

User's Manual

MM20-GSM-V2

M-Bus & RS-485 / GSM converter

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Note: The specifications in this document are valid as of the listed versions of software and/or hardware. Revised versions of this manual, as well as software and driver updates are available in the download area of the Decode web site.

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1 Preface

1.1 Symbols



WARNING - Safety notice, which must be followed, may have influence on the user's safety or the function of the device.



IMPORTANT - Notice, which must be followed to avoid possible problems, which can arise in specific cases.



NOTE - Notice, which contains useful advice.

1.2 Safety Instructions

Device must be used in compliance with any and all applicable international and national laws and in compliance with special restrictions regulating the utilization of the communications of the communication module in prescribed applications and environments.



WARNING - We suggest you to adhere to following recommendations so as to avoid any damage to person or property.

- **All the associated (interconnected) equipment, PC and power supply units (PSU) shell comply with requirements of standard IEC 60950- 1:2005+A1:2009+A2:2013.**
- **Power supply must have SELV output and for security reasons connection must include series 1A fuse protection.**
- **Access to relay connections must be checked and restricted in the end installation using potential hazardous voltage.**
- **Installation and technical support of the device can be performed only by a qualified personnel or a person who has enough knowledge about this device and safety requirements.**
- **Unauthorised modifications or utilization of accessories that have not been approved may result in damage to the device and in a breach of applicable regulations, and result in the termination of the validity of the guarantee.**
- **Do not expose the device to extreme ambient conditions. Protect the device against dust, moisture and high temperature.**



IMPORTANT - GSM radio signal level and availability depends on the environment in which it is working, which could affect performance and functioning of device.

1.3 Document versions

Document version	Firmware version	Date	Note
v1.0	v2.2	25/11/2015	First release
v1.1	v2.3	10/12/2015	Reboot time for call set to 30 seconds (D.RRT=30)
v1.2	v2.4	06/07/2016	Changed value range for reboot timers of RS-485 i M-Bus port (0-65535 minutes, 0-disabled) Added password for SMS access (default PASS=1234) Added option to stop initialization of device, because of adjusting parameters, by pressing ESC button in terminal program Added internal M-Bus slave at address 251 Added internal Modbus slave at address 251 Added option of sending PING packet after timeout of G.PIT minutes to G.PIP IP address
v1.3	v2.5	01/12/2016	Suppressed local echo of the M-Bus receive line Solved the problem of UDP communication at RS485 port Corrected error in this manual to adjust the parity on the serial ports
V1.4	V2.6	10/04/2017	Changed behaviour for UDP communication - if remote IP address is set to 0.0.0.0, device sends response to IP address and port of client which have sent query If device can not set TCP/UDP servers (e.g. due to wrong APN parameters) it resets and check SMS messages for 3 minutes and then restarts again Implemented automatic selection of authentication type (none/CHAP/PAP)

2 Overview

MM20-GSM is communication device intended for remote readout over GSM/GPRS connection:

- devices on M-Bus line with M-Bus protocol (heat, water, electric, gas meters...),
- devices on RS-485 line with transparent or Modbus RTU protocol (PLCs, I/O modules, pumps...).



Fig. 1: MM20-GSM converter

GSM/GPRS communication is carried out via microcontroller controlled GSM module which enables multiple UDP/TCP server connections. M-Bus and RS-485 ports can be assigned to one of these connections.

MM20-GSM is designed to work with fixed IP addresses in VPN (Virtual Private Network). Contact GSM provider for obtaining appropriate SIM cards.

Setting of parameters that determine operating modes is enabled through RS-232 interface, SMS messages or telnet service using the TCP protocol on port 23.

Upload of latest firmware is enabled through the same RS-232 interface.

Device has two versions, depending on power supply:

Version	Power supply
MM20-GSM DC	9-30V DC
MM20-GSM AC	230V AC

3 Device Description

MM20-GSM device is enclosed in 95x35x77mm plastic housing ready for DIN 35 mm rail mounting.

Front panel contains connectors for power supply, serial RS-232/RS-485 communication, M-Bus communication, SIM card holder, LED indicators and antenna connection.

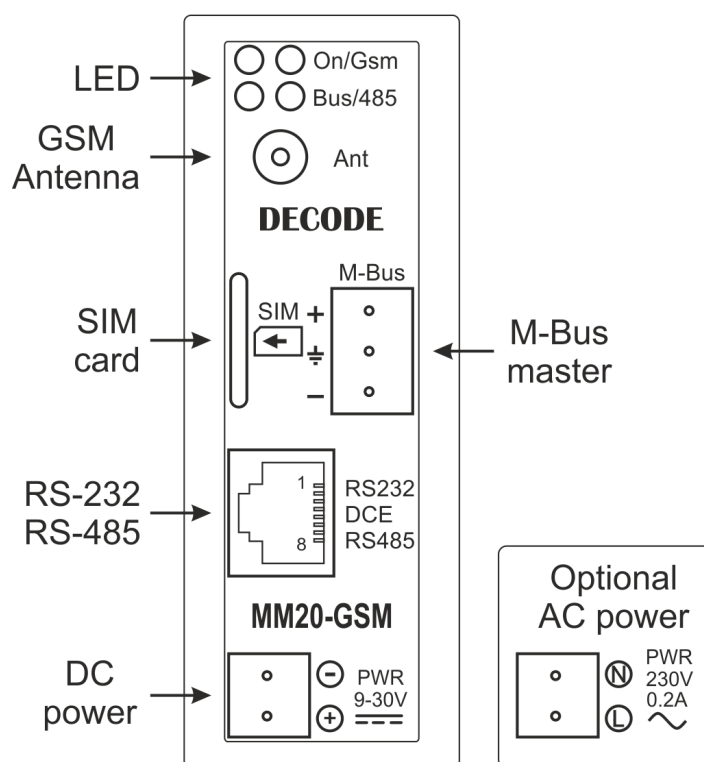


Fig. 2: Front panel connectors

3.1 Power supply

Depending on type of power supply, there are two versions of device:

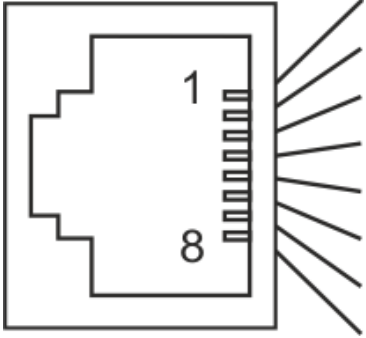
Version	Power supply
MM20-GSM DC	9-30V DC no galvanic isolation reverse polarity protection, diode in serial overvoltage protection, tranzorb
MM20-GSM AC	230V AC galvanically isolated 3kVAC, 500VDC range 85 ~ 264VAC, 120 ~ 370VDC frequency 47 ~ 440Hz

3.2 RS-232/RS-485 port

RS-232 communication with PC and/or communication with devices on RS-485 line can be established through RJ45 port.

RS-232 communication with PC is done at 115200b/s baud rate with 8N1 data format.

RS-485 communication parameters are adjustable.

MM20-GSM - RJ45 pin		Signal	Type
	1	RTS	RS-232 Output
	2	-	Not connected
	3	GND	-
	4	TxD	RS-232 Output
	5	RxD	RS-232 Input
	6	A (+)	RS-485 +
	7	B (-)	RS-485 -
	8	CTS	RS-232 Input

RS-485 port has termination resistor (120R) and fail safe resistors (1k2) which are enabled by default with jumpers Term1 and Term2 on PCB board. To disable termination resistor and fail safe resistors user must open the enclosure and remove jumpers Term1 and Term2 next to the RJ45 connector.

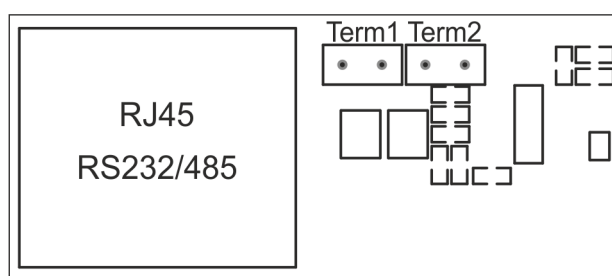


Fig. 3: RS-485 termination jumpers

3.3 M-Bus master port

M-Bus master port can sustain up to 20 M-Bus slave devices of 1.5mA unit load (heat, water, electric and other meters which support M-Bus protocol). Baud rate and data format are adjustable for this port.

Device is designed to withstand short circuit on M-Bus line.

Polarity of M-Bus line is not important for connecting M-Bus slave devices.

Pin	Signal	Type
1	+Mbus	M-Bus master +
2		Ground
3	-Mbus	M-Bus master -

3.4 SIM card

Device supports standard Mini SIM card designed for 1.8V/3.0V voltage.

MM20-GSM is designed to work with fixed IP addresses in VPN (Virtual Private Network). Contact GSM provider for obtaining appropriate SIM cards.

3.5 LED indicators

Light indicators with LE diodes shows if device is being powered, if GSM module is initialized properly, GSM/GPRS network status, if TCP connection is established, if there is data transfer over GSM/GPRS network, and if there is data transfer over M-Bus or RS-485 line.

Name	Color	Purpose
On	green	Device is turned on. GSM/GPRS network state.
Gsm	red	GSM module state. Data transfer over GSM/GPRS network.
Bus	green	Data transfer over M-Bus line.
485	red	Data transfer over RS-485 line.

In case of regular operation the sequence of LED changes is following:

Device state	LED indicators
Switching on the device	LED On and Gsm turned on
GSM module is initialized	LED Gsm is turned off
GSM network registering	every 1s LED On blink once (turned on 0.1s, turned off 0.9s)
GSM network registered	every 3s LED On blink once (turned on 0.1s, turned off 0.9s)
GPRS service attached	every 3s LED On blink twice (turned on 0.1s, turned off 0.1s)
TCP client connected	every 3s LED On blink thrice (turned on 0.1s, turned off 0.1s)
Data transfer over GSM network	LED Gsm blinks (turned on 0.1s, turned off 0.1s)
Data transfer over M-Bus line	LED Bus blinks, turned on while there is data
Data transfer over RS-485 line	LED 485 blinks, turned on while there is data

By observing the same LEDs it is possible to determine following irregularities:

Irregularity	LED indicators
SIM card not detected	every 3s LED On turn off three times for 0.1s, otherwise it is turned on
GSM network registration error	every 3s LED On turn off four times for 0.1s, otherwise it is turned on
GPRS service attaching error	every 3s LED On turn off five times for 0.1s, otherwise it is turned on

3.6 Antenna connection

Antenna connection is realized via SMA jack type of connector.

Folding GSM antenna or magnetic antenna with 2.5-3m cable length is supplied with MM20-GSM device. The optional antenna extension cable can be ordered.



Fig. 4: Folding GSM Antenna



Fig. 5: Magnetic antenna with 2.5-3m cable length

4 Operation description

PC, over serial connection and GSM modem, or LAN connection and 2G/3G router, connects to GSM/GPRS VPN network.

Client software sends UDP/TCP packets with requests for RS-485 and M-Bus devices. MM20-GSM converter extracts serial requests from UDP/TCP packets and sends it to RS-485 and M-Bus ports.

Responses from serial ports are packed by MM20-GSM device in to UDP/TCP packets and sent back to client software.

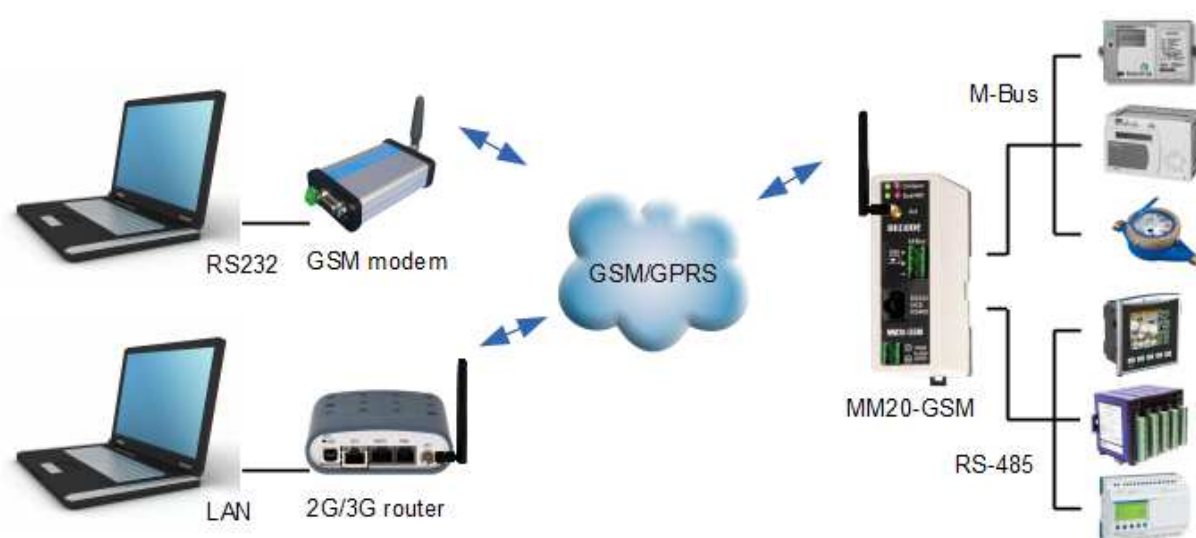


Fig. 6: System for remote readout of RS-485 and M-Bus devices with MM20-GSM converter

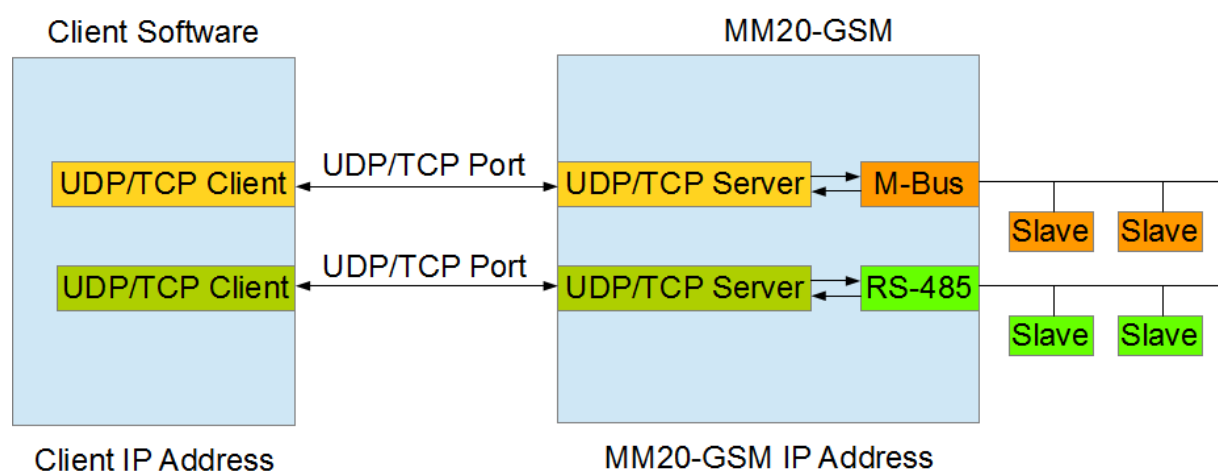


Fig. 7: Communication diagram of client software with RS-485 and M-Bus devices

MM20-GSM device has multiple UDP server and TCP server connections which can be assigned to RS-485 and M-Bus ports.

One of the TCP connection is reserved for remote configuration via telnet service using the TCP protocol on port 23 without authentication.

Communication between UDP/TCP servers and serial ports is transparent. Further more, device can convert Modbus TCP packets in to Modbus RTU serial protocol at RS-485 port. It is necessary to setup RS-485 protocol parameter PC.PR to value 2 and local/remote ports to 502 (see example on page 17).

For remote readout of M-Bus slave devices, DECODE company has free software called „M-Bus Master v1.x“ which enables readout through serial, Dial-up, TCP/IP and UDP/IP connection.

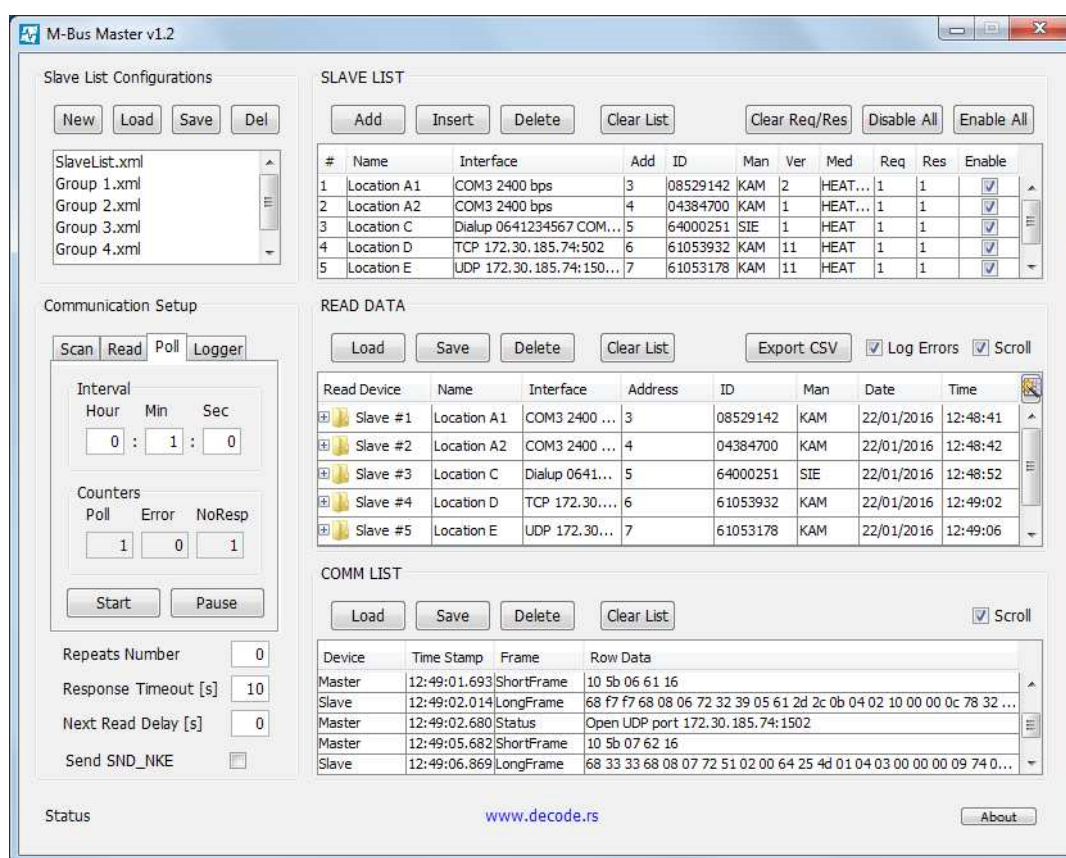


Fig. 8: M-Bus Master software

For more information about software, contact DECODE company or visit www.decode.rs.

5 Device setup

5.1 Commands description

Commands are used for setup of device parameters. List of commands is shown in table:

Command	Description
HELP	Display command and parameter description
=	Assign value operator
PRINT	Display parameter value
?	Display parameter value
LIST	Display all parameters values
WRITE	Write all parameters values to non volatile memory
LOAD	Load parameters values from non volatile memory
DEFAULT	Load default parameters values
STATUS	Display device status, GSM network level
REBOOT	Reboot device
GSMUPDATE	Uploading GSM module firmware
FWUPDATE	Uploading device firmware
GOAT	Enter AT command mode with GSM module
EXIT	Exit AT command mode with GSM module
DEBUG	Enter/Exit debug mode of device

Commands can be entered in lower and/or upper case. After entering command, press ENTER. It can be entered more than one command, separated with semicolon (;).

Example:

Print D.T; ?d.t; sTAtuS; ?D.S; LIST



IMPORTANT!

After parameters setup, command WRITE must be entered for saving parameters values to non-volatile memory. Otherwise, after device reboot, parameters will have values before setup.

Change of GSM/GPRS network parameters and protocol types for RS-485 and M-Bus ports, needs reboot of device by entering command REBOOT.

5.2 Parameters description

Group of parameters describing device properties and ID are following:

Parameter	Description	Default	Type/Range
D.T	Device type	MM20-GSM-V2	Read Only
D.S	Device serial number	060515-001	Read Only
D.F	Device firmware version	v2.6	Read Only
D.MT	GSM module type	SARA-G340-02S-00	Read Only
D.MF	GSM module firmware version	08.90	Read Only
D.MI	GSM module IMEI number	353386062804071	Read Only
D.PASS	Password for SMS access	1234	R/W (1000~9999)

The next group are the parameters which values represent the timeout intervals after which comes to reboot of the device.

If since the last communication on the RS-485 port expires timeout interval represented by the parameter D.CICT, device will reboot. Similarly, to reboot of the device will come if since the last communication on the M-Bus port expires timeout interval represented by the parameter D.BICT. The value of 0 disables reboot of the device.

If the subscriber number of the SIM card in the device is called and the timeout interval represented by the D.RRT parameter expires, the device will reboot. A value of 0 disables reboot of the device. **It is recommended to set this parameter to e.g. 30sec (D.RRT = 30).**

Parameter	Description	Default	Range
D.CICT	Reboot time - RS-485 port	0 min disabled	0~65535 min (0-disabled)
D.BICT	Reboot time - M-Bus port	0 min disabled	0~65535 min (0-disabled)
D.RRT	Reboot time for call	30 sec	0~60 sec (0-disabled)

Example:

It is necessary that the device is rebooted 10 minutes if there was no communication on M-Bus port, and that the time elapsed since the last communication on the RS-485 port does not lead to a reboot:

D.BICT=10; D.CICT=0

```
D.BICT OK
D.CICT OK
>
```

Parameters of serial and GSM/GPRS communication on RS-485 and M-Bus ports, are following:

Parameter	Description	Default	Value	Meaning
PC.BR PB.BR	Baud rate on RS-485 port Baud rate on M-Bus port	5 (9600 bps) 3 (2400 bps)	0	300 bps
			1	600 bps
			2	1200 bps
			3	2400 bps
			4	4800 bps
			5	9600 bps
			6	14400 bps
			7	19200 bps
			8	28800 bps
			9	38400 bps
			10	56000 bps
			11	57600 bps
			12	115200 bps
PC.DB PB.DB	Data bits on RS-485 port Data bits on M-Bus port	8 8	7	7 bits
			8	8 bits
PC.P PB.P	Parity bit on RS-485 port Parity bit on M-Bus port	0 (None) 2 (Even)	0	None
			1	Odd
			2	Even
PC.SB PB.SB	Stop bits on RS-485 port Stop bits on M-Bus port	1 1	1	1 stop bit
			2	2 stop bits
PC.PR PB.PR	Protocol type on RS-485 Protocol type on M-Bus	2 (Modbus TCP) 1 (TCP)	0	UDP
			1	TCP
			2	Modbus TCP (RS-485 only)
PC.LP PB.LP	Local GPRS port for RS-485 Local GPRS port for M-Bus	502 1502	0~65535	-
			0~65535	-
PC.RP PB.RP	Remote GPRS port for RS-485 Remote GPRS port for M-Bus	502 1502	0~65535	-
			0~65535	-
PC.IP PB.IP	Client IP address for RS-485 Client IP address for M-Bus	0.0.0.0 0.0.0.0	16 chars	xxx.xxx.xxx.xxx

Example:

Parameters of serial communication on RS-485 port are following:

baud rate – 9600bps

data bits – 8

parity bit – N

stop bits – 1

It is necessary to send the following commands:

PC.BR=5; PC.DB=8; PC.P=0; PC.SB=1

PC.BR OK

PC.DB OK

PC.P OK

PC.SB OK

>

Parameters of GSM/GPRS communication on RS-485 port are following:

protocol – Modbus TCP

local port – 502

remote port – 502

Client IP address (PC) – 172.30.185.70

It is necessary to send the following commands:

PC.PR=2; PC.LP=502; PC.RP=502; PC.IP=172.30.185.70

PC.PR OK

PC.LP OK

PC.RP OK

PC.IP OK

>

**IMPORTANT!**

After parameters setup, command WRITE must be entered for saving parameters values to non-volatile memory. Otherwise, after device reboot, parameters will have values before setup.

Change of GSM/GPRS network parameters and protocol types for RS-485 and M-Bus ports, needs reboot of device by entering command REBOOT.

Last group of parameters consist of GSM/GPRS VPN network parameters:

Parameter	Description	Default	Type/Range
G.AN	APN name	apn	32 characters
G.AU	APN user name	user	32 characters
G.AP	APN password	pass	32 characters
G.IP	SIM card IP address	0.0.0.0	Read Only
G.PIT	Time without communication after PING packet is sent	0	0~65535 min (0-disabled)
G.PIP	IP address for PING to send	0.0.0.0	16 characters

Example:

Parameters of GSM/GPRS network are following:

APN – corpmts064

user name – mts

password – 064

It is necessary to send the following commands:

G.AN=corpmts064; G.AU=mts; G.AP=064

```
G.AN OK
G.AU OK
G.AP OK
>
```



NOTE:

It is recommended to set PING packet sending to client IP address, G.PIP, if there is no communication at RS-485 or M-Bus port during G.PIT minutes (eg. 5 minutes).

This ensures restoring the connection to the GSM provider in the event that it is terminated by the GSM provider for scheduled maintenance.

G.PIT=5; G.PIP=172.30.185.70

```
G.PIT OK
G.PIP OK
>
```

Value G.PIT=0 disables sending PING packet regardless of the communication at RS-485 or M-Bus port.

**IMPORTANT!**

After parameters setup, command WRITE must be entered for saving parameters values to non-volatile memory. Otherwise, after device reboot, parameters will have values before setup.

Change of GSM/GPRS network parameters and protocol types for RS-485 and M-Bus ports, needs reboot of device by entering command REBOOT.

If device is initialized properly, command ?G.IP will return SIM card IP address:

?G.IP

```
G.IP=172.30.185.74  
>
```

**IMPORTANT!**

GSM/GPRS network parameters (G.AN, G.AU, G.AP) should not be changed by SMS or via telnet service, because after reboot device will not initialize if these parameters are set incorrectly. In this case, it will not be possible to configure the device by telnet.

However, device will attempt to boot and after failure it will wait up to 3 minutes to receive SMS message. User can send SMS message to check device's parameters and send SMS message to adjust wrong one (message should contain commands WRITE and REBOOT at the end). It might take up to 3 minutes to get response from device, depending on boot state.

5.3 Device initialization

Turn off power supply. Insert appropriate SIM card with fixed IP address in VPN network. Connect GSM antenna. Connect MM20-GSM over RS-232 interface to PC.

Start terminal program (HyperTerminal, Terminal.exe), choose appropriate COM port, set baud rate to 115200bps and data format to 8N1.

Turn on power supply. In terminal program following log will be displayed:

Device initializing...	Switching on the device
0 GSM Powering OFF...	GSM module power off
300 GSM Powering OFF -> OK	
300 GSM Powering ON...	GSM module power on
702 AT -> OK	GSM module serial interface check
702 GSM Powering ON OK	GSM module powered on successfully
702 GSM Init...	GSM module initialization
755 AT -> OK	GSM module serial interface check
808 AT&F -> OK	Load default parameters of GSM module
861 ATE0 -> OK	Local echo off
914 AT+UGPIOC=16,2 -> Set LED OK	Turn on GSM LED
967 AT+CPIN? -> READY	Check SIM card
1017 AT+CMGF -> OK	Set SMS text mode
1067 AT+CNMI -> OK	Set SMS service
1117 AT+CMGD -> OK	Delete all SMS messages
1167 AT+W -> OK	Save configuration of GSM module
1221 ATI -> Get modem type OK	Read type of GSM module
1275 AT+CGMR -> Get firmware version OK	Read firmware version of GSM module
1329 AT+CGSN -> Get IMEI OK	Read IMEI number of GSM module
1329 GSM Init OK	GSM module initialized successfully
1329 GSM TCP/UDP connections restart...	TCP/UDP server connections initialization
1329 Waiting +CREG: 0,1 up to 60sec	GSM network registration, up to 60sec
1383 AT+CREG? -> +CREG: 0,1	Device registered to GSM network
1383 Waiting +CGATT: 1 up to 60sec	Attaching to GPRS service, up to 60sec
1436 AT+CGATT? -> +CGATT: 1	Device attached to GPRS service
1496 Clear profile 0 parameters -> OK	Clear profile
1506 Set up APN name -> OK	Set up APN parameters
1516 Set up APN username -> OK	Set up APN parameters
1526 Set up APN password -> OK	Set up APN parameters
1586 Set authentication type to auto -> OK	Set authentication type to auto (NONE/PAP/CHAP)
1646 Save profile 0 parameters -> OK	Save profile
1706 Load profile 0 parameters -> OK	Load profile
1766 Activate PDP context -> OK	Activate PDP context
2119 Profile 0 is active -> OK	Profile is active
2172 Get Local IP address -> OK	Getting local IP address
2176 Create TCP/UDP for M-Bus -> OK	Create TCP/UDP for M-Bus
2181 Set listening socket for M-Bus -> OK	Set listening socket for M-Bus
2185 Create TCP/UDP for RS485 -> OK	Create TCP/UDP for RS-485
2189 Set listening socket for RS485 -> OK	Set listening socket for RS-485
2193 Create TCP/UDP for CLI -> OK	Create TCP/UDP for telnet
2198 Set listening socket for CLI -> OK	Set listening socket for telnet
2198 GSM TCP/UDP connections restart -> OK	TCP/UDP server connections initialized
Type HELP for more information	Command HELP displays command and parameter description and its usage
Ready	
>	Device initialized successfully

Number at beginning of each line is incremental counter with 10msec step (timestamp).

Above is a log of properly initialized device. Initialization may be interrupted by pressing ESC. In case of GSM network parameters are not set, or not inserted correct SIM card, or no GSM signal, the device will try 3 times to initialize (in an unsuccessful initialization step will be displayed one of these messages: Failed, ERROR, NOT READY), and then, in the terminal will be displayed following:

```
Device not initialized
```

```
Press ENTER within 5 seconds to check parameters...
```

Press ENTER within 5 seconds since the appearance of this message and wait for:

```
Type HELP for more information
```

```
>
```

If the time of 5 seconds has elapsed, and the user has not pressed a key, the device will reboot and try to initialize again.

If device fails to initialize TCP/UDP servers after 3 attempts, and user doesn't press ENTER within 5 seconds since the appearance of the message, following message will be displayed in terminal window:

```
Device not initialized
```

```
Press ENTER within 5 seconds to check parameters...
```

```
ENTER not detected
```

```
Checking for new SMS messages...
```

```
Rebooting after 3 minutes...
```

This allows remote overview and setup of device parameters via SMS messages, e.g. in case of wrong APN parameters. Device will reboot after 3 minutes unconditionally.

Check parameter values by typing command LIST:

D.T=MM20-GSM-V2	Device type
D.S=060515-001	Device serial number
D.F=v2.6	Device firmware version
D.MT=SARA-G340-02S-00	Type of GSM module
D.MF=08.90	Firmware version of GSM module
D.MI=353386062804071	IMEI number of GSM module
D.PASS=1234	Password for SMS access
D.CICT=0	Reboot time on RS-485 port - disabled
D.BICT=0	Reboot time on M-Bus port - disabled
D.RRT=30	Reboot time for call - disabled
PC.BR=5	Baud rate on RS-485 port - 9600bps
PC.DB=8	Data bits on RS-485 port - 8
PC.P=0	Parity bit on RS-485 port - None
PC.SB=1	Stop bits on RS-485 port - 1
PC.PR=2	Protocol type on RS-485 - Modbus TCP
PC.LP=502	Local GPRS port for RS-485 - 502
PC.RP=502	Remote GPRS port for RS-485 - 502
PC.IP=0.0.0.0	Client IP address for RS-485 - 0.0.0.0
PB.BR=3	Baud rate on M-Bus port - 2400bps
PB.DB=8	Data bits on M-Bus port - 8
PB.P=2	Parity bit on M-Bus port - Even
PB.SB=1	Stop bits on M-Bus - 1
PB.PR=1	Protocol type on M-Bus - TCP
PB.LP=1502	Local GPRS port for M-Bus - 1502
PB.RP=1502	Remote GPRS port for M-Bus - 1502
PB.IP=172.30.185.70	Client IP address for M-Bus - 172.30.185.70
G.AN=corpmts064	APN name - corpmts064
G.AU=mts	APN user name - mts
G.AP=064	APN password - 064
G.IP=172.30.185.74	SIM card IP address - 172.30.185.74
G.PIT=0	Idle time for sending PING packet - disabled
G.PIP=0.0.0.0	Client IP address for sending PING packet - 0.0.0.0
>	Prompt - device ready for new command



NOTE:

In the case of UDP communication, if remote IP address (parameters PC.IP / PB.IP) is set to 0.0.0.0, device will send response to IP address and port of client which have sent query.

In the case of TCP communication, these parameters (PC.IP / PB.IP) are not important.

Command HELP displays following:

```
=====
COMMAND          DESCRIPTION          EXAMPLE
=====
HELP             Display this Help             HELP
=               Assign Value to Parameter      D.RRT=30
PRINT           Print Parameter Value      PRINT D.T
?              Print Parameter Value      ?D.T
LIST           List all Parameters Values    LIST
WRITE          Write Parameters to EEPROM    WRITE
LOAD           Load Parameters from EEPROM   LOAD
DEFAULT        Load Default Parameters      DEFAULT
STATUS         Print Device Status          STATUS
REBOOT         Reboot device                REBOOT
GSMUPDATE      Enter GSM Firmware Update Mode          GSMUPDATE
FWUPDATE       Enter Device Firmware Update Mode          FWUPDATE
GOAT           Enter GSM AT Command Mode          GOAT
EXIT           Exit GSM AT Command Mode          EXIT
DEBUG          Enter/Exit Serial Debug Mode      DEBUG
=====

Device Parameters
=====
D.T            Type [Read only]
D.S            Serial Number [Read only]
D.F            Firmware Version [Read only]
D.MT           GSM Modem Type [Read only]
D.MF           GSM Modem Firmware Version [Read only]
D.MI           GSM Modem IMEI [Read only]
D.PASS         Password for SMS access[1000~9999]
D.CICT         RS485 Idle Connection Timeout[0~65535min] (0-disabled)
D.BICT         M-Bus Idle Connection Timeout[0~65535min] (0-disabled)
D.RRT          Ring Reboot Timeout[0~60sec] (0-disabled)
=====

RS-485 Port Parameters
=====
PC.BR          Baud Rate [0-12] (300,600,1k2,2k4,4k8,9k6,14k4,19k2,28k8,38k4,56k,56k6,115k2)
PC.DB          Data Bits [7,8]
PC.P           Parity [0,1,2] (N,O,E)
PC.SB          Stop Bits [1,2]
PC.PR          Protocol [0,1,2] (UDP,TCP,Modbus TCP)
PC.LP          Local Port [0-65535]
PC.RP          Remote Port [0-65535]
PC.IP          Remote IP Address for UDP
=====

M-Bus Port Parameters
=====
PB.BR          Baud Rate [0-12] (300,600,1k2,2k4,4k8,9k6,14k4,19k2,28k8,38k4,56k,56k6,115k2)
PB.DB          Data Bits [7,8]
PB.P           Parity [0,1,2] (N,O,E)
PB.SB          Stop Bits [0,1]
PB.PR          Protocol [0,1] (UDP,TCP)
PB.LP          Local Port [0-65535]
PB.RP          Remote_port [0-65535]
PB.IP          Remote IP Address for UDP
=====

GPRS Parameters
=====
G.AN           APN Name
G.AU           APN Username
G.AP           APN Password
G.IP           Local IP Address [Read only]
G.PIT          PING Idle Timeout[0~65535min] (0-disabled)
G.PIP          PING IP Address
>
```

5.4 Remote setup over SMS messages

MM20-GSM converter supports remote setting of parameters via SMS. It is necessary to contact the GSM mobile telephony operator and provide appropriate SIM subscriber cards with enabled SMS service in addition to support for VPN.

Commands are entered in the same way as in a terminal program, where necessary as a one of commands to enter a password. If the password is not entered, the device discards the message and does not send a return message. Multiple commands can be entered separated by a semicolon (;). All SPACE characters are ignored.

The password can be entered anywhere in the message in the following forms:

PASS=1234; Print D.T

Pass=1234; ?d.s

Status; ?D.f; pass=1234

Changing the password can be done through SMS message by first indicating the old password, then a new password command and the command to save the parameters:

Pass=1234; D.Pass=4567; Write

Change the password via the serial port does not require the entry of the old password:

D.Pass=4567; Write

```
D.PASS OK
Write OK
>
```



NOTE:

The password must contain 4 digits and can be in the range of 1000 ~ 9999.



IMPORTANT!

GSM/GPRS network parameters (G.AN, G.AU, G.AP) should not be changed by SMS, because after reboot device will not initialize if these parameters are set incorrectly.

In this case, device will attempt to boot and after failure it will wait up to 3 minutes to receive SMS message. User can send SMS message to check device's parameters and send SMS message to adjust wrong one (message should contain commands WRITE and REBOOT at the end). It might take up to 3 minutes to get response from device, depending on boot state.

The command REBOOT can be used if for some reason there is no communication, and it is suspected that the problem is in MM20-GSM converter. If the device does not respond after this command, try to reboot it by calling subscriber number of SIM card in the device. It is necessary that the parameter D.RRT be set to a value greater than 0.

Commands DEFAULT, HELP, GSMUPDATE, FWUPDATE, GOAT, DEBUG are not supported for remote setting of parameters via SMS.

The user can send all the parameter settings in concatenated message, if necessary. The device sends concatenated message to user if the answer is longer than 160 characters.

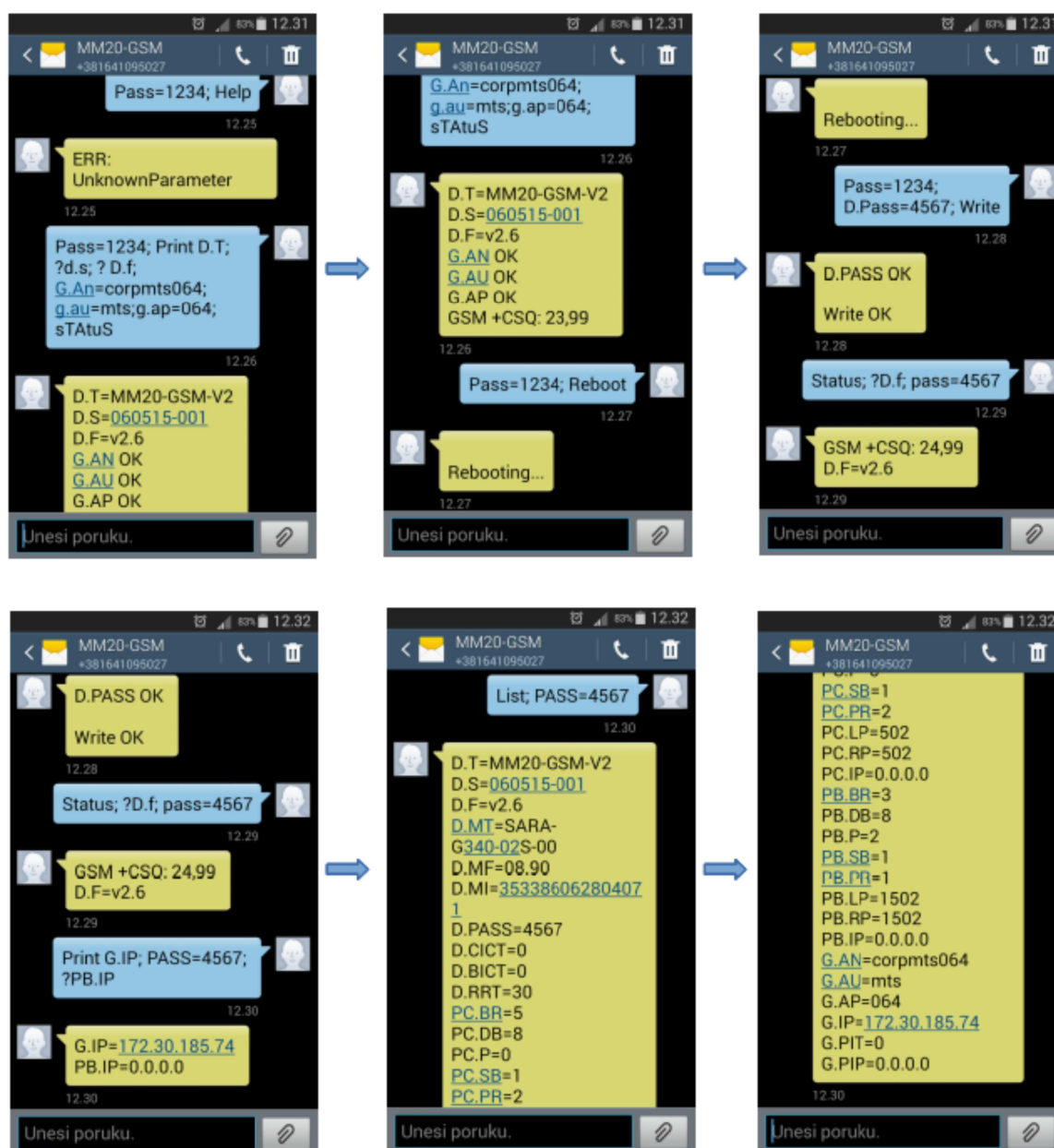


Fig. 9: SMS messages

5.5 Remote setup over telnet service

MM20-GSM device allows remote configuration via telnet service using TCP protocol on port 23 without authentication. It can be used with any software that supports TCP client connection (eg. Hercules by HW-Group, PuTTY, ExtraPuTTY...):

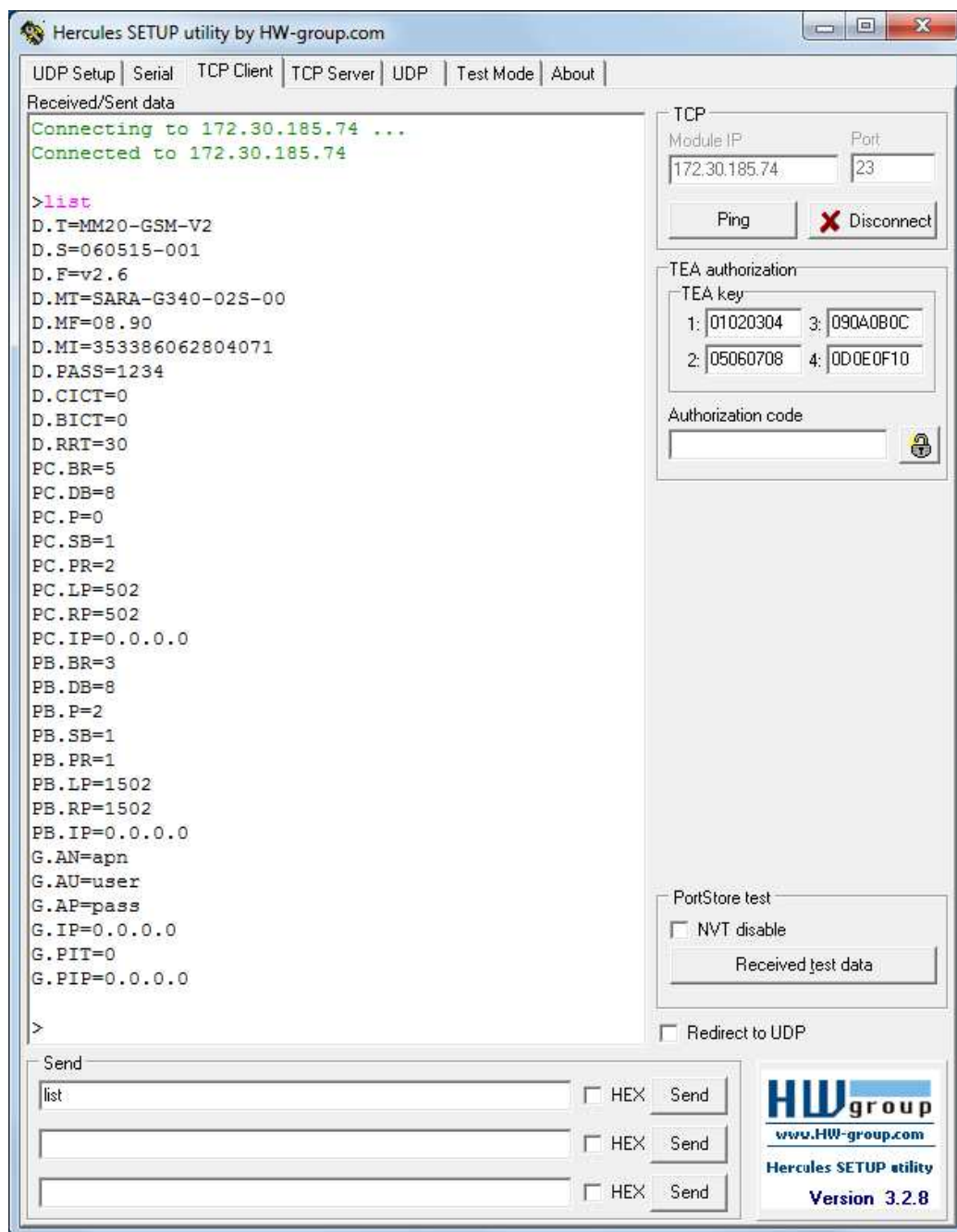


Fig. 10: Telnet client screen capture

Commands DEFAULT, HELP, GSMUPDATE, FWUPDATE, GOAT, DEBUG are not supported for remote setting of parameters via telnet service.

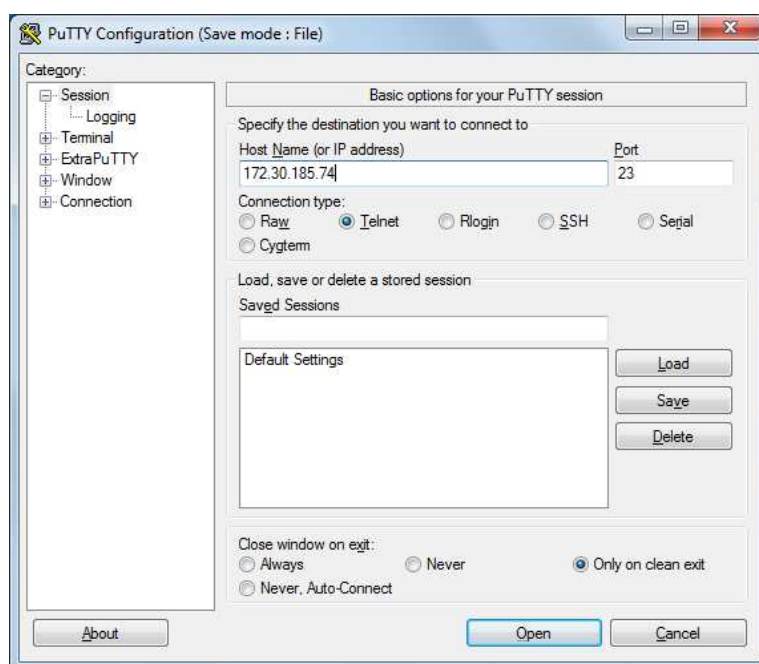


Fig. 11: PuTTY setup screen for telnet service

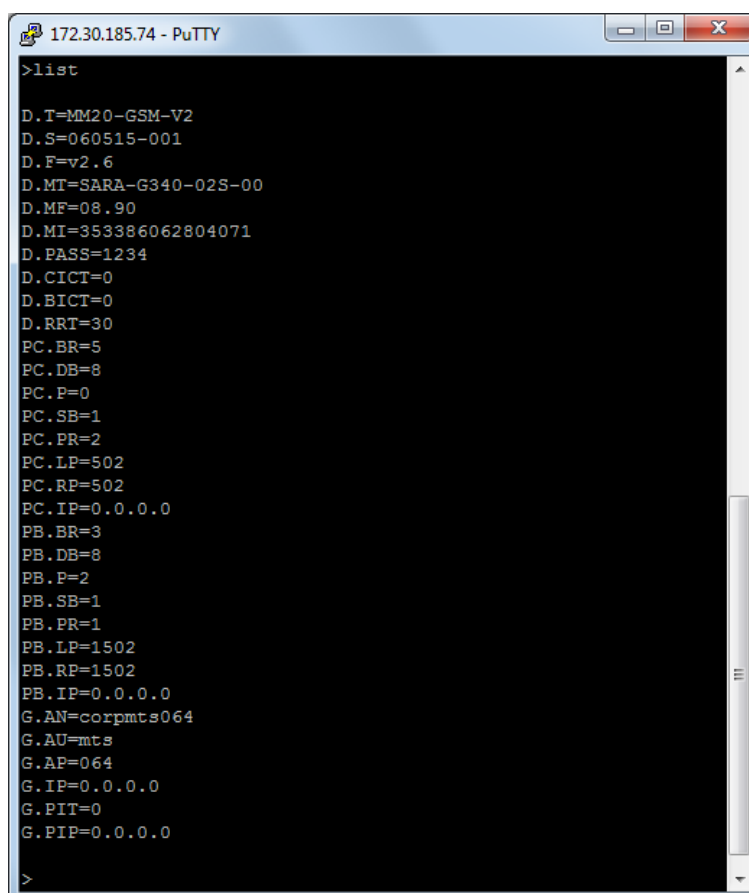


Fig. 12: PuTTY client screen capture

5.6 AT command mode with GSM module

MM20-GSM device can be used as a standard GSM terminal, if for some reason needed. Document "[u-blox-ATCommands_Manual_\(UBX-13002752\).pdf](#)" can be downloaded from the website www.decode.rs or from the included CD.

Turn off power supply. Connect MM20-GSM over RS-232 interface to PC.

Start terminal program (HyperTerminal, Terminal.exe), choose appropriate COM port, set baud rate to 115200bps and data format to 8N1.

Turn on power supply. In terminal program following log will be displayed:

```
Ready  
>
```

or, if the device fails to initialize, wait for it to appear:

```
Device not initialized  
  
Press ENTER within 5 seconds to check parameters...
```

Press ENTER within 5 seconds since the appearance of this message and wait for:

```
Type HELP for more information  
  
>
```

Send command GOAT, for entering AT command mode with GSM module. In terminal program following log will be displayed:

```
GSM AT Command Mode
```

After this, AT commands can be send to GSM module.

Command	Response
AT	OK
ATI	SARA-G340-02S-00 OK
AT+CGMR	08.90 OK

AT command mode with GSM module exits by sending command EXIT (or by rebooting the device). In terminal program following log will be displayed:

```
Online Mode  
>
```

5.7 Debug mode of device

In case there is a communication problem on the RS-485 and/or M-Bus port, debug mode can be entered by sending command **DEBUG**. Log file can be recorded and sent to the technical support of DECODE company for analysis.

```
Debug Mode ON
>
```

RS-485 communication:

```
64970 GSM parser enter t=472 h=530 RxBuff: CRLF+UUSOLI:
3,"172.30.185.70",54253,1,"172.30.185.74",502CRLF
64970 RS485 1 - TCP incoming connection, socket=3
64971 GSM parser exit t=530 h=530 RxBuff:
65316 GSM parser enter t=530 h=547 RxBuff: CRLF+UUSORD: 3,12CRLF
65316 RS485 2 - TCP packet received, size=12
65316 GSM parser exit t=547 h=547 RxBuff:
65327 RS485 3 - sent TCP read command, size=12
65334 GSM parser enter t=547 h=584 RxBuff: CRLF+USORD:
3,12,"<0><0><0><0><0>###<0><0><0>LF"CRLFCRLFOKCRFLF
65334 RS485 4 - TCP read packet...
65335 GSM OK
65335 GSM parser exit t=584 h=584 RxBuff:
65335 RS485 5 - forward TCP/UDP packet to serial port
65348 RS485 6 - data received, size=25, waiting for TCP/UDP write...
65358 RS485 7 - TCP write command sent, waiting @...
65365 GSM parser enter t=584 h=587 RxBuff: CRLF@
65365 RS485 8 - received @
65365 GSM parser exit t=587 h=587 RxBuff:
65376 RS485 9 - sending TCP/UDP packet, size=29
65383 GSM parser enter t=587 h=609 RxBuff: CRLF+USOWR: 3,29CRLFCRLFOKCRFLF
65383 RS485 10 - sent TCP packet OK
65384 GSM OK
65384 GSM parser exit t=609 h=609 RxBuff:
65583 GSM parser enter t=609 h=623 RxBuff: CRLF+UUSOCL: 3CRLF
65583 RS485 11 - TCP connection closed
65583 GSM parser exit t=623 h=623 RxBuff:
66000 GSM - checking status - CREG, CGATT, CSQ
66040 GSM parser enter t=623 h=683 RxBuff: CRLF+CREG: 0,1CRLFCRLFOKCRFLFCRLF+CGATT:
1CRLFCRLFOKCRFLFCRLF+CSQ: 31,99CRLFCRLFOKCRFLF
66041 GSM OK
66041 GSM - CREG: 0,1 -> Registered, home network
66042 GSM OK
66042 GSM - CGATT: 1 -> GPRS Attached
66042 GSM OK
66042 GSM - CSQ: 31,99
66042 GSM parser exit t=683 h=683 RxBuff:
```

Periodical check of GSM/GPRS connection:

```
66000 GSM - checking status - CREG, CGATT, CSQ
66040 GSM parser enter t=623 h=683 RxBuff: CRLF+CREG: 0,1CRLFCRLFCOKCRLFCRLF+CGATT:
1CRLFCRLFCOKCRLFCRLF+CSQ: 31,99CRLFCRLFCOKCRLF
66041 GSM OK
66041 GSM - CREG: 0,1 -> Registered, home network
66042 GSM OK
66042 GSM - CGATT: 1 -> GPRS Attached
66042 GSM OK
66042 GSM - CSQ: 31,99
66042 GSM parser exit t=683 h=683 RxBuff:
```

M-Bus communication:

```
68129 GSM parser enter t=743 h=802 RxBuff: CRLF+UUSOLI:
3,"172.30.185.70",54371,0,"172.30.185.74",1502CRLF
68129 M-Bus 1 - TCP incoming connection, socket=3
68130 GSM parser exit t=802 h=802 RxBuff:
68164 GSM parser enter t=802 h=818 RxBuff: CRLF+UUSORD: 3,5CRLF
68164 M-Bus 2 - TCP packet received, size=5
68164 GSM parser exit t=818 h=818 RxBuff:
68175 M-Bus 3 - sent TCP read command, size=5
68181 GSM parser enter t=818 h=847 RxBuff: CRLF+USORD: 3,5,"#@û;#"CRLFCRLFOKCRLF
68181 M-Bus 4 - TCP read packet...
68182 GSM OK
68182 GSM parser exit t=847 h=847 RxBuff:
68182 M-Bus 5 - SND_NKE for internal M-Bus slave
68182 M-Bus 6 - data received, size=1, waiting for TCP/UDP write...
68193 M-Bus 7 - TCP write command sent, waiting @...
68200 GSM parser enter t=847 h=850 RxBuff: CRLF@
68200 M-Bus 8 - received @
68200 GSM parser exit t=850 h=850 RxBuff:
68211 M-Bus 9 - sending TCP/UDP packet, size=1
68218 GSM parser enter t=850 h=871 RxBuff: CRLF+USOWR: 3,1CRLFCRLFOKCRLF
68218 M-Bus 10 - sent TCP packet OK
68219 GSM OK
68219 GSM parser exit t=871 h=871 RxBuff:
68448 GSM parser enter t=871 h=887 RxBuff: CRLF+UUSORD: 3,5CRLF
68448 M-Bus 2 - TCP packet received, size=5
68448 GSM parser exit t=887 h=887 RxBuff:
68459 M-Bus 3 - sent TCP read command, size=5
68464 GSM parser enter t=887 h=910 RxBuff: CRLF+USORD: 3,5,"#[ûV#"CRLFCRLFOKCRLF
68464 M-Bus 4 - TCP read packet...
68465 GSM OK
68465 GSM parser exit t=916 h=916 RxBuff:
68465 M-Bus 5 - REQ_UD2 for internal M-Bus slave
68465 M-Bus 6 - data received, size=21, waiting for TCP/UDP write...
68476 M-Bus 7 - TCP write command sent, waiting @...
68476 GSM parser enter t=916 h=916 RxBuff:
68476 GSM parser exit t=916 h=916 RxBuff:
68482 GSM parser enter t=916 h=919 RxBuff: CRLF@
68482 M-Bus 8 - received @
68482 GSM parser exit t=919 h=919 RxBuff:
68493 M-Bus 9 - sending TCP/UDP packet, size=21
68500 GSM parser enter t=919 h=941 RxBuff: CRLF+USOWR: 3,21CRLFCRLFOKCRLF
68500 M-Bus 10 - sent TCP packet OK
68501 GSM OK
68501 GSM parser exit t=941 h=941 RxBuff:
68629 GSM parser enter t=941 h=955 RxBuff: CRLF+UUSOCL: 3CRLF
68629 M-Bus 11 - TCP connection closed
68629 GSM parser exit t=955 h=955 RxBuff:
```

Debug mode exits by sending command DEBUG, or by rebooting the device:

```
Debug Mode OFF
>
```

5.8 Internal M-Bus slave and Modbus slave

The device has an internal software M-Bus slave and Modbus slave. They are intended to check the connection in case the devices connected to the RS-485 and/or M-Bus port are not responding.

M-Bus slave is set to M-Bus address 251 (0xfb). It supports following queries:

Master	Slave
SND_NKE: 10 40 fb 3b 16	CON: e5
REQ_UD2: 10 5b fb 56 16	RSP_UD: 68 0f 0f 68 08 fb 72 01 50 51 60 a3 10 01 0e 01 00 00 00 3a 16

In response to REQ_UD2, internal M-Bus slave sends the following information:

68 0f 0f 68 - start, length, length, start
 08 - control field
 fb - M-Bus address
 72 - CI field
 01 50 51 60 - Device ID, in BCD format, last 8 digits (60515001)
 a3 10 - manufacturer (DEC)
 01 - version
 0e - type (Bus/System)
 01 - access number (increasing by one per module 256)
 00 - error status
 00 - signature
 00 - no encryption
 3a - checksum
 16 - end

Modbus slave is set to Modbus address 251 (0xfb). It supports following query:

Master	Slave
Modbus TCP, Read Holding Registers, Start Address = 1, Length = 3: 00 03 00 00 00 06 fb 03 00 00 00 03	Returns Device ID: 00 03 00 00 00 09 fb 03 06 00 00 03 9b 62 b9

In response to the Read Holding Registers, with a starting address 1 and a length 3, internal Modbus slave sends the following information:

00 03 00 00 00 09 - Modbus TCP header
 fb - Modbus address
 03 - Read Holding Registers
 06 - number of bytes
 00 00 03 9b 62 b9 - Device ID, in hex format (60515001)

6 Uploading device firmware

For uploading new firmware version to device, software Texas Instruments „LM Flash Programmer“ can be downloaded from the website www.decode.rs or from the included CD.

Install software to PC and run it.

Setup „LM Flash Programmer“ as on pictures and load file **MM20-GSM-V2 vX.X.bin**:

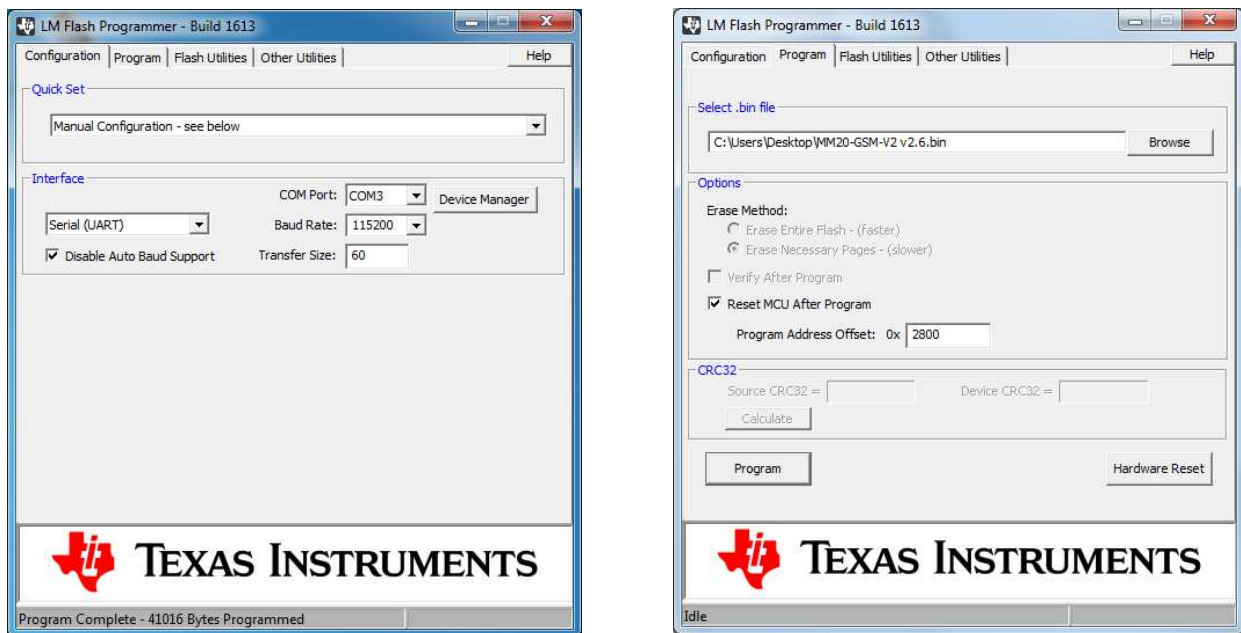


Fig. 13: LM Flash Programmer screen capture



IMPORTANT!

- Disable Auto Baud Support - check
- Program Address Offset – 0x2800

Turn off power supply. Connect MM20-GSM over RS-232 interface to PC.

Start terminal program (HyperTerminal, Terminal.exe), choose appropriate COM port, set baud rate to 115200bps and data format to 8N1.

Turn on power supply. In terminal program following log will be displayed:

```
Ready
>
```

or, if the device fails to initialize, wait for it to appear:

```
Device not initialized
```

```
Press ENTER within 5 seconds to check parameters...
```

Press ENTER within 5 seconds since the appearance of this message and wait for:

Type HELP for more information

>

Send command FWUPDATE. In terminal program following log will be displayed:

MM20-GSM firmware update

Disconnect this terminal program

Start "Texas Instruments LM Flash Programmer"

Configuration tab:

select "Manual Configuration - see below"

select "Serial(UART)" Interface

select corresponding COM Port at 115200bps

set "Transfer Size" to 60

select "Disable Auto Baud Support"

Program tab:

select file "MM20-GSM-V2 vX.X.bin"

select "Reset MCU After Program"

set "Program Address Offset" to 0x2800

Click "Program"

Click on Disconnect in the terminal program and then click on the Program in the "*LM Flash Programmer*" software. Wait until the message "Program Complete" appears and immediately click on the Connect in the terminal program. Check and, if necessary, setup the values of the parameters of the device.



IMPORTANT!

New firmware versions can automatically overwrite content of non-volatile memory, if number or order of parameters is changed. Be sure to check the parameter settings.

Such changes will be recorded in a note to the new firmware version, and also can be seen at the first reboot after new firmware upload:

Device initializing...

Default Parameters Loaded

The message indicates that the non-volatile memory is loaded with the factory default parameters.

7 Uploading GSM module firmware

For uploading new firmware version to GSM module, use software "ExtraPuTTY" (or similar which supports Xmodem 1K protocol, eg. HyperTerminal) which can be downloaded from the website www.decode.rs or from the included CD.

Connect MM20-GSM over RS-232 interface to PC. Install software to PC, run it and choose Session->Serial. Set the appropriate serial port and baudrate to 115200bps.

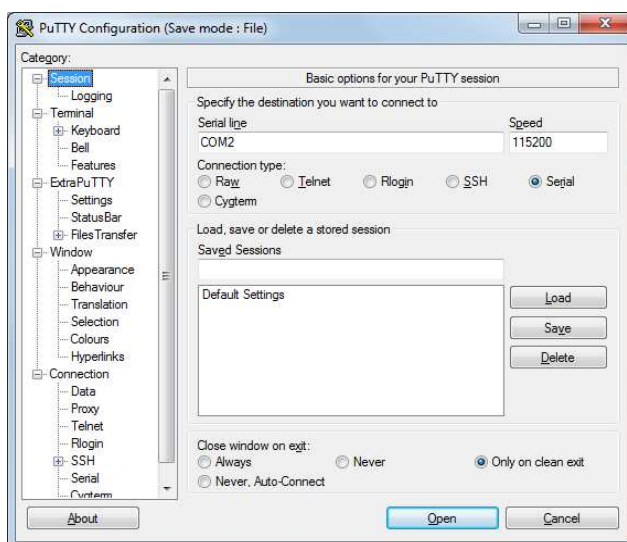


Fig. 14: PuTTY setup screen for GSM module firmware upgrade

In the Connection->Serial set the parameters as shown below:

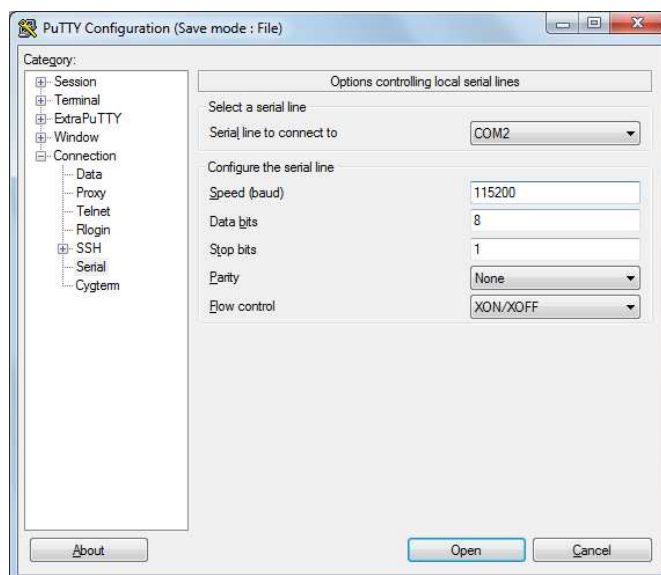


Fig. 15: PuTTY setup screen for GSM module firmware upgrade

Click Open.

Check the version of firmware of the GSM module in following way:

Turn off and turn on power supply. In terminal program following log will be displayed:

```
Ready  
>
```

or, if the device fails to initialize, wait for it to appear:

```
Device not initialized
```

```
Press ENTER within 5 seconds to check parameters...
```

Press ENTER within 5 seconds since the appearance of this message and wait for:

```
Type HELP for more information
```

```
>
```

Send commands ?D.MT i ?D.MF (or command LIST) and check firmware version of GSM module:

```
D.MT=SARA-G340-02S-00  
D.MF=08.90
```

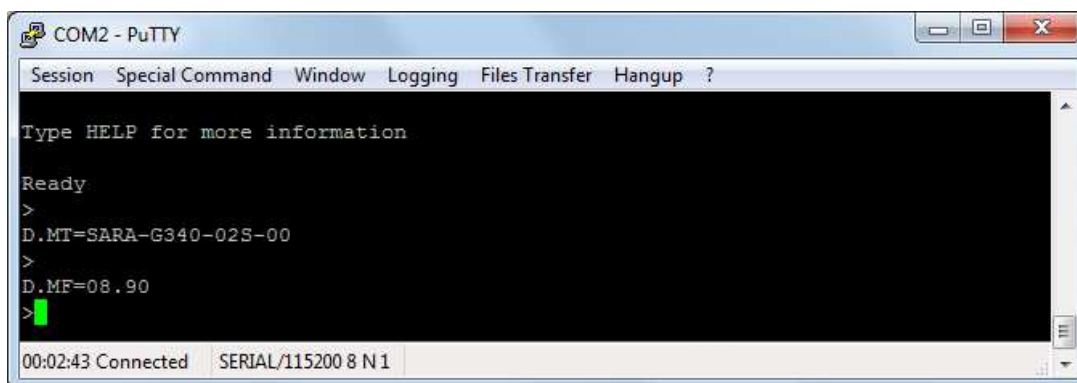


Fig. 16: Checking firmware version of GSM module

If, for some reason, these fields are not filled, send a command GOAT, for entering the AT command mode with GSM module, and send commands:

Command	Response
AT	OK
ATI	SARA-G340-02S-00 OK
AT+CGMR	08.90 OK

Exit this mode by sending command EXIT:

```
Online Mode  
>
```

If a new version of the firmware in the GSM module is need to be written, from terminal program (ExtraPuTTY) send command GSMUPDATE and wait for following log to be displayed:

```
GSM module firmware update
```

Within 10 seconds, click on FileTransfer->Xmodem 1K->Send and choose file "SARA-G340-02S-00_FWxx.yy_A00.02_IP.flS"

Within 10 seconds, click File Transfer->Xmodem 1K->Send. Choose a file (eg. SARA-G340-02S-00_FW08.90_A00.02_IP.flS) and wait until the transfer is complete.

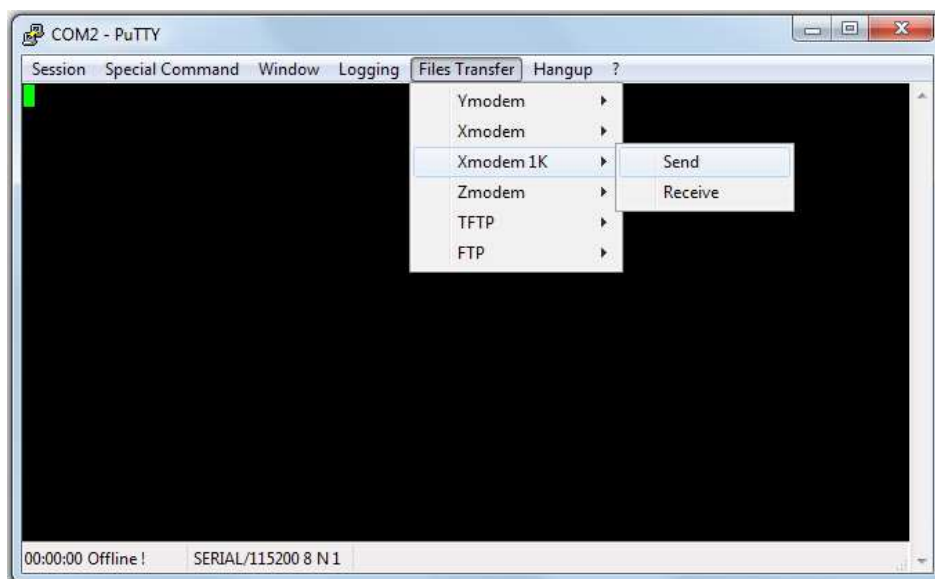


Fig. 17: Starting X-Modem file transfer

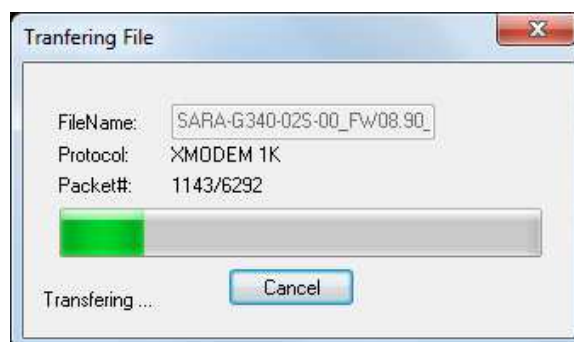


Fig. 18: X-Modem file transfer

The process of uploading the new firmware in the GSM module takes about 15 minutes. Upon completion, reboot the device by turning off and turning on the power supply, and check whether it is uploaded preferred version of firmware, by sending a LIST command.

 **NOTE:** If the command GSMUPDATE is sent by error, wait approximately 2 minutes for the following message:

```
Timeout
```

```
ERROR1
```

```
OK
```

Then turn off and turn on the device's power supply and wait for device to initialize.

If there is an interruption of the firmware update (eg. due to power loss), device's power supply must be turned off and turned on, and wait for following log in terminal program (ExtraPuTTY):

```
Device initializing...
```

```
0 GSM Powering OFF...
```

```
300 GSM Powering OFF -> OK
```

```
300 GSM Powering ON...
```

Press ESC and wait for:

```
650 GSM Powering ON Failed
```

```
Device not initialized
```

```
Press ENTER within 5 seconds to check parameters...
```

Press ENTER and wait for:

```
Type HELP for more information
```

```
>
```

From terminal program send command GSMUPDATE and after following log:

```
GSM module firmware update
```

```
Within 10 seconds, click on FileTransfer->Xmodem 1K->Send  
and choose file "SARA-G340-02S-00_FWxx.yy_A00.02_IP.flr"
```

click File Transfer->Xmodem 1K->Send. Choose file (eg. SARA-G340-02S-00_FW08.90_A00.02_IP.flr) and wait until the transfer is complete.

8 Technical specifications

GSM module	uBlox SARA G340, Dual-band GSM/GPRS
GSM antenna connection	SMA jack
SIM card	Standard (1.8V/3.0V) SIM card
Remote connection	Over GPRS, multiple TCP/UDP/IP servers
Remote setup	Over SMS messages or telnet servis
Serial interface	Connection: RJ45 RS-232 DCE – device setup, firmware update speed 115200bps, data format 8N1 RS-485 – transparent or Modbus RTU protocol speed and data format adjustable for RS-485 interface
M-Bus interface	Connection: pluggable screw terminal, wire 1.3 - 3.3mm ² M-Bus master – transparent protocol up to 20 M-Bus slave devices speed (300–9600bps) and data format adjustable quiescent current: 0-30mA short circuit: 50-70mA with restart function, line voltage: 30.5V ± 5%, internal resistance <100 Ohm over voltage protection: tranzorb > 12km@300bps, > 4km@2400bps, > 1km@9600bps cable JYSTY nx2x0.8
LED indications	On, Gsm, Bus, 485
Power supply	Connection: pluggable screw terminal, wire 1.3 - 3.3mm ² 9-30V DC 10W, reverse polarity and overvoltage protection 230 AC 0.2A, optional, with galvanic isolation
Protection	IPX0
Temperature range	from -20°C to +50°C, humidity <90% non condensing
Dimensions	95x35x77mm
Mounting	35mm DIN rail

9 Product label

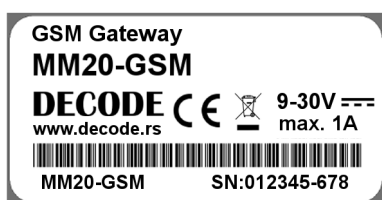


Fig. 19: Product label

The label fixed on the right side of enclosure comprises information listed in next table.

Line 1	Product name		Additional information about product (optional)	
Line 2	Product model			
Line 3	Manufacturer	CE sign	Waste Disposal	Supply voltage
Line 4	Manufacturer address			Maximum current
Line 5	Bar code with Product ID and Serial number			
Line 6	Product ID		Serial number	

10 Disposal and Recycling



You must dispose of this product properly according to local laws and regulations. Because this product contains electronic components, it must be disposed of separately from household waste. When this product reaches its end of life, contact local authorities to learn about disposal and recycling options, or simply drop it off at your local Decode office or return it to Decode.

11 Contact

Please contact a Decode office if you have any questions regarding the information contained in this manual or Decode products, or if you have any other inquiries.

Decode d.o.o.

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