QUICK START GUIDE

M110 Series – Cellular modem

Version 1.1

Copyright

ⓘ Note: This document is subject to change without notice

This manual covers the following products:

- M111#02
- M111
- M112#8
- M112#K
- M112#8K
- M112#5
- M112#S
- M113#D
- M113#245C
- M113
- M115#02
- M115

DOCUMENT VERSION	DATE
1.0 Initial document release	Sept. 17
1.1 RAM size and model table update	Oct. 17
1.2 Model table update	Nov. 17

This manual is written without any warranty.

M&F Technologies Limited reserves the right to modify or improve the product and its accessories which can also be withdrawn without prior notice.

Our company stresses the fact that the performance of the product and its accessories depends on the proper use conditions as well as the surrounding environment.

M&F Technologies Limited assumes no liability for damage incurred directly or indirectly from errors, omissions or discrepancies between the modem and this manual.

This software, solution or application is provided on an "as is" basis. No warranty whether expressed or implied is given by **M&F Technologies Limited** in relation to this software, solution or application. User shall assume the entire risk of using or relying on this software, solution, and application.

In no event will **M&F Technologies Limited** be liable for any loss or damage including without limitation, indirect or consequential loss, damage, or any loss, damage whatsoever arising from loss of data or profit arising out of, or in connection with, the use of this modem product. Every effort is made to keep the product and its software up and running smoothly. However, **M&F Technologies Limited** takes no responsibility for, and will not be liable for, the product or its software being temporarily unavailable due to technical issues beyond our control.

The above terms and conditions are subject to change without prior notice. The present use of this product solution implies that the user approves and understands all the above terms and conditions.

Table of Contents

1 SAFETY PRECAUTIONS 5

1.1 GENERAL PRECAUTIONS 5
1.2 USING THE MODEM IN VEHICLE 5
1.3 PROTECTING YOUR MODEM 5

2 OVERVIEW 6

2.1 SCOPE 6
2.2 TARGET AUDIENCE 6

3 PRODUCT OVERVIEW 7

3.1 M110 SERIES COMPATIBLE MODELS 7

4 PRODUCT FEATURES 9

4.1 HARDWARE 9
4.2 POWER 9
4.3 INTERFACE 9
4.4 SOFTWARE (MPACK SOFTWARE SUITE) 10

5 M110 CABLES AND ACCESSORIES 11

6 PHYSICAL DIMENSIONS AND LED 12

6.1 PHYSICAL DIMENSIONS 12
6.2 LED INDICATORS 13
6.3 ENABLING/DISABLING THE LED 13

7 HARDWARE INSTALLATION 14

7.1 INSERT THE SIM CARD: 14
7.2 CONNECT THE CELLULAR ANTENNA: 14
7.3 CONNECT THE USB TYPE-C CONNECTOR (OPTIONAL) 15
7.4 CONNECT THE 9-PIN SUB-D SERIAL CABLE 15
7.5 POWER THE MODEM 15

8 COMMUNICATING WITH THE M110 15

8.1 COMMUNICATIONS TESTING FOR THE M110 16
8.2 VERIFYING THE RECEIVED SIGNAL STRENGTH 17
8.3 VERIFYING THE NETWORK REGISTRATION 17
8.4 CHECKING THE PIN CODE STATUS 18
8.5 MAIN AT COMMANDS FOR THE M110 19
8.6 ECHO FUNCTION 20

9 SUPPORT 21

1 Safety Precautions

1.1 General precautions

- The modem generates radio frequency (RF) power. When using the modem, care must be taken to ensure safety as well as compliance with all the regulations surrounding the use of RF equipment.
- Do not use the modem in aircraft, hospitals and petrol stations or in places where using GSM products or other RF equipment is prohibited.
- Be sure that the modem will not be interfering with nearby equipment such as pacemakers or medical equipment. The antenna of the modem should be directed away from computers, office equipment, home appliance, etc.
- Always keep the modem at a minimally safe distance of 26.6cm or more from a human body.
- Do not put the antenna inside metallic boxes or other containers

1.2 Using the modem in vehicle

- Check for any regulation or law authorizing the use of GSM equipment in vehicles in your country before installing the modem.
- Installation of the modem should be done by qualified personnel. Consult your vehicle dealer for any possible interference concerns related to the use of the modem.
- Be careful when the modem is powered by the vehicle's main battery. The battery may be drained after extended period.

1.3 Protecting your modem

To ensure error-free usage, please install and operate your modem with care and comply with the following:

- Do not expose the modem to extreme conditions such as high humidity/rain, high temperatures, direct sunlight, caustic/harsh chemicals, dust, or water.
- Do not try to disassemble or modify the modem as there are no user serviceable parts inside and the warranty would be void in case of tampering.
- Do not drop, hit or shake the modem.
- Do not use the modem under extreme vibrating conditions.

- Do not pull the power supply cable. Please attach or detach it by holding the connector after switching off the supply.
- Install and connect the modem in accordance to the instruction manual. Failure to do so will void the warranty.

2 Overview

2.1 Scope

This document provides you all the information you need to set-up, configure and use the Maestro M110 Series modem.

2.2 Target audience

This document is intended for customers and integrators who understand basic telecommunications and information technology terminology and concepts.

3 Product overview

3.1 M110 Series compatible models

Model name	Territories or Operator(s)	Cellular type	Band(s)	Fall back mode	Bands	GNSS	Planned certifications	FCS (*)	Order code
M111	EMEA, [most of] Asia Pacific	2G	3/8				RED, GCF	Q1 '18	M111#02
	World excluding Japan, Korea		2/3/5/8				TBD		M111
M112	EMEA	NB-IoT	8					Q2 '18	M112#8
			20						M112#K
			8/20	×	N/A				M112#8K
	Asia Pacific		5						M112#5
			28						M112#S
M113	Verizon Wireless	LTE-M1	13				FCC (**), Verizon Wireless		M113#D
	AT&T Wireless, T-Mobile USA, Sprint		2/4/5/12				FCC (**), PTCRB, AT&T Wireless		M113#245C
	World	LTE-M1 NB-IoT	2/3/4/5/8/ 12/13/20/28	2G	3/8		TBD	Q3 '18	M113
M114	EMEA	LTE cat. 1	3/7/20				RED, GCF	Q1 '18	M114#37K##38
	Asia Pacific		3/8/28	3G	1		RCM, NCC, NBTC	Q2 '18	M114#38S#1
	NTT docomo		1/19	×	N/A		JPA, JRF	Q3 '18	M114#1J
M115	EMEA, [most of] Asia Pacific	3G	1/8	2G	3/8		TBD	Q1 '18	M115#02
	World		1/2/5/8		2/3/5/8		RED, GCF		M115

Please consult us regarding the models shown in grey which are subject to MOQ and other considerations

Uplink / Downlink maximum data rates:

- 3G: 5.76 / 7.2 Mbps;
- NB-IoT: 62.5 / 27.2 kbps;
- LTE-M1: 375 / 375 kbps

** First customer shipment ** Also Class I Division 2 for use in explosive atmospheres*

4 Product features

The M110 is the perfect solution for M2M applications facing tough environmental conditions and extended lifetime requirements. This compact and intelligent modem running eCOs and Maestro MPack is perfect to connect industrial equipment such as electricity meters, programmable logic controllers, lifts and vending machines.

4.1 Hardware

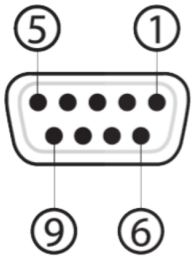
- Casing: Extruded Aluminum
- Dimensions: 60 x 60 x 21.7 mm
- Weight: Approximately 80 g
- Operating temperature range
  - Class A: -30°C ~ +70°C
  - Class B: -40°C ~ +85°C
- Memory
  - Flash memory [executable]: 256 KB
  - RAM: 128 KB

4.2 Power

- Main source: 8 VDC ~ 32 VDC w/ Slow Start and absorption of 2G current bursts
- Last Gasp (factory option): Approximately 20-second-long via two industrial-grade super caps

4.3 Interface

- RS-232: on a 9-pin sub-D connector:
  1. DCD
  2. Rx
  3. Tx
  4. DTR
  5. Ground
  6. DSR
  7. RTS
  8. CTS
  9. RI



- USB: on a Type-C connector (M113 and M115 only)
- I/Os: Two versatile[1] I/Os:
  - either 2-way (M111 and M112)
  - or 3-way (M113 and M115 only)
- Cellular antenna: External via SMA connector
- SIM interface 2FF SIM 1.8 V / 3.0 V
- LEDs: Two

4.4 Software (Mpack Software suite)

- Connectivity
- Dial-up
- TCP / UDP permanent client / server or on-demand client with two TCP / UDP sockets for failover,
- Network connectivity watchdog
- Miscellaneous features
- Support for concatenated SMS
- Conversion between Modbus RTU and Modbus TCP
- Configurable text and recipients upon Last Gasp
- DoTA: via user's HTTP server or D2Sphere
- Configuration via
  - Hyperterminal
  - Workbench through RS-232 or, when available, USB
  - SMS
  - Telnet
  - D2Sphere™

[1] i.e. user-configurable, each one independently from the other, as (i) analogue input; or (ii) digital output (2-way); or (iii) analogue input suited to the so-called 'current loop' sensors – aka 4 mA ~ 20 mA sensors (3-way)

5 M110 cables and accessories

Part Number	Description
Power Supply / Power Cable	
ACC-PS20F	4-pin Molex 1.2A power adapter with Euro plug 2-pin - Europe
ACC-CA10	Stripped wire to 4pin MicroFit (M) with 2.5A fuse length: 1m cable
Serial and USB cable	
ACC-CA07	DB9(M) to DB9(M) cable
Antennas	
ACC-A01	2G Europe, Magnetic Mount SMA length: 2.5m cable
ACC-A02	2G Europe SMA L-shape
ACC-A11	2G/3G, L-Shape SMA
ACC-A17A	2G/3G Magnetic Mount SMA length: 3m cable
ACC-A25	2G/3G/4G, Hinged, L-Shape SMA
Miscellaneous	
ACC-DIN	Metal DIN Rail clip
Snap-Cap	Snappily converts M110 series' RS-232 port on a 9-pin sub-D connector into an isolated*, half- or full-duplex (user-selectable via a slide switch) RS-485 port on a 5-pin, 3.5 mm pitch, COMBICON connector.

6 Physical dimensions and LED

6.1 Physical dimensions

M110 Series dimensions without connector	
Lenght	60 mm
Depth	60 mm
Height	21.7 mm
Weight	80g

6.2 LED indicators

The M110 operational status is defined by 2 LEDs, which are located on the front side of the M110. Refer to table below for more information about the M110 LED status indicator.

LED state	Orange LED	Green LED
ON	Fixed - Cellular connection is established	Fixed - Good CSQ > 10
	Blinking - Cellular connection is established and data are transferring	Slow blink - No Signal, or CSQ < 4,99
		Fast Blink - Bad CSQ <9
OFF	No cellular connection	No power

6.3 Enabling/disabling the LED

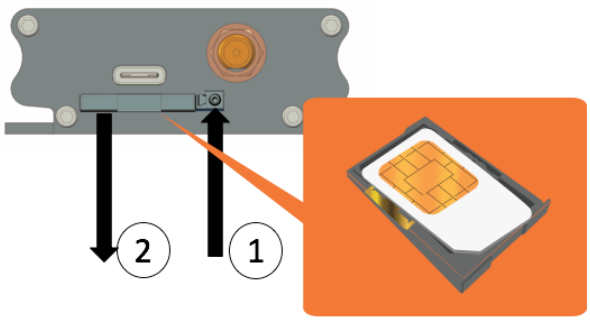
The M110 has a green LED indicator that shows the status of the GSM network. It is possible to disable this LED during Sleep mode in order to reduce power consumption. Using a communication software such as HyperTerminal, enter:

- AT+WHCNF=1,0 LED will be on all the time
- AT+WHCNF=1,1 With no SIM card – LED OFF
  With SIM card – see chapter 7.2

/!\ *The M110 will need to be restarted for the new settings to take effect*

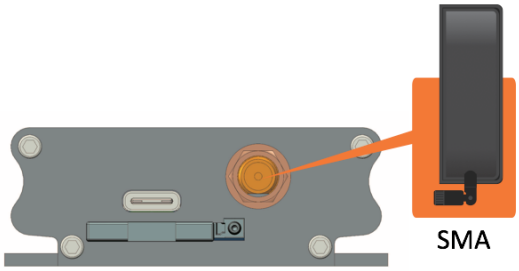
7 Hardware installation

7.1 Insert the SIM card:



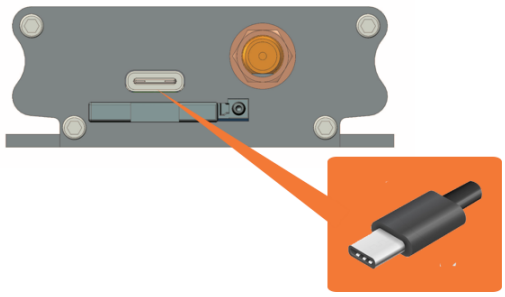
Eject the SIM card but pushing SIM tray eject button ① and remove the SIM tray ② to insert the mini-SIM card, SIM chip facing up. Once done put the tray back in place carefully.

7.2 Connect the cellular antenna:



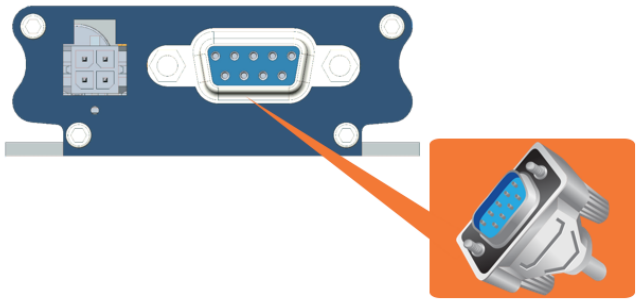
Connect the SMA antenna to SMA connector

7.3 Connect the USB type-C connector (optional)



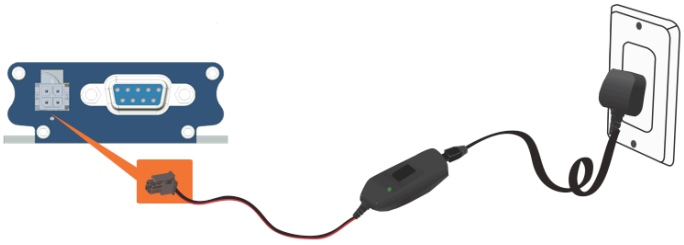
Insert the USB type-C cable.

7.4 Connect the 9-pin sub-D serial cable



Connect the 9-pin sub-D serial cable.

7.5 Power the modem



Connect the 4-pin molex connector to the M110 and apply power.

8 Communicating with the M110

After setting up the M110, communications can be established by directly sending AT commands to the device using terminal software such as HyperTerminal for MS Windows. The following sub-sections describe how this is done.

8.1 Communications Testing for the M110

To perform a communications test after the M110 has been setup, do the following:

- Connect the RS-232 link between the external application (DTE) and the M110 (DCE), or the USB type-C cable.
- Configure the RS-232 port of the DTE as follows:
  - Bits per second: 115, 200bps
  - Data bits: 8
  - Parity: None
  - Stop Bits: 1
  - Flow control: hardware
- Using a communication software such as HyperTerminal, enter:

  AT↵

- When communications have been established, the M110 will respond with an "OK", which is displayed in the HyperTerminal window.

If communications cannot be established with the M110, do the following:

- Check the RS-232 connection between the application (DTE) and the M110 (DCE).
- Check the configuration of the COM port used on the DTE

Refer to the table below for other AT commands that can be used after getting the M110 started.

AT Command	Description
AT+CGMI	To check if the serial link is OK. The M110 will respond with "Sierra Wireless" when it is OK.
AT+CPIN=xxxx	To enter a PIN code, xxxx (if activated).
AT+CSQ	To verify the received signal strength.
AT+CREG?	To verify the registration of the M110 on the network.
ATD<phone number>	To initiate a voice call.
ATH	To hang up (end of call).

Table: Basic AT Commands for the M110

8.2 Verifying the Received Signal Strength

The M110 only establishes a call if the received signal strength is strong enough. Using communication software such as HyperTerminal, enter **AT+CSQ** to check the received signal strength. The response returned will follow the format ***+CSQ: <rssi>, <ber>***

where:<rssi> = received signal strength indication, and <ber> = channel bit error rate.

Refer to the table below for the description of the <rssi> values returned.

<rssi> Value	Description
0 – 10	Received signal strength may be insufficient.
11 – 31	Received signal strength is sufficient.
32 – 98	Not defined.
99	No measure available.

Table: <rssi> Value Description

8.3 Verifying the Network Registration

To check the network registration, make sure that a valid SIM card has been properly inserted into the M110.

Note: When using the M110 with Embedded SIM, ensure that the device has been registered by the network provider.

Using a communication software such as HyperTerminal, enter **AT+CREG?** to verify the network registration of the M110. Refer to the table below for the list of main responses returned.

AT+CREG Response	Description
+CREG: 0,0	Not registered.
+CREG: 0,1	Registered on the home network.
+CREG: 0,5	Registered on a roaming network.

Table: AT+CREG Main Reponses

If the M110 is not registered on the network, do the following:

- Check the connection between the M110 and the antenna.
- Verify the signal strength to determine the received signal strength (refer to section 8.2 Verifying the Received Signal Strength).

8.4 Checking the PIN Code Status

Using a communication software such as HyperTerminal, enter AT+CPIN? to check the PIN code status. Refer to the table below for the list of main responses returned.

AT+CPIN Response	Description
+CPIN: READY	The PIN code has been entered.
+CPIN: SIM PIN	The PIN code has not been entered.

Table: AT+CPIN Main Responses

8.5 Main AT Commands for the M110

The table below lists the main AT Commands required for starting the M110. For other available AT Commands, refer to document [1] Firmware 7.42 AT Commands Manual (Open AT Application Framework 2.32).

Feature/Function	AT Command	Response	Description
Check network registration	AT+CREG?	+CREG: 0,1	The M110 is registered on the network.
		+CREG: 0,2	The M110 is not registered on the network; registration attempt is ongoing.
		+CREG: 0,0	The M110 is not registered on the network; no registration attempt has
Enter PIN code	AT+CPIN=xxxx (xxxx = PIN code)	OK	PIN code accepted.
		+CME ERROR: 16	Incorrect PIN code (with +CMEE = 1 mode*).
		+CME ERROR: 3	PIN code already entered (with +CMEE = 1 mode*).
Receive a call	ATA	OK	Answer the call.
Initiate a call	ATD<phon enumber>; (Do not forget the « ; » at the end for « voice » call)	OK	Communication established.
		+CME ERROR: 11	PIN code not entered (with +CMEE = 1 mode).
		+CME ERROR: 3	AOC credit exceeded or communications has already been established.
Initiate an emergency call	ATD112; (Do not forget the « ; » at the end for « voice » call)	OK	Communications established.
Hang up	ATH	OK	
Communication has been lost		NO CARRIER	
Store the parameters in	AT&W	OK	The configuration settings are stored in EEPROM (non-volatile

Table: Main AT Commands used for the M110

* The command AT+CMEE=1 switches to a mode that enables a more complete error diagnostic.

8.6 Echo Function

If no echo is displayed when entering an AT command, it could mean either of the following:

- The “local echo” parameter of your communication software such as HyperTerminal is disabled.
- The M110 echo function is disabled.

To enable the M110 echo function, enter the AT command ATE1.

When sending AT commands to the M110 using a communication software such as HyperTerminal, it is recommended to:

- Disable the “local echo” parameter of your communication software
- Enable the M110 echo function (use the ATE1 AT command)

In a machine-to-machine communication with the M110, it is recommended to disable the M110’s echo function (using the ATE0 AT command) in order to avoid useless CPU processing.

9 Support

There are several resources available to you for support and troubleshooting of your Maestro product or for resolving configuration difficulties at Maestro's support website, http://support.maestro-wireless.com/knowledgebase.php.

Try these troubleshooting steps to eliminate your problem. After working through these steps and if your problem is not solved, please send a ticket to Maestro support team.

Fill out an Online Support Request via: http://support.maestro-wireless.com/index.php?a=add. You will need to create a user account if one is not already set up.