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RACOM
RADIO DATA NETWORKS

## Operating manual


# GPRS routers – MG100

**1.9**
**9/15/2015**

**RACOM s.r.o.** • Mirova 1283 • 592 31 Nove Mesto na Morave • Czech Republic
Tel.: +420 565 659 511 • Fax: +420 565 659 512 • E-mail: racom@racom.eu

**www.racom.eu**

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# Introduction

This operator manual serves as the primary document for familiarising users with the parameters of the GPRS router, its properties, modifications and with the parameters of connecting parts. In order to master all the functions of the router and the MORSE system you should refer to other documents.

In next description is used the notation **router** instead of **GPRS router**.


*Fig. 1: Router MG100 with Cannon connectors*

# 1. GPRS router MG100

MG100 uses the GPRS technology created for GSM networks. It has been designed for complementing the MORSE networks in places where there is no possibility to use regular transmission medium, e.g. a radio channel, private (LAN, WAN) or public (Internet) IP network, satellite channel, etc. The quality and speed of communication over the MG100 unfortunately depends on the instant properties and capacity of the particular GSM network provider.

The great advantage of MG100 is the possibility of creating hybrid MORSE networks. Thanks to the unification of MORSE devices the user is guaranteed to get standard interfaces - not only HW (RS232, RS422/485, Ethernet), but also SW (protocols on the user interfaces) - including all of the popular control and diagnostic tools.

Due to general characteristics of the GSM network the MG100 is suitable for places where a small amount of data with less importance needs to be transmitted less frequently and where the delivery times are not critical.

The router is of modular design with one to three standard RS232 ports (an RS422 or RS485 port can be used in place of one of them) available to the user. The configuration can be extended by an Ethernet interface and also by a module with analog and digital inputs/outputs ADIO. The ADIO is generally manufactured with two analog inputs and outputs and with two digital inputs and outputs.

The design and construction of this device allows for long-term loading and for this reason it is primarily determined for continuously running applications.

Software control is compatible with the operation and configuration of the other radio modems of the MORSE system. A description of software control and configuration is available in publications describing MORSE Firmware.

The configuration of PPP-GPRS protocol can be found in the Interface Protocol[1] section.

**General Areas of Use**

- complementing the MORSE network in places where it is not economical to set up radio coverage and GSM coverage already exists
- for points of the network where there is no emphasis on a guaranteed response time
- for points of the network which communicate with very little frequency (several times a day)
- for points of the network where a GSM network failure of several hours is not critical
- for complementing the MORSE network with a point over which remote surveillance, servicing and diagnostics may be carried out; specially at points where remote access (e.g. via Internet) is not possible)

[1] https://www.racom.eu/eng/support/prot/ppp-gprs_a/index.html

# 2. Description of router MG100 Functions

## 2.1. GPRS part

MG100 uses OEM modules manufactured as standard for GPRS communication. The GPRS module is connected to the computer part of the device via the RS232 serial port. Diagnostics and settings of the GPRS module are gradually improved in the MORSE network in line with improvements in software for GPRS modules, see PPP-GPRS protocol for MORSE[1].

## 2.2. Modem part

The control microcomputer has 4 MB of FLASH memory and 16 MB of RAM memory available. The battery, real time backup supply, detector of supply voltage failure and watch dog circuits belong amongst the other circuits of this block. If there is a supply voltage failure the fact is recorded into memory with the respective time data thanks to the charge stored in electrolytic capacitors. The user therefore has information available about the time and duration of possible faults caused by power failures. It is possible to connect equipment with signalling rates up to 115.2 kbit/s to the modem via the RS232 data interface. RS232 interface converters are protected against overvoltage with TRANSIL elements. A lithium battery is used for backing up in the modem part.

**Note**

Owing to the use of lithium batteries in the modem part it is not recommended to store them for a period of longer than 2 years.

## 2.3. Supplying

The router is supplied by the DC current 13,8 V. The consumption in the quiet state is from 200 to 260 mA according to module used, the consumption at transmitting is up to 350 mA. The router can be set in the SLEEP mode when the consumption drops down to 2,5 mA. The return in the active mode can be done by the signal inputting on the serial port or after a preset time.

## 2.4. GPRS router assembly

Routers MG100 are special devices which require skilled assembly. All supplied equipment is assembled by RACOM at the user's site. For subsequent maintenance RACOM specially trains the user's skilled staff and as an additional aid provides them with Operating regulations for radio data networks and MORSE Firmware – Documentation.

**Important**

CAUTION! Danger of explosion upon replacing the incorrect type of battery. Follow the manufacturers instructions for handling used batteries.

[1] https://www.racom.eu/eng/support/prot/ppp-gprs/index.html

# 3. Connectors

## 3.1. Antenna

The cable for connecting the antenna is fitted with an FME type connector. Use a connector of the corresponding type and impedance as its mate.

**Important**

CAUTION. The router cannot be connected to the power supply without the antenna connected (or corresponding artificial load). Otherwise this could lead to damage to the radio part of the router.


*Fig. 3.1: Connector type FME*

## 3.2. Serial Interface

The router can be equipped with serial ports RS232 or RS422/485, the ports can be optical isolated. According to the configuration it is possible to use a terminal block or DSUB 9 (Canon) connectors for connecting data cables via the serial interface. See Chapter *Dimensional Diagram and Labeling*. Data rate on the serial interface can be from 200 bps to 230,400 bps.

### 3.2.1. RS232, RS422 and RS485 Connectors

**a) Table of data connector RS232 connections**

**Tab. 3.1: Table of data connector RS232 connections**

| RS232 signal | Screw terminals | DSUB9F pin |
|---|---|---|
| **CTS** | 1 | 8 |
| **RTS** | 2 | 7 |
| **RxD** | 3 | 2 |
| **TxD** | 4 | 3 |
| **GND** | 5 | 5 |
| **DTR** | | 4 |
| **DSR** | | 6 |
| **CD** | | 1 |
| **RI** | | 9 |


*Fig. 3.2: RS232 DSUB9 female*

**b) Table of data connector RS422 connections**

**Tab. 3.2: Table of data connector RS422 connections**

| RS422 signal | Screw terminals | DSUB9F pin |
|---|---|---|
| **TxD-** | 1 | 7 |
| **TxD+** | 2 | 3 |
| **RxD-** | 3 | 8 |
| **RxD+** | 4 | 2 |
| **GND** | 5 | 5 |

**c) Connection diagram of data cable RS485**

When you are connecting RS485, your “A” has to be connected to TxD+ and RxD+ simultaneously and “B” to TxD- and RxD- simultaneosly.

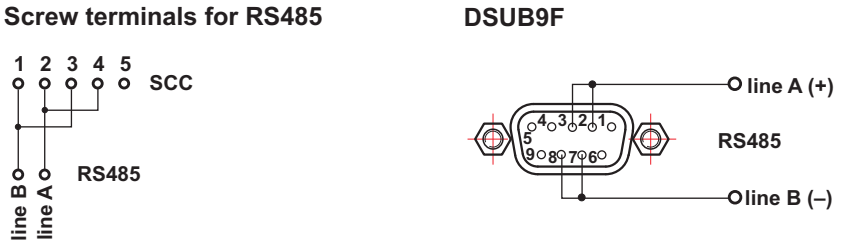



*Fig. 3.3: Data cable RS485 connections*

**Note** - For data connector RS485 connection see *Table of data connector RS422 connections*.

**Important** - For making data cables for connecting the user´s terminal equipment to the serial port we recommend using a shielded cable, particularly in an industrial environment, and connecting the shielding to GND (pin No. 5). When using a multi-core cable all free conductors should be connected to pin No. 5. In the case of a galvanically separate port for RS485 (RS422) only ground one side of the data cable. We recommend using only the necessary minimum length for data cables.

## 3.2.2. Distinguishing Data Modules by Colour

For RS232 RxD is the output from the router (approx. -6V when inactive) and TxD is the input to the router (according to the RS 232 standard). Hardware versions of the interface can be distinguished according to the colours of LED diodes next to the connector.

**Tab. 3.3: Table for distinguishing LEDs for RxD and TxD by colour**

| Type of interface | Colour (RxD / TxD) |
|---|---|
| RS232 | red / green |
| RS232 opt. separated | orange / green |
| RS422/485 opt. separated | orange / yellow |

### 3.2.3. Labelling of SCC terminals

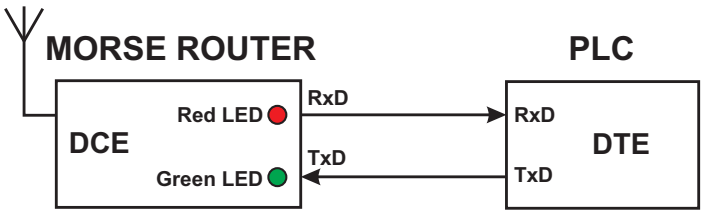



*Fig. 3.4: Labelling of serial interface terminals*

The SCC ports of the router are DCE type devices. Based on standards the receiver terminal RxD of the connected DTE device is connected to the transmitting terminal of the router's SCC port which is also labelled RxD. Similarly the red LED indicating transmission from SCC is labelled RxD.

## 3.3. Ethernet

- Connector RJ-45 for Ethernet 10BaseT and 100BaseT corresponds to the EIA TIA T568B standard.
- Informative LED diodes indicate:
  - Tx – yellow - output or input active (*Tx - red - output from ETH channel)
  - Rx – yellow - output or input active (*Rx - green - input to ETH channel

    **Note**

    Green LED **Tx** and yellow LED **Rx** flash simultaneuosly. The informations marked (*) are valid for hw version produced until 07/2008.

  - 100 – yellow - if lit the 100Base-TX net is indicated otherwise is 10Base-T
  - LINK – green - indicates correctly connected link
  - F.D. – green - indicates full duplex operation
- The direct cable serves for connecting to the Ethernet network via the hub (repeater) or switch-hub (router).
- A crossed cable serves for connecting only two devices - MR400-MC100, MR400-PC, etc.

The ETH module consumption is 30 mA (60 mA until 07/2008).

The following table contains connector connections and colours of conductors. For the crossed cable the order of conductors on one side is the same as for the direct cable.

**Tab. 3.4: Table of Ethernet to cable connector connections**

| PIN | Signal | Direct cable | Crossed cable |
|---|---|---|---|
| 1 | TX+ | white - orange | white - green |
| 2 | TX- | orange | green |
| 3 | RX+ | white - green | white - orange |
| 4 | — | blue | blue |
| 5 | — | white - blue | white - blue |
| 6 | Rx- | green | orange |
| 7 | — | white - brown | white - brown |
| 8 | — | brown | brown |

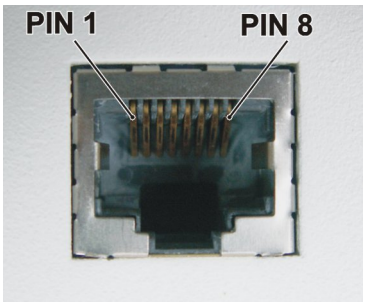



*Fig. 3.5: RJ-45F*

## 3.4. Analog and Digital Inputs and Outputs

The module of analog and digital inputs and outputs (ADIO) is designed for :

- creating 20 mA current loops
- switching loads supplied with DC and AC current
- scanning digital signals

Each functional group of terminals is galvanically separated from the rest of the device as shown on the internal layout diagram for the ADIO module on the image below:

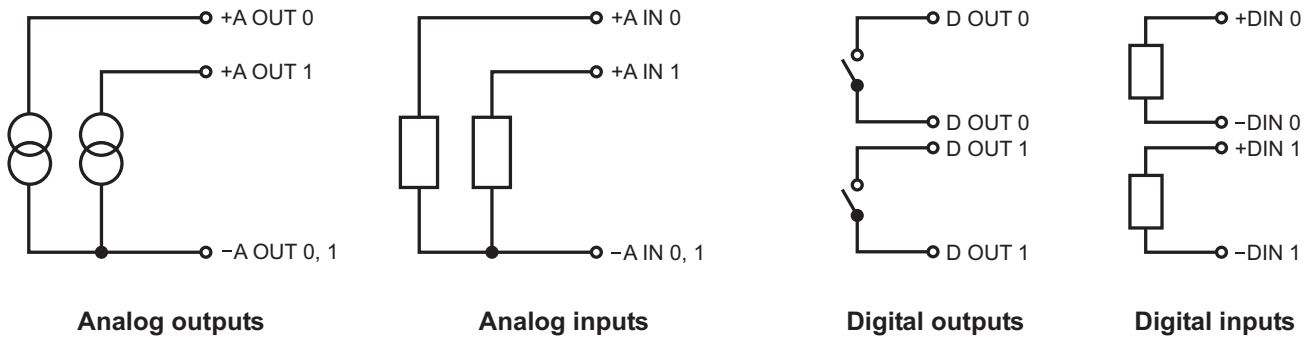



*Fig. 3.6: Wiring diagrams for analog and digital inputs and outputs*

### 3.4.1. Labelling

Individual terminals of terminal blocks are labelled:

Connector A OUT - analog outputs

Connector A IN - analog inputs

Connector D OUT - digital outputs

Connector D IN - digital inputs

Terminal UP this clamps pair is not used

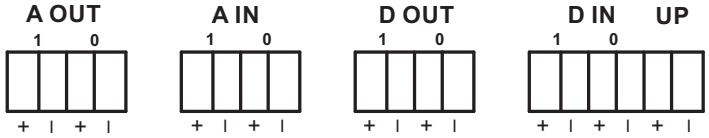



*Fig. 3.7: Description of analog and digital inputs and outputs*

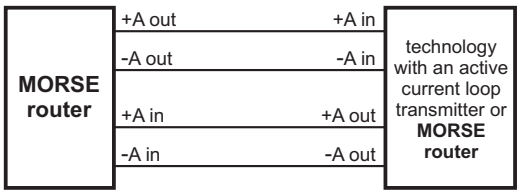
### 3.4.2. Parameters

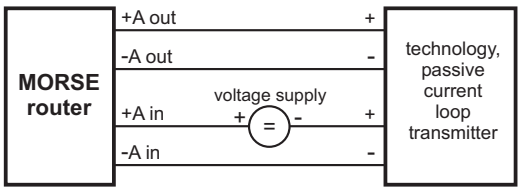
**Tab. 3.5: Table of digital and analog input and output parameters**

| | | |
|---|---|---|
| 2 × optically separated digital output | – bipolar SSR switch design<br>– voltage for supplying load max. 30 V DC, 24 V AC<br>– switched current typically 300 mAresistance in on state max. 1 Ω<br>– protection against current overload in on state<br>– protection against overvoltage in off state | passive |
| 2 × optically separated digital input | – passive optical element design<br>– input voltage 0–2,3 V will be evaluated as log. 0<br>– input voltage 2–30 V will be evaluated as log. 1<br>– max. value of input voltage 30 V | passive |
| 2 × optically separated analog output | – current source 4–20 mA<br>– load resistance max. 250 Ω<br>– settings accuracy better than 0.1 % | active |
| 2 × optically separated analog input | – sensitivity 0–20 mA (or after sw configuration 4–20 mA)<br>– accuracy of measured values better than 0.1 %<br>– input resistance 60 Ω<br>– no protection against current overload<br>– max. value of input current 50 mA | passive |

Analog inputs 0 and 1 have **-** (minus) terminals connected and galvan. separated from router GND.

Analog outputs 0 and 1 have **-** (minus) terminals connected and galvan. separated from router GND.




The MORSE router used in the diagram showing examples of wiring can, of course, be replaced by any MORSE system equipment (e.g. MD160, MX 160, MWxxx, MRxxx, MC100, MG100i, ...)

*Fig. 3.8: Examples of wiring analog inputs and outputs*

## 3.5. Supply Connector

Terminals of this connector are labelled in the standard manner. Only DC voltage in the range from 10.8 to 15.6 V can be connected. Connecting higher voltage may damage the router.

Terminal PI (power indicator) - if the router is fed from the MS2000 power supply information about supply method from source clamp MAIN PWR OFF can be lead:

- level TTL1 or unconnected clamp - network supply
- level TTL0 or grounded clamp - battery supply

Maximal supply cable length is 3 m.


*Fig. 3.9: Power connector & information LED*

## 3.6. Information LED

### Information LED diodes next to the supply connector:

**Tab. 3.6: Modes of LED diodes Power**

| LED name | LED mode | Operating state | |
|---|---|---|---|
| GS A | red, shining | Module attached to GSM network and PPP connection is established. | |
| GS Rx | green, flashes | Receiving data (GPRS/UMTS). | |
| low+middle +high | 3 yellow LEDs | rss, signal better then -79 dBm | These LEDs are refreshed after expiring of *Info timeout* of the router (SXe r 1g). If this timeout is set to zero then router displays the rss at the moment of init of PPP protocol (typically at the router restart). |
| low+middle | 2 yellow LEDs | rss, signal better then -89 dBm | |
| low level | 1 yellow LED | rss, signal better then -107 dBm | |
| POWER ON | green, shining | POWER ON — router is correctly supplied | |

### Meaning of LED diodes by the antenna connector

LED diodes by the antenna connector signal the status and operation of the GPRS/UMTS module which is located below the partition in the radio part of the router.

GS GPRS/UMTS status – diode flashes in different modes, the meaning is given in the table bellow. This is conditional upon setting up the appropriate parameters of PPP protocol in the SPe menu.

TX communication between the GSM module and the MG100 router – transmission of data from the modem to the module

RX communication between the GSM module and the MG100 router – receipt of data to the modem from the module

**Tab. 3.7: Modes of LED diode GS for MG100M, MG100M2and MG100M3**

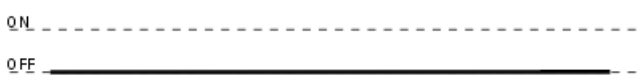
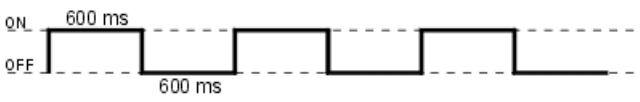
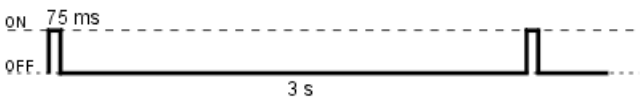
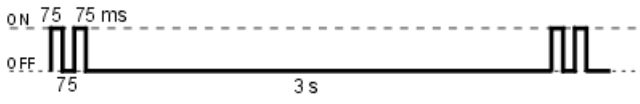
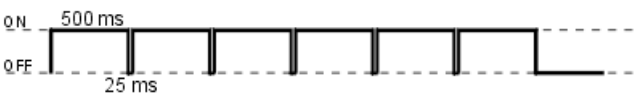
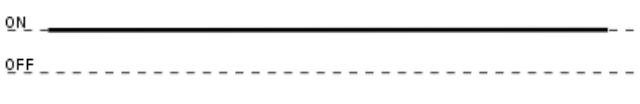
| GS LED mode | Operating state |
|---|---|
| lightless (OFF) | Module has no supply, or is in SLEEP mode. |
| flashes quickly (0,5 s ON/0,5 s OFF) | Location of network underway, or module is not attached to the network, or SIM card not inserted, or PIN code not entered. |
| flashes slowly (0,3 s ON/2,7 s OFF) | GSM module attached to the network (cellular net connected). |
| steady light (ON) | Ongoing communication. |


*Fig. 3.10: Information LEDs*

**Tab. 3.8: Modes of LED diodes GS for MG100M4**

| GS LED mode | Operating state |
|---|---|
| lightless (OFF) | Module has no supply. |
| steady light (ON) | Ongoing network search and registration in it. |
| flashes slowly (0,8 s ON/0,8 s OFF) | The module is registered in GSM network. |
| flashes quickly (0,2 s ON/0,2 s OFF) | Ongoing communication. |

**Tab. 3.9: Modes of LED diodes GS for MG100M0**

| LED mode | Operating state |
|---|---|
|  | Module has no supply, or alarm mode, or NONCYCLIC SLEEP mode, or CYCLIC SLEEP mode waiting for awakening. |
|  | SIM card not inserted, or PIN code not entered, or location of network underway, or user verification underway, or logging on to network underway. |
|  | IDLE mode: Device registered in GSM network, data transmission not taking place. |
|  | PDP context activated, connection made to GPRS network – normal status for MORSE/GPRS system. |
|  | Packet transmission of data underway. |
|  | Connection to remote module – only in the case of CSD, doesn't occur in the case of GPRS. |

## 3.7. Service Connector

The service connector RJ-12 serves for short-term connections of the service cable during local adjustment of MORSE router parameters. Upon attaching the connector (connecting to the RS232 link (RxD,TxD, GND)) the router automatically switches to service mode and the module slot 1 disconnects. Slots numbering see section Section 3.9, “View of MG100 router”.

**Tab. 3.10: Table of service connector connections**

| | | |
|---|---|---|
| 1 | AF_OUT | output of modulation from RF part of router |
| 2 | SER_RxD | RS232 RxD output from router |
| 3 | SER_TxD | RS232 TxD input to router |
| 4 | MOD_BSB | input modulation to radio part of router |
| 5 | GND | ground |
| 6 | PTT | keying of TX carrier waves for service purposes |


*Fig. 3.11: Service connector*

**Important**

ATTENTION! The service mode is not suitable for normal operation

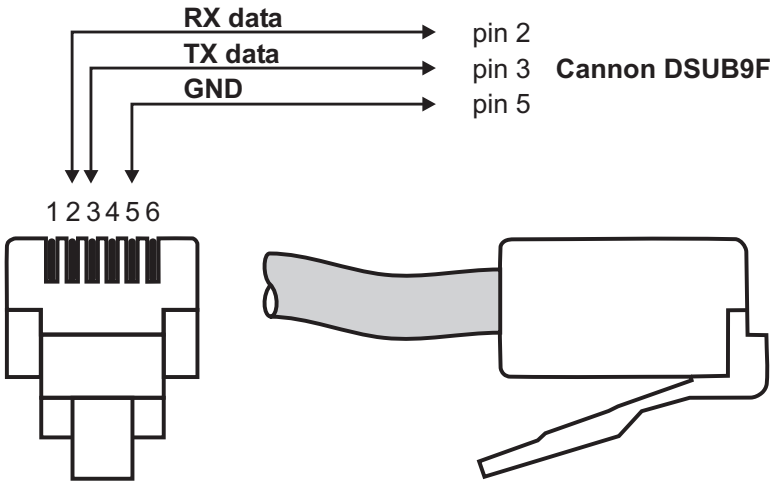



*Fig. 3.12: Service cable connector connections*

## 3.8. Inserting SIM cards into the reader

There is an opening at the bottom edge of the right side of the router through which the SIM card holder is inserted into the plug-in reader.



The SIM card holder is released by pressing the yellow ejector button inside the opening next to the SIM card holder using a suitable sharp tip, e.g. a ballpoint pen.

## 3.9. View of MG100 router

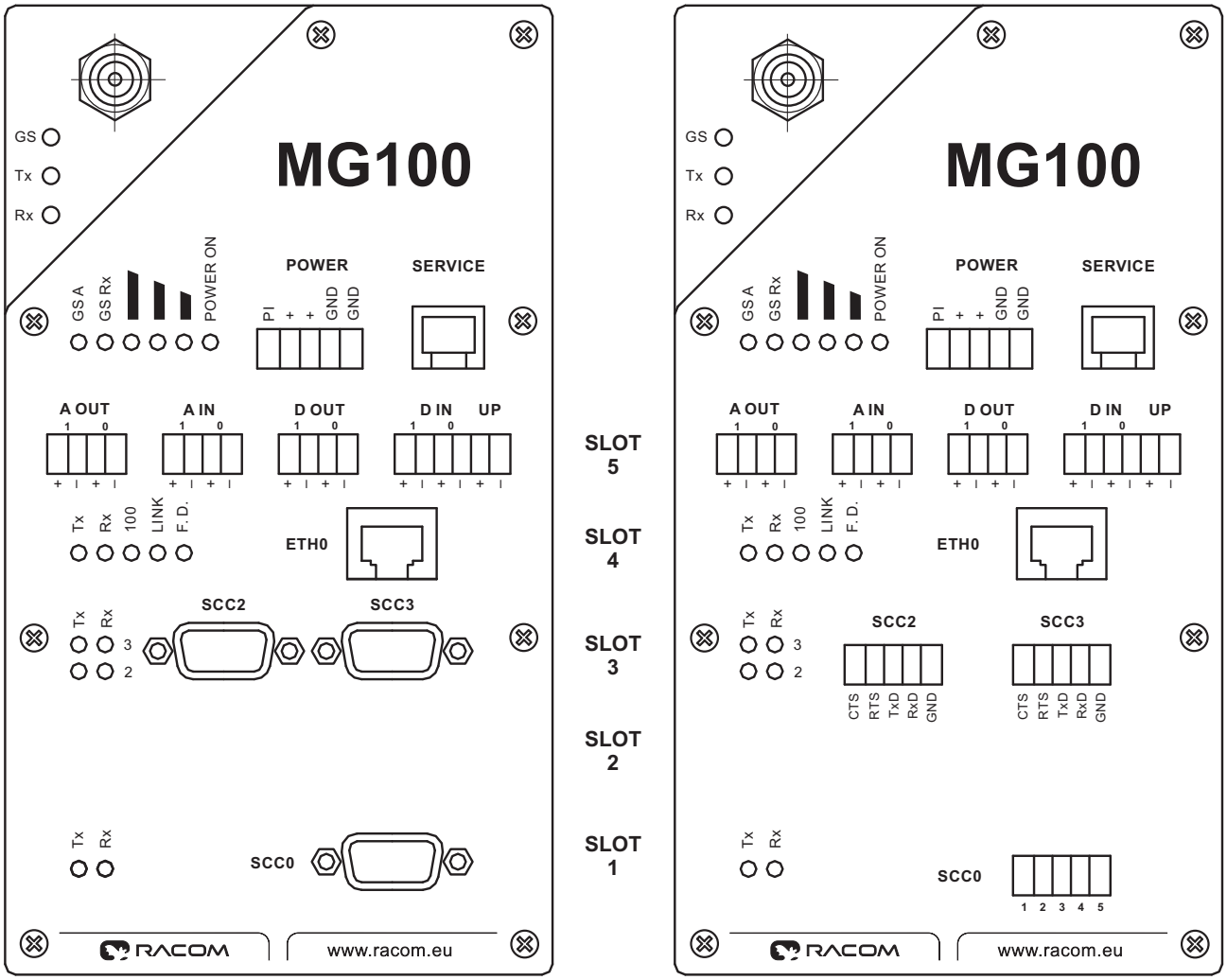



*Fig. 3.13: View of GPRS router — description of connectors, model with DSUB (Canon) connectors and with terminals*

**Tab. 3.11: Slot options**

| Optional modules | |
|---|---|
| slot 5 | ADIO (analog and digital inputs and outputs) |
| slot 4 | ethernet 10/100 Mbps |
| slot 3 | 2×RS232 |
| slot 2 | reserved for connection of GPRS module |
| slot 1 | RS232 or galv.sep. RS232 or RS422/RS485 |

# 4. Table of Technical Parameters

**Tab. 4.1: Table of technical parameters**

| | |
|---|---|
| Frequency range | |
| MG100x0 – module GPRS | (obsolete, not in production) |
| MG100x1 – module GPRS | Quad band GPRS (850, 900, 1800,1 900 MHz) |
| MG100x2 – module UMTS/HSDPA | (obsolete, not in production) |
| MG100x3 – module UMTS/HSDPA | (obsolete, not in production) |
| MG100x4 – module UMTS/HSDPA/HSUPA | (obsolete, not in production) |
| Optional modules | |
| slot 5 | ADIO (analog and digital inputs and outputs) |
| slot 4 | ethernet 10/100 Mbps |
| slot 3 | 2×RS232 |
| slot 2 | reserved for connection of GPRS module |
| slot 1 | RS232 or galv. sep. RS232 or RS422/RS485 |
| Antenna connector | FME – male |
| MTBF(Mean Time Between Failure) | > 100 000 hours |
| Supply voltage | typically 13.8 V (10.8-15.6) |
| Power consumption MG100-GPRS | |
| Receiving | 200–260 mA according to mounted modules |
| Transmitting | 260–320 mA according to mounted modules |
| Power consumption MG100-UMTS | |
| Receiving | 200–260 mA according to mounted modules |
| Transmitting | 290–350 mA according to mounted modules |
| Consumption in SLEEP mode | 2.5 mA |
| Operating range of temperature | −30 to +65 °C |
| Humidity | 5 to 95% non-condensing |
| Storage range of temperature | −40 to +85 °C |
| Mechanical dimensions | 208×108×63 mm (71 mm – DIN rail including) |
| | 184×108×63 mm (short version) |
| Fasten holes spacing | 198×65 mm; ø 4.8 mm |
| Weight | 1.2 kg |

**Tab. 4.2: Standards complied**

| | |
|---|---|
| EMC (Electromagnetic Compatibility) | ETSI EN 301 489-1<br>ETSI EN 301 489-7 GSM/GPRS<br>ETSI EN 301 489-24 UMTS |
| Electrical safety | CSN EN 60 950:2001 |
| Wheeled vehicle usage | UN Regulation No.10 (EHK No.10) |

# 5. Dimensional Diagram and Labeling

## Dimensional Diagram

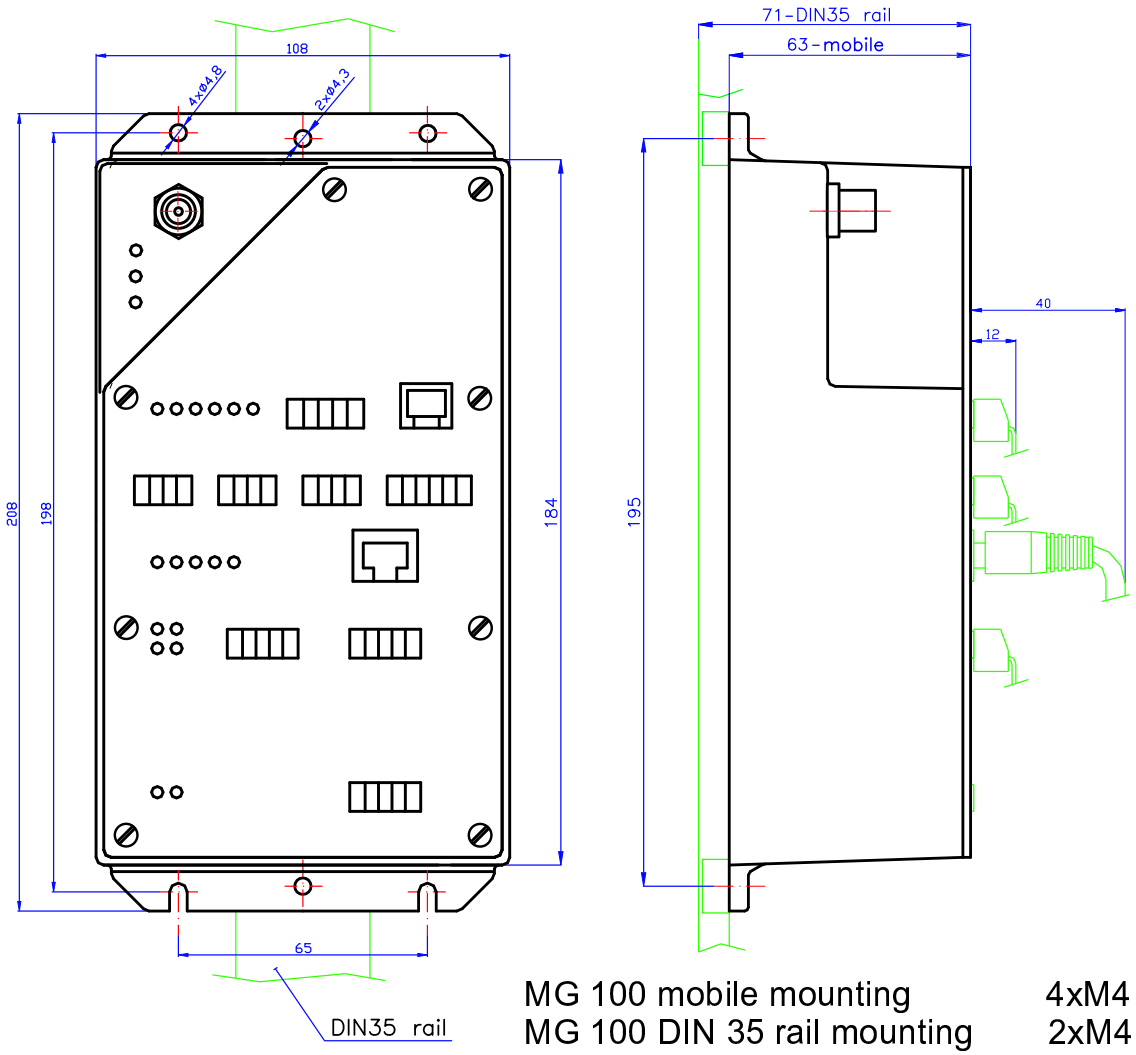



*Fig. 5.1: Mounting dimensions*

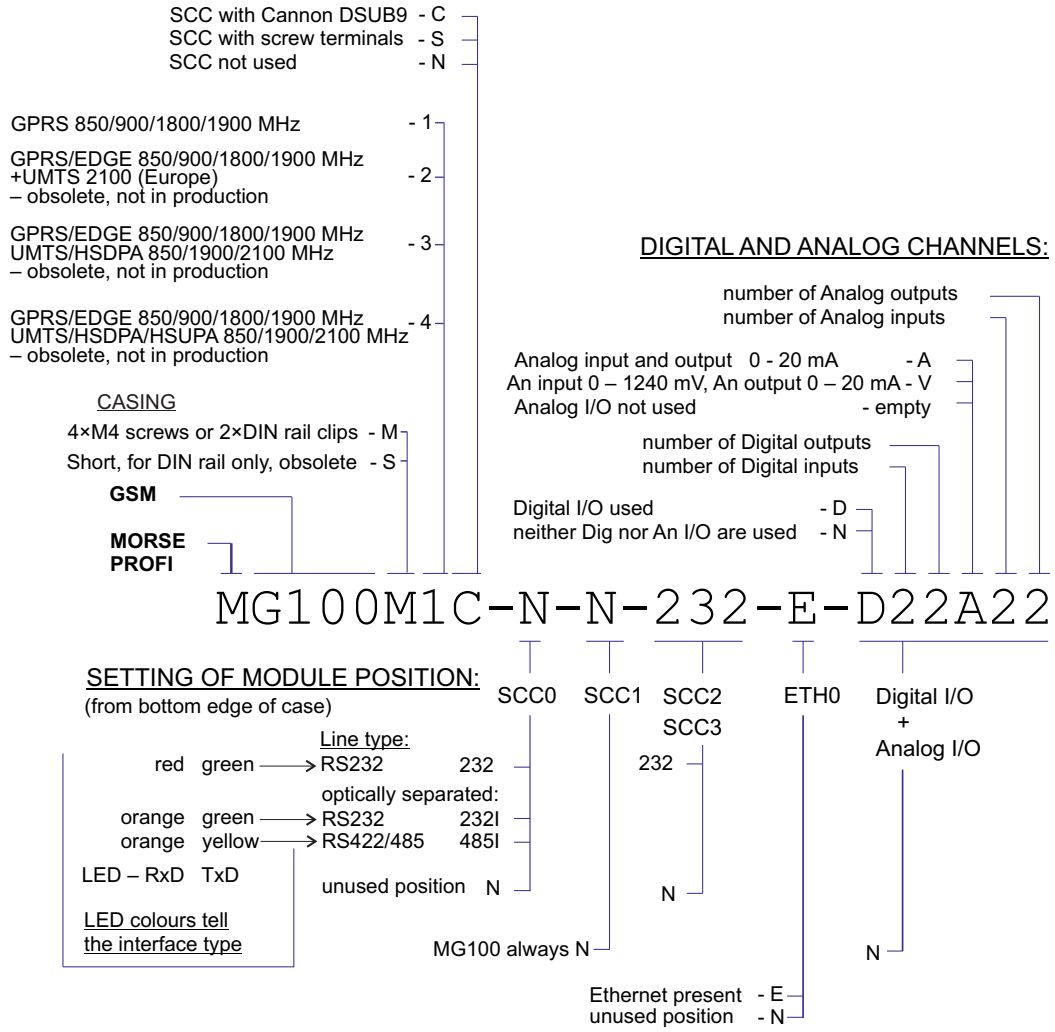
The router can be fasten by four screws M4 (for mobile application especially) or by the mounting rail DIN35 (stable applications). The flexile clamps mounted in the central holes are used for fastening on the DIN35 rail.

## Labelling GPRS routers

is described in next table:

# MORSE components production code
# GPRS router

For equipment serie: **MG100**




**Comment:**
1) Modem is the DCE equipment - both data output RS23

**Example:**

**MG100M1S-232I-N-232-E-N**

= MORSE GPRS router MG100i series, for bands 850/900/1800/1900
casing with flanges for screws and/or DIN rail clips, SCC connectors with screw terminals,
SCC0 - RS232, optically separated,
SCC1 - not allowed position at MG100,
SCC2 - RS232,
SCC3 - RS232,
Ethernet

07 2014

Generally, the MG100 is a trade name for all GPRS routers. MG100 is a standard marking of innovative GPRS routers from MG100M1 to MG100M4. Older MG100M0 is no longer manufactured.

# 6. Router installation

## 6.1. General description of installation

Racom routers are built into a robust metal case and are suitable for applications which place them in various environments from air-conditioned offices to heavy industry factories. To a certain extent the method of installation needs to be adapted to this. All information in this chapter describes the standard method of installation for normal industrial applications, which has been derived from valid regulations for such equipment and also from the long-term experience of our engineers. In the case of larger-scale networks and more complicated applications we recommend that users order a project assessment from Racom, or a partner company, which should consist of careful measurements of the strength and quality of a signal and an assessment of the conditions for the propagation of radio waves.

Each radio equipment must comply with operating conditions for the given frequency band in the country in which it is operated and the person running the equipment is responsible for this.

For reliable operation of routers it is important to ensure that all equipment, for which data is transmitted through the router, is connected correctly. Also ensure the antenna is correctly connected and installed, a suitable and safe supply of electricity is provided, equipment is mounted correctly, and that all corresponds to the given operating conditions, without a negative influence on the specific properties of our equipment. A description and wiring of individual connectors and interfaces is described in the connectors chapter.

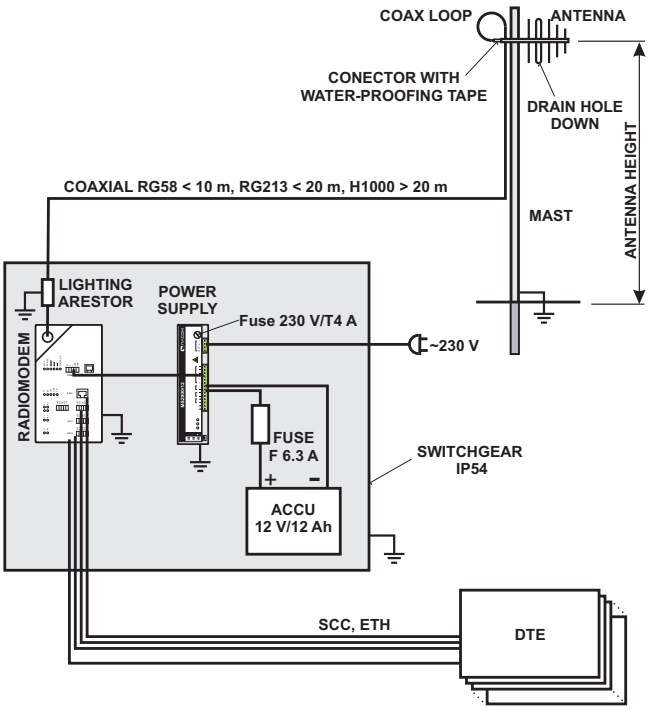



*Fig. 6.1: Example of a typical installation of a data network radio point*

## 6.2. Antenna installation

Optimum installation of the antenna is influenced by a number of factors. The topography of the radio network, the separation of radio points, the terrain profile between them, and conditions for signal

propagation all influence the type of antenna to be used and where it should be located. Sometimes the appearance of the structure on which the antenna is to be located and the possibility of its damage in publicly accessible places should also be taken into consideration. Generally it can be said that for point-to-point type connections directional antennas are used, and for more remote points and points with a poorer signal multilink directional antennas with greater gain are used. The height of the antenna above ground level may improve the quality of the signal. The standard height of approx. 5 m can be increased severalfold, but always in consideration of the length of the antenna lead, because each coaxial cable used has its own defined attenuation. For longer leads coaxial cables with lower attenuation are used and generally these have a larger cross-section, worse mechanical properties and are more expensive. When using external antennas we recommend protecting radio router with overvoltage protection on the coaxial cable.

Racom radio equipment in typical installations comply with applicable standards for human exposure to RF electromagnetic fields, namely with standard EN 50385: 2002. The minimal safe distance is ensured by the antenna position on a mast. When special installation is required, the conditions of the standard above have to be met. The distance between the persons and antenna minimal 0.5 m comply with applicable standards for human exposure of general public to RF electromagnetic fields, namely with standard EN 50385: 2002. It is valid for all power levels and all antenna types which firm Racom provides.

## 6.3. Power supply

A power supply meeting the specified parameters (see the table of technical parameters) needs to be used for supplying radio routers. We recommend using an MS2000[1] power supply or other power supply of MORSE system[2] , which has been developed specially for these purposes, and where necessary is capable of switching to a back-up battery, as well as monitoring its state of charge, and also charging.

## 6.4. Technology connection

The Data Terminal Equipment, a programmable controller, a PC or any other device communicating over the radio network, has to be connected to the router by a data cable to the serial or the Ethernet interface according to the respective standard. These interfaces are described in detail in the chapter Connectors.

## 6.5. Mechanical mounting

Radio routers can be mounted either to a mounting plate using screws or by mounting on a DIN rail. See the table of technical parameters for the dimensions and spacing separation of mounted parts. Generally for industrial applications[3] the radio routers are mounted together with the overvoltage protection, power supply, and back-up battery into a switchboard with IP54 protection.

[1] http://www.racom.eu/eng/products/ms2000.html
[2] http://www.racom.eu/eng/products/supplies.html
[3] https://www.racom.eu/eng/references/references.html

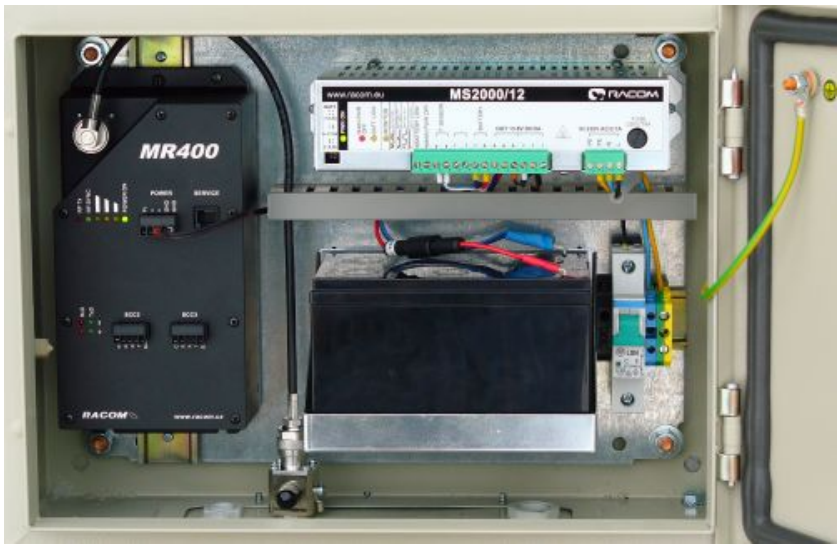



*Fig. 6.2: Example of the layout of equipment in a switchboard*

# 7. Conditions for MG100 Operation

## 7.1. Important Warning

RACOM s. r. o. (hereinafter referred to as RACOM) is the exclusive owner of all rights to this operator manual. All rights reserved. Any duplication of this manual in any way, shape or form, or translation to any other language (without the prior written consent of the owner of the rights) is strictly forbidden. RACOM retains the right to make changes to the technical specification or functions of this product or to terminate production of this product, or to terminate service support of this product without advance written notice to the customer. RACOM firmware is available free of charge. Source code is the property of RACOM and is not available to any user. Any commercial use of the software with this licence is strictly forbidden. Changes to software and documentation are forbidden. RACOM firmware is released with the intention that it will be useful, however without any specific guarantees.

Under no circumstances is the Racom or any other company or person responsible for incidental, accidental or related damage arising as a result of the use of this product. The manufacturer shall not provide the user with any form of guarantee containing assurance of the suitability and applicability for its application. RACOM products are not developed, designed or tested for use in equipment which directly affects the health and life functions of humans or animals and neither as part of other important equipment, and RACOM does not provide a guarantee if company products are used in such equipment.

## 7.2. Conditions of Liability for Defects and Instructions for Safe Operation of Equipment.

Please read these safety instructions carefully before using the product:

- Liability for defects does not apply to any product that has been used in a manner which conflicts with the instructions contained in this operator manual, or if the case in which the router is located has been opened, or if the equipment has been tampered with.
- The GPRS router can only be operated on frequencies stipulated by the body authorised by the radio operation administration in the respective country and cannot exceed the maximum permitted output power. RACOM is not responsible for products used in an unauthorised way.
- Equipment mentioned in this operator manual may only be used in accordance with instructions contained in this manual. Error-free and safe operation of this equipment is only guaranteed if this equipment is transported, stored, operated and controlled in the proper manner. The same applies to equipment maintenance.
- In order to prevent damage to the router and other terminal equipment the supply must always be disconnected upon connecting or disconnecting the cable to the router data interface. It is necessary to ensure that connected equipment has been grounded to the same potential. Before connecting the supply cable the output source voltage should be disconnected.

## 7.3. RoHS and WEEE compliance

The routers are fully compliant with the European Commission‟s RoHS (Restriction of Certain Hazardous Substances in Electrical and Electronic Equipment) and WEEE (Waste Electrical and Electronic Equipment) environmental directives.

RoHS Restriction of hazardous substances (RoHS)

The RoHS Directive prohibits the sale in the European Union of electronic equipment containing these hazardous substances: lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBBs), and polybrominated diphenyl ethers (PBDEs).

End-of-life recycling programme (WEEE)

The WEEE Directive concerns the recovery, reuse, and recycling of electronic and electrical equipment. Under the Directive, used equipment must be marked, collected separately, and disposed of properly. Racom has instigated a programme to manage the reuse, recycling, and recovery of waste in an environmentally safe manner using processes that comply with the WEEE Directive (EU Waste Electrical and Electronic Equipment 2002/96/EC).

Battery Disposal—This product may contain a battery. Batteries must be disposed of properly, and may not be disposed of as unsorted municipal waste in the European Union. See the product documentation for specific battery information. Batteries are marked with a symbol, which may include lettering to indicate cadmium (Cd), lead (Pb), or mercury (Hg). For proper recycling return the battery to your supplier or to a designated collection point.

## 7.4. Product Conformity

RACOM s. r. o. hereby declares that its GPRS router MG100 complies with the basic requirements and other respective measures of regulation 1999/5/EC. This equipment therefore bears the CE marking.

CE

...the broadest narrowband money can buy

RACOM
RADIO DATA NETWORKS

## Declaration of Conformity – MG100i

In accordance with directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity

| | |
|---|---|
| **Producer:** | **RACOM s.r.o.** |
| **Address:** | **Mirova 1283, 592 31 Nove Mesto na Morave, Czech Republic** |
| **VAT:** | **46343423** |
| **Product:** | **MG100i** |
| **Purpose of use:** | **GPRS/EDGE/UMTS Router** |

CE

**We, the manufacturer of the above mentioned product, hereby declare that this product:**
Conforms to the essential requirements of the directive 1999/05/EC of the European parliament and of the council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

Nove Mesto na Morave, 5th of June 2009
Jiri Hruska, Managing Director

**RACOM s.r.o.** • Mirova 1283 • 592 31 Nove Mesto na Morave • Czech Republic
Tel.: +420 565 659 511 • Fax: +420 565 659 512 • E-mail: racom@racom.eu
www.racom.eu

*Fig. 7.1: Declaration of conformity MG100i*

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RACOM
RADIO DATA NETWORKS

## Declaration of Conformity – MG100

- in accordance with **73/23/EEC** Directive of 19th of February 1973 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits and **89/336/EEC** Directive of 3th of May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.

| | |
|---|---|
| **Producer:** | **RACOM s.r.o.** |
| **Address:** | **Mirova 1283, 592 31 Nove Mesto na Morave, Czech Republic** |
| **VAT:** | **46343423** |
| **Product:** | **MG100** |
| **Purpose of use:** | **GPRS Modem** |

CE

**We, the manufacturer of the above mentioned product, hereby declare that this product:**

- conforms to the essential requirements of the European Union directives **73/23/EEC** and **89/336/EEC**;
- is safe on condition of usage mentioned in the operating manual.

**This Declaration of Conformity is based on the following documents:**

| Test specification: | Document No.: | Date of issue: | Laboratory: |
|---|---|---|---|
| ETSI EN 301 489-5 V1.2.1 | 17/04 | 26.02. 2004 | TESTCOM Praha, CZ |
| EN 60950 | EB1265 | 10.03. 2004 | TESTCOM Praha, CZ |
| ETSI EN 301 489-5 V1.3.1 | 29/608/2006 | 24.04. 2006 | VUS Banska Bystrica, SK |

Nove Mesto na Morave, 7th of December 2005
Jiri Hruska, Managing Director

**RACOM s.r.o.** • Mirova 1283 • 592 31 Nove Mesto na Morave • Czech Republic
Tel.: +420 565 659 511 • Fax: +420 565 659 512 • E-mail: racom@racom.eu

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*Fig. 7.2: Consistency declaration MG100*

## 7.5. Country of Origin

RACOM
RADIO DATA NETWORKS

**Country of Origin Declaration**

| | |
|---|---|
| **Manufacturer:** | **RACOM** |
| **Address:** | **Mirova 1283, 592 31 Nove Mesto na Morave, Czech Republic** |
| **VAT No:** | **CZ46343423** |

**We, the manufacturer, hereby declare that Country of Origin of the MR radio series and its accessories is the Czech Republic, EU.**

| Part Number | Description |
|---|---|
| **MC100** | Controller, modules according to spec. |
| **MD160 25W** | 160 MHz, 12.5 or 25 kHz, 25W, full-duplex, modules according to spec. |
| **MR160 25W** | 160 MHz, 12.5 or 25 kHz, 25W, half-duplex, modules according to spec. |
| **MR160 5W** | 160 MHz, 12.5 or 25 kHz, 5W, half-duplex, modules according to spec. |
| **MR300 5W** | 300 MHz, 12.5 or 25 kHz, 5W, half-duplex, modules according to spec. |
| **MR400 25W** | 400 MHz, 12.5 or 25 kHz, 25W, half-duplex, modules according to spec. |
| **MR400 5W** | 400 MHz, 12.5 or 25 kHz, 5W, half-duplex, modules according to spec. |
| **MW160 25W** | 160 MHz, 200 kHz, 25W, half-duplex, modules according to spec. |
| **MX160 25W** | 160 MHz, 200 kHz, 25W, full-duplex, modules according to spec. |
| **MG100** | Cellular router, modules according to spec. |
| **MS2000/12** | 230 V AC / 13.8 V DC, intelligent back-up |
| **MS2000/24** | 230 V AC / 24 V DC, intelligent back-up |
| **MSU120** | Arbitrary solar panel / 14.7 V DC |
| **DCC24** | 20–60 V DC / 13.8 V DC |

Nove Mesto na Morave, 1 of March 2014
Jiri Hruska, CEO

**RACOM s.r.o.** • Mirova 1283 • 592 31 Nove Mesto na Morave • Czech Republic
Tel.: +420 565 659 511 • Fax: +420 565 659 512 • E-mail: racom@racom.eu

**www.racom.eu**

ver. 1.1

*Fig. 7.3: Country of Origin declaration*

# Appendix A. Revision History

Revision 1.1 2005-03-11
1. xml version derived from MR400

Revision 1.2 2007-03-20
New design of the modem, the exchange of all photos

Revision 1.3 2008-09-23
M-Bus module description supplemented

Revision 1.4 2009-5-5
T-port module description supplemented

Revision 1.5 2009-5-5
Modification MG100i, module EDGE/UMTS, indicator LED, power consumption

Revision 1.6 2012-3-20
T-port module description removed

Revision 1.7 2014-1-22
M-BUS module description removed

Revision 1.8 20014-03-27
Added section Section 7.5, “Country of Origin”

Revision 1.9 2014-07-17
removed GPS module, completed MORSE code