Bus (Philips)
ID No	Identification Number
IF	Intermediate Frequency
LMT	Local Maintenance Terminal
MS	Mobile Station
NSO	Network Supervision Option
OMC	Operation and Maintenance Center
PCMCIA	Personal Computer Modem Communication International Association
PCS	Personal Communication System
PSTN	Public Switched Telephone Network
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
TCH	Traffic Channel
TDMA	Time Division Multiple Access
TX	Transmitter
UL	Uplink
UMTS	Universal Mobile Telecommunication System
UPS	Uninterruptible Power Supply
VSWR	Voltage Standing Wave Ratio

## 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. For US and Canadian installations: 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 40 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, including coaxial cable loss, is 0 dBi.
7. Make sure access is restricted to qualified personnel.
8. 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.
9. Due to power dissipation, the remote unit may reach a very high temperature.
10. Before opening the unit or (dis-)connecting the mains connector at the remote unit, ensure that mains supply is disconnected.
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. Make sure the system settings are according to the intended use (see also product information of manufacturer) and regulatory requirements are met.
14. Although the remote unit is internally protected against overvoltage, it is strongly recommended to earth the antenna cables close to the remote unit's antenna connectors for protection against atmospheric discharge.
15. Laser radiation – Class 1! Do not stare into the beam; do not view it directly or with optical instruments.



### 1.3. PREAMBLE

Mikom An Andrew Company 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.

Mikom has engineering and manufacturing facilities in Germany, Italy and the USA. In addition, it maintains many field engineering offices throughout the world.

Mikom GmbH operates a quality management system which complies with the requirements of ISO 9001. All equipment is manufactured using only highly reliable materials. In order to ensure constant first-rate quality of the products, a comprehensive quality assurance has been conducted at all fabrication stages. Every component leaves the factory only after a thorough final acceptance test, accompanied by a test certificate guaranteeing optimal function.

The declaration of conformity for the product is available on request via the local offices or from Mikom GmbH An Andrew Company directly.

Any intervention must be carried out by authorized persons only. If technical assistance for the product is required, please contact the local office or Mikom directly at one of the following addresses:

**Mikom GmbH An Andrew Company**  
**Industriering 10**  
**86675 Buchdorf**  
**Germany**  
**Phone: +49 (0) 9099 69 0**  
**Fax: +49 (0) 9099 69 930**  
**email: WIsupport.germany@andrew.com**

**for The Americas:**

**Mikom US An Andrew Company**  
**Phone: +1 (919) 771-2570**  
**email: WIsupport.us@andrew.com**

When set-up is performed according to this manual, the system will operate without complications for a significant length of time.



#### 1.4. INTERNATIONAL CONTACT ADDRESSES

<p><b>in Australia</b></p> <p>6 Stuart Street Padstow NSW 2211</p> <p>Australia</p> <p>Phone: +61 (2) 9774-4200 Fax: +61 (2) 9774-4500 email: WIsupport.australia@andrew.com</p>	<p><b>in France</b></p> <p>Z.I. des Ebisoires 78370 Plaisir</p> <p>France</p> <p>Phone: +33 (1)30-79-15-36 Fax: +33 (1) 30-55-55-37 email: WIsupport.france@andrew.com</p>	<p><b>in the USA</b></p> <p>108 Rand Park Drive Garner NC 27529 USA</p> <p>Phone: +1 (919) 771-2570 Fax: + 1 (919) 771- email: WIsupport.us@andrew.com</p>
<p><b>in the UK</b></p> <p>Guildgate House Pelican Lane Newbury RG14 1NX, Berkshire, U.K.</p> <p>Phone: +44 (1635) 569-695 Fax: +44 (1635) 569-463 email: WIsupport.uk@andrew.com</p>	<p><b>in China</b></p> <p>Rm 915 Chevalier Commercial Centre; 8 Wang Hoi Rd; Kowloon Bay SAR, Hong Kong</p> <p>Phone: +852 3106-6100 Fax: +852 2751-7800 email: WIsupport.china@andrew.com</p>	<p><b>in Canada</b></p> <p>1815 Ironstone Manor, # 12 Pickering, Ontario L1W 3W9</p> <p>Canada</p> <p>Phone: +1 (905) 839-3474 Fax: +1 (905) 839-4663 email: WIsupport.canada@andrew.com</p>
<p><b>in Switzerland</b></p> <p>Tiergartenweg 1 4710 Balsthal Switzerland</p> <p>Phone: +41 (6238) 61260 Fax: +41 (6238) 61261 email: WIsupport.switzerland@andrew.com</p>	<p><b>in Italy</b></p> <p>Via De Crescenzi 40 48018 Faenza Italy</p> <p>Phone: +39 0546 697111 Fax: +39 0546 682768 email: WIsupport.italia@andrew.com</p>	<p><b>in Austria</b></p> <p>Weglgasse 10 2320 Schwechat Austria</p> <p>Phone: +43 (1) 706 – 3999 Fax: +43 (1) 706 – 39999 email: WIsupport.austria@andrew.com</p>
<p><b>in the Czech Republic</b></p> <p>U Morusi 888 530 06 Pardubice-Svitkov Czech. Republic</p> <p>Phone: +42 (0406) 301280 Fax: +42 (0406) 301298 email: WIsupport.czechrep@andrew.com</p>		

table 1-1 List of international contact addresses

For your notes:

## **2. INTRODUCTION**

### **2.1. PURPOSE**

Cellular telephone systems transmit signals in two directions between base transceiver station (BTS) and mobile stations (MS) 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, extension of the transmission range can be achieved by means of an optical distribution system.

Such a system contains an optical master unit and a remote unit. The number of the remote unit depends on the hardware and software configuration. The remote unit is connected to the master unit with optical links. The optical loss must be less than 10 dB inclusive optical couplers or splitters.

The master unit is the connection to the base transceiver stations. The configuration of a master unit depends on the number of the remote units and the frequency range.

The optical transmission uses WDM-systems with a wavelength of 1550 nm in the uplink and 1310 nm in the downlink.

### **2.2. THE MMR8L L SINGLE BAND REMOTE UNIT**

The MMR8L L is a single-band multi-operator remote unit. It is used in conjunction with a master unit in the MMR optical distribution system. This system transports the whole LMR band simultaneously providing a cost effective solution for distributing capacity from one or more base stations.

The MMR8L L transports signals on the RF layer in a very inexpensive manner. This means that services from various operators can be transmitted simultaneously from a cluster of base station to a remote location over the same fibre.

For your notes:

### 3. FUNCTIONAL DESCRIPTION

#### 3.1. GENERAL

The following figure shows the configuration of an MMR8L L remote unit.

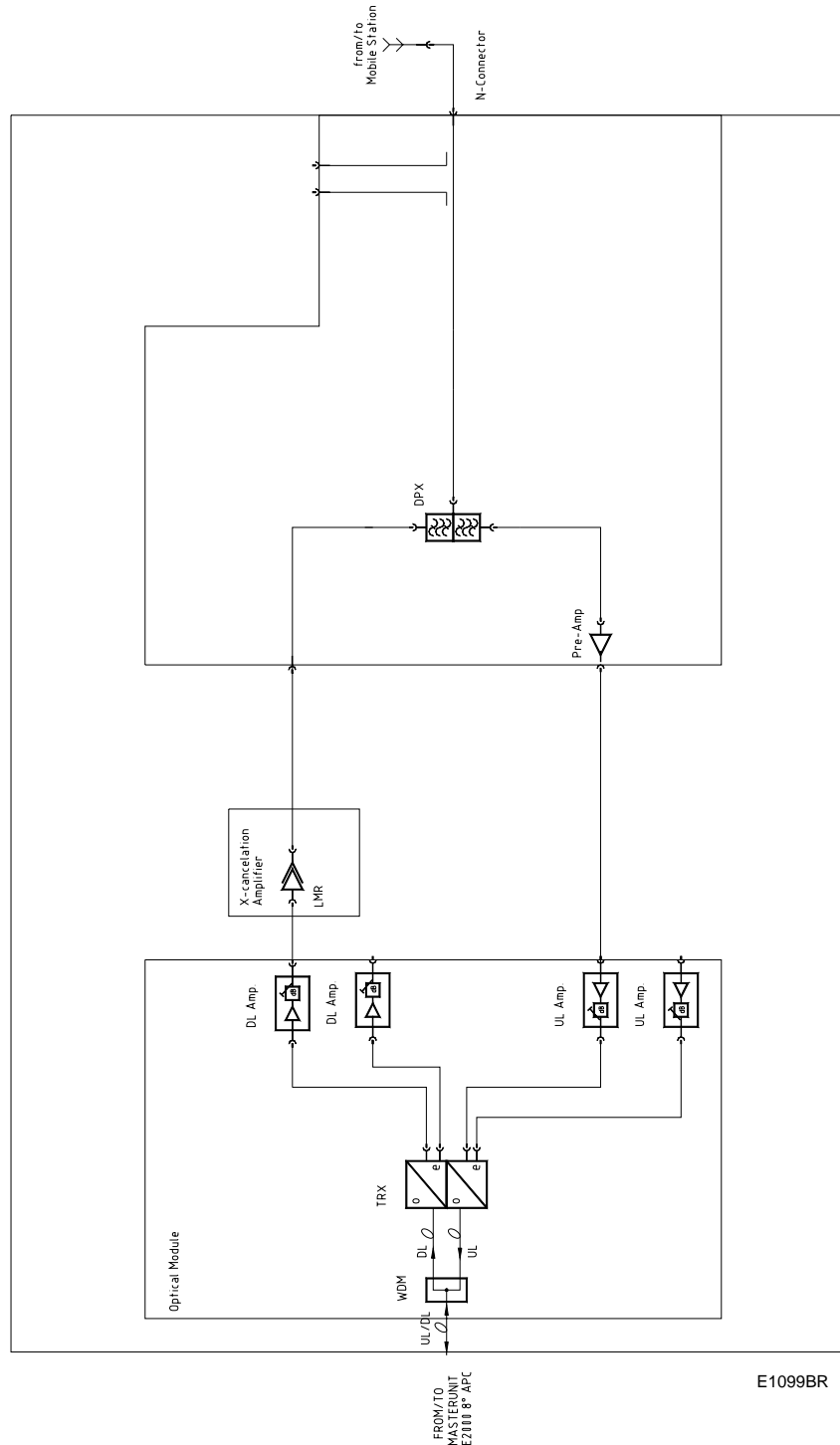


figure 3-1 Configuration of an MMR8L L remote unit

### 3.2. COMPONENTS OF THE MMR8L L REMOTE UNIT

The actual configuration of the remote unit can be seen at the configuration list which is part of the delivery.

The following figure shows an exemplary view of an MMR8L L remote unit to illustrate the individual components.

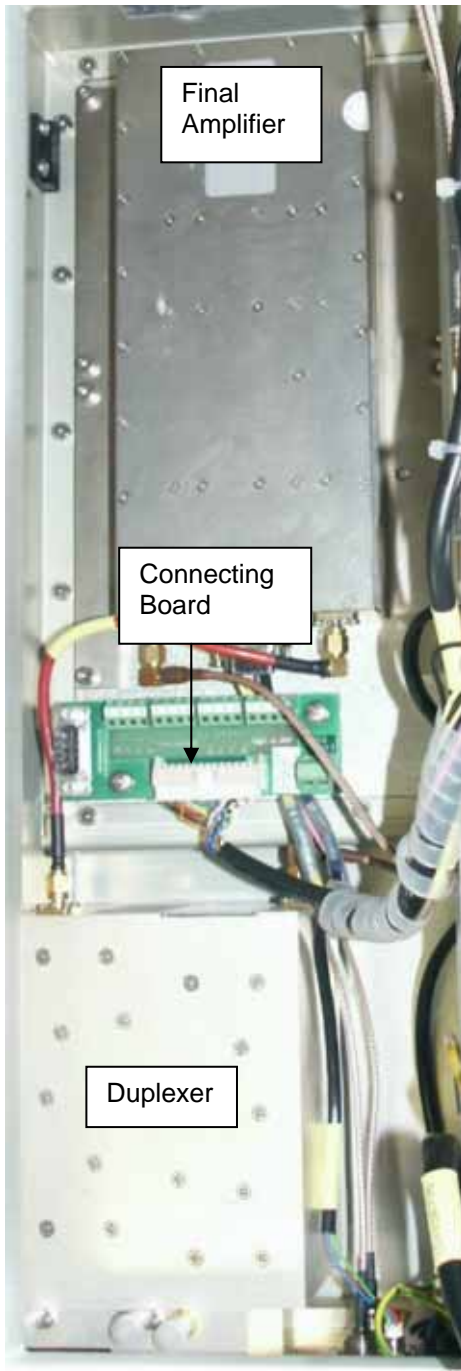


figure 3-2 MMR8L L, base



figure 3-3 MMR8L L, lid

## 4. INSTALLATION


### 4.1. MECHANICAL INSTALLATION

#### 4.1.1. General


Read the health and safety warnings in chapter *1.2 Health and Safety Warnings*.

1. Do not install the unit in a way or at a place where the specifications outlined in the Environmental and Safety Specifications leaflet of the manufacturer are not met.
2. It is strongly recommended to install the unit vertically. If a different installation of the remote unit is required, please contact customer service for further information.
3. It is recommended only to use the mounting hardware delivered by the manufacturer. If different mounting hardware is used, the specifications for stationary use of the remote unit must not be exceeded.

 **Note:** Exceeding the specified load limits may cause the loss of warranty!

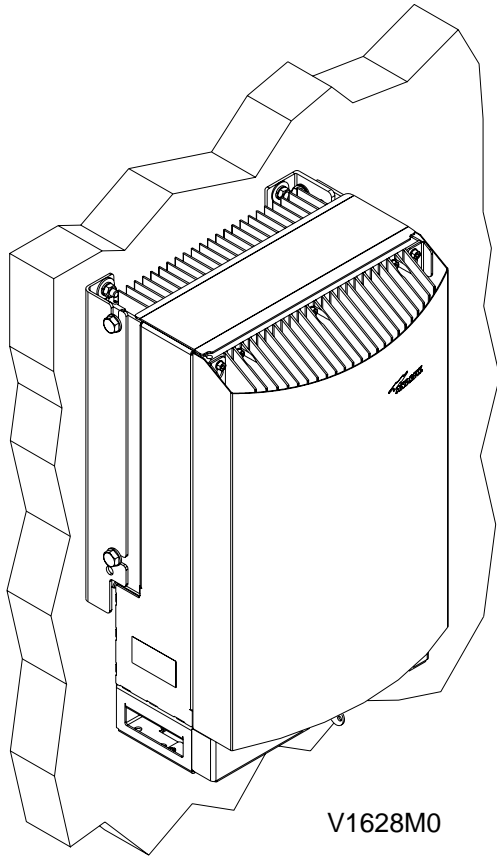
4.  The unit is considerably heavy. Make sure that a suitable mounting surface is used. Ensure there is adequate manpower to handle the weight of the system.
5. Due to power dissipation, the remote unit may reach a very high temperature. Ensure sufficient airflow for ventilation. Above and below the unit a minimum distance of 300 mm to ceiling, floor, etc. has to be kept. Also observe the instructions in the individual mounting procedures.

If any different or additional mounting material is used, ensure that the mounting remains as safe as the mounting designed by the manufacturer. Ensure that the static and dynamic strengths are adequate for the environmental conditions of the site. The mounting itself must not vibrate, swing or move in any way that might cause damage to the remote unit.

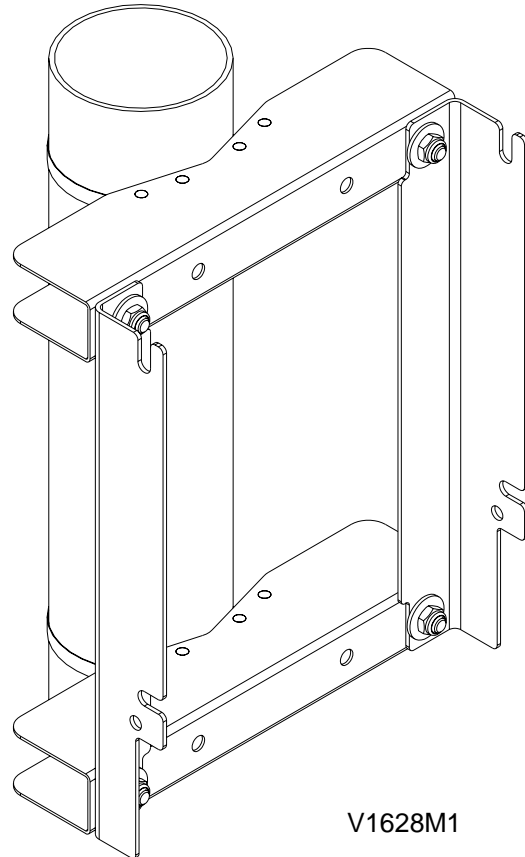
 **Note:** The remote unit is delivered with a pre-mounted front cover. This cover is of vital importance for the passive cooling of the unit. Thus, do not operate the unit without cover.

#### 4.1.2. Wall and Pole Mounting

Wall and pole mounting equipment for the unit is available. For the according mounting please refer to the mounting plan (drawing) that is part of the delivery.



*figure 4-1 Wall mounting*



*figure 4-2 Pole mounting*



## 4.2. ELECTRICAL INSTALLATION

### 4.2.1. General

Read the health and safety warnings in chapter *1.2 Health and Safety Warnings*.



1. This unit contains dangerous voltages. Loss of life, severe personal injury or property damage can be the result if the instructions contained in this manual are not followed.
2. It is compulsory to ground the unit before connecting power supply. A grounding bolt is provided on the cabinet to connect the ground bonding cable.
3. Although the remote unit is internally protected against overvoltage, it is strongly recommended to earth the antenna cables close to the remote unit's antenna connectors for protection against atmospheric discharge. In areas with strong lightning it is strongly recommended to insert additional lightning protection.
4. If the mains connector of the remote unit is not easily accessible, a separation device in the mains circuit must be provided within easy reach.
5. Before connecting or disconnecting the mains connector at the remote unit, ensure that mains supply is disconnected.
6. Make sure that an appropriate circuit breaker and an overcurrent limiting device are connected between mains and remote unit.
7. A connection of mains supply to a power socket requires the power socket to be nearby the remote unit.
8. The remote unit might be supplied from IT mains. (The maximum nominal line to line voltage must not exceed 400VAC).
9. Incorrectly wired connections can destroy electrical and electronic components.
10. To avoid corrosion at the connectors caused by electrochemical processes, the material of the cable connectors must not cause a higher potential difference than 0.6V (see electrochemical contact series).
11. It is sufficient to tighten the N antenna connector hand-screwed. Any use of a tool (e.g. pair of pliers) might cause damage to the connector and thus lead to malfunctioning of the remote unit.
12. For unstabilized electric networks which frequently generate spikes, it is advised to use a voltage limiting device.
13. The unit complies with the surge requirement according to EN 61000-4-5 (fine protection); however, it is recommended to install an additional medium (via local supply connection) and/or coarse protection (external surge protection) depending on the individual application in order to avoid damage caused by overcurrent.
14. Observe the labels on the front panels before connecting or disconnecting any cables.

### 4.2.2. Connections

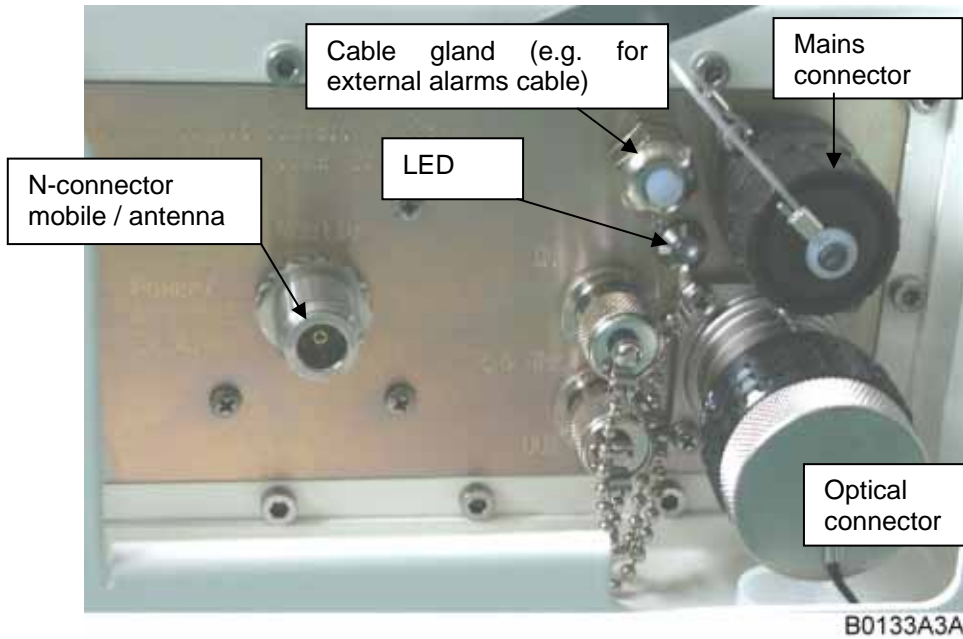


figure 4-3 Connector flange

### 4.2.3. Grounding

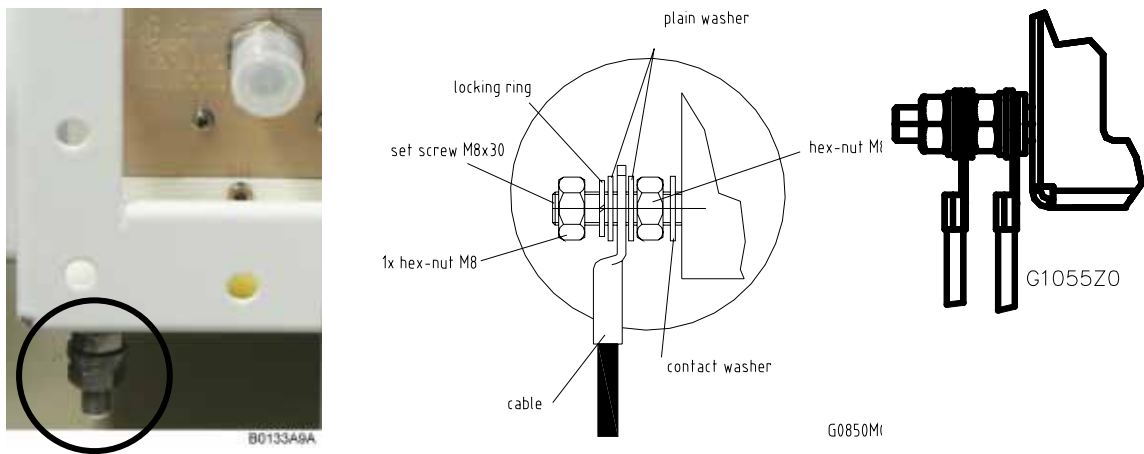


figure 4-4 Grounding bolt

Grounding must be carried out. Connect an earth bonding cable to the grounding connection provided at the outside of the remote unit (see *figure 4-3 Connector flange*). Do not use the grounding connection to connect external devices.

After loosening the hex nut, connect the earth bonding cable between the two washers as illustrated in *figure 4-4 Grounding bolt*. Then, fasten all parts again with the hex nut.

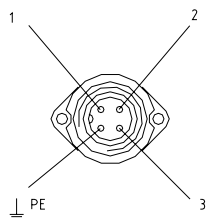
#### 4.2.4. Power Connection

Before connecting electrical power to the units, the system must be grounded as described in the previous chapter.

Mains power must be connected at the mains connector of the unit (see *figure 4-3 Connector flange*).

The power supply plug is part of the delivery. The correct wiring of the power supply plug is as follows:

AC PIN assignment:



Flange connector

Pin 1 = Phase (brown)

Pin 2 = Neutral (blue)

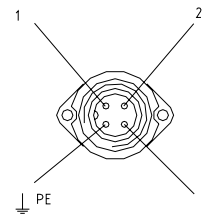
Pin 3 = n.c.

⏚ = PE (green/yellow)

G1055Z0

*figure 4-5 AC mains plug*

DC PIN assignment:



Flange connector

Pin 1 = n.c.

Pin 2 = -48V (black)

Pin 3 = 0V (red)

⏚ = n.c.

G1055Z0

*figure 4-6 DC mains plug*



**For the AC power supply connection, a minimum cross section of 1.5 mm<sup>2</sup> is required and for the DC power supply connection, a minimum cross section of 2.5 mm<sup>2</sup> is required. Each wire must observe the applicable national regulations regarding loop impedance, voltage drop, and methods of installation. Make sure to connect the correct voltage to the unit.**

**Note:** Do not connect or disconnect the power cord at the mains connector while power is on. Turn off mains\* power before connecting the power cord at the remote unit, then, engage mains again.

\* Mains power must be interrupted with an external mains breaker. For the mains breaker, observe the following recommendation:

120 Volt / 20 Amp max. or 240 Volt / 16 Amp, single-phase, 50/60 Hz AC service is needed, i.e. the external AC breaker should be 20 Amps max. for 120-Volt service or 16 Amps for 240-Volt service.

For the DC power supply, observe the local regulations of the DC service provider.

#### 4.2.5. Connection of the Antenna Cables

The remote unit has an N-type antenna connector or can be delivered with a 7/16 adapter. For its location please refer to *figure 4-3 Connector flange*. For mounting the cable connectors, it is recommended to refer to the corresponding documentation of the connector manufacturer. The bending radius of the antenna cables must remain within the given specifications.

For the selection of cable and antenna it should be considered that a cable with higher loss is less expensive but on the other hand it impairs performance.



**It is sufficient to tighten the N-type (or 7/16) antenna connectors hand-tight. The use of a tool (like pliers) may cause damage to the connector and, therefore, lead to a malfunctioning of the remote unit.**

#### 4.2.6. Optical Fibre Cable Connection



**In case of a backbone structure it has to be guaranteed that there is a minimum wavelength difference of 20 nm. This will be guaranteed by using four different optical interfaces with four different wavelengths according to ITU grid. Thus, there are also four different remote units. In one optical backbone, each type of unit can only be used once!**

#### Rules for optical fibre connection

Optical signals are transmitted by use of optical fibres. When connecting these fibres observe the following instructions.

**Note:** Care should be taken when connecting and disconnecting fibre optic cables. Scratches and dust significantly affect system performance and may permanently damage the connector. Always use protective caps on fibre optic connectors not in use.

In general optical fibres do not need special protective measures. However, protection against environmental influences e.g. rodents and humidity must be considered.

The optical fibre is a single mode fibre. Type is E9/125µm with the following minimum requirements.

Attenuation:	<0.36 dB/km @ 1310 nm	/	<0.26 dB/km @ 1550 nm
Dispersion:	<3.5 ps/nm km @ 1310 nm	/	<18.0 ps/nm km @ 1550 nm

The specified bending radius of the optical fibres must not be exceeded. The pigtails for the connection between mini master and remote unit must have a sufficient length. A protection for the feeding into units must be given. For MMR8L L the system attenuation of the optical fibres, including the connectors, must not exceed 10 dB.

System attenuation and attenuation of optical components must be determined. This can be achieved by measuring attenuation and reflection with an appropriate measuring instrument. For pigtails, a total value of < 0.4 dB (measured to a reference plug) can be assumed due to the dead zone of the reflectometer. These measurements must be made with a sufficient length of optical fibre, at the in- and output of the device which has to be measured.

Fibre cable connectors have to be of the same type (E2000APC) as the connectors used for the unit. The fibre optic cables are connected to the optical transceiver.

**Note:** **Angled connectors are not compatible with straight optical connectors; non-compatibility of connectors will result in permanent damage to both connectors.**

Before connecting the fibre cables, follow the procedure below to ensure optimized performance. It is important that these procedures are carried out with care:

- Remove fibre optic protective caps.
- Do not bend the fibre optic cable in a tight radius (< 4 cm) as this may cause cable damage and interrupt transmission.
- Using high-grade alcohol and lint-free cotton cleaning swabs, clean the end of the fibre optic cable that will be inserted in the optical connectors on the donor interface box.
- Blow out the laser receptacle with clean and dry compressed air to remove any particulate matter.
- Connect the fibre optic cables by inserting the cable end into the laser receptacle and aligning the key (on the cable end) with the keyed slot.
- Do not use any index matching gels or fluids of any kind in these connectors. Gels are intended for laboratory use and attract dirt in the field.

#### 4.2.6.1. Protective Plug

##### Connection:

A protective plug is provided for the connection of the fibre-optic cables.



B0122AFA

*figure 4-7 Protective plug assembly*

 **Note:** Only high-quality connectors must be used for this type of plug. Qualified brands are Diamond or Huber & Suhner.



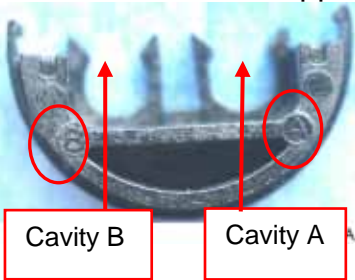
For plug assembly observe the following instruction.

1. Pass one or two contacts through the backshell and the clamp ring.



B0122A1A

2. Place the contact(s) on the lower insulation body by pushing the groove of the contact into the cavity. If there is only one contact, cavity A **must** be used. Cavity B is used for the diversity path.\*
3. Then, mount the upper insulation body on the lower insulation body. \*\*

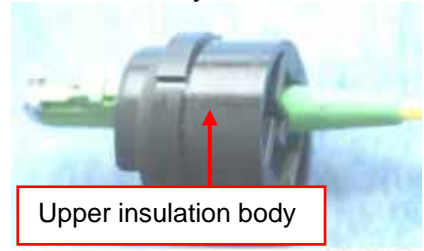


Cavity B

Cavity A



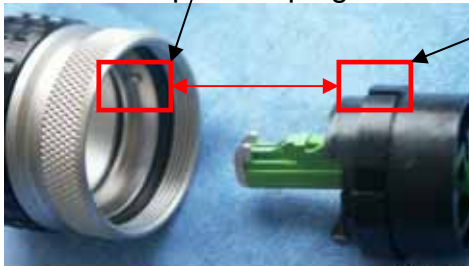
B0122A3A



Upper insulation body

B0122A4A

4. Bring the insulator into the plug. The narrow groove of the insulator must be fitted into the stamp of the plug.



B0122AEA



B0122A6A

- \* To release the contact for disassembling push the inner snap to the side and pull the contact out.
- \*\* To release upper and lower insulation body for disassembling, use a small screwdriver and carefully open the snap-connections at the left and the right side of the insulator without damaging them.

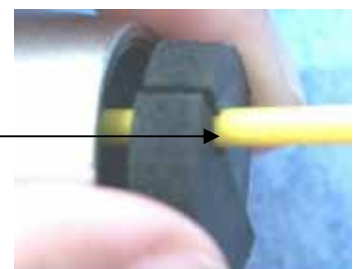
5. Fasten the insulator by screwing the backshell tight onto it. Use a spanner with opening 32 to screw the backshell tight (no gap).



B0122A7A

6. Place the appropriate seal parts (with one groove for one contact or two grooves for two contacts) over the cable(s) and push them into the backshell.

Seals with one groove



B0122A8A

7. Bring the plastic ring over the cable(s), push it into the backshell and compress the seals and plastic ring by screwing the clamp ring tight (no gap) using a spanner with opening 20. \*\*\*

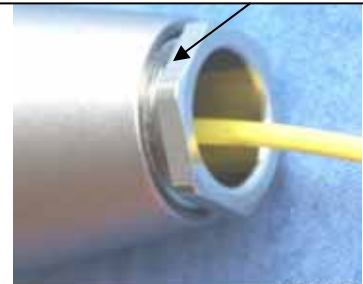


B0122A9A



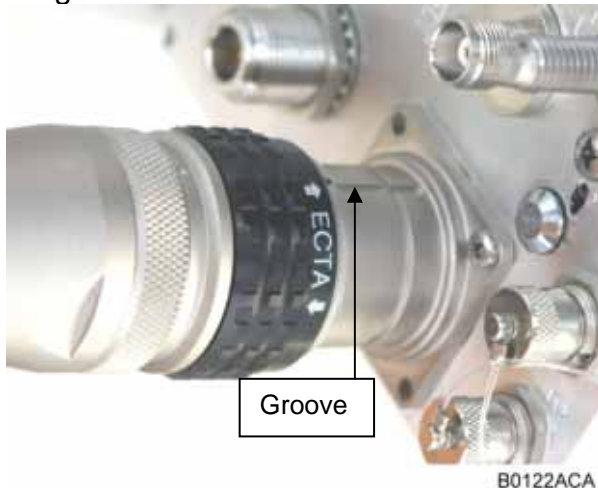
B0122AAA

Screw tight till gap is closed



B0122ABA

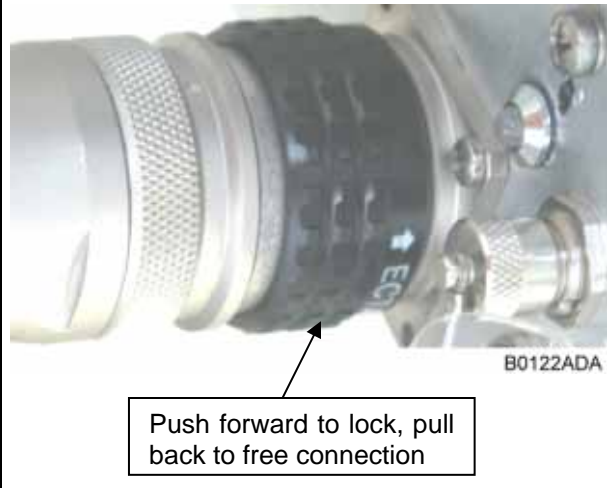
8. Connect the plug to the optical fibre connector of the remote unit, again by fitting a stamp on the plug into the groove of the connector.



B0122ACA

Groove

9. To lock the connector push the black locking ring forward.\*\*\*\*



B0122ADA

Push forward to lock, pull back to free connection

\*\*\* For disassembling, release the clamping ring and remove the seals and the plastic ring first.

\*\*\*\* Locking mechanism: The system of locking the plug is based on a "push-pull" mechanism. The locking ring has to be pushed forward to lock the connector and pulled back to free the connection.

#### 4.2.7. Protective Tube Kit

As additional protection for the optical fibres, this connector type can be supplemented by a special tube kit. To fasten the tube correctly, first unscrew the clamp ring (if already installed) of the original plug kit.

Then, proceed according to the following instruction:



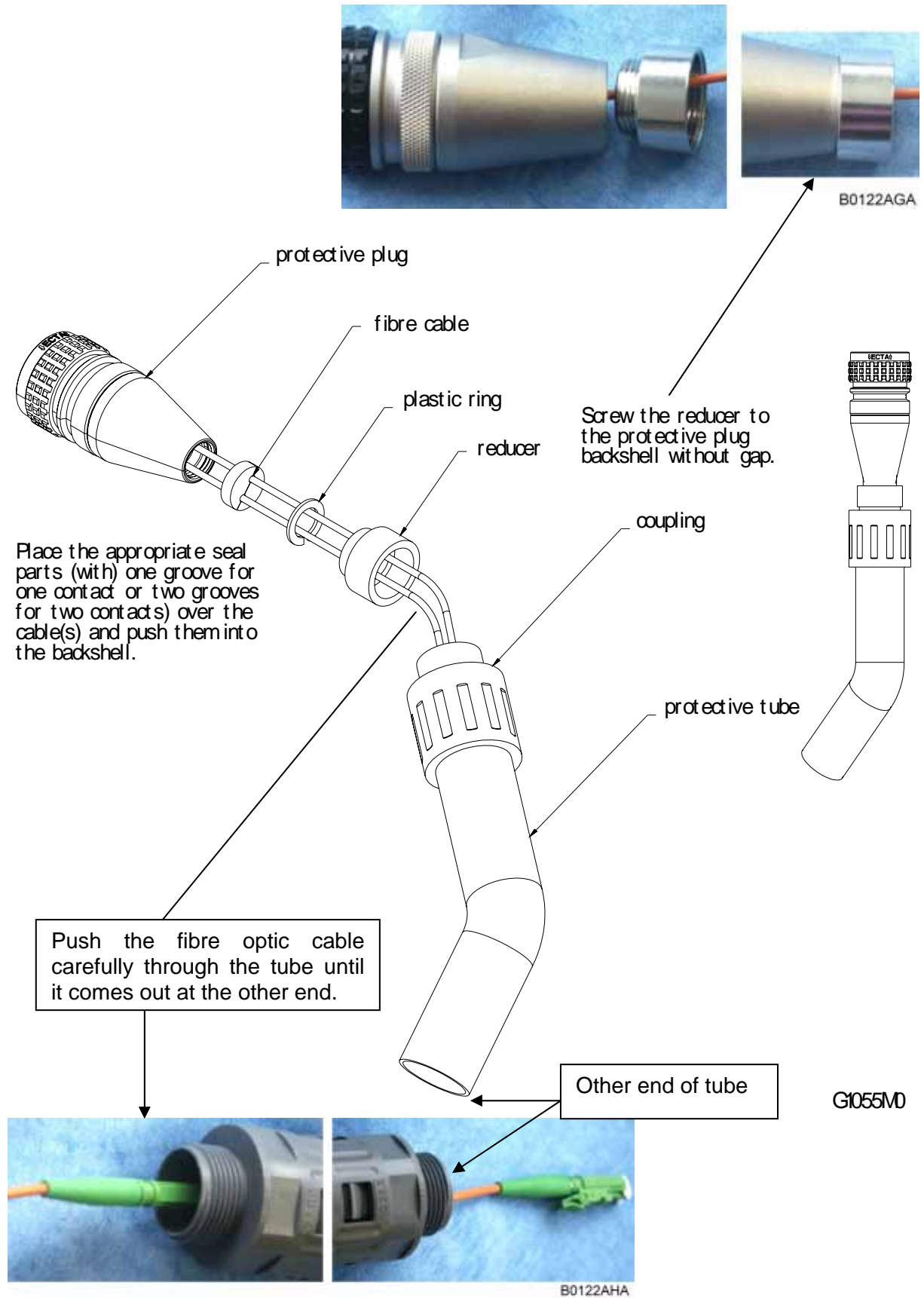


figure 4-8 Tube kit installation

For your notes:

## 5. COMMISSIONING

### 5.1. GENERAL

Read the health and safety warnings in chapter *1.2 Health and Safety Warnings* as well as the description carefully to avoid mistakes and proceed step by step as described!

- Do not operate the remote unit without terminating the antenna connectors. The antenna connectors may be terminated by connecting them to their respective antennas or to a dummy load.
- Only qualified personnel should carry out the electrical, mechanical, commissioning and maintenance activities that require the unit to be powered on when open.
- When opening the remote unit do not damage the warranty labels on the internal devices. The warranty is void if the seals are broken.
- Ensure that all connections have been performed according to chapter *4.2.2 Connections*.

### 5.2. AUTO-LEVELLING

For a proper operation of the auto-levelling function, a defined level has to be set at the optical interface (DL) of the master unit. For details refer to the software manual of the master unit.

For your notes:

## **6. ALARMS**

### **6.1. BITE AND ALARMS**

The Built-In Test concept comprises the monitoring of the power supplies, the power amplifiers and the optical interface.

All occurring alarms can be checked via software at the master unit.

### **6.2. HANDLING OF ALARMS**

As soon as the software acknowledges a valid alarm, a message is transmitted to the master unit.

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

### **6.3. ALARM STATUS**

For details refer to the corresponding software documentation of the Master Unit.

## 6.4. LED ALARMS

For local supervision, a LED on the connector flange of the remote unit gives an indication of possible reasons for alarms. This table shows possible on-site measures that could be checked before referring to the master unit alarm list.

<b>LED Indication</b>	<b>Alarms</b>	<b>Possible on-site measures</b>
Green	No alarm → Status ok	
Orange	Door alarm	Close the door (RUs with door).
	<i>Alarms not directly related to RU:</i>	
	External alarms	Check externally connected devices.
	Optical alarm Rx	Check fibre loss of optical link. Check optical connectors. Clean optical connectors. <i>(MU: Check optical output power of corresponding OTRx at master unit).</i>
	ALC alarm	<i>(MU: Decrease DL input power of affected band).</i>
Red	<i>Alarms directly related to RU:</i>	
	Power 28V	Change power supply (RUs with door). Replace the affected remote unit.
	Temperature	Reduce environmental temperature. Eliminate thermal short circuit.
	Fan	Disconnect and connect mains. Fans should run briefly (SW version > 2.4). If not, replace the fans at RU.
	I <sup>2</sup> C	Disconnect and connect mains.
	Optical alarm Tx	-
	Amplifier "Power Down"	<i>(MU: Change amplifier setting at MU controller).</i>
LED off	Mains	Check power switch inside of RU (RUs with door). Check mains cabling. Check mains power.

table 6-1 LED alarms

For the position of the LED see *chapter 6.4 LED Alarms*.

Explicit troubleshooting is available in the MU software, (software manual or WEB Interface).

## 6.5. EXTERNAL ALARM INPUTS AND OUTPUTS

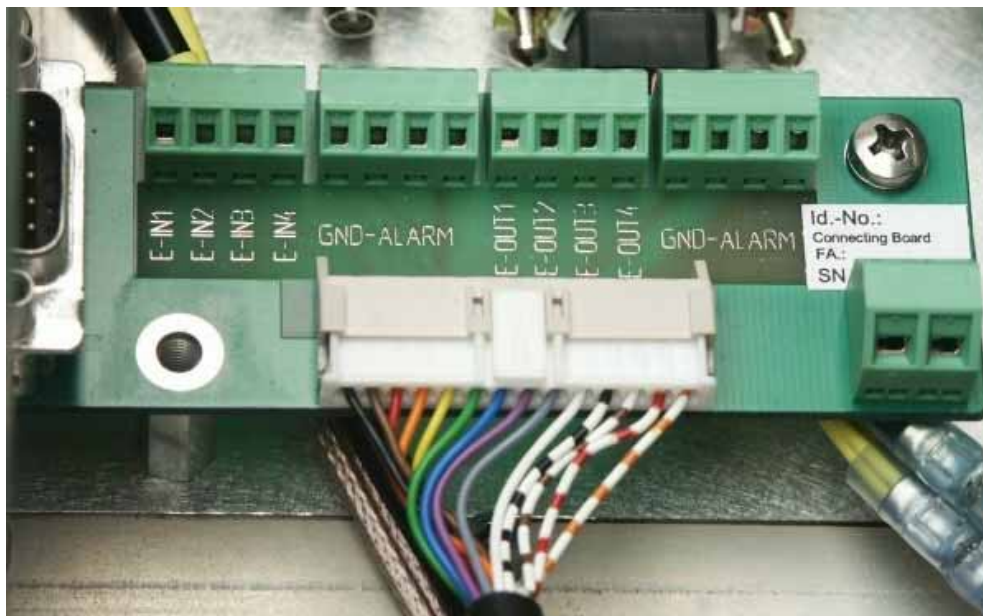
There are four alarm inputs and four alarm outputs. The alarm outputs (open collector output 5 V / 1 mA) are normally low. In case of an alarm they are high active (5V). They can be used to monitor alarms with an external alarm indicator. Each alarm output can be set individually to any alarm at the Remote Unit. For details please refer to the according chapter in the software manual of the Master Unit.

**Note:** The manufacturer/ supplier of this system accepts no liability for damage caused by equipment connected to external outputs or by effects from such equipment.

With the external alarm inputs, it is possible to monitor the status of connected devices, e.g. a UPS, via software. All alarm inputs are normally high (5V) without connection.

The device to be monitored must be connected so that the alarm contacts (contact on the right is always GND) will be closed in case of an alarm ( $I_{max} = 8 \text{ mA}$ ). The alarm inputs are potential-free with common ground.

For the location of the external alarm inputs and outputs refer to *figure 6-1 Connecting board*. Settings have to be done via the MMR Master Controller and are described in the according software documentation.



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*figure 6-1 Connecting board*

## 6.6. TROUBLESHOOTING

The status of the remote unit can be checked via the MMR Master Unit (for details please refer to the software manual of the MMR Master Controller). Locally, the status can be checked at the LED, see chapter *6.4 LED Alarms*.



## 7. MAINTENANCE

### 7.1. MAINTENANCE

Read the health and safety warnings in chapter *1.2 Health and Safety Warnings*.

**Note:** The remote unit does not require preventative maintenance measures.

Maintenance of the MMR8L L should be performed on a FRU (Field Replaceable Unit) basis only. Do not damage the warranty labels on the components, as this voids the warranty.

The spare parts list contains only units that can be replaced without tuning or soldering work.

**Note:** Defect parts should only be replaced by original parts from the supplier. All interventions inside the housing are at one's own risk.

**Note:** During maintenance ensure that the unit has been disconnected from mains.

To open the cabinet of the MMR8L L, observe the instructions in chapter *4.1.1 General*.

**Note:** Before disconnecting any cables, label any unlabeled cables to ensure correct reconnection.

To replace an FRU, use the appropriate tools. Replacement tools may be ordered from the supplier. All screws have a right-hand thread, turn the tool clockwise for tightening and anti-clockwise for loosening.

SMA connectors have a specified torque of 100 Ncm. Use an appropriate tool to fasten and unfasten these connectors. Do not over-tighten the connectors or screws. The table below shows various screws with their respective torques.

<b>Screw Type</b>	<b>Tallow-drop</b>	<b>Socket head cap</b>	<b>Countersunk head</b>
<i>Thread size</i>	<i>Specified Torque (in Ncm)</i>		
M 2.0	40	not in use	40
M 2.5	82	not in use	82
M 3.0	145	100	145
M 4.0	330	330	330
M 5.0	650	tbd.	650

*table 7-1 Specified torques for various screw types*

**Note:** Do not forget to reinstall the front cover after the replacement procedure to ensure safe operation.

If any FRU not contained in the following chapter needs to be replaced, contact customer service for additional instructions.

## 7.2. GENERAL

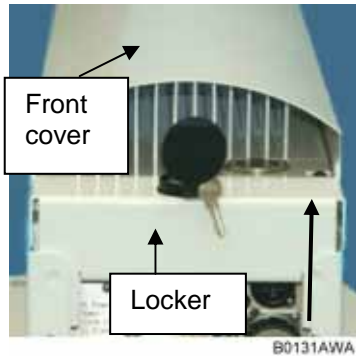


figure 7-1 Locker with key

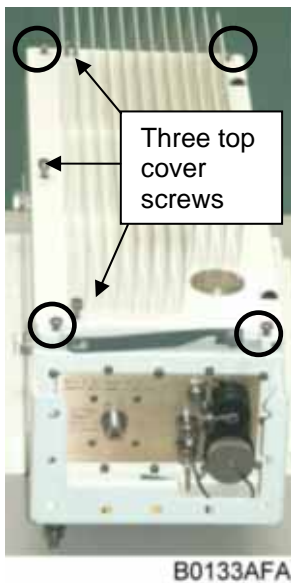


figure 7-2 Front and top cover screws

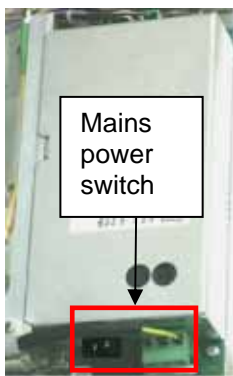


figure 7-3 Position of mains power switch

- To open the cabinet of the remote unit, first dismount the locker by unlocking it with the key (which is part of the delivery) and pulling it out carefully.

- Then remove the front cover by loosening the four M5 socket head cap screws (circle-marked in *figure 7-2* on the left). Do not remove those screws. When they are loosened, the front cover can be taken off.

- To open the cabinet, unscrew the three M5 socket head cap screws (captive) of the top cover of the remote unit.

- **Set the mains power switch inside to On (I):**
- Close the cabinet.
- ☞ **Note: Do not forget to reinstall the front cover afterwards to ensure safe operation.**
- Check the status of the LED. Ensure it is showing a green light.

### 7.3. REPLACEMENT OF POWER SUPPLY

- To remove a power supply, first disconnect mains, mains cable and DC cable.
- Unscrew the hexagon socket head cap screw on the left-hand side and loosen the other socket head cap screw on the right-hand side (circle-marked) with an Allen key.
- Pull the power supply out.
- Apply heat-conducting paste to the mounting surface of the new power supply.
- Carefully insert the new power supply.
- Fasten the two socket head cap screws.
- Reconnect all cables.

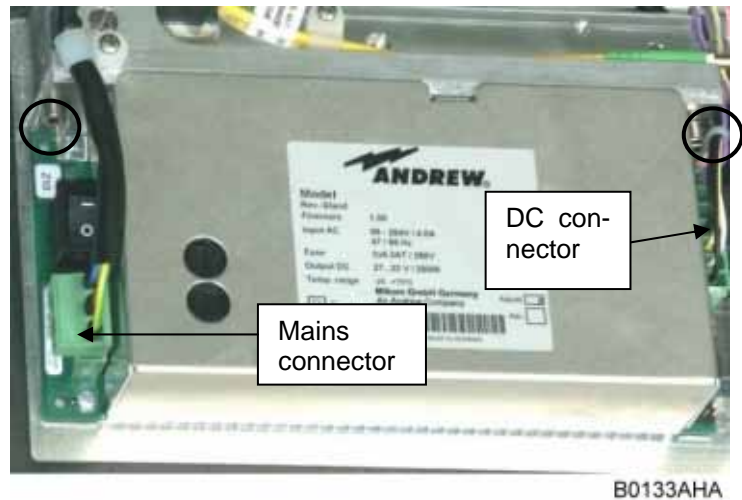


figure 7-4 Power supply screws

For your notes:

## 8. APPENDIX

### 8.1. LAYOUT



B0133ANA

*figure 8-1 Layout of the remote unit*

## 8.2. SPECIFICATIONS

### 8.2.1. Electrical Specifications


<b>MMR8L L</b>		
<b>Power Supply</b>	Mains power	100 to 240 Vac 36 to 72 Vdc
	Power consumption	180 W
<b>Interface</b>		
<b>BTS Interface</b>	Number of connectors	1 single duplexed RF port
	Input power	Micro: 33/43 dBm typical
<b>Antenna Port</b>	Connector	N Female or DIN 7/16
	Return loss	15 dB
<b>Optical link</b>	Connectors	E2000/APC 8°
	Optical return loss	45 dBm minimum
	Fiber type	Single mode E9/125 μm
	Optical link budget	0 to 10 dB
	Composite input power @ OTRX master side	+4 dBm maximum
<b>System supervision and control</b>		
<b>Commands</b>	RF on/off; External control ports	
<b>Alarms</b>	Summary Power supply Optical UL and DL failure RF UL and DL failure Temperature Door open	
<b>Supervision</b>	Composite output power	
<b>Frequency ranges</b>		
Nominal 20 dB Bandwidth		51 MHz
800 MHz band	LMR	UL: 806 to 824 MHz DL: 851 to 869 MHz
Mean rated output power <sup>1)</sup>		40 dBm
Output power <sup>2)</sup>	@ 1 carrier	40 dBm <sup>3)</sup> Analog; 40 dBm <sup>3)</sup> iDEN; 40 dBm TDMA/ EDGE; 40 dBm <sup>3)</sup> CDMA; 38 dBm <sup>3)</sup> WCDMA
	@ 2 carriers	37 dBm <sup>3)</sup> Analog; 37 dBm <sup>3)</sup> iDEN; 37 dBm <sup>3)</sup> TDMA/ EDGE; 35 dBm <sup>3)</sup> CDMA; 35 dBm <sup>3)</sup> WCDMA
	@ 4 carriers	34 dBm <sup>3)</sup> Analog; 34 dBm <sup>3)</sup> iDEN 34 dBm <sup>3)</sup> TDMA/ EDGE; 32 dBm <sup>3)</sup> CDMA; 32 dBm <sup>3)</sup> WCDMA
	@ 8 carriers	31 dBm <sup>3)</sup> Analog; 31 dBm <sup>3)</sup> iDEN 31 dBm <sup>3)</sup> TDMA/ EDGE 29 dBm <sup>3)</sup> CDMA; 29 dBm <sup>3)</sup> WCDMA
Intermodulation distance		-60 dBc

D L	Output tolerance over frequency	± 1.0 dB	
	Output tolerance over temperature	± 1.0 dB	
		<i>ICP3 optimized</i> <sup>4)</sup>	<i>NF optimized</i> <sup>4)</sup>
	Gain <sup>5)</sup>	+33 dB	
	Gain @ remote unit <sup>6)</sup>	58 dB	
	Output impedance	50 Ohms	
U L		<i>ICP3 optimized</i> <sup>4)</sup>	<i>NF optimized</i> <sup>4)</sup>
	Input ICP3	+1.5 dBm	-9 dBm
	Noise figure (NF) <sup>7)</sup>	13.5 dB	6.0 dB
	Gain <sup>5)</sup>	33 dB	45 dB
	Gain @ remote unit <sup>6)</sup>	70 dB	
	Automatic Level Control (ALC)	factory set	
	Input impedance	50 Ohms	

- 1) Mean rated output power specified for signals with 0 dB peak to average signals.  
**Note:** The manufacturer's rated output power of this equipment is for single carrier operation. For situations when multiple carrier signals are present, the rating would have to be reduced by 3.5 dB, especially where the output signal is re-radiated and can cause interference to adjacent band users. This power reduction is to be by means of input power or gain reduction and not by an attenuator at the output of the device.
- 2) Spurious < -13 dBm @ 1 MHz RBW / -73 dBm @ 1 Hz RBW
- 3) All dB and dBm figures are typical values.
- 4) 0 to 10 dB optical loss
- 5) Gain calculation from reference point A to B, auto-levelling active (gain range software adaptable )
- 6) Auto-levelling not active
- 7) **Note:** The noise figure (NF) stated above refers to one Remote Unit (RU) per sector. The NF system increases with the number of the RUs per sector. It is recommended not to operate above four RUs per sector. With four RUs per sector, the system NF will be increased by 6 dB.

**All data is subject to change without notice!**


## 8.2.2. Environmental and Safety Specifications

 **Note:** For detailed information, please refer to the Environmental and Safety Specifications leaflet of the supplier, related to ETS 300 019 (European Telecommunication Standard).

Operating temperature range	-33° C to +50° C
Ingress protection	IP66

**All data is subject to change without notice!**

### 8.2.3. Mechanical Specifications

 **Note:** The unit is mounted directly to the wall or pole. Vertical mounting, and a spacing of 300 mm (11.8") above and below is required. Do not block air inlet and outlet.

Height, width, depth	546 x 190 x 260 mm (21.5 x 7.5 x 10.25 inch)
Weight	16 kg (35 lb)

**All data is subject to change without notice!**

### 8.3. PARTS LIST

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

#### Parts List of the Remote Unit MMR8L L

<b>Designation:</b>	<b>ID No</b>	<b>FRU</b>
<b><i>MMR8L L</i></b>	<b><i>163506</i></b>	
Control Unit populated Board 1570.5	156470	
Cover	160736	x
DC/ DC converter 28V/ 12V 0.7A	163549	
Dpx UL-aktiv 806-824 851-869	162326	
Fin.Ampl. 82W 851-869 36dB	161175	
Locker	160734	x
OTRx 8RU	163500	
Power Supply Unit DC IN 48V	161751	x
User's Manual for MMR8L L	163511	
Pole Mounting Kit for K-/ L-/ Q-Cabinet	163746	x
Wall Mounting Kit	162809	x

The manufacturer reserves the right to replace the spare parts listed above by equivalent substitutes!



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## 10. LIST OF CHANGES

Version	Changes	Release Date
M0106ASA		14-January-2005
M0106ASB	<ul style="list-style-type: none"><li>- Chapter 1.2 extended</li><li>- Chapter 3 changed</li><li>- Chapter 4.1.2 changed</li><li>- Chapter 4.2.4 changed</li></ul>	27-January-2005