AtlasScientific
Biology • Technology

ENV-RGB

V 1.6

All Weather (NEMA-6P) True RGB Color Detector And light intensity Probe

Features
- R,G,B and light intensity sensor
- R,G,B data is in true 8-bit RGB format from 0-255
- light intensity is output in lux (lx)
- lx given for R ,G and B as well as full spectrum lx
- RGB color data and lx can be output simultaneously
- lx range from 0- 3,235 lux
- Light saturation indicator if lx is over 3,235
- Three different output modes:
- RGB only
- Lx only
- RGB and lx
- Data output is a single comma separated string
- Simple asynchronous serial connectivity **(voltage swing 0-VCC)**
- Harsh environment ready
- Water proof
- Dust proof
- Ice/sleet tolerant
- Non reactive to salt water
- Probe will sink when submerged
- NEMA 6P
- IP 68
- Wide operating temperature range: -40 Celsius to +85 Celsius
- Simple instruction set consisting of only 5 commands
- Reading time: 1200ms
- Wide operating voltage range: 3.1V to 5.5V
- Shock resistant to 16 mega Pascals (2,339 pounds per square inch)
- Dimensions 12mm X 35mm (1/2" X 1.4")

4.15 mA at 3.3V in active mode
2.95 mA at 3.3V in quiescent mode

4.3 mA at 5V in active mode
2.95 mA at 5V in quiescent mode

Summary

The Atlas Scientific ENV-RGB Color Detector Probe is a rugged all weather color detector specifically designed for environmental monitoring applications. The ENV-RGB probe exceeds NEMA 6P and IP 68 standards for device enclosures - submersible, water tight, dust tight & Ice/Sleet Resistant - Indoors/Outdoors- . The probe can be submerged in both fresh and salt water for an indefinite amount of time and withstand temperatures of -40 Celsius to +85 Celsius.

Description

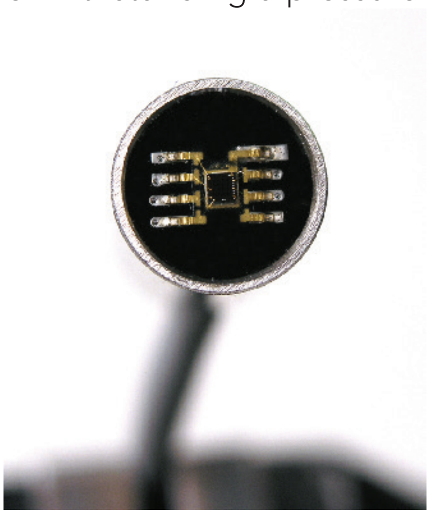
The Atlas Scientific ENV-RGB's sensing capabilities are based off a color light to frequency converter. A significant amount of processing is done to convert the frequency into meaningful data. The Atlas Scientific ENV-RGB's strongest capabilities are found in its ability to read total lux and the lux of each color individually (R,G,B). This is followed by its ability to detect red, green and blue light and convert that light into R,G,B color data. The highest sensitivity for R,G,B is found at 640nm, 524nm and 470nm wave lengths, respectively. The RGB data that is output is in true 8-bit RGB format where each color has a value from 0-255.

It is important for the embedded system engineer to fully understand that a light source of at least 70lux should be detected by the ENV-RGB for the device to discern the color of that light. Because light sources vary greatly in there spectra it will be necessary for the embedded system engineer to further process the RGB data to accurately read intermediary colors such as yellow.

Contents

Physical properties

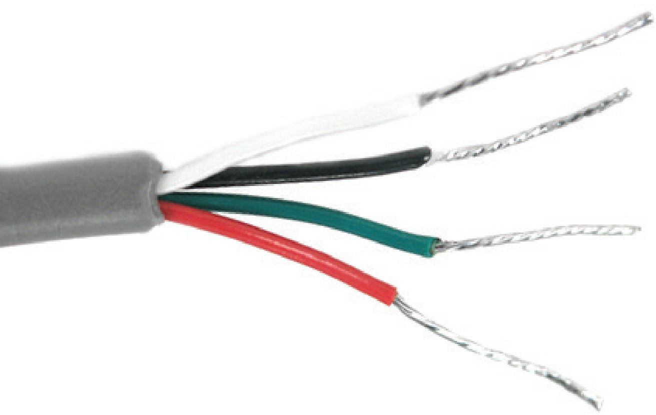
The probe consists of a 33mm long (1.3 inch), 316 grade molybdenum bearing stainless steel tube. With a diameter of 13 mm (0.5 inches); the stainless steel tube is capable of withstanding a pressure of 16 mega Pascals (2,339 pounds per square inch).



The front of the ENV-RGB probe is made up of a clear epoxy matrix that is highly resistant to yellowing. The small spectral loss is caused by the clear epoxy matrix is compensate for by the probes internal computer system.

The back end of the probe (where the wire exists from) is made of a high viscosity moderate porosity epoxy. This moderate porosity epoxy is further encased in a low viscosity no porosity black epoxy. This allows for high temperature and pressure resistance, as well as providing for 100% water impermeability. The black epoxy also stops light from entering the back probe and reaching the color detector unit; insuring that the light detected by the probe is only coming from the sensing end of the probe.

The 1 meter gray cable is a shielded 4 conductor cable with a 4.67 mm diameter. Each conductor is a 24 AWG stranded copper conductor which terminates to 4 tinned conductors; **Black** | **Red** | **White** | **Green**. Where **Black** is GND, **Red** is VCC, **White** is RX and **Green** is TX.



Cable data table

Parameter	**SI (International System of Units)**	**Imperial system**
Cable length	1 meter	39.37 inches
Cable diameter	4.67 mm	0.16 inches
Maximum Pulling Tension	97.86 Newtons	22 pounds force
Insulation wall thickness	0.254 mm	0.01 inches
Insulation wall material	PVC - Polyvinyl Chloride	N/A
Conductors X3	24 AWG	N/A

Probe enclosure table

Parameter	**SI (International System of Units)**	**Imperial system**
Enclosure length	33mm	1.3 inches
Enclosure diameter	6.35 mm	0.25 inches
Enclosure burst pressure	16,126,837 pascals	2,339 psi

Pin Out

Black **GND**
Red **Vcc** (3.1V to 5.5V)
White **RX**
Green **TX**

TX TX output delivers asynchronous serial data in TTL RS232 format, except voltages are 0-Vcc. The output is (up to 38) ASCII characters always terminating with a carriage return (ASCII 13).

The baud rate is: 38400, 8 bits, no parity, with one stop bit.
The voltage swing 0-VCC, not +/- 12 volts

If standard voltage level RS232 is desired, connect an RS232 converter such as a MAX232.

Device operation

When the ENV-RGB sensor is properly connected and powered for the first time, it will enter continuous mode.

Command list quick reference

R	Take a single color reading
C	Take continues color readings every 1200 milliseconds
E	End continues readings, enter standby/quiescent mode
I	Information: Type of device • firmware version • firmware creation date
M[1-3]	Set mode 1,2 or 3 (RGB only, lx only, RGB and lx simultaneously)

Command Definitions

R Instructs the ENV-RGB sensor to return a single reading.
(The M[1-3] instructions dictates the output. Default is M0- RGB only.
M0 will be assumed to be the output in this example.)

*This instruction takes 1200 milliseconds to complete

Full proper syntax: **r<cr> or R<CR>**

The ENV-RGB will respond:

rrr,ggg,bbb <CR>

Where rrr is the RGB representation of red light from 0-255
Where ggg is the RGB representation of green light from 0-255
Where bbb is the RGB representation of blue light from 0-255

C Instructs the ENV-RGB sensor to return a continues stream
of color reading every 1200 milliseconds.

Full proper syntax: **c<cr> or C<CR>**

The ENV-RGB will respond:

rrr,ggg,bbb <CR> (1200 ms)
rrr,ggg,bbb <CR> (2400 ms)
rrr,ggg,bbb <CR> (3600 ms)

Where rrr is the RGB representation of red light from 0-255
Where ggg is the RGB representation of green light from 0-255
Where bbb is the RGB representation of blue light from 0-255

E This instructs the ENV-RGB to end continuous mode and enter its' standby/quiescent mode.

Delivering the "E" (END) instruction when not in continuous mode will have no effect on the ENV-RGB.

Full proper syntax: **e<CR> or E<CR>**

The ENV-RGB will respond by ceasing data transmission.
There is no ASCII response to this instruction.

I This instructs the ENV-RGB to transmit it version number

A comma separated string will be transmitted that will contain 3 values.

1. The type of device:	"C" (for Color)
2. The firmware version number:	"V1.5"
3. The firmware version date:	"4/12" (April /2012)

Full proper syntax: **i<cr> or I<CR>**

The ENV-RGB will respond: **C,V1.0,1/12<CR>**

M[1-3] Instructs the ENV-RGB to change its output mode.
All changes to the output mode are stored in EEPROM

M1- This is the default state: The output is R,G,B<CR>

M2- The output in M2 mode lx only:
This output is a 5 value string, consisting of an lx value for RGB and value for the total lx. A final value is used to indicate if the ENV-RGB is detecting radiation from beyond the visible spectrum (IR or UV).

174,48,99,325,4

4 extra lx has been detected however it is not in the visible color spectrum

325 is the total lx

M3- the output in M3 mode is R,G,B,lxr,lxg,lxb,lxtotal,lxbeyond.
This string can be quite long, consisting of up to 36 ASCII characters.

Full proper syntax: m1<cr> or M1<CR>
or
Full proper syntax: m2<cr> or M2<CR>
or
Full proper syntax: m2<cr> or M2<CR>

The ENV-RGB will respond: RGB<CR> or lx<CR> or RGB+lx<CR>

Light saturation

The * is added to the output string regardless of the mode the ENV-RGB is in when the light intensity is above the saturation point (3,235 lx). Any reading in which a * is appended to the output string should be considered inaccurate due to light saturation. During saturation the ENV-RGB is no longer able to discern where the light is coming from because the energy is so intense that the RGB readings start to bleed into one another. Saturation will **not damage** the ENV-RGB, however the output should be considered inaccurate.

Output example (M1):

255,255,255,*<CR>

Warranty

Atlas Scientific warranty's the ENV-RGB Sensor to be free of defect during the debugging phase of device implementation, or 30 days after receiving the ENV-RGB Sensor (which ever comes first).

The debugging phase

The debugging phase is defined by Atlas Scientific as the time period when the ENV-RGB Sensor is inserted into a bread board or shield and is connected to a microcontroller according to this wiring diagram. Reference this wiring diagram for a connection to USB debugging device, or if a shield is being used, when it is connected to its carrier board.

If the ENV-RGB Sensor is being debugged in a bread board, the bread board must be devoid of other components. If the ENV-RGB Sensor is being connected to a microcontroller, the microcontroller must be running code that has been designed to drive the ENV-RGB Sensor exclusively and output the ENV-RGB Sensor's data as a serial string.

It is important for the embedded systems engineer to keep in mind that the following activities will void the ENV-RGB Sensor's warranty:

- **Soldering any part of the ENV-RGB Sensor**
- **Running any code that does not exclusively drive the ENV-RGB Sensor and output its data in a serial string**
- **Embedding the ENV-RGB Sensor into a custom made device**
- **Removing any potting compound**

Reasoning behind this warranty

Because Atlas Scientific does not sell consumer electronics; once the device has been embedded into a custom made system, Atlas Scientific cannot possibly warranty the ENV-RGB Sensor against the thousands of possible variables that may cause the ENV-RGB Sensor to no longer function properly.

Please keep this in mind:

1. **All Atlas Scientific devices have been designed to be embedded into a custom made system by you, the embedded systems engineer.**
2. **All Atlas Scientific devices have been designed to run indefinitely without failure in the field.**
3. **All Atlas Scientific devices can be soldered into place.**

*Atlas Scientific is simply stating that once the device is being used in your application, Atlas Scientific can no longer take responsibility for the ENV-RGB Sensor continued operation. This is because that would be equivalent to Atlas Scientific taking responsibility over the correct operation of your entire device.