

## Environmental Monitor

**Base** (EMB[G]433, EMB[G]868, EMB[G]915)

**Drop** (EMD433, EMD868, EMD915)

**Rover** (EMR[G]433, EMR[G]868, EMR[G]915)

**User Manual v 1.3**



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## Features

- Integrated MCU
- Ruggedized unit with power source
- Optional GPS (base and rover models only)
- Bluetooth (rover model only)
- IR sunlight detection (base model only)
- Streamer and thermostat (drop model only)
- Corrected atmospheric pressure readings
- Derived elevations with customizable datum
- Mesh networking
- Simple serial interface
- Metric or Imperial output units

## Application Examples

- Indoor elevations
- Building pressurization monitoring
- Multi-node telemetry networks
- Altitude reference for UAVs
- Wildfire Forward Rate of Growth (FROG) sensor (patent pending)

## Overview

The EM(BDR)[G]xxx series differential barometer/altimeter (patent pending) environmental monitor integrates the EMOxxx module in a ruggedized unit with power source, Bluetooth (rover only) and optional GPS capabilities. Refer to the EMOxxx module documentation on our website at <https://www.asr-web.com/support> for technical details and specifications.

There are three models offered: base, drop and rover.

The **base** model (EMB[G]xxx) is re-usable and has rechargeable NiMh batteries. There is an optional GPS add-on [G] for this model.

The **drop** model (EMDxxx) is disposable, has non-rechargeable alkaline batteries and is equipped with a streamer designed to be air-dropped from a helicopter.

The **rover** model (EMR[G]xxx) is re-usable, has rechargeable NiMh batteries and Bluetooth. There is an optional GPS add-on [G] for this model.

Depending on region all three models are offered at operating frequencies of 433, 868 and 915MHz.

## Setup

The following is the setup procedure for a **rover/drop combination**:

1. Plug in a USB cable to a power source and then to the rover unit to charge. The power toggle switch must be in the down position. A solid green LED light indicates charging state. Note that if plugged in with the toggle switch in the up position the unit will not charge even though the LED light will be solid green. Allow 10-12 hours to fully charge, it is normal for the unit to get warm while charging.
2. Once fully charged mount the unit upright and level with a clear view of the sky using two pipe clamps to the forward section of the helicopter skid opposite the tail rotor with the power toggle switch facing forward. The pipe clamps are slotted through the mounting bar on the underside of the rover unit.
3. Flip the power toggle switch in the up position on the rover to turn it on.
4. Confirm that the rover is ready by checking that the LED light is blinking occasionally.
5. Start the EMD program (see below) .
6. Confirm that a Bluetooth connection is established and that rover telemetry data is being displayed.
7. Wait for a GPS lock and confirm that Bluetooth is in range by sitting in the desired position in the helicopter with the doors closed. The class 2 Bluetooth unit on the rover should allow for at least 10 meters of range but this can be impacted by the particular aircraft.
8. Once over the desired drop zone arm a drop module by loosening the wing nut on the pivot stud and removing the wing nut from the off (outer) stud. Move the arming bar to the on (inner) stud and tighten both nuts.
9. Confirm that the drop is ready by checking that the LED light is blinking occasionally.
10. Note the *NodeID* of the drop module and ping it from EMD.
11. Confirm that the drop module is responding by checking that base telemetry data is being displayed for the *NodeID*.
12. **Remove streamer retainer elastics** and release drop module while hovering.
13. After ground impact confirm that the drop module is still responding in EMD.
14. Mark position in EMD before moving. Expected line-of-sight range for the drop modules is approximately 1 km (433, 915Mhz) and 5Km (868Mhz) with a battery life of 48 hours. Individual drops act as mesh network repeaters when in range of any others potentially increasing totals beyond these specifications.
15. If returning to an area EMD will pickup the drop signal automatically when in range, if EMD was restarted the drop module must be pinged again but if previously marked its coordinates can be restored when prompted.

The setup procedure is similar for a **rover/base combination**:

1. Plug in a USB cable to a power source and then to the rover and base units to charge. The power toggle switch must be in the down position. A solid green LED light indicates charging state. Note that if plugged in with the toggle switch in the up position the units will not charge even though the LED light will be solid green. Allow 10-12 hours to fully charge, it is normal for the units to get warm while charging.
2. Flip the power toggle switch in the up position on the rover to turn it on.
3. Confirm that the rover is ready by checking that the LED light is blinking occasionally.
4. Start the EMD program (see below) .
5. Confirm that a Bluetooth connection is established and that rover telemetry data is being displayed.
6. Wait for a GPS lock and confirm that Bluetooth is in range. The class 2 Bluetooth unit on the rover should allow for at least 10 meters of range but this can be impacted by different setups.
7. Once at the desired base location flip the power toggle switch in the up position on the base to turn it on.
8. Confirm that the base is ready by checking that the LED light is blinking occasionally.
9. Note the *NodeID* of the base module and ping it from EMD.
10. Confirm that the base module is responding by checking that base telemetry data is being displayed for the *NodeID*.
11. Mark position in EMD before moving if the base is not GPS equipped. Expected line-of-sight range for the base modules is approximately 1 km (433, 915Mhz) and 5Km (868Mhz) with a battery life of 48 hours. Individual bases act as mesh network repeaters when in range of any others potentially increasing totals beyond these specifications.
12. If returning to an area EMD will pickup the base signal automatically when in range, if EMD was restarted the base module must be pinged again but if previously marked its coordinates can be restored when prompted.

## EMD Software

The Environmental Monitor Drop (EMD) software is available for download on our website at <https://www.asr-web.com/support> and allows users to track telemetry from rover, drop and base units. Data is logged and .KML (keyhole markup language) files are generated for use in Google Earth Pro (GEP) as a moving map.

Note that a user must be a local administrator on a system in order to install and run this program.

After installation edit the **settings.txt** file in the program installation directory to set the parameters.

Line 1: port number

Line 2: UTC offset

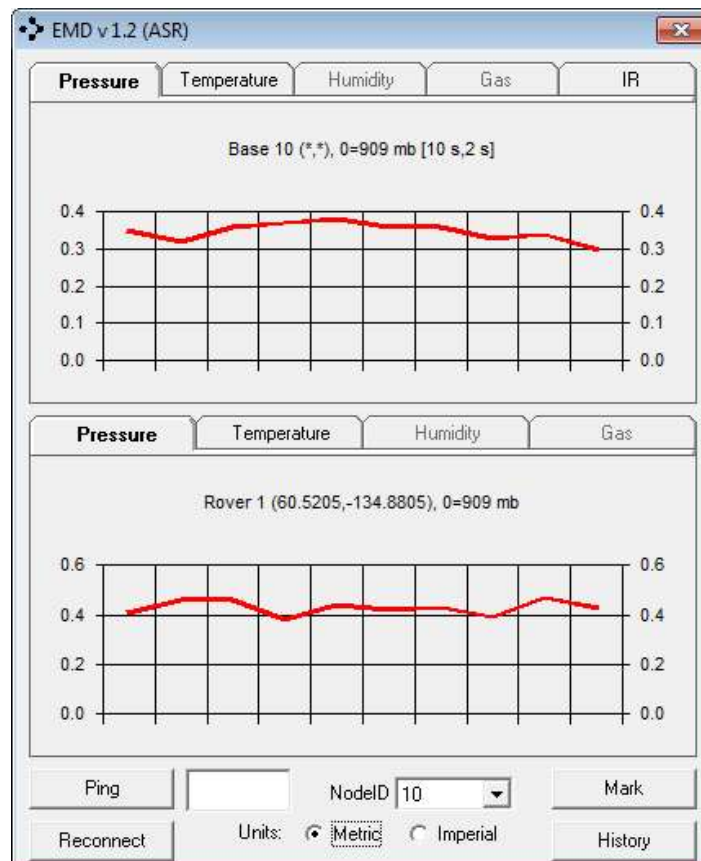
Once started the rover telemetry will be shown in the bottom graph. If equipped and locked the rover will display a GPS position as (decimal latitude, decimal longitude). (\*,\*) will be displayed if no position is available. \* will prefix the last known positions if GPS lock is lost.

To track a *NodeID* for a base/drop type in the number and click the **Ping** button. If there is a response the telemetry for the *NodeID* will be shown in the top graph. The latency since last ping response will be shown in seconds as [previous response time, current time elapsed]. Multiple *NodeIDs* will be automatically and simultaneously tracked when within range, the **NodeID** combo box selects which one is displayed. When the preset drop thermostat is triggered at 50C in the presence of fire the base graph title will show in red.

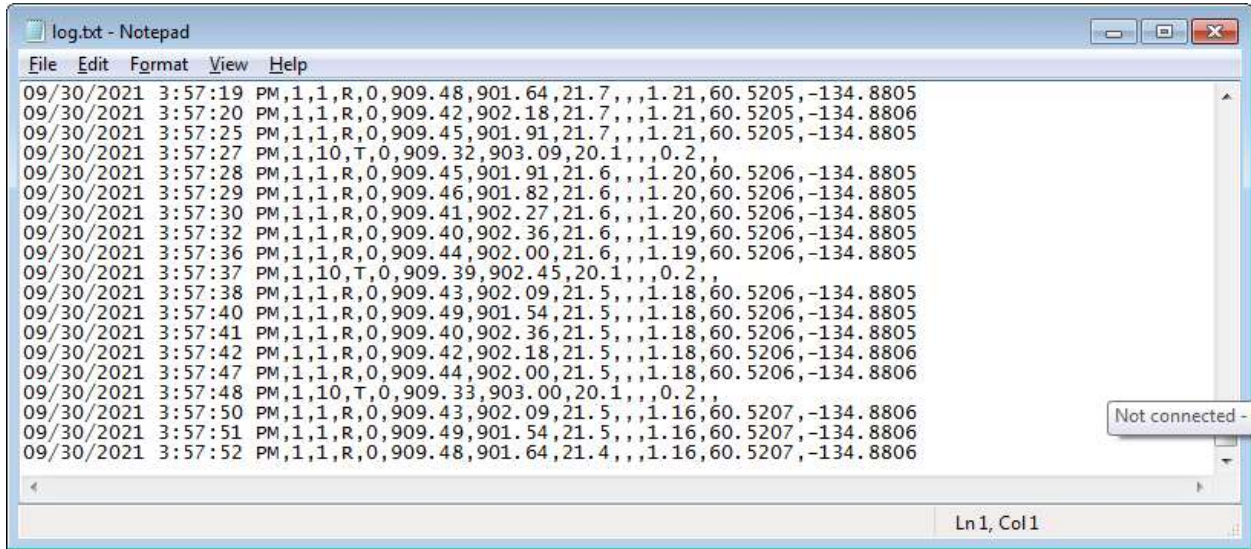
To mark the position of a *NodeID* using the rover GPS click the **Mark** button. This will generate and update a point in the **tracking.kml** file located in the application directory. Any unit that is GPS equipped will automatically be mapped when lock is acquired. Clicking the **History** button will generate a timespan in the **tracking\_history.kml** file from the log.txt file between specified dates/times in the **History** window. Both files can be linked to GEP as a moving map (see below).

If a connection is lost with the rover during a session clicking the **Reconnect** button will attempt to restore it without having to restart the program.

The current units can be changed on the bottom.



A **log.txt** file in the application directory stores all output with a date/time stamp. See the EMOxxx documentation for details.



```
log.txt - Notepad
File Edit Format View Help
09/30/2021 3:57:19 PM,1,1,R,0,909.48,901.64,21.7,,1.21,60.5205,-134.8805
09/30/2021 3:57:20 PM,1,1,R,0,909.42,902.18,21.7,,1.21,60.5205,-134.8806
09/30/2021 3:57:25 PM,1,1,R,0,909.45,901.91,21.7,,1.21,60.5205,-134.8805
09/30/2021 3:57:27 PM,1,10,T,0,909.32,903.09,20.1,,0.2,,
09/30/2021 3:57:28 PM,1,1,R,0,909.45,901.91,21.6,,1.20,60.5206,-134.8805
09/30/2021 3:57:29 PM,1,1,R,0,909.46,901.82,21.6,,1.20,60.5206,-134.8805
09/30/2021 3:57:30 PM,1,1,R,0,909.41,902.27,21.6,,1.20,60.5206,-134.8805
09/30/2021 3:57:32 PM,1,1,R,0,909.40,902.36,21.6,,1.19,60.5206,-134.8805
09/30/2021 3:57:36 PM,1,1,R,0,909.44,902.00,21.6,,1.19,60.5206,-134.8805
09/30/2021 3:57:37 PM,1,10,T,0,909.39,902.45,20.1,,0.2,,
09/30/2021 3:57:38 PM,1,1,R,0,909.43,902.09,21.5,,1.18,60.5206,-134.8805
09/30/2021 3:57:40 PM,1,1,R,0,909.49,901.54,21.5,,1.18,60.5206,-134.8805
09/30/2021 3:57:41 PM,1,1,R,0,909.40,902.36,21.5,,1.18,60.5206,-134.8805
09/30/2021 3:57:42 PM,1,1,R,0,909.42,902.18,21.5,,1.18,60.5206,-134.8806
09/30/2021 3:57:47 PM,1,1,R,0,909.44,902.00,21.5,,1.18,60.5206,-134.8806
09/30/2021 3:57:48 PM,1,10,T,0,909.33,903.00,20.1,,0.2,,
09/30/2021 3:57:50 PM,1,1,R,0,909.43,902.09,21.5,,1.16,60.5207,-134.8806
09/30/2021 3:57:51 PM,1,1,R,0,909.49,901.54,21.5,,1.16,60.5207,-134.8806
09/30/2021 3:57:52 PM,1,1,R,0,909.48,901.64,21.4,,1.16,60.5207,-134.8806
Ln 1, Col 1
```

## Linking in GEP (Moving Map)

1. Double-click the file **EMD.kmz** in the application directory and GEP will open it.
2. Click and drag **EMD** folder from **Temporary Places** into **My Places**
3. Select **File -> Save -> Save My Places**
4. Add a geo-referenced map: Select **File -> Import...** -> select **GeoTIFF (\*.tif)** type -> **Open -> Ok**

