

MC2L

WLAN + LTE-5G Gateway

Short description



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1 Technical description MC2L

The MC2L is an LTE 5G gateway with 2 GBit LAN ports and an 802.11abgn (WiFi4) WLAN interface.

Using the MC2L, network devices can be connected wireless and wired to each other and also to the Internet in various scenarios.

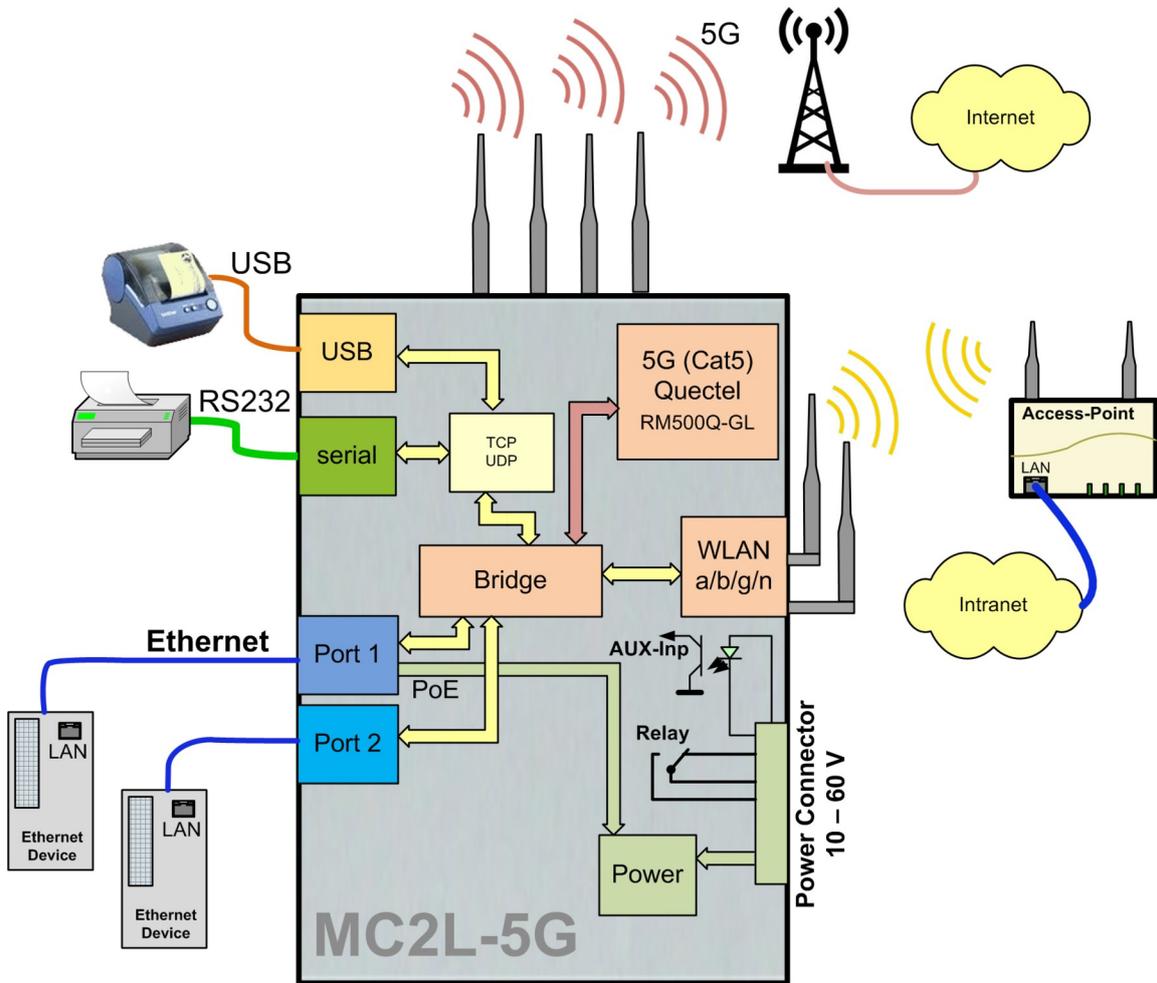


Figure 1: Complete system (example)

1.1 MC2L Antenna connectors

The following pictures show how the indicator LEDs and connectors are arranged on the MC2L.

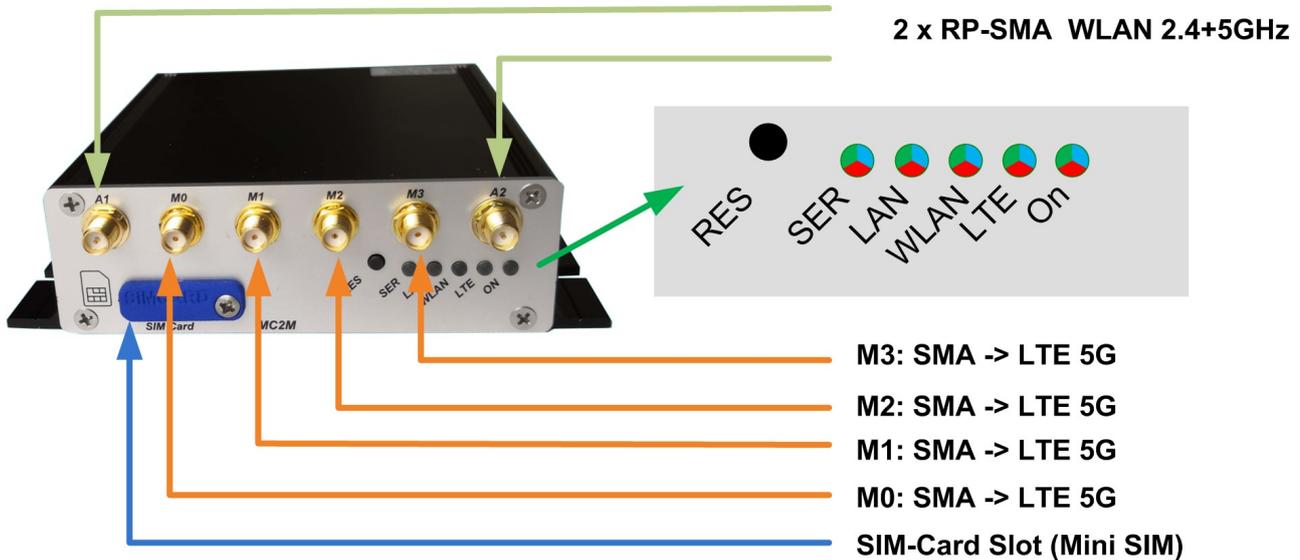


Figure 2: MC2L Front panel

Specifications of the LTE-5G antenna connectors when using an RM500Q-GL 5G card:

Connector	Description	Frequency range	Impedance
M0	- 5G NR (n41/n77/n78/n79 TRX1); - LTE LMHB TRx0; - B42/B43/B48 MIMO1	600–5000 MHz	50 Ohm
M1	- 5G NR (n77/n78/n79 DRx, n41 TRX0) - LTE MHB MIMO1; - B42/B43/B48 DRX; - LAA PRX	1100–6000 MHz	50 Ohm
M2	- 5G NR (n77/n78/n79 MIMO2,n41 DRX); - LTE MHB MIMO2; - B42/B43/B48 MIMO2; - LAA DRX; - GNSS L1 (GPS)	1400–6000 MHz	50 Ohm
M3	- 5G NR (n77/n78/n79 TRx0, n41 MIMO2); - LTE LMHB DRX; - B42/B43/B48 TRX0	600–5000 MHz	50 Ohm

Table 1: LTE-5G Antenna connectors

1.2 Meaning of the LED indicators

The 5 LEDs on the front panel indicate the operating status of the MC2L. All LED's are 3-color red, green and blue illuminated LED's. When all three colors are on, the LED's light up white. All 5 LED's light up white once briefly after power on or after a reset. If the LEDs WLAN + LAN + SER flash blue, either a new firmware is being flashed or a new configuration is being activated.

LED	State	Function
On	off	No or insufficient supply voltage
	green	Supply voltage connected
	Blinking green /orange	Normal operation This green / orange flashing indicates that the MC program is working.
	light blue flickering	The MC device has previously worked with a USB config stick and is now waiting for this stick to be plugged in again. If a USB config stick is no longer to be used, the MC must be reset via the reset button by factory default reset.
LTE	off	LTE is not activated
	Blue / off blinking	MC waits for the detection and for the first reaction of the LTE card.
	White / off blinking	The MC performs an initial initialization of the LTE card
		PIN attempts are exhausted. PUK is requested on the configuration web page.
	Green / off blinking (1:1)	Provider search + logon to the base station
	Green / off blinking (1:3)	Logon OK. Data dial-up (User+Password+APN) is performed
	Green / blue (quick change)	PIN is transferred
	Green / blue blinking permanently	PIN incorrect
	White/Red change	PIN attempts are exhausted. PUK is requested on the configuration web page.
	Yellow/blue change	No SIM was detected in the slot.
	Green permanent	Internet connection is established At intervals of 10 seconds, the status of the LTE connection is indicated by a sequence of short red flashes:1 x rot → 2G 2 x red → 3G 3 x red → 3.5G 4 x red → 4G (LTE)
Green / Light blue binking	Base station supported 5G : NSA (None Stand Alone)	
Light blue permanent	5G / SA Connection (SA = Stand Alone)	
WLAN	off	WLAN option switched off
	red flashing	MC is searching for matching AP's or is in the process of authenticating

	green	WLAN connection OK. Short red flash indicates activity (sending or receiving) on the interface.
LAN	off	No device connected to the LAN port(s)
	green	A device is connected to one of the LAN ports and switched on.
	green / orange flashing	Short orange flash when there is activity on the interface.
Serial TCP mode	off	The interface is inactive
	green	A communication partner has connected to the interface. When data is sent or received, the red LED is switched on for a short time.
	green / orange flashing	
	green flashing	The interface is active in TCP server mode and waits for a connection.
Serial UDP mode	red flashing	The interface is active in TCP client mode and waits for the connection to the server to be established.
	off	The interface is inactive
	green	Interface initialized
	green / white flashing	Data is being sent or received. When data is continuously being sent or received, the LED will be solid white.

Table 2: LED status display

1.3 Connections at the MC2L

1.3.1 MC2L with M12 connector

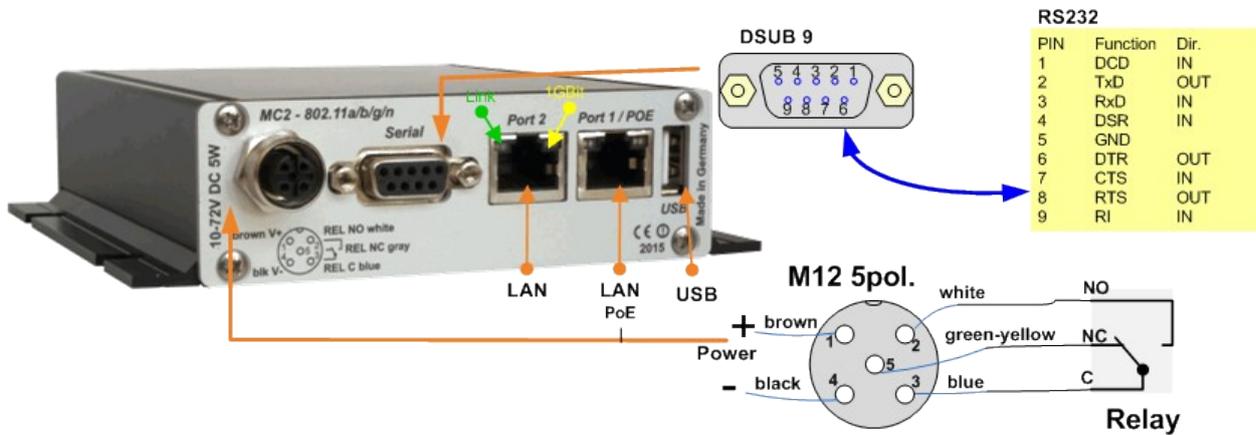
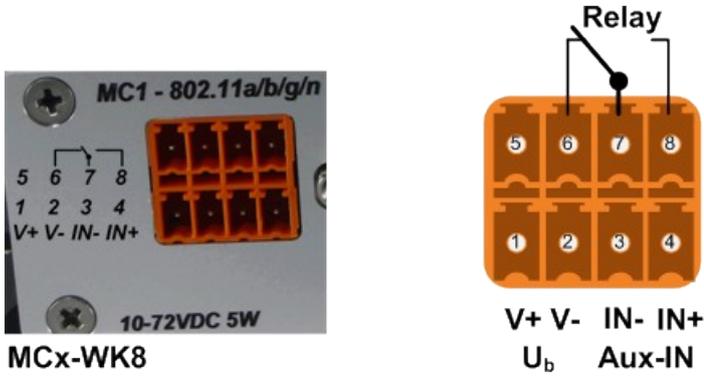


Figure 3: Connectors on the back of the MC2L-5G-M12

The illustration shows the MC2L in the standard configuration with a serial interface and a 5-pin M12 connector for connecting the voltage and the relay switching contact.

The voltage connection is available for the MC2L in further variants:

1.3.2 MC2L with WK8 connector



1.3.3 MC2L with M8 power connector



1.4 Technical features

Specifications:	
Ethernet	2 x 10/100/1000 MBit Auto MDI/MDIX
Serial	1 x RS232, 300-460,8 KBit/s, RTS, CTS, DSR, DTR, RI, DCD or (optional) RS485
USB	1 x USB 2.0
Relay	1 x Switch over, max 1A@24V, max 125VAC
Signal Input	1 x galv. separated 10 – 60V
Antenna Connectors	2 x RPSMA (WLAN) + 4 x SMA (LTE 5G)
Power Supply	10 – 60VDC or 802.3af PoE via LAN Port 1
Energy	<= 10W (typically 7W)

Temperature	0-60°
Dimensions	105x125x35mm
Weight	ca. 400g

1.5 Wireless LAN – Interface

Wireless LAN-Interface:		
Technology	802.11 a/b/g/n WLAN (2.4 + 5 GHz Band)	
Antennas	2 Antennas (2T2R MIMO)	
Encryption	WEP (64, 128bit) + TKIP/AES	
Security	802.11i WPA(2)(3) – PSK 802.1x EAP-PEAP, -TLS, -TTLS, -LEAP	
Channels	802.11b/g/n ETSI 1-13, USA/Canada 1-11 802.11a/n ETSI 19 + 5, USA/Canada 25 (U-NII-1 + UNII-2A + U-NII-2C+U-NII-3)	
Data Rates	Mode	Data Rate
	802.11b:	1, 2, 5.5, 11Mbps
	802.11g / a	6, 9, 12, 18, 24, 36, 48, 54Mbps
	802.11n (20MHz)	1Nss: max. 72.2Mbps 2Nss: max. 144.4Mbps
	802.11n (40MHz)	1Nss: max. 150Mbps 2Nss: max. 300Mbps
Transmission Power	802.11b/g 17 dBm	802.11a 15 dBm
	802.11gn 16 dBm	802.11an 15 dBm

1.6 LTE-5G Interface

5G-Interface:																				
Technologies / Bands	<table border="1"> <tr> <td rowspan="2">5G NR</td> <td>NSA</td> <td>n1/n2/n3/n5/n7/n8/n12/n13/n14/n20/n25/n26/n28/n29/n30/n38/n40/n41/n48/n66/n71/n75/n76/n77/n78/n79</td> </tr> <tr> <td>SA</td> <td>n1/n2/n3/n5/n7/n8/n12/n13/n14/n20/n25/n26/n28/n29/n30/n38/n40/n41/n48/n66/n71/n75/n76/n77/n78/n79</td> </tr> <tr> <td rowspan="3">LTE</td> <td>LTE-FDD</td> <td>B1/B2/B3/B4/B5/B7/B8/B12/B13/B14/B17/B18/B19/B20/B25/B26/B28/B29/B30/B32/B66/B71</td> </tr> <tr> <td>LTE-TDD</td> <td>B34/B38/B39/B40/B41/B42/B43/B48</td> </tr> <tr> <td>LAA</td> <td>B46 (only support 2 × 2 MIMO)</td> </tr> <tr> <td>UMTS</td> <td>WCDMA</td> <td>B1/B2/B4/B5/B8/B19</td> </tr> <tr> <td>GNSS</td> <td colspan="2">GPS/GLONASS/BeiDou (Compass)/Galileo</td> </tr> </table>		5G NR	NSA	n1/n2/n3/n5/n7/n8/n12/n13/n14/n20/n25/n26/n28/n29/n30/n38/n40/n41/n48/n66/n71/n75/n76/n77/n78/n79	SA	n1/n2/n3/n5/n7/n8/n12/n13/n14/n20/n25/n26/n28/n29/n30/n38/n40/n41/n48/n66/n71/n75/n76/n77/n78/n79	LTE	LTE-FDD	B1/B2/B3/B4/B5/B7/B8/B12/B13/B14/B17/B18/B19/B20/B25/B26/B28/B29/B30/B32/B66/B71	LTE-TDD	B34/B38/B39/B40/B41/B42/B43/B48	LAA	B46 (only support 2 × 2 MIMO)	UMTS	WCDMA	B1/B2/B4/B5/B8/B19	GNSS	GPS/GLONASS/BeiDou (Compass)/Galileo	
5G NR	NSA	n1/n2/n3/n5/n7/n8/n12/n13/n14/n20/n25/n26/n28/n29/n30/n38/n40/n41/n48/n66/n71/n75/n76/n77/n78/n79																		
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Antennas:	Up to 4 Antenna																			
GNSS	GPS, GLONASS, BeiDou, Galileo																			
Data rates (max.)	<table border="1"> <thead> <tr> <th>Mode</th> <th>Data rate</th> </tr> </thead> <tbody> <tr> <td>5G SA Sub-6</td> <td>DL 2.4 Gbps; UL 900 Mbps</td> </tr> <tr> <td>5G NSA Sub-6</td> <td>DL 3.3 Gbps; UL 600 Mbps</td> </tr> <tr> <td>LTE</td> <td>DL 1.6 Gbps; UL 200 Mbps</td> </tr> <tr> <td>WCDMA</td> <td>DL 42 Mbps; UL 5.76 Mbps</td> </tr> </tbody> </table>		Mode	Data rate	5G SA Sub-6	DL 2.4 Gbps; UL 900 Mbps	5G NSA Sub-6	DL 3.3 Gbps; UL 600 Mbps	LTE	DL 1.6 Gbps; UL 200 Mbps	WCDMA	DL 42 Mbps; UL 5.76 Mbps								
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2 Initial startup

Please connect the MC via the Ethernet-Port with a PC using a patch cable for the initial startup.

When turning on power supply voltage, all LEDs briefly blink white. After that only the ON-LED lights up green, which soon starts blinking orange (red & green) and green. After about 15 seconds the application is ready and the LEDs indicate the modes described above.

2.1 Startup of the MC2L

2.1.1 Startup with the MC-Config program

For its initial startup the MC is only able to communicate via its LAN-Port because typically there is no wireless network with a suitable SSID.

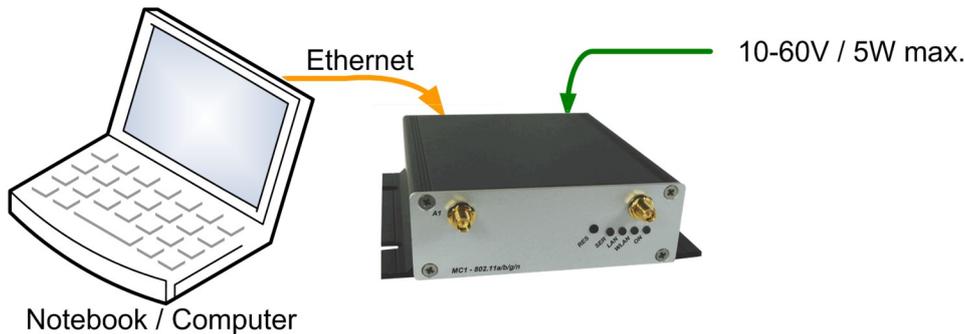


Figure 6: Setting for the initial configure of the MC

To do the „first time setup“ the MC has to be connected via the LAN-Interface to the computer (PC) that runs the MC-Config-Program.

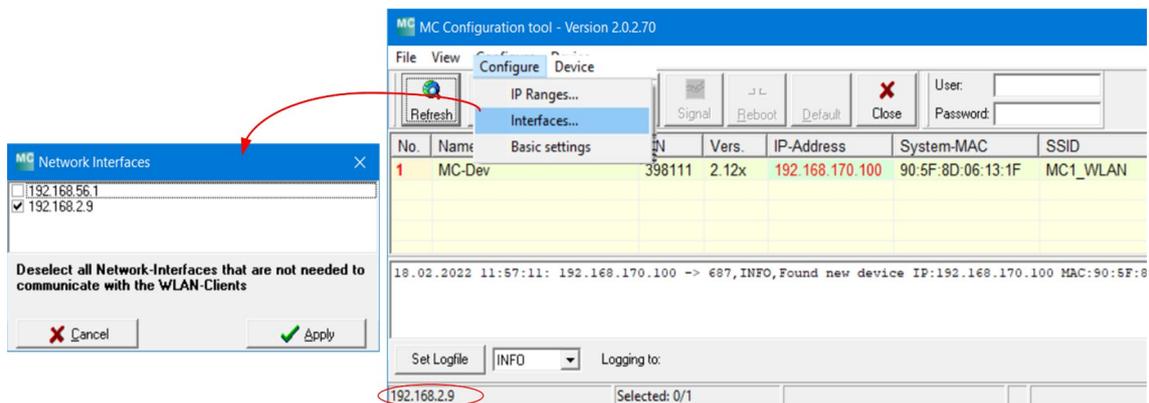


Figure 7: Initial setup with the MCConfig program

What to take into account:

- The connected PC (Notebook) should have a fixed IP-Address on its LAN-Port (no DHCP).
- This IP should show up in the status field at the bottom right of the MC-Config program.
- If several IP addresses are listed there, you can specifically activate only the relevant interface with "Configure" → "Interfases".
- After changing this setup, press the "Refresh" button on the MC-Config program again.
- An active Firewall on the PC might prevent communication with the MC.

After launch, the MC-Config-Application first detects all network interfaces, that are currently active on the PC. A Broadcast-UDP-Request is then sent out to all these interfaces and the MC devices will respond. The responding devices will be registered and listed in the application.

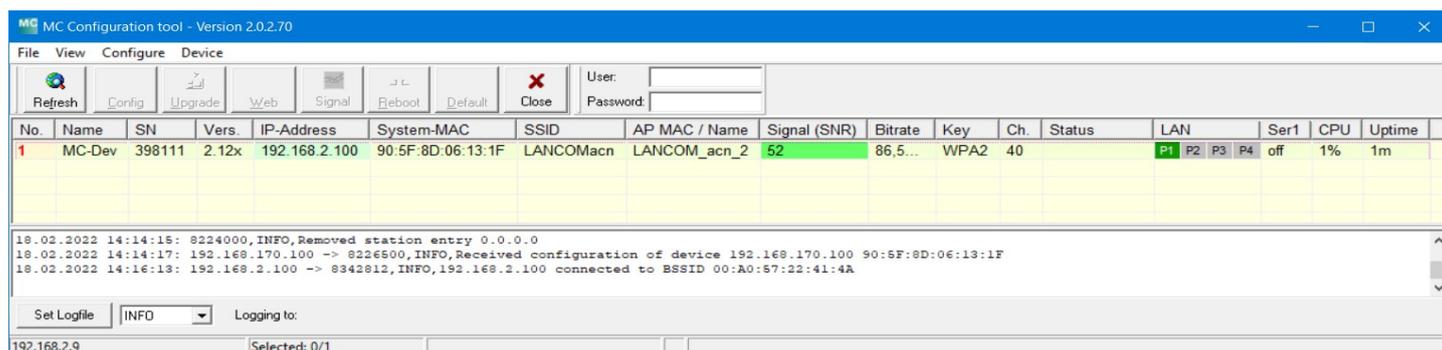


Figure 8: Screenshot of the MC-Config-Programm

In addition to device data such as name, serial number, firmware version, IP address and MAC address, WLAN connection data is also displayed. At first you can only see the set SSID. If there is a connection to an access point, the MAC address and, for certain WLAN systems, also the name of this AP is displayed. The signal strength is displayed as SNR value in dBm with a corresponding background color. The SNR values can be interpreted as follows:

- Signal ≥ 40 → Very good connection
- Signal ≥ 30 → Good connection
- Signal ≥ 20 → Connection still sufficient
- Signal < 20 → connection is restricted, the bit rates are reduced to transfer data.

A more detailed description of how to operate the MC-Config program can be found in a separate manual.

2.1.2 Startup via the MC WEB-Interface

If you do not want to or cannot use the MC-Config program, the MC devices can also be put into operation using a WEB browser. To do this, you must set the LAN interface of the startup computer to a fixed IP address. The IP 192.168.1.1 with the subnet mask 255.255.255.0 would be suitable, for example

If the MC2L starts with the default setting you can access the home page of the MC by using the WEB browser and entering the address 192.168.1.100. You have to wait a while to get access via this IP, because the MC2L first tries to get a IP address via DHCP. After a while with no DHCP offers (1 minute) the MC2L takes the 192.168.1.100.

2.2 Reset to factory settings

By pressing the reset-button for a long time, the MC can be set back to its factory settings. When keeping the reset button pressed, the MC goes through different sequences that are visualized by all five LEDs lighting up in the same color. The LED-sequences start with lighting up in white, then blue, then red and then green; restarting with white again. Holding the reset button pressed after the third time the all LEDs light up blue, the device is set back to its factory settings. All LEDs are off during the reset to factory settings. After that, the reset button can be released. When the reset button is released before the factory reset was initiated, then the MC needs to be restarted by briefly pressing the reset button again.

The MC can be reset to the factory settings by holding down the reset button. If you press and hold the reset button, the MC runs through sequences which are indicated by changing colors on all 4 LEDs. Starting with white the color changes to blue --> red --> green and then starts again from the beginning with white. When the 3rd time appears blue and you keep pressing the reset button, the settings are reset. All LED's will be switched off. Afterwards the reset button can be released. If the reset button is released before the 3rd "blue phase", the MC must be restarted by shortly pressing the reset button again.

The MC has the following (important) factory settings:

Device Name: „MC/WLAN/LTE“
SSID = „MC1_WLAN“
Wireless mode = infrastructure (WLAN Client)
Encryption mode = no encryption
WLANMODE = 2.4 + 5 GHz

LTE enable = off

BridgeMode = NAT (fixed)
WLAN IP = 192.168.170.100
WLAN Netmask = 255.255.255.0
WLAN Gateway = 192.168.170.1

LAN-Port DHCP active after power on:
if no DHCP response arrives, the following values are set.

LAN-IP = **192.168.1.100**
LAN Netmask= **255.255.255.0**
LAN Gateway = 0.0.0.0

user = “ (empty)
password = “ (empty)
Serial 1: off
Relay: off
Input: off

3 LTE settings

The various configuration options available for LTE are explained below:

Mobile	
Enable	Check this box to enable the LTE function so that the device can connect to the LTE network.
SIM Card	
PIN	Enter the personal identification number (PIN) of your SIM card to access the network.
Username + Password	Enter the username + password provided by your network operator to connect to the LTE network. This specification is not always required
Select Auth	Select the authentication mode, e.g. PAP or CHAP, as required by your network operator.
APN	Enter the access point name (APN) used to connect to the LTE network. This information is provided by your network operator.
Roaming	Select this check box to enable mobile data roaming so that the device can connect to other networks when traveling.
Enable watchdog	Select this check box to enable a connection monitoring feature that uses DNS queries to monitor the stability of the network connection.
Watchdog Host Lookup	Specify a hostname for the watchdog to test the connection by performing a lookup.
Connection timeout	Set the watchdog timeout in seconds that determines how long the watchdog waits before it considers the connection broken.
Custom LTE Band	This setting allows you to restrict the device to specific LTE bands, e.g. B43 for LTE-B43 only. If you want to use multiple bands, separate them with commas, e.g. B20,B43 for both bands. (experimental function)
Scan for providers	Enable this option to allow the device to search for available network operators. (experimental function)
Select provider	Enter the provider ID you want to connect to, or leave the field blank to enable automatic provider selection. (experimental function)
Network	
Routing Priority	Set the routing priority from highest (1) to lowest (3) to configure which default gateway is used, if available.
State information	
Query signal status	Set the interval (in seconds) for polling signal strength indicators such as RSSI (Received Signal Strength Indicator), RSRQ (Reference Signal Received Quality) and RSRP (Reference Signal Received Power).
Debugging	
Debug LTE	This option allows you to select the protocol configuration for LTE. By selecting the appropriate protocol configuration, you can monitor the performance and health of the LTE connection, which makes it easier to detect and fix potential problems in real time.
Traffic Simulation	
	This function is exclusively intended for testing the LTE-5G connection. The user should not activate this function.

3.1 Unlocking the SIM card by entering the PUK.

If an incorrect PIN has been configured for the inserted SIM card, the SIM card is blocked after a certain number of failed attempts.

The LTE module signals this to the operating system and requests the PUK belonging to the SIM card.

The input field at the start of the form is then activated to enter this PUK.

MC2 Wireless LAN / LTE Gateway

Home Device Configuration Statistics Support

Enter PUK SIMA (Disabled - not required)

Mobile

Configuration for mobile connection via LTE

Enable

[Check this box to enable mobile data connection.](#)

4 Open Source Compliance Information

Version: MC WLAN Client Adapter

To whom it may concern,

Written Offer

This product contains software whose rightholders license it under the terms of the GNU General Public License, version 2 (GPLv2), version 3 (GPLv3) and/or other open source software licenses. If you want to receive the complete corresponding source code we will provide you and any third party with the source code of the software licensed under an open source software license if you send us a written request by mail or email to the following addresses:

Email: modas oss support team: opensource@modas.de

Postal:

modas mobile Datensysteme GmbH
Belziger Str, 69-71
10823 Berlin/Germany

detailing the name of the product and the firmware version for which you want the source code and indicating how we can contact you.

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