User's Manual

for

MR303D Varia

Id.-Nos.: 152796, 152797 & 154595

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LIST OF FIGURES AND TABLES

LIST OF ABBREVIATIONS

ALC	Automatic Level Control
BCCH	Broadcast Control Channel
BITE	Built In Test Equipment
BTS	Base Transceiver Station
CEPT	Conférénce Europe´ennedes Postes et Telecommunications
D.I.C.E.	Distributed Indoor Coverage Equipment
DL	Downlink
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
FSK	Frequency Shift Keying
GSM	Global System for Mobile communication
Id.-No.	Identification Number
IF	Intermediate Frequency
LMT	Local Maintenance Timeout
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
UL	Uplink

CONTENTS OF DELIVERY

Qty 1 Repeater MR303D Varia

Qty 1 User's manuals for repeater MR303D Varia

Qty 1 Set of test protocols consisting of an electrical acceptance test protocol
and a safety test protocol regarding the power supply

Qty 1 Wall mounting template

HEALTH AND SAFETY WARNINGS

☞ **Note:** **Electrical installation must be carried out in accordance with the safety regulations of the local authorities. Due to safety reasons, electrical installation must be conducted by qualified personnel only. The cover of this unit should not be opened while power is applied. Subsequent installations, commissioning and maintenance activities that require the unit to be under power while the cover is open, must only be carried out by suitably qualified personnel.**

☞ **Note:** **ESD precautions must be observed! Before commencing maintenance work, disconnect the repeater from mains.**

PREAMBLE

In cellular systems, repeaters are used to extend the coverage of a base station in regions where, due to topological or structural conditions, weak field strengths disable communication. MIKOM is a leading manufacturer of repeaters, providing excellent electrical characteristics. The repeaters are light-weight and easy to install. MIKOM repeaters provide a preferred solution for extended cellular coverage.

This repeater has been built using only highly reliable materials. A comprehensive quality assurance has been carried out on all fabrication steps, ensuring constant quality of the product. Every repeater leaves the factory only after a thorough final acceptance test, accompanied by a test certificate, which guarantees perfect function.

Any intervention must be carried out by authorised persons only. If technical assistance for the repeater MR303D Varia is needed, contact the local sales office (see List of international sales offices on the following page) or contact MIKOM directly at the following address:

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

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

List of international sales offices

Allen Telecom 30500 Bruce Industrial Parkway Cleveland, Ohio 44 139-3996 USA Phone: +1 (216) 349-8657 FAX: +1 (216) 349-8408	**Allen Telecom (Australia) P/L** 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: +39-39-605-41 FAX: +39-39-605-4477	**AT Singapore** 80 Marine Parade Road #19-1 Parkway Parade Singapore 449269 Phone: +65-345-8022 FAX: +65-345-8033	**AT China** CITIC Building, # 11-05 19 Jiangguomenwai 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, Kow Loon 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		

1 INTRODUCTION

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 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 signal from a donor antenna of an existing cell, amplifies and re-transmits it into the required 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.

1.1 The MR303D Varia

The repeater MR303D Varia is a bi-directional amplifier with adjustable RF-bandwidth. The first and the last channel of the transmission bandwidth can be set manually by means of rotary switches. The repeater has been designed for applications in medium sized rooms such as suites, offices and basements. A quality connection with a mobile phone can usually not be established in these rooms.

The repeater is equipped with a connector for an external receiving/transmitting antenna which provides the RF connection to the mobile. Connection to the BTS can be established via an outdoor antenna. Other components of the D.I.C.E. COAX system can also be connected to the repeater.

The final amplifiers are protected by individual level limiters, which allow the mobile unit to be operated in close proximity to the repeater. Third order intermodulation products are kept below the CEPT limit of -36 dBm constantly, even if the repeater receives the signals of more than one mobile unit.

1.2 Functional Description

The MR303D Varia is a repeater operating in the GSM900 frequency range. The operation principle for uplink and downlink is depicted in the following block diagram:

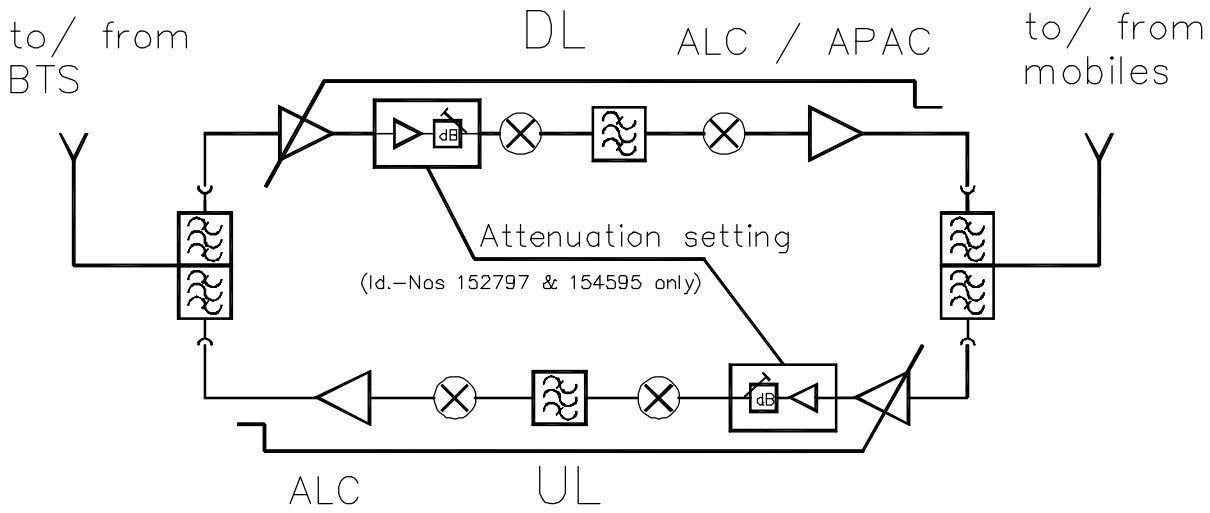


figure 1-1 Block diagram

1.3 Downlink

Downlink signals are received by the external antenna and fed to the duplexer. The duplexer is the frequency separation unit that splits and recombines uplink (UL) and downlink (DL).

After processing through the duplexer the signals are transferred to a pre-amplifier and then enter the attenuation selection. The gain of the repeater can be set by introducing attenuation into the amplifier chain (see chapter 3.2 Setting the Attenuation). Then the signals are relayed to a mixer. The mixer converts the signals down to an intermediate frequency (IF). An IF filter provides the selectivity of the repeater. After the IF filter the signals are reconverted to the original frequency again with another mixer. A final amplifier amplifies the signal once again to the required output power.

After amplification a power detection feature, called automatic level control (ALC), measures the output power and controls the gain. The ALC keeps intermodulations below - 36 dBm. Finally, the signals are supplied to the antenna output.

1.4 Uplink

The uplink signals are received by the antenna and fed into the repeater where a pre-selection of the frequency is made. The signals are then converted down to IF by means of a mixer and an IF filter provides the selectivity against other frequencies. After the re-conversion the signals are amplified in an amplifier that provides the output power. The signals are then fed to the antenna via the duplexer.

In this link, an ALC and an automatic power adjust circuit (APAC) is provided. APAC limits the output power if two carriers are present at the one UL input. This again keeps intermodulations to the desired limit. The repeaters with Id.-Nos. 152797 & 154595 provide an attenuation selection unit, which allows the gain to be set on UL and DL -simultaneously, but not separately- by introducing attenuation into the amplifier chain. (See chapter 3.2 Setting the Attenuation).

In the MR303D the bandwidth of the RF modules can be set within the GSM900 band to a desired value with rotary-switches on the outside of the modules. To set a defined bandwidth, the start channel, as well as the stop channel must be adjusted with the rotary-switches. (See chapter 3.1 Adjusting the Frequency).

2 FUNCTIONS AND FEATURES

2.1 Configuration of the Connectors

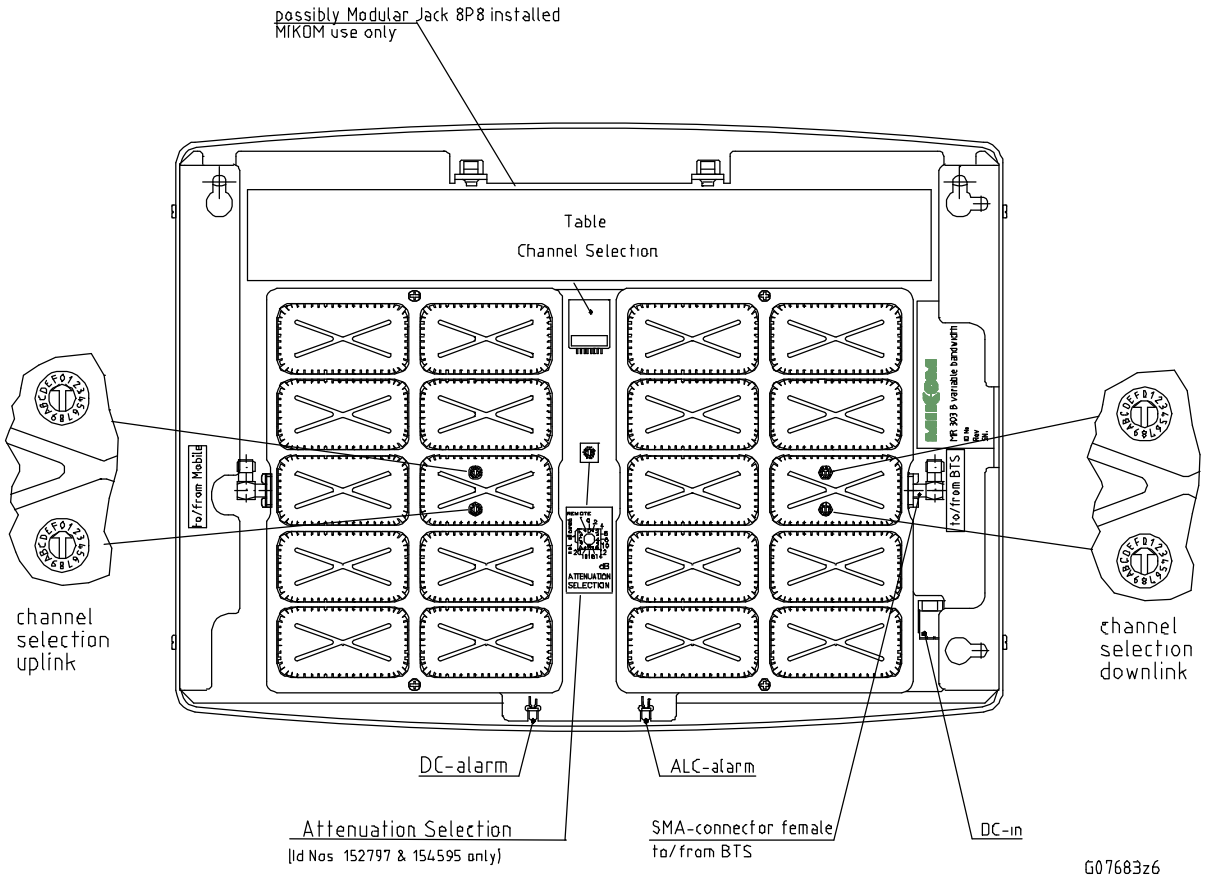


figure 2-1 Configuration of the connectors

2.1.1 RF Connectors

The RF connectors (SMA female) are situated on both sides of the repeater. These ports must be connected to the RF cables of the external antennas to/from the BTS and to/from the mobiles.

2.1.2 Power supply

The socket for the DC supply is located next to the RF connector to/from the BTS. Power supply voltage is 6.7 Vdc, current is 1.6 A typ for Id.-No.: 152796 and 2.5 A for Id.-Nos.: 152797 & 154595.

There are two possibilities to provide the MR303D Varia with power:

- Use external power supply and connection to the DC socket of the repeater. (Use only the power supply that is delivered with the unit).

Or:

- Bias the MR303D Varia via the cable to the RF port to/from BTS. Ensure that the correct voltage is fed into the repeater.

☞ **Note: The DC socket of the MR303D Varia must not be connected if the bias via RF cable is carried out.**

2.2 Configuration of the LEDs

The LED to the left (DC alarm) can show green or red light:

- Green indicates the normal operation of the repeater. Power is present and the current consumption of the unit is within the specifications.
- Red indicates that the current consumption of the repeater is not within defined limits and that the repeater might not work properly. If the LED is off, the MR303D Varia does not receive any DC power.

The right hand LED is the ALC/APAC alarm LED:

- LED "on" indicates that the input power received by the repeater is too high.

The output power of the repeater must be limited. This can be either done by the UL ALC or APAC, or the DL ALC. Limitation of power ensures that the final stage is not overdriven and that intermodulations are kept below the CEPT limits (- 36 dBm).

2.3 Mechanical Installation

Install the MR303D Varia according to the directions provided with the wall mounting sheet. The unit can be mounted horizontally or vertically. The alarm LEDs must point downwards (horizontal mounting) or to the left-hand side (vertical mounting). The unit has a weight of approximately 1.6 kg.

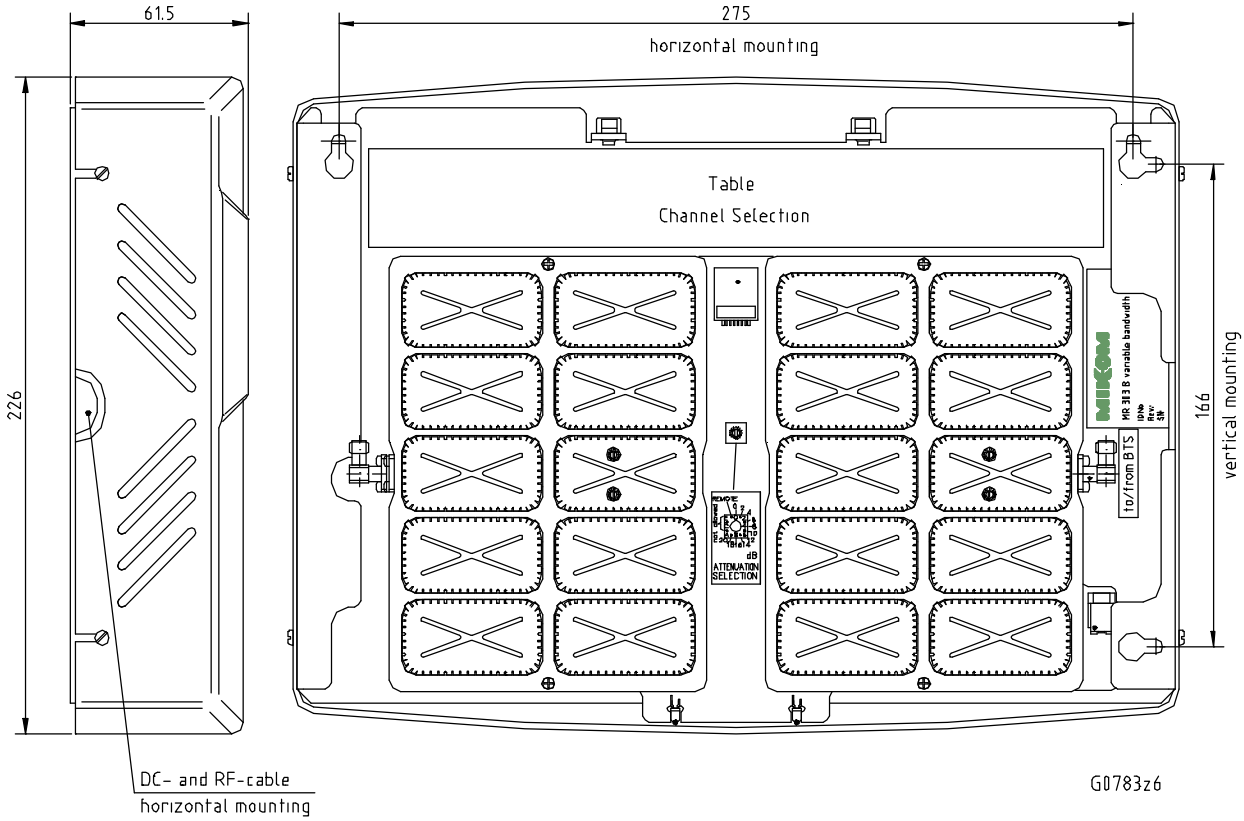


figure 2-2 Installation drawing

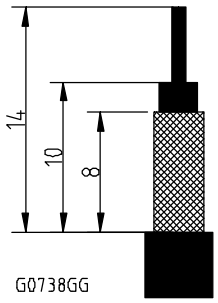
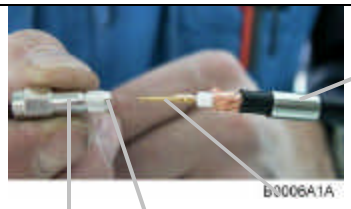
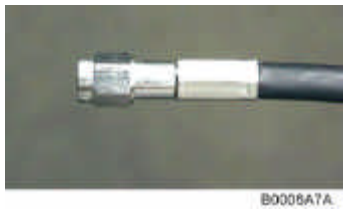
2.4 Electrical Installation

☞ **Note:** **Electrical installation must be carried out in accordance with the safety regulations of the local authorities. Due to safety reasons electrical installation must be performed by qualified personnel only.**

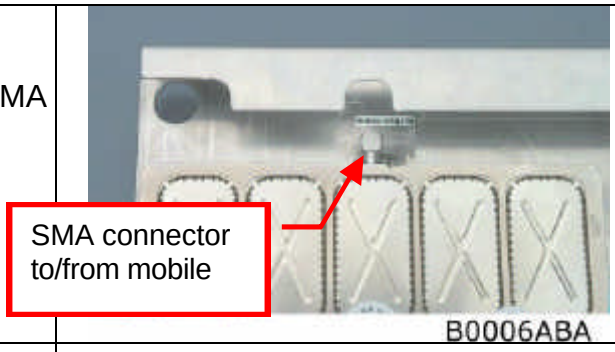
Connection of the cables to/from the BTS and connection of power supply:

The cable to the external antenna to/from the BTS and the SMA-connector must be ordered separately if reqired.

If the cable is part of the delivery, adjust the cable to a suitable length and connect the SMA-connector.

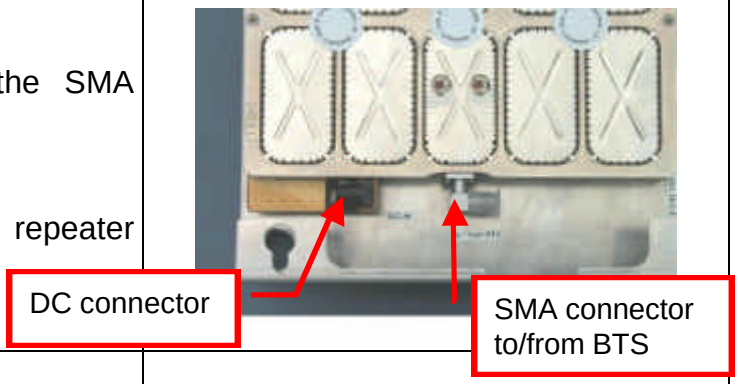
Cut the antenna cable to the required length. Strip the jacket at the cut end to the length of 14 mm, the copper braiding carefully to 8 mm and the inner insulation to 10 mm.	
Place the split taper socket over the cable. Insert the inner conductor into the opening at the rear of the SMA pin. Slot the pin and cable into the opening at the rear of the SMA connector. Carefully push the copper braiding over the knurled end of the connector. Take care that none of the wires of the copper braiding contact the inner conductor. Pull the split taper socket over the cable up to the base of the SMA-connector. Complete the connection by crimping the split taper socket with crimping pliers.	 

➢ Connect one RF cable to the SMA connector *to/from mobile*.



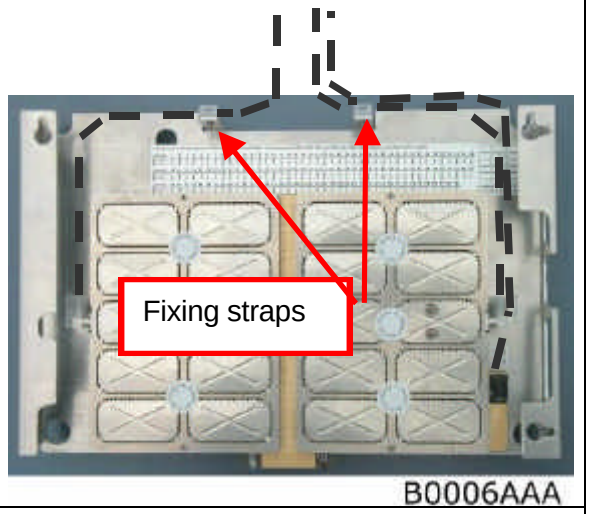
➢ Connect one RF cable to the SMA connector *to/from the BTS*.

➢ Connect the DC cable to the repeater DC connector.



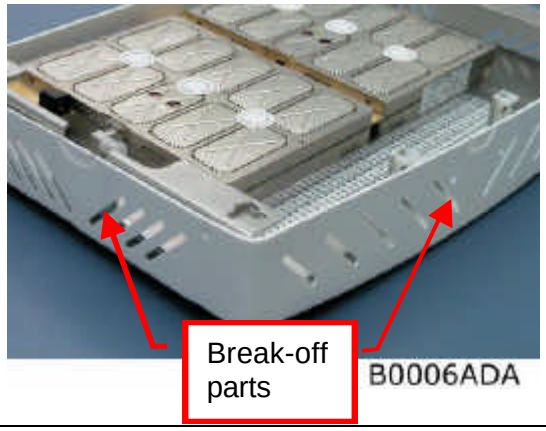
To avoid excess strain on the cables, the cables must be fastened to the fixing straps with cable clamps.

E.g.: Horizontal mounting



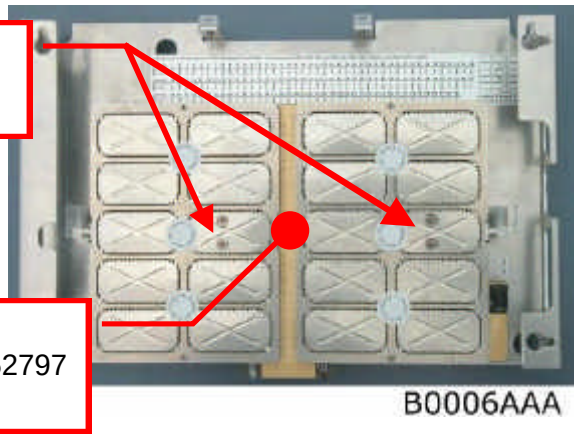
The cables can be fed through the repeater's housing at one of the two semi-holes provided to adapt the position of the cable to the mounting position of the repeater.

➢ Open off the required semi-hole by removing the respective break-off-part with pliers.

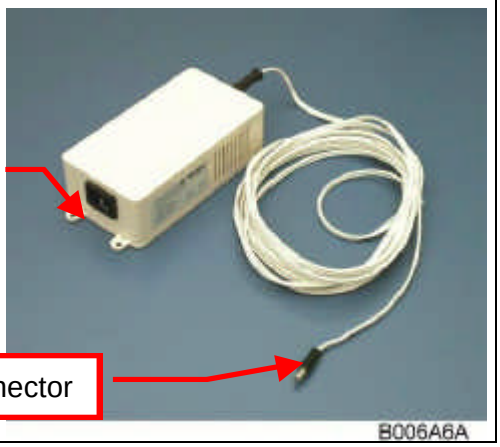


- Adjust the frequency.
- Set the attenuation

(at repeater with Id.-No.: 152797 & 154595 only!).



- Close the repeater by replacing the cover.
- Connect the power supply to mains.



3 SETTING INTO OPERATION

3.1 Adjusting the Frequency

The setting of the start channel and the stop channel must be carried out in accordance to the following tables:

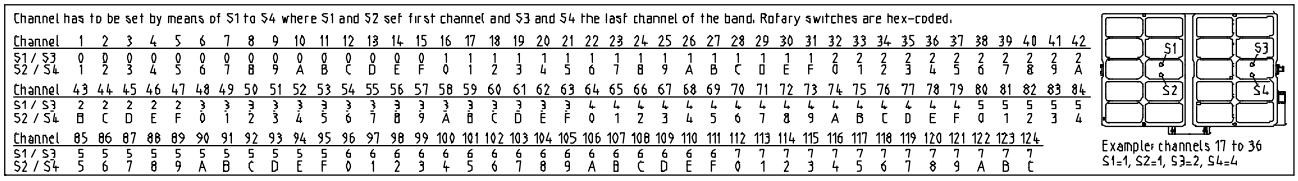


figure 3-1 Channel setting for Id.No. 152796 & 154595

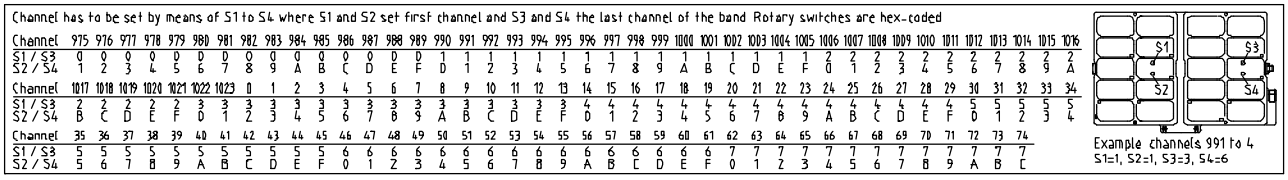


figure 3-2 Channel setting for Id.No. 152797

3.2 Setting the Attenuation

(Id.-Nos. 152797 & 154595 only)
The attenuation can be set by means of a rotary switch, which is located in the centre of the repeater. Use a small screw driver to turn the switch carefully to the position for the required attenuation. The label below the rotary switch shows the possible positions and the corresponding values of the attenuation.

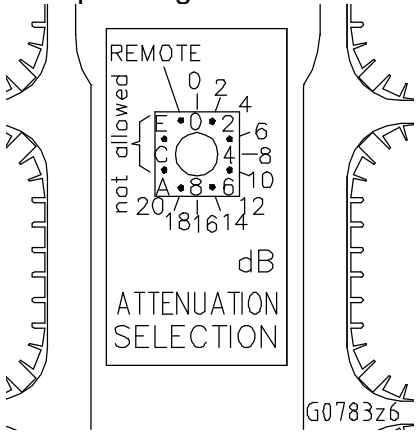


figure 3-3 Rotary switch for attenuation setting

4 APPENDIX

4.1 Electrical Specification

MR303D Varia	Id.No.:152796	Id.No.:152797	Id.No.: 154595
Frequency range UL DL	890 – 915 MHz 935 – 960 MHz	880 – 905 MHz 925 – 950 MHz	890 – 915 MHz 935 – 960 MHz
Band adjust	BW manually adjustable from 1 to 24.8 MHz in steps of 200 kHz		
In band gain min./typ.	55 dB / 58 dB	50 dB / 58 dB	50 dB / 58 dB
Gain ajust	--	20dB in 2dB steps max.	20dB in 2dB steps max.
In band ripple	± 2 dB		
Out of band gain	according to GSM 0505 Ver. 4.20.0 Annex E		
Delay	6 µsec max.	5 µsec typ.; 5.3 µsec. max.	5 µsec typ.; 5.3 µsec. max.
ICP3 Out @ max.gain	DL 26 dBm min UL 33 dBm min	DL 35 dBm UL 42 dBm	DL 35 dBm UL 40 dBm
DL P_{out} 1 channel	8 dBm (ALC active)	13 dBm	13 dBm
DL P_{out} 2 channels	5 dBm each min. (ALC active)	10 dBm	10 dBm
DL OICP3	26 dBm min	16 dBm typ; 18 dBm max.	16 dBm typ; 18 dBm max.
UL Pout 1 channel	24 dBm (ALC active)	22 dBm	22 dBm
UL Pout 2 channels	10 dBm each min. (APAC active)	15 dBm	15 dBm
UL OICP3	33 dBm min.		
Automatic power control	DL: ALC; UL: APAC and ALC		
Max input without damage	10 dBm min.	10 dBm min.	10 dBm min.
Noise figure UL DL	15 dB max.	12 dB max. @ max.gain	15 dB max. @ max.gain
	10 dB max.	12 dB max. @ max.gain	10 dB max. @ max.gain
Spurious emissions	according to GSM 05.05 ver 4.40.0 Annex E.2		
Power consumption	12 Watts (1.6 A @ 6.7 Vdc)	15 Watts typ. 20 Watts max	15 Watts typ. 20 Watts max
Power supply	external mains adapter 230 Vac (±10%) 50 Hz (±2 Hz) to 6.7 Vdc		
Alarms	Amplifier failure and ALC (via LEDs)		
RF connectors	SMA female, others on request		

All data is subject to change without notice!

4.2 Mechanical Specification

Height, Width, Depth	approx. 226 x 310 x 61.5 mm
Sealing class	IP30
Weight:	approx. 1600 g

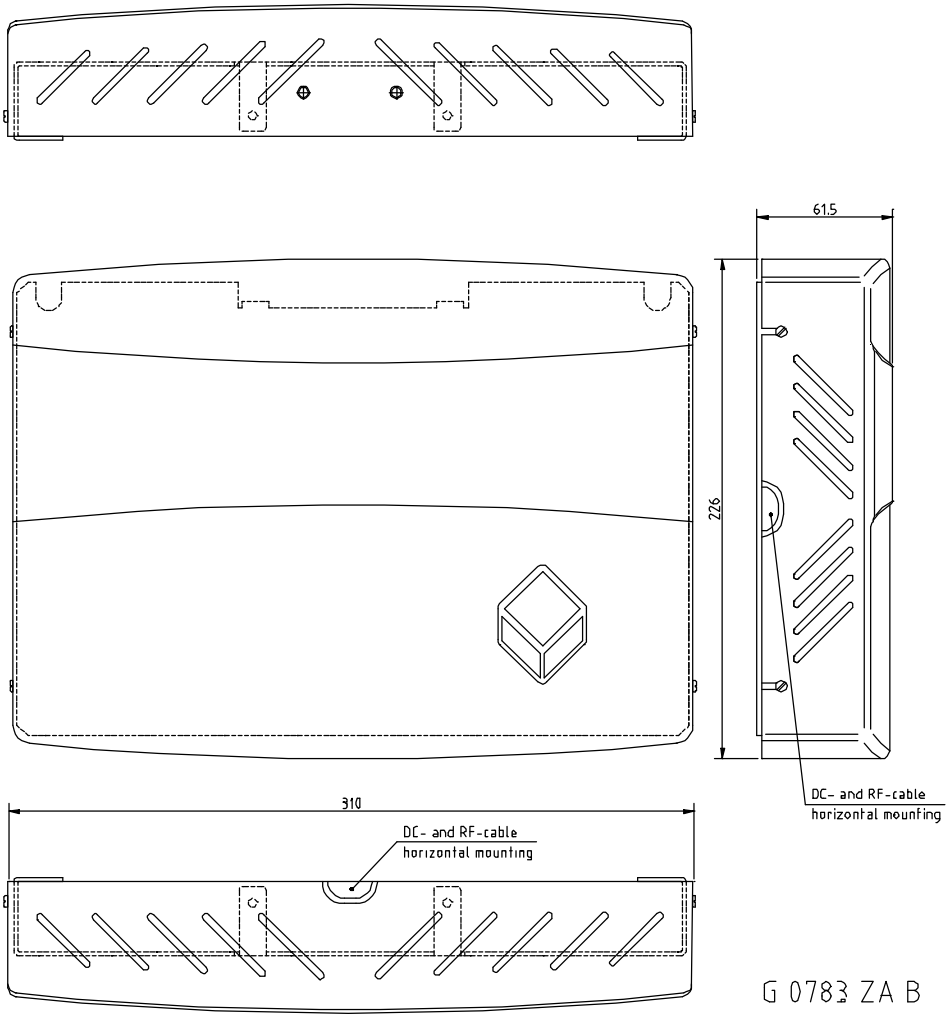


figure 4-1 Cabinet drawing

4.3 Environmental and Safety Specifications

Specifications for environmental and safety conditions are according to ETS 300 019 (European Telecommunication Standard). For further details refer to the environmental and safety leaflet for MIKOM repeaters.

All data is subject to change without notice!

4.4 Spare part list

Part	Id.- No.		
Repeater MR303 D Varia	**152796**	**152797**	**154595**
Power Supply	146902		

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