

# User Manual

## MC92



V1.0.4

## Content

1	General .....	4
1.1	Warranty provisions .....	4
2	Safety.....	4
2.1	Technical limiting values .....	4
2.2	Obligations of the operator .....	4
2.3	Qualification of personnel .....	4
2.4	Guidelines for transport and storage .....	5
2.5	Labels on the product.....	5
2.6	Environmental protection .....	5
2.7	Basic safety requirement.....	6
3	Use of open-source software .....	6
3.1	General .....	6
3.2	Liability regulations .....	7
3.3	Used open-source software .....	7
4	Content.....	7
5	Technical specifications.....	8
5.1	Technical Data .....	8
5.1.1	Physical properties .....	8
5.1.2	Technological mobile network features.....	8
6	Installation.....	8
6.1	Antenna .....	8
6.2	Inserting the SIM card .....	9
6.3	Power supply .....	9
6.4	Configuration via Putty.....	9
6.5	Configuration via STTY.....	9
6.6	Configuration via Minicom .....	10
6.7	Configuration via C/C++.....	10
7	Ports, display and operating elements.....	11
7.1	Power Supply.....	11
7.2	RS485 GPIO.....	12
7.3	RS232.....	12
7.4	LED Indicators.....	12
8	AT Commands .....	13
8.1	AT commands for SIM presence and status.....	13
8.1.1	SIM Presence .....	13
8.1.2	SIM PIN Status .....	13

8.2	Send SMS using AT commands.....	14
8.2.1	Setting up the device.....	14
8.2.2	Sending the message.....	15
8.2.3	Sending a Unicode SMS message .....	16
8.3	GPS .....	16
8.3.1	Turn on and off the GNSS.....	16
8.3.2	Get Location .....	16
8.4	Wi-fi.....	18
8.4.1	Turn on and off Wi-fi .....	18
8.4.2	Set SSID.....	18
8.4.3	Enable/Disable Broadcast.....	18
8.4.4	Set Authorization Type, Encryption Mode and Password.....	19
8.4.5	Query the Number of Wi-Fi Clients .....	20
9	MC Feature Extensions.....	20
9.1	AT+MCT:GPIO.....	20
9.2	AT+MCT:LED .....	21
9.3	AT+MCT:CFG.....	21
9.4	AT+MCT:DEVICE .....	22
9.5	AT+MCT:ERR.....	23
9.6	Sending notifications .....	23
9.6.1	E-Mail configuration .....	23
9.6.2	Setting recipients.....	23
9.7	MQTT.....	25
9.7.1	Add connection information .....	25
9.7.2	Add a new subscription .....	25
9.7.3	Add a new publication.....	26
9.7.4	Configure relay .....	26
9.7.5	Apply changes.....	26
10	Change Serial Port Connection Type .....	27
11	Maintenance, repair and troubleshooting .....	28
11.1	Maintenance .....	28
11.2	Troubleshooting .....	28
11.3	Repair .....	28
12	Disposal .....	28
12.1	Return of the old equipment.....	28

## 1 General

These instructions enable the safe and efficient handling of the product. The instructions are an integral part of the product and must be kept accessible at all times to installation, commissioning and operating personnel.

### 1.1 Warranty provisions

Unauthorized use, non-observance of this documentation, the use of insufficiently qualified personnel and unauthorized modifications exclude the manufacturer's liability for resulting damages. The manufacturer's warranty is void. The provisions of our terms and conditions of delivery and purchase (AGB) apply. These can be found on our website ([www.mc-technologies.net/en/terms-and-conditions.php](http://www.mc-technologies.net/en/terms-and-conditions.php))

## 2 Safety

The Safety section provides an overview of the safety instructions to be observed when operating the product.

The product has been constructed in compliance with the currently valid rules of technology and is safe to operate. It has been tested and has left the factory in perfect condition in terms of safety. In order to maintain this condition over the operating time, the information in the applicable publications and certificates must be observed and followed.

The basic safety instructions must be strictly maintained when operating the product. In addition to the basic safety instructions, the individual sections of the documentation contain descriptions of procedures and operating instructions with specific safety information.

Furthermore, the local guidelines for the prevention of accidents and general safety regulations for the area of application of the device should be applied.

Only the consideration of all safety instructions enables the optimum protection of personnel and the environment against hazards as well as the safe and trouble-free operation of the product.

### 2.1 Technical limiting values

The product is exclusively intended for use within the technical limits specified in the data sheets. The following limit values must be observed:

- The surrounding temperature limits must not be exceeded or dropped below.
- The supply voltage range must not be violated under or above.
- The maximum air humidity must not be exceeded and condensation must be avoided.
- The maximum switching voltage and the maximum switching current load must not be exceeded.
- The maximum input voltage and the maximum input current must not be exceeded.

### 2.2 Obligations of the operator

The operator must always observe the national regulations applicable in his country regarding the operation, functional testing, repair and maintenance of electronic devices.

### 2.3 Qualification of personnel

Installation, commissioning and maintenance of the product may only be carried out by trained specialist personnel authorised by the system operator. The qualified personnel must have read and understood this documentation and follow the instructions.

The electrical installation and commissioning of the product may only be carried out by a person who, due to his or her specialist training, knowledge and experience as well as knowledge of the relevant standards and regulations, is able to carry out work on electrical systems and independently detect and avoid possible hazards.

## 2.4 Guidelines for transport and storage

The following instructions must be observed:

- Do not expose the product to moisture or other potentially harmful environmental conditions (radiation, gases, etc.) during transport and storage. Pack the product properly.
- Pack the product so that it is protected from shocks during transport and storage, e.g. by using air-cushioned packaging.
- Before installing the product, check it for possible damage that may have been caused by improper transport or storage. Damage in transit must be noted on the shipping documents. All claims for damages must be made immediately and before installation to the carrier / company responsible for storage.

## 2.5 Labels on the product

The type plate of the product is located as a sticker on one surface of the product. It may contain the following markings, among others, which are explained in more detail here.

	<p><b>Dispose of old equipment in an environmentally responsible manner</b> This symbol indicates that old devices must be disposed of separately from residual waste at suitable collection points. See also the disposal section in this manual.</p>
	<p><b>CE-label</b> By affixing the CE marking, the manufacturer confirms that the product complies with the product-specific applicable European regulations.</p>

## 2.6 Environmental protection

Dispose the product and its packaging in accordance with the relevant environmental protection regulations. Refer to the disposal section of this manual for instructions on how to dispose of the product. Separate the packaging components made of cardboard and paper as well as plastic and recycle them using the appropriate collection systems.

## 2.7 Basic safety requirement

	<p><b>Electrostatic discharges can damage the product!</b>  <b>Damage the product.</b>          Observe the general precautions for handling electrostatically sensitive components.</p>
	<p><b>Moisture and liquids from the surrounding area can get inside the product!</b>  <b>Risk of fire and damage to the product.</b>          The product must not be used in wet or humid environments or in the immediate vicinity of water. Install the product in a dry place protected from splashing water. Turn off the power before performing any work on a device that has been exposed to moisture.</p>
	<p><b>Short circuits and damage due to improper repairs and modifications and opening of maintenance areas!</b>  <b>Risk of fire and damage to the product.</b>          It is not permitted to open the product for repair work or modifications beyond the removal and insertion of the plug-in cards provided for this purpose.</p>
	<p><b>Overvoltage and voltage peaks from the power supply system!</b>  <b>Fire hazard and damage to the device due to overvoltage.</b>          Install a suitable surge protection.</p>
	<p><b>Distance between antennas and persons!</b>  <b>Too small distance between mobile phone antennas and people can affect their health.</b>          Please note that the mobile phone antenna must be at least 20 cm away from persons during operation.</p>

## 3 Use of open-source software

### 3.1 General

This product includes, among other things, so-called open-source software, which was produced by third parties and published for free use by everyone. The open-source software is subject to special open-source software licenses and the copyright of third parties. Every customer can use the open-source software according to the license terms of the respective manufacturer. The rights of the customer to use the open-source software beyond the purpose of our product are regulated in detail by the respective open source software license. The customer may freely use the open-source software, as provided for in the respective valid license, beyond the purpose of the open-source software in our product. In the case that there is a contradiction between our license terms for our product and the respective open-source software license, the respective open-source software license takes priority over our license terms as far as the respective open-source software is affected.

The use of the open-source software used is free of charge. We do not charge any user fees or comparable fees for the use of the open-source software contained in our product. The use of the open-source software by the customer in our product is not part of the profit we make with the contractual remuneration.

The provided list shows all open source software programs that are included in our product. The most important open-source software licenses are listed in the licenses section at the end of this publication.

As far as programs contained in our product are under the GNU General Public License (GPL), GNU Lesser General Public License (LGPL), the Clarified Artistic License or any other open-source software license, which stipulates that the source code must be made available, we will send the source code at any time on request. Our offer to send the source code on demand automatically ends 3 years after delivery of our product to the customer. Requests should be sent to the following address, if possible stating the serial number of our product:

**MC Technologies GmbH**  
**Kabelkamp 2**  
**30179 Hannover**

### 3.2 Liability regulations

We do not assume any warranty or liability if the open-source software programs contained in our product are used by the customer in a way that no longer corresponds to the purpose of the contract on which the purchase of our product is based. This applies in particular to any use of the open source software programs outside of our product. For the use of the open source software beyond the purpose of the contract, the warranty and liability provisions provided for in the applicable open source software license for the corresponding open source software, as listed below, shall apply. In particular, we shall not be liable if the open source software in our product or the entire software configuration in our product is changed. The warranty given in the contract on which the purchase of our product is based shall only apply to the unchanged open source software and the unchanged software configuration in our product.

### 3.3 Used open-source software

Please contact our support department (support@mc-technologies.net) for a list of open source software used in this product. Alternatively, a list of the open source software used can be found in the MC92 web interface under System -> Software -> Installed.

## 4 Content

The package includes the accessories listed below. Please check that all accessories listed are included in your box. If a part is missing or damaged, please contact MC Technologies directly.

- MC92
- Quick Installation Guide
- Safety Instructions
- DIN Mount Clip-in for DIN Rail

Optional accessories are not included. Among others, the following parts are available at MC Technologies:

- Mobile phone antennas
- DIN Rail
- Ethernet cable
- GSM (LTE)-Antenna
- GPS Antenna
- Wifi Antenna

## 5 Technical specifications

The following specifications apply to all versions of the MC92. If these variants differ from one another, the different values are indicated separately.

### 5.1 Technical Data

#### 5.1.1 Physical properties

Physical characteristics	Value
Supply Voltage	8 V to 30 V DC
Dimensions (W x H x D)	44 x 105 x 84mm
Operation temperature	-10°C to +60°C
Housing	Aluminium
Mounting	Tabletop / DIN rail

The extended temperature range allows temporary operation at increased temperatures. This may result in functional restrictions (especially during data transmission). This serves to protect the internal electronics.

#### 5.1.2 Technological mobile network features

Technological feature	Description
Supporting networks	LTE FDD: B1/B3/B5/B7/B8/B20
	UMTS: B1/B5/B8
	GSM/EDGE: B3/B8
Transmission rates LTE	Up to 5 Mbps uplink and 10 Mbps downlink
Transmission rates DC-HSPA+	Up to 5.76 Mbps uplink and 42 Mbps downlink
Transmission rates WCDMA	Up to 384 kbps uplink and 384 kbps downlink
Transmission rates EDGE	Up to 236.8 kbps uplink and 296 kbps downlink
Transmission rates GPRS	Up to 85.6 kbps uplink and 107 kbps downlink
Antenna connections	SMA (female)
GPS/GNSS	Optional (<2.5m)
RTC (Real Time Clock)	Integrated, buffered

## 6 Installation

The MC92 data terminal is designed for applications over LTE with fall back to UMTS, EDGE and GSM multifunctional applicable.

**Please follow the instructions step by step and configure the settings for the SIM card. An incorrect PIN can lead to the SIM card being blocked.**



**Warning:** user must be at least 20 cm away from the transmitting antenna during device long-term operation.

### 6.1 Antenna

Mount the supplied antenna on connector "LTE" of the MC92. Check whether there is sufficient local network coverage from your mobile phone provider.

## 6.2 Inserting the SIM card

Insert your SIM card as shown in the figure below until it locks into place.



## 6.3 Power supply

The MC92 is operated with a supply voltage of 8 - 30V DC. Please connect an external DC power supply with an output voltage of 8 - 30V DC to the power supply socket "PWR".

Please connect the power supply unit to the power supply or switch on the power supply. A green "PWR" LED will light up.

After a short initialization phase (approx. 30 seconds) the device is ready for operation.

## 6.4 Configuration via Putty

1. In Putty, "Serial" as a Connection type.
2. Choose the right Serial port for your USB-RS232 connector.
3. Set the speed to "115200".
4. Expand the connection tab on the right side, then under "SSH" click on "Serial".
5. Set "Flow control" to "None"

## 6.5 Configuration via STTY

You can use "stty" to configure your "tty" and connect to the Modem using "cat" and "echo".

1. Using Command Prompt, give the command:

```
stty -F /dev/ttyUSB0 -crtscts 115200 cs8 -cstopb -parenb -echo -echon1
```

Execute `cat /dev/ttyUSB0` in one terminal and `echo "AT+CSQ" >/dev/ttyUSB0` in another.

## 6.6 Configuration via Minicom

You can use the linux command line tool minicom to connect to the MC92.

- 1 Using Command Prompt, give the command:

```
minicom --device /dev/ttyUSB0 --baud 115200,8,N,1
```

- 2 Disable flow control by pressing CTRL+A followed by O to get into configuration. Then go down to "Serial port setup", press "Enter" to enter and press "F" do toggle "Hardware Flow Control"

The Modem will now respond to AT-Commands.

## 6.7 Configuration via C/C++

The following snippet should help you in order to get a connection to the modem:

```
Portname = "/dev/ttyUSB0";
serial_port = open(portname, O_RDWR);
// Check for errors
if (serial_port < 0) {
    fprintf(stderr, "Could not open %s: %s\n", portname, strerror(errno));
    exit(EXIT_FAILURE);
}
// Create new termios struc, we call it 'tty' for convention
struct termios tty;
memset(&tty, 0, sizeof tty);
// Read in existing settings, and handle any error
if (tcgetattr(serial_port, &tty) != 0) {
    fprintf(stderr, "Error %i from tcgetattr: %s\n", errno, strerror(errno));
    fprintf(stderr, "Could not get options for modem connection%s\n", portname);
    exit(EXIT_FAILURE);
}
tty.c_cflag &= ~PARENB; // Clear parity bit, disabling parity
tty.c_cflag &=
~CSTOPB; // Clear stop field, only one stop bit used in communication
tty.c_cflag |= CS8; // 8 bits per byte
tty.c_cflag &= ~CRTSCTS; // Disable RTS/CTS hardware flow control
tty.c_cflag |=
CREAD | CLOCAL; // Turn on READ & ignore ctrl lines (CLOCAL = 1)
tty.c_lflag &= ~ICANON;
tty.c_lflag &= ~ECHO; // Disable echo
tty.c_lflag &= ~ECHOE; // Disable erasure
tty.c_lflag &= ~ECHONL; // Disable new-line echo
tty.c_lflag &= ~ISIG; // Disable interpretation of INTR, QUIT
and SUSP
tty.c_iflag &= ~(IXON | IXOFF | IXANY); // Turn off s/w flow ctrl
tty.c_iflag &= ~(IGNBRK | BRKINT | PARMRK | ISTRIP | INLCR | IGNCR | ICRNL); // Disable
any special handling of received bytes
tty.c_oflag &= ~OPOST; // Prevent special interpretation of output bytes (e.g. // newline
chars)
tty.c_oflag &= ~ONLCR; // Prevent conversion of newline to carriage return/line feed
tty.c_cc[VTIME] = 10; // Set timeout, returning as soon as any
// data is received.
tty.c_cc[VMIN] = 0;
// Set in/out baud rate to be 115200
cfsetispeed(&tty, B115200);
cfsetospeed(&tty, B115200);
// Save tty settings, also checking for error
if (tcsetattr(serial_port, TCSANOW, &tty) != 0) {
    fprintf(stderr, "Error %i from tcsetattr: %s\n", errno,
strerror(errno));
    fprintf(stderr, "Could not set options for modem connection %s\n", portname);
    exit(EXIT_FAILURE);
}
```

### 7 Ports, display and operating elements



Port	Description
PWR	Power supply
GPIO	General input and output connector
RS485	RS485 Serial port connected directly to LTE Module UART interface
RS232	Male DB9 Serial port connected directly to LTE Module UART interface
LTE	SMA antenna
GPS	GPS antenna
USB	USB port type B connected directly to LTE Module

#### 7.1 Power Supply

Connection to an AC power supply must be made by using a suitable power supply unit. The DC voltage must be between 8 and 30V, typical supply voltage is 12V.

## 7.2 RS485 GPIO



Pin	Description
A	RS485-A (+)
B	RS485-B (-)
GND	RS485 GND
IO GND	GNDIO (Ground for galvanically isolated inputs and outputs)
GPIO 1	GPIO_1
GPIO 2	GPIO_2
GPIO 3	GPIO_3
GPIO 4	GPIO_4
PWR +	V+
PWR -	V- / GND

## 7.3 RS232

Port	Signal	Description
1	Nc	Not connected
2	RXD	Receive Data
3	TXD	Transmit Data
4	Nc	Not connected
5	GND	Ground
6	Nc	Not connected
7	RTS	Request To Send
8	CTS	Clear To Send
9	Nc	Not connected

## 7.4 LED Indicators

LED	Description
LED 1	Always on. Indicates that the device is connected to power source
LED 2	Configurable.
LED 3	Configurable.
LED 4	Configurable.
LED 5	Configurable
LED 6	Directly connected to LTE module, indicates the status of the connection.

## 8 AT Commands

### 8.1 AT commands for SIM presence and status

#### 8.1.1 SIM Presence

1. Enable the extended error codes to get a verbose format:

```
AT+CMEE=2  
OK
```

2. Now get the status of SIM presence:

```
AT+cpin?  
+CME ERROR: SIM not inserted
```

Above AT command response indicates that SIM card is not present.

3. Verify that SIM is inserted properly and check again:

```
AT+cpin?  
+CPIN: READY  
OK
```

When the SIM card is ready, above AT response will be received from the module.

#### 8.1.2 SIM PIN Status

1. Get the status of SIM PIN:

```
AT+CPIN?
```

Pin status can be:

- READY: SIM PIN is already unlocked or lock has been disabled.
  - SIM PIN: This means SIM PIN is locked and code is required.
  - SIM PUK: Maximum number to retries to unlock has reached. PUK code is required from network provider
2. If SIM PIN is required enter the following command to unlock the SIM:

```
AT+CPIN="XXXX"
```

**Enter the SIM PIN instead of XXXX**

## 8.2 Send SMS using AT commands

### 8.2.1 Setting up the device

- Activate SMS text mode using the following command:

```
AT+CMGF=1
```

- In text mode there are some additional parameters that can be set. Using the following command, we can read the current values:

```
AT+CSMP?
```

The device will respond with a string like this:

```
> +CSMP: 1,169,0,0
> OK
```

The first value is a combination of some option bits:

bit 7	RP	Reply path, not used in text mode
bit 6	UDHI	User Data Header Information
bit 5	SRR	Set this bit to request a delivery report
bit 3,4	VPF	Validity Period, set b4=1 if a VP value is present
bit 2	RD	Reject Duplicates, do not return a message ID when a message with the same destination and ID is still pending
bit 0,1	MTI	Message Type Indicator b1=0 & b0=0 -> SMS-DELIVER b1=0 & b0=1 -> SMS-SUBMIT

Bit 0 of the message is always set when sending messages (SMS-SUBMIT). So, the first value should be 1 or higher. The second parameter sets the Validity Period of the message. This value is encoded as follows:

0 - 143	(VP + 1) x 5 minutes
144 - 167	12 Hours + ((VP-143) x 30 minutes)
168 - 196	(VP-166) x 1 day
197 - 255	(VP-192) x 1 week

The third parameter contains the PID (Protocol Identifier). This parameter is only used for advanced messaging. The fourth parameter contains the DCS (Data Coding Scheme). This parameter is used to select the character set/message type. When setting the DCS parameter to '0' standard 7-bit text is sent. When setting this parameter to '16' the message is sent as a flash message.

To send a message with a validity period of 1 day, the parameters have to be set like this:

Bit 0 and 4 of the first field has to be set, so the first value will become  $1 + 16 = 17$ .

Send the following command to the modem to set these parameters:

```
AT+CSMP=17,167,0,16
```

If the modem responds with "OK", the modem is ready to send (flash) text messages with a validity period of 1 day.

### 8.2.2 Sending the message

- To send the SMS message

```
AT+CMGS="+4917604069083"
```

- Replace the above phone number with the wanted phone number. The device will respond with:

```
>
```

- Type the message text and send the message using the <CTRL>-<Z> key combination:

```
> Test! <CTRL-Z>
```

```
<wait>
```

```
> +CMGS: 62
```

```
Message was sent correctly
```

### 8.2.3 Sending a Unicode SMS message

To check whether your device supports this mode, just type the following command:

```
AT+CSCS=?
```

This command displays the code pages supported by the device. The device will respond like this:

```
+CSCS: ("IRA","GSM","UCS2")
```

If this string contains "HEX" or "UCS2", Unicode seems to be supported. To specify that you will use a UCS2 string to send the message, set the codepage to "UCS2" depending on the device response. In our example we will set the device to "UCS2":

```
AT+CSCS="UCS2"
```

Next, specify the correct DCS (Data Coding Scheme) for Unicode messages, which is 0x08. Set this value by changing the fourth parameter of the AT+CSMP command to '8':

```
AT+CSMP=1,167,0,8
```

The device is now ready to send messages as Unicode.

## 8.3 GPS

### 8.3.1 Turn on and off the GNSS

- Turn on GNSS function:

```
AT+QGPS=1
```

- Turn off GNSS function:

```
AT+QGPSEND
```

- Set GNSS function to turn on automatically:

```
AT+QGPSCFG="autogps",1
```

### 8.3.2 Get Location

- Enable <nmeasrc> functionality:

```
AT+QGPSCFG="nmeasrc",1
```

- Obtain positioning information:

```
AT+QGPSLOC?
```

- Obtain NMEA sentence: (NMEA must be enabled)
  - AT+QGPSGNMEA="GGA"                      Query GGA information
  - AT+QGPSGNMEA="RMC"                      Query RMC information
  - AT+QGPSGNMEA="GSV"                      Query GSV information
  - AT+QGPSGNMEA="GSA"                      Query GSA information
  - AT+QGPSGNMEA="VTG"                      Query VTG information
  - AT+QGPSGNMEA="GNS"                      Query GNC information
- Send NMEA GPS data over the dedicated USB NMEA port
  - AT+QGPSCFG="outport","usbnmea"
- Disable <nmeasrc> functionality:
  - AT+QGPSCFG="nmeasrc",0

Error	Meaning
501	Invalid Parameter(s)
502	Operation not support
503	GNSS subsystem busy
504	Session is on Going
505	Session is not active
506	Operation timeout
507	Function not enabled
508	Time information error
512	Validity time is out of range
513	Internal resource error
514	GNSS locked
515	End by E911
516	Not fixed now (No GPS position received)
549	Unknown error

## 8.4 Wi-fi

### 8.4.1 Turn on and off Wi-fi

- Turn on Wi-fi function:

AT+QWIFI=1

- Turn off Wi-fi function:

AT+QWIFI=0

- Wi-Fi Status

AT+QWIFI?

### 8.4.2 Set SSID

- Get current SSID

AT+QWSSID?

- Set new SSID

AT+QWSSID=<ssid>

### 8.4.3 Enable/Disable Broadcast

- Broadcast status

AT+QWBCAST?

- Enable Broadcast

AT+QWBCAST=1

- Disable Broadcast

AT+QWBCAST=0

#### 8.4.4 Set Authorization Type, Encryption Mode and Password

AT+QWAUTH=<auth>,<encrypt>,<passwordindex>,"<pass1>","<pass2>","< pass3>","< pass4>"

Parameter	Description
<auth>	Authorization type  0 Open/shared 1 Open 2 2 Shared 3 WPA 4 WPA2 5 WPA/WPA2
<encrypt>	Encryption mode  0 No encryption 1 1 WEP 2 TKIP 3 3 AES 4 4 TKIP-AES
<passwordindex>	Number of passwords used.  If <encrypt>=0: "<pass1>","<pass2>","< pass3>","< pass4>" should be empty.  If <encrypt>=1: <ul style="list-style-type: none"> <li>• <math>1 \leq \text{&lt;passwordindex&gt;} \leq 4</math></li> <li>• &lt;passwordindex&gt; =1, "&lt;pass1&gt;" must be in password format "&lt;pass2&gt;","&lt; pass3&gt;","&lt; pass4&gt;" can be set to ""</li> </ul> If <encrypt>=1: <ul style="list-style-type: none"> <li>• &lt;passwordindex&gt; cannot be set</li> <li>• "&lt;pass2&gt;","&lt; pass3&gt;","&lt; pass4&gt;" cannot be set</li> </ul>

- Set authorization type as open/shared and encryption mode as null  
AT+QWAUTH=0,0
- Set authorization type as open/shared and encryption mode as WEP  
AT+QWAUTH=0,1,1,"11111","22222","",""
- Set authorization type as shared and encryption mode as WEP  
AT+QWAUTH=2,1,2,"11111","22222","",""
- Set authorization type as WPA/WPA2 and encryption mode as TIKP-AES  
AT+QWAUTH=5,4,"12345678"

### 8.4.5 Query the Number of Wi-Fi Clients

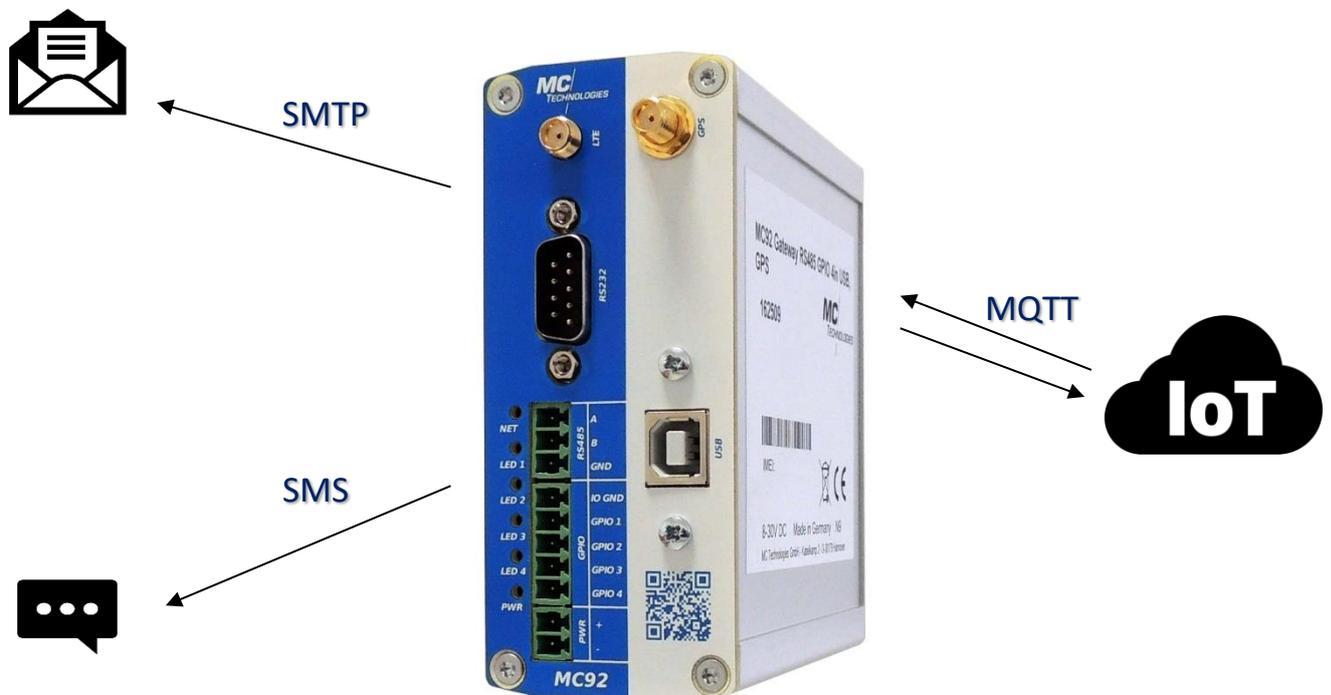
- Query the number of clients connected to AP:  
AT+QWCLICNT?
- URC of Client Connection Status

If a client is connected or disconnected to AP, the URC will be reported to indicate the client's MAC address:

+QWIFIND:<status>,<mac>

Parameter	Description
<status>	Client connection/disconnection status 0 Client is disconnected to AP 1 Open 2 Client is connected to AP
<mac>	MAC address of the client. Format: HEX number, such as: "0A:0B:0C:0D:0E:0F"

## 9 MC Feature Extensions



### 9.1 AT+MCT:GPIO

Command for setting and reading GPIO pins of the device.

Command	Function	Example
---------	----------	---------

<b>AT+MCT:GPIO=?</b>	Get an overview on how the command is to be used	AT+MCT:GPIO=? AT+MCT:GPIO=(1-8)[,(0-1,)] > OK
<b>AT+MCT:GPIO=X</b>	read the value of a GPIO pin X	AT+MCT:GPIO=1ON > OK
<b>AT+MCT:GPIO=X,[0/1]</b>	set the value of a GPIO pin X	AT+MCT:GPIO=3,1 > OK

### 9.2 AT+MCT:LED

Command for setting and reading LEDs of the device.

Command	Function	Example
<b>AT+MCT:LED=?</b>	Get an overview on how the command is to be used	AT+MCT:LED=? AT+MCT:LED=(1-4)[,(0-1)] > OK
<b>AT+MCT:LED=X</b>	read the value of a LED X	AT+MCT:LED=1 > ON > OK
<b>AT+MCT:LED=X,[0/1]</b>	set the value of a LED X	AT+MCT:LED=3,1 > OK

### 9.3 AT+MCT:CFG

Read and set configuration settings:

Command	Function	Example
<b>AT+MCT:CFG=?</b>	Get an overview on how the command is to be used	AT+MCT:CFG=? AT+MCT:CFG=command[,configpath[,value[,...]]] OK
<b>AT+MCT:CFG?</b>	List all Configurations	AT+MCT:CFG?
<b>AT+MCT:CFG=changes</b>	Show what has been changed, but not applied yet.	AT+MCT:CFG=changes > gpio.cfg047f03.directiongpio.cfg037f03.direction='in' > OK
<b>AT+MCT:CFG=apply</b>	Apply all changes, and restart the services.	AT+MCT:CFG=apply > OK
<b>AT+MCT:CFG=revert,section</b>	Revert changes made to section	AT+MCT:CFG=revert,gpio > OK
<b>AT+MCT:CFG=rename,configpath,newname</b>	Rename a section	AT+MCT:CFG=rename,notification.cfg057f03,pin3 > OK
<b>AT+MCT:CFG=show</b>	Show an overview of available configurations	AT+MCT:CFG=show > device > Gpio > Mqtt > notification > relay > OK
<b>AT+MCT:CFG=show,configpath</b>	Show a specific path or value	AT+MCT:CFG=show,device > device.mobile=service > device.network=service > OK
<b>AT+MCT:CFG=add,configpath,configuration</b>	Add a new section block. The command will reply with the	AT+MCT:CFG=add,notification,ioconf > cfg057f03 > OK

	name of the new section.	
<b>AT+MCT:CFG=set,configpath,value</b>	Set a configuration option to a specific value	AT+MCT:CFG=set,notification.pin3.enable,1 > OK
<b>AT+MCT:CFG=set,configpath,value,value[,...]</b>	Set a list of values, to one configuration option	AT+MCT:CFG=set,relay.@network[3].members, gpio.inp ut.4', gpio.led.4' > OK
<b>AT+MCT:CFG=delete,configpath</b>	Delete an option	AT+MCT:CFG=delete,gpio.@ioconf[3].direction > OK

If one of the values or paths does contain a “,”, you can enclose the value with parentheses like this:

```
AT+MCT:CFG=gpio.cfg047f03.id,"3"
AT+MCT:CFG='gpio.cfg047f03.id',"3"
AT+MCT:CFG="gpio.cfg047f03.id",3
```

## 9.4 AT+MCT:DEVICE

Retrieve information about the device.

Command	Function	Example
<b>AT+MCT:DEVICE?</b>	Get an overview on how the command is to be used	AT+MCT:DEVICE? > AT+MCT:DEVICE=SW_VERSION > AT+MCT:DEVICE=HW_VARIANT > OK
<b>AT+MCT:DEVICE=SW_VERSION</b>	Returns the software version of the Firmware	AT+MCT:DEVICE=SW_VERSION > v2.12.0 > OK
<b>AT+MCT:DEVICE=HW_VARIANT</b>	Return the Hardware variant	AT+MCT:DEVICE=HW_VARIANT > I2O2 > OK

Hardware variant can be one of the following: O4 - The device has 4 Output GPIOs

I4 - The device has 4 Input GPIOs

I2O2 – GPIO 1, 2 are inputs, GPIO 3, 4 are Outputs.

NOIO - There are no GPIOs available

## 9.5 AT+MCT:ERR

Retrieve Information about the last error

Command	Function	Example
<b>AT+MCT:ERR=?</b>	Get an overview on how the command is to be used	AT+MCT:ERR=? > OK
<b>AT+MCT:ERR?</b>	Return a more descriptive explanation of the last error	AT+MCT:LED=5 > ERROR AT+MCT:ERR=? > LED 5 not found > OK

## 9.6 Sending notifications

The device is capable of sending E-Mail or SMS-Notifications on pin-change.

### 9.6.1 E-Mail configuration

You need to configure the SMTP server.

- Check if an SMTP configuration exists:

```
AT+MCT:CFG=show,notification.@smtp[0]
-> if result is ERROR
AT+MCT:CFG=add,notification,smtp
```

- Set required parameters:

```
AT+MCT:CFG=set,notification.@smtp[0].username,<username>
AT+MCT:CFG=set,notification.@smtp[0].password,<password>
AT+MCT:CFG=set,notification.@smtp[0].fromaddr,<mail@example.com>
AT+MCT:CFG=set,notification.@smtp[0].url,<smtp://smtp.example.com:25>
```

The URL needs to contain the protocol and port.

### 9.6.2 Setting recipients

For every input pin the recipients can be set individually.

An example config could look like this:

```
AT+MCT:CFG=show,notification
> notification.smtp=smtp
> notification.smtp.username='username'
> notification.smtp.password='password'
> notification.smtp.fromaddr='mail@example.com'
> notification.smtp.url='smtp://smtp.example.com:25'
> notification.default=default
> notification.default.receiver='+4917604069034' '+49176040690367' 'user1@example.com'
> notification.default.allowedsender='+4917604069026' '+4917604069018'
> notification.default.smstext='Pin ${id} changed to ${state} for device ${device}'
> notification.default.mailtext='Pin ${id} changed to ${state} for device ${device}'
> notification.default.mailsubject='Notification from terminal ${device}'
> notification.default.flank='rising'
```

```

> notification.pin1=ioconf
> notification.pin1.pin='1'
> notification.pin1.enable='1'
> notification.pin1.receiver='+4917604069083'
> notification.pin2=ioconf
> notification.pin2.pin='2'
> notification.pin2.enable='1'
> OK

```

In this configuration, there are two GPIOs configured:

GPIO 1: Pin 1 has the only receiver +491789123456.

GPIO 2: Pin 2 has no receiver set and will therefore use all receivers from the default block.

### *Adding a new pin*

1. Add a new ioconf and give it a suitable name:

```

AT+MCT:CFG=add,notification,ioconf           Add new ioconf
> cfg057f03                                  > Given is the name
> OK
AT+MCT:CFG=rename,notification.cfg057f03,   Rename ioconf cfg057f0 as pin3
> OK

```

2. Specify for which pin this should be used:

```

AT+MCT:CFG=set,notification.pin3.pin,3      ioconf pin3 is set to pin(GPIO) 3
> OK
AT+MCT:CFG=set,notification.pin3.enable,1    Enable getting notification from pin3
> OK

```

Each pin, as well as default has the following configuration options:

- allowedsender (Can be a list)
- receiver (Can be a list)
- smstext - Can be any string, with the following special values
  - `#{id}` - ID of the pin. For example, 3
  - `#{state}` - New state it changed to. Will be 0 or 1.
  - `#{device}` - Name of the device, if set. Default is the IMEI.
- mailtext - Can be any string, with the following special values
  - `#{id}` - ID of the pin. For example, 3
  - `#{state}` - New state it changed to. Will be 0 or 1.
  - `#{device}` - Name of the device, if set. Default is the IMEI.
- mailsubject - Can be any string, with the following special values
  - `#{id}` - ID of the pin. For example 3
  - `#{state}` - New state it changed to. Will be 0 or 1.
  - `#{device}` - Name of the device, if set. Default is the IMEI.
- flank - Can only be one of the following values
  - rising                                   GPIO status 1
  - falling                                   GPIO status 0
  - both (default)

*Example:*

Configure pin 3 to send an E-Mail with the text “The machine is down!” and the subject “Urgent notification” to “urgent@example.com” if the pin status is 0.

```

AT+MCT:CFG=set,notification.pin3.mailtext,"The machine is down!"
> OK
AT+MCT:CFG=set,notification.pin3.mailsubject,"Urgent notification"
> OK
AT+MCT:CFG=set,notification.pin3.receiver,"urgent@example.com"
> OK
AT+MCT:CFG=set,notification.pin3.flank,falling
> OK

AT+MCT:CFG=show,notification.pin3
> notification.pin3=ioconf
> notification.pin3.pin='3'
> notification.pin3.enable='1'
> notification.pin3.mailtext='The machine is down!'
> notification.pin3.mailsubject='Urgent notification'
> notification.pin3.receiver='urgent@example.com'
> notification.pin3.flank='falling'
> OK

```

Save the config and restart the notification service:

```

AT+MCT:CFG=apply
> OK

```

**9.7 MQTT**

This example will show you how to configure the device in a way, that upon changing the voltage level on an input pin a message is posted to an MQTT topic.

**9.7.1 Add connection information**

```

AT+MCT:CFG=add,mqtt,connection
> OK
AT+MCT:CFG=set,mqtt.@connection[0].host,<mqtt-server.example.com>
> OK
AT+MCT:CFG=set,mqtt.@connection[0].username,<username>
> OK
AT+MCT:CFG=set,mqtt.@connection[0].password,<password>
> OK

```

**9.7.2 Add a new subscription**

This is necessary, if you want to set the output pins with messages to a MQTT topic.

```

AT+MCT:CFG=add,mqtt,subscription
-> cfg123456
AT+MCT:CFG=rename,cfg123456,<mysubscription>
> OK
AT+MCT:CFG=set,mqtt.mysubscription.name,'my/topic/path/#'
> OK
AT+MCT:CFG=set,mqtt.mysubscription.qos,<qos-nr.>
> OK

```

You can execute the command sequence multiple times. The names given must be unique.

### 9.7.3 Add a new publication

```
AT+MCT:CFG=add,mqtt,publication
> OK
AT+MCT:CFG=set,mqtt.@publication[0].name,<publication-name>
> OK
AT+MCT:CFG=set,mqtt.@publication[0].retained,'false'
> OK
AT+MCT:CFG=set,mqtt.@publication[0].qos,<qos-nr.>
```

This allows the device to publish to all topics inside the mqtt server.

### 9.7.4 Configure relay

All changes to INPUT pins are internally published to a message bus. The relay will reroute messages from one topic to another, making it possible to send input changes to a specific topic.

Relays are always bidirectional and can also span multiple topics.

This way it is also possible to publish one changed input to multiple MQTT channels.

All input changes will be published under `gpio.input.<gpionumber>`

All output changes must be published to `gpio.output.<gpionumber>`

```
AT+MCT:CFG=add,relay,network
AT+MCT:CFG=set,relay.@network[0].members,gpio.input.1,mqtt.transmitter.my/mqtt/path/1
```

### 9.7.5 Apply changes

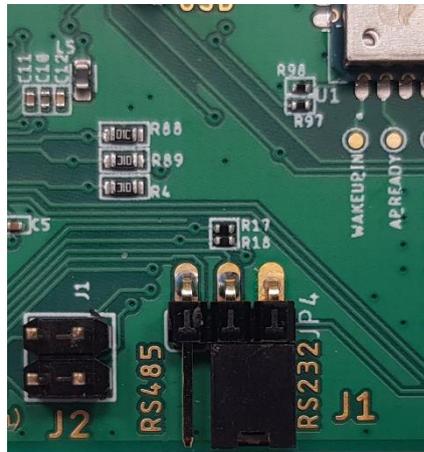
After everything has been configured, you can apply the configuration. For this you have to execute the following command:

```
AT+MCT:CFG=apply
> OK
```

This last command might take a while, as all services will be restarted. Please allow for a few seconds before returning with OK.

## 10 Change Serial Port Connection Type

As Default, is RS232 interface used to establish serial connection.



To change to RS485 interface:

1. On the PCB, change the position of jumper J1 to connect RS485 pin with the middle pin



## 11 Maintenance, repair and troubleshooting

### 11.1 Maintenance

The product is maintenance-free and requires no special regular maintenance.

### 11.2 Troubleshooting

If a fault occurs during operation of the product and you need assistance, please contact MC Technologies support. You can reach our support department by e-mail at [support@mc-technologies.net](mailto:support@mc-technologies.net).

### 11.3 Repair

Send defective products with a detailed error description to:

**MC Technologies GmbH, Kabelkamp 2, 30179 Hannover**

Before shipping the device:

- Call our support team and ask for an RMA (Return to Manufacturer Authorisation) number.
- Remove possibly inserted SIM cards.
- Back up the configurations on the device and any other data stored on it.
- Back up any applications running on the device.

***It is not permitted to open the product for repair work or modifications.***

## 12 Disposal

### 12.1 Return of the old equipment

In accordance with WEEE regulations, the return and recycling of old MC Technologies equipment for our customers is regulated as follows:

Please send your old devices carriage paid to the following address:

**MC Technologies GmbH  
-Entsorgung-  
Kabelkamp 2  
30179 Hannover**