



ASTROMI.CH

## MGBBox V2 Manual

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## Introduction

Thank you for purchasing MGBBox V2 (short for Meteo- and GPS Box, referenced as MGBBox throughout this manual), a small, self-contained device that delivers positional information, barometric pressure, temperature, humidity and dew point information with high accuracy.

Version 2 of MGBBox introduces some new functionality and changes based on customer feedback.

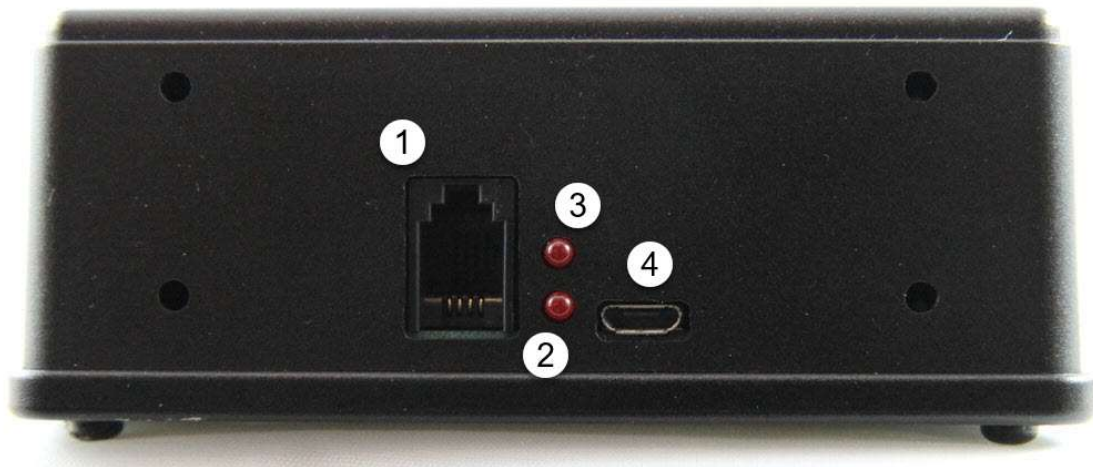
Sophisticated telescope mounts usually allow the creation of models to minimize inaccuracies in pointing and tracking that can result from mechanical tolerances, atmospheric refraction and other factors. In order for this model to be of the highest quality, the mount computer or controlling software can use the data that MGBBox provides and thus improve the accuracy in their calculations.

Because of the small size of MGBBox, it can be used in both mobile astronomy as well as stationary setups inside an observatory.

MGBBox is self-declared CE conform according to EN 301489-1 Class B and EN 61000-6-3 Class B

MGBBox is also ROHS compliant.

## Overview



1 – RJ10 Port

2 – GPS Status LED

- LED blinks in 1 second interval if no GPS Fix is acquired
- LED remains off once a valid GPS Fix is achieved

3 – Mount Status LED

- Only relevant for the 10Micron specific Firmware
- Indicates if communication with the mount has been established. If the LED is on, MGBBox and the mount are not communicating with each other.

4 –USB Connector

## System Requirements

MGBBox was tested on WindowsXP, Windows 7 and Windows 10 in a mix of 32-bit and 64-bit versions. It is assumed that the Windows OS is updated to the latest patches and updates.

### General Requirements

#### Windows Operating Systems

- Windows 10
- Windows 8 / 8.1
- Windows 7
  - No further requirements, in case the FTDI Driver is missing or overwritten by the Windows update process, please reinstall the one from the FTDI website (<http://www.ftdichip.com/Drivers/VCP.htm>)
- WindowsXP
  - Service Pack 3
  - .Net Framework 4.0
  - FTDI Driver (<http://www.ftdichip.com/Drivers/VCP.htm>)

#### Other Operating Systems

Although untested, MGBBox should work on Mac or Linux operating Systems. It may be necessary to install the proper driver that is available from FTDI (see link above). For a description of the command protocol please refer to Section [Application Interface](#).

### ASCOM Connections

For connections thru ASCOM the following needs to be installed:

- ASCOM Platform 6.5SP1 or later
- Astromi.ch MGBBox Driver

## MGBBox usage

MGBBox can either be used with or without a computer.

If you use the RJ10 interface of MGBBox, please check the pinout of your mount's computer before hookup. We take no responsibility for possible damages resulting from improper configurations! Please see Chapter "[RJ10 Interface](#)" for details

### Usage with computer

- Connect MGBBox to your computer using the supplied USB-Cable and launch the application. MGBBox will be recognized by Windows as a new Com-Port
- It is recommended to do this at least once in order to configure the behavior of the RJ10 Port.
- On older Windows Versions or other Operating Systems, it might be necessary to install the proper FTDI Driver before the device becomes available.

### Usage without computer

- MGBBox can also be connected to your mount using the supplied RJ10 cable. The RJ10-Port is configured similar to a serial port and MGBBox can draw power either thru the USB-Port or from the RJ10-Port.
- Using just the RJ10 Port makes MGBBox operate in stand-alone mode where it just keeps sending data according to its configuration.

**Note:** For 10Micron Mounts, if the mount is powered off but the mount's power source remains on, MGBBox will continue to receive power from the mount.

## Windows Application

Please consult the respective manual for a description of the windows application.

## Hardware information

MGBBox uses a Bosch Sensortec BME280 Sensor that delivers pressure, temperature and Humidity with very high accuracy. The following is an excerpt from the specifications of the sensor depicting its tolerances and operating limits:

### Pressure Sensor

Parameter	Min	Typical	Max	Unit
Operating temperature range	-40	25	+85	°C
Operating pressure range	300		1100	hPa
Absolute accuracy pressure		+ - 1.0		hPa
Relative accuracy pressure		+ - 0.12		hPa

### Temperature Sensor

Parameter	Min	Typical	Max	Unit
Operating range	-40	25	+85	°C
Absolute accuracy temperature		+ - 1.0		°C

### Humidity Sensor

Parameter	Min	Typical	Max	Unit
Operating Temperature Range	-40	25	+85	+C
Absolute accuracy tolerance		+ - 3.0		%RH

## Microprocessor

The “heart” of MGBBox is an Atmel ATmega2560V microprocessor that interfaces with the Sensor over the I<sup>2</sup>C protocol. It features 256KB of flash memory, 4KB of EEPROM, 8Kbytes of internal SRAM and 86 general-purpose I/O lines.

The ATmega2560 runs at 8Mhz using and external ceramic resonator.

## GPS Module

MGBBox uses either a Sierra Wireless XA1100 or a Quectel L80 GPS Module. Please find below a table with the most significant specifications for the modules.

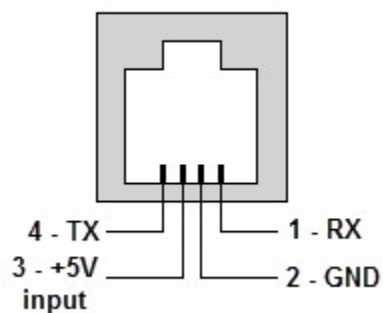
GPS-Module Model	Sensitivity	Chipset	Patch Antenna	Tracking/ Acquisition Channels
Sierra Wireless XA1100	Acquisition: -148dBm, Reacquisition: -163dBm Tracking: -165dBm	MediaTek MT3333	Integrated	22/66
Quectel L80	Acquisition: -148dBm, Reacquisition: -160dBm Tracking: -165dBm	MediaTek MT3339	Integrated	22/66



## RJ10 Interface

The RJ10 Interface works almost like a typical RS-232 Interface with the exception that only V+, GND, TX and RX are used.

The following picture illustrates the pinout:



Conversion from TTL to RS-232 is done by a Max3232ESE+ IC.

The supplied cable is a standard RJ10 cable and the pinout is as follows (colors may vary):

P1		P2
1	BLACK	4
2	RED	3
3	GREEN	2
4	YELLOW	1

**Important: Please consult your mount manual before connecting MGBBox to it.  
We will not take responsibility for possible damages resulting from wrong connections!**

## Application Interface

This section provides information about how to interface with MGBox from your own application or script.

### Serial Port settings

Use the following settings to connect to MGBox and start receiving data:

Baud:	38400
Data-Bits:	8
Stop-Bits:	1
Parity:	None

### Serial Port settings RJ10

With the following settings you can receive data from the RJ10 Serial Port:

Baud:	9600
Data-Bits:	8
Stop-Bits:	1
Parity:	None

## Protocol

MGBBox uses, for compatibility reasons, the NMEA 0183 Protocol that is used by various navigation devices.

MGBBox sends data from the sensor in the following format:

```
$PXDR,P,96276.0,P,0,C,31.8,C,1,H,40.8,P,2,C,16.8,C,3,0.8*39<cr><lf>
```

This breaks down into the following, more readable format:

\$	Start of sentence
P	Proprietary sentence
XDR	Transducer type
P	Sensor type, pressure
96276.0	Sensor value
P	Sensor units, pascal
0	Sensor ID
C	Sensor type, temperature
31.8	Sensor value
C	Sensor units, °C
1	Sensor ID
H	Sensor type, humidity
40.8	Sensor value
P	Sensor units, percent
2	Sensor ID
C	Sensor type, temperature
16.8	Sensor value
C	Sensor units, °C
3	Sensor ID
0.8	MGBBox firmware
*39	Checksum

Additionally, MGBox can also send information about calibration values stored in the EEPROM.

Standard Firmware:

\$PCAL,P,0,T,0,H,0,MM,1,MG,0\*69<cr><lf>

\$	Start of sentence
P	Proprietary sentence
CAL	Calibration data
P	Sensor type, pressure
20	Calibration value multiplied by 10, e.g. 2.0 hPa
T	Sensor type, temperature
50	Calibration value multiplied by 10, e.g. 5.0 °C
H	Sensory type, humidity
-10	Calibration value multiplied by 10, e.g. -1.0 %RH
MM	MM: Send Meteo-Data to moun
1	Yes (0 = No)
MG	MG: Send GPS-Data to mount
0	Disabled (1 = Enabled)
*69	Checksum

## Setting, resetting, receiving Calibration data and other commands

In order to set, reset or query calibration data from the MGBox, similar formatted sentences can be sent to the device. Please limit the commands to about 1 per second in order to give the device time to respond to each command.

### Setting pressure calibration

:calp,50\*

:calp	Set calibration value for pressure
50	Calibration value multiplied by 10, e.g. 5.0 hPa
*	End of message indicator

### Setting temperature calibration

:calt,22\*

:calt	Set calibration value for temperature
22	Calibration value multiplied by 10, e.g. 2.2 °C
*	End of message indicator

### Setting humidity calibration

:calh,50\*

:calh	Set calibration value for humidity
50	Calibration value multiplied by 10, e.g. 5.0%
*	End of message indicator

### Resetting calibration values

:calreset\*

:calreset	Resets all calibration values
*	End of message indicator

### Getting calibration values

:calget\*

:calget	Retrieves all calibration values
*	End of message indicator

### Send GPS-Data to Mount

:mg,1\*

:mg	Set's if GPS-Data should be sent to the Mount
1	Enabled (0 = disabled)
*	End of message indicator

### Send Meteo-Data to Mount

:mm,1\*

:mm	Set's if Meteo-Data should be sent to the Mount
1	Enabled (0 = disabled)
*	End of message indicator

### Rebooting the GPS-Module

:rebootgps\*

:rebootgps	Reboots the GPS-Module
*	End of message indicator

### Rebooting MGBox

:reboot\*

:reboot	Reboots MGBox
*	End of message indicator

### Turning GPS Module On

:gpson\*

:gpson	Enables Power to the GPS Module
*	End of message indicator

### Turning GPS Module Off

:gpsoff\*

:gpsoff	Removes Power from the GPS Module
*	End of message indicator

### Query Device type

:devicetype\*

:devicetype	Queries the Type of the Device connected
*	End of message indicator

## Troubleshooting

If your MGBox does not work as expected, please check the following:

- Verify in Device Manager the FTDI Serial Port shows up. Install / reinstall the driver if necessary (<http://www.ftdichip.com/Drivers/VCP.htm>)
- If configuring ASCOM Connection and it appears that nothing happens when you click the "Configure" button, look in your task bar for an additional window. Sometimes the ASCOM Setup-Dialog ends up behind the other windows and is therefore not apparently visible.