3. User manual

1. Booth screen

Plug the included USB cable into the Earth Listener and into a 5V min. 500mA USB port.
The screen will be white and shortly after, it will show the boot screen with the software version number.

The logo will cycle from white to red, to green and finally to blue. If you have the optional VMA318 ARDUINO® COMPATIBLE 3 COLOUR RGB SMD LED MODULE connected, the LED will mimic the color of the logo.

Next, you will see all connected sensors & the status of the SD card. If all is OK, the screen should show this:

CCS811: the Air quality sensor status (part of VMA342), should be DETECTED
AS3935: the Lightning sensor (VMA343), should be DETECTED
BME280: the Atmosphere sensor (part of VMA342), should be DETECTED

If any of the sensors' state is ‘NOT FOUND’, please power cycle. If that doesn’t fix the problem, please check the connections.

SD card: not necessary for normal operation, but there will be no logging as long as you don’t insert an SD card.

Note: If you enter an SD card after the boot or during normal operation, please reboot the Earth Listener.

2. Home screen

This is the home screen you will see when the Earth Listener is in normal mode.

The following information is displayed:

eCO2 button and value

- temperature button and value
- pressure button and value
- TVOC button and value
- humidity button and value
- lightning button and value
- slideshow button (a circle with 2 vertical stripes, displayed in the lower left corner)
    - if you press this button, the slideshow will start, sliding through the different pages. You can stop this by pressing the play button or by manually changing a screen.
- setup button (gear wheel)
- overall air quality value

- the earth listener will tell you what the overall air quality is based on the eCO2 value
- the Velleman Projects logo's color will mimic the air quality
- if you have added the optional Arduino compatible 3 color RGB SMD LED module (VMA318), the LED color will also mimic the air quality

3. Setup screen

After pushing the setup button (gear wheel), you will see the setup page as displayed below. You can use the button in the lower right corner to go back (it looks like a circle with 3 horizontal stripes).

The following values can be changed:

- Buzzer on/off
  - This will control the buzzer on the sensor shield for Arduino® ATmega (VMA212) when lightning is detected.
- Slideshow timer
  - the time each slide will be shown when the Earth Listener is in slideshow mode.
  - You can adjust this value between 1 and 60 seconds.
- Indoor / Outdoor use
  - This setting will affect the lightning sensor (VMA343). After changing this value, please reboot the device.

Important: set the value for indoor/outdoor the first time that you use the EarthListener!

4. eCO2 page

When pressing the eCO2 cloud button, you will go to the page displayed below. This page shows the eCO2 value in ppm (parts per million). The CCS811 sensor is capable of measuring values between 400 ppm and 8192 ppm. The scale will show values between 400 ppm and 3000 ppm. The white line shows the current value. Learn how to interpret these values in the chapter “all about values: eCO2”.

Press the button in the right corner to go back to the home screen, or slide between screens by pressing the left or right side of the screen.

5. Temperature page

This page shows the temperature value in degrees Celsius. The BME280 sensor is capable of measuring values between -40 °C and 85 °C. The scale will show values between -5 °C and 40 °C. The white line shows the current value.

Note: since the BME280 sensor is enclosed together with other parts (like the TFT screen, which will heat up over time), we compensate the temperature value. See chapter ‘all about

values: compensation'.

6. Air pressure page

This page shows the barometric pressure value in Millibar (same unit as hPa: hectopascal). The BME280 sensor is capable of measuring values between 300 mBar and 1100 mBar.

Note: the BME280 sensor is also capable of measuring the altitude based on the barometric pressure. However, you need to set the current barometric pressure at sea level at your location for this to work properly. This value changes every day, so it needs to be set manually every time the altitude is measured. The Arduino code is already provided but commented out.

7. TVOC page

This page shows the TVOC value in parts per billion. The CCS811 sensor is capable of measuring values between 0 ppb and 1187 ppb. The scale will show values between 0 ppb and 300 ppb. The white line shows the current value. Learn how to interpret these values in the chapter "all about values: TVOC".

8. Humidity page

This page shows the humidity value in percent. The BME280 sensor is capable of measuring values between 0 % and 100 %. The white line on the scale shows the current value. Note: since the BME280 sensor is enclosed together with other parts (like the TFT screen, which will heat up over time and affect the humidity), we compensate the humidity value. See chapter 'all about values: compensation'.

9. Lightning page

This page shows the last detected lighting eventday ago. The AS3935 sensor is capable of measuring lightning up to 20km away. If lightning is detected, this page will turn up immediately while giving a short beep from the buzzer. Note: small electronic discharges might influence the sensor. If the disturbance keeps happening, please move the EarthListener to another location.

10.Logging

If you have inserted an SD card into the EarthListener slot (right next to the USB connection),

then the values per second of the connected sensors will be logged into a CSV file called “DATALOG.CSV”.

This file can be opened with Microsoft Excel and will resemble the screenshot above.

Note: Since the EarthListener doesn’t have a real time clock present, the logging will use the number of seconds, starting from boot. This will be logged in Days, hours, minutes and seconds. If the current time is required, please add a VMA301 DS1302 REAL-TIME CLOCK MODULE / WITH BATTERY CR2032 (2 pcs) module to the EarthListener.

11. Coding.

The EarthListener is pre-programmed with all functionalities as described in the previous chapters. However, if you want to make sure you have the latest version, please visit our Github page on https://github.com/Velleman/VM211_Firmware.

Download the latest version onto your computer and make sure to import the libraries into your Arduino library folder first. Next, open the main program into the Arduino software and upload it onto the Arduino Mega. Do not forget to specify the right board, processor and port first:

After programming the EarthListener, while connected to your computer via USB, you can use the Serial Monitor to get feedback from the EarthListener. If an SD card is inserted, the measured values will be shown each second.

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