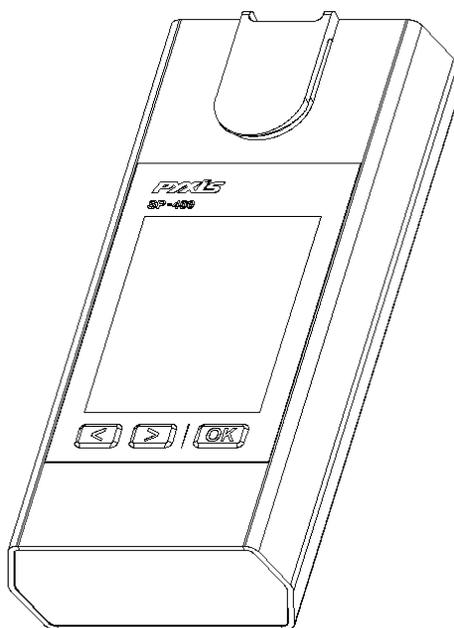


EM-400 Handheld In-vivo Chlorophyll-a Analyzer Operation Manual



Rev. 1.0

Firmware version 1.10

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Confidentiality

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Standard Limited Warranty

Pyxis Lab warrants its products for defects in materials and workmanship. Pyxis Lab will, at its option, repair or replace instrument components that prove to be defective with new or remanufactured components (i.e., equivalent to new). The warranty set forth is exclusive and no other warranty, whether written or oral, is expressed or implied.

Warranty Term

The Pyxis warranty term is thirteen (13) months ex-works. In no event shall the standard limited warranty coverage extend beyond thirteen (13) months from original shipment date.

Warranty Service

Damaged or dysfunctional instruments may be returned to Pyxis for repair or replacement. In some instances, replacement instruments may be available for short duration loan or lease.

Pyxis warrants that any labor services provided shall conform to the reasonable standards of technical competency and performance effective at the time of delivery. All service interventions are to be reviewed and authorized as correct and complete at the completion of the service by a customer representative, or designate. Pyxis warrants these services for 30 days after the authorization and will correct any qualifying deficiency in labor provided that the labor service deficiency is exactly related to the originating event. No other remedy, other than the provision of labor services, may be applicable.

Repair components (parts and materials), but not consumables, provided in the course of a repair, or purchased individually, are warranted for 90 days ex-works for materials and workmanship. In no event will the incorporation of a warranted repair component into an instrument extend the whole instrument's warranty beyond its original term.

Shipping

A Repair Authorization Number (RA) must be obtained from the Technical Support (service@pyxis-lab.com) before any product can be returned to the factory. Pyxis will pay freight charges to ship replacement or repaired products to the customer. The customer shall pay freight charges for returning products to Pyxis. Any product returned to the factory without an RA number will be returned to the customer.

1 General Description

1.1 Specification

Measurement Range	0.3-100 ppb (In-vivo Chlorophyll-a) ^[1]
Excitation Wavelength	470 nm LED
Emission Wavelength	675 nm
Wavelength Accuracy	±1 nm
Detection Limit	0.3 ppb
Accuracy	±2% or ±4.0 ppb
Battery	9V alkaline battery
Typical Battery Life	3200 readings (480mAh battery)
Display	320x240 TFT-LCD, visible under direct sunlight
Dimension	L160 W74 H33 (mm)
Weight	310g (without battery)
Temperature Range	40 to 106 °F (4 to 41 °C)
Humidity	85% at 106 °F (41 °C)
Environmental	IP67, dustproof and waterproof

[1] The detection range can be customized according to the user requirement.

1.2 Pyxis EM-400 Major Features

The Pyxis EM-400 analyzer measures the in-vivo chlorophyll-a concentration in live algae cells. Chlorophyll a is the main photosynthetic pigments of algae. Chlorophyll a measurement can be used to assess algal biomass. Main features include:

- The EM-400 is pre-calibrated with using a live algae sample. The fluorescence chlorophyll-a measurement is automatically compensated for sample color and turbidity interference.
- EM-400 can be calibrated using a water sample with known chlorophyll-a concentration or a simulated 470/675 (Ex/Em) fluorescent sample through a user-friendly menu-driven procedure.
- No sample cuvette is needed and variations associated with the cuvette is eliminated.
- Large color graphic screen that can be read in direct sunlight.

1.3 Unpacking the Instrument

Remove the instrument and accessories from the shipping container and inspect each item for any damage that may have occurred during shipping. Verify that all items listed on the packing slip are included. If any items are missing or damaged, please contact Pyxis Customer Service at service@pyxis-lab.com.

1.4 Standard Accessories

- Quick instruction guide
- 9V alkaline battery
- Full instrument manual is available from www.pyxis-lab.com

1.5 Optional Accessories

- Carrying case for EM-400
- 100 ppb simulated CHLOROPHYLL-A calibration standard

1.6 Light Shield Cover

The light shield cover is shown in Figure 1. It should be in the closed position during CHLOROPHYLL-A measurement.

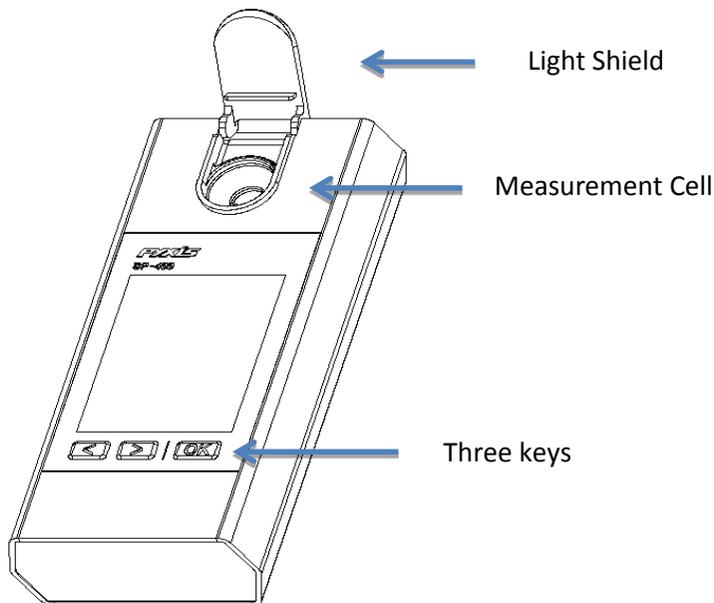


Figure 1 Light Shield in the Open Position

2 Start Pyxis EM-400

2.1 Battery Installation

The EM-400 is powered by a 9-volt alkaline battery. Do not use rechargeable nickel cadmium (NiCad) or lithium batteries. A typical 9V battery lasts for two months and enables about 3000 measurements. When the battery capacity is critically low, the EM-400 will display a LOW BATTERY warning for 5 seconds and then automatically turn off.

Replace the battery to resume operation of the EM-400 after the battery warning. The EM-400 will automatically turn on in the measurement mode after new battery installation.

The EM-400 battery compartment, shown in Figure 2, is on the back side of the instrument.

Install battery as follows:

1. Remove the battery compartment cover by loosening two screws.
2. Make sure that the smaller circular terminal (positive) of the battery is aligned with the hexagonal socket (positive) of the battery holder and the hexagonal socket (negative) of the battery with the circular terminal of the holder. Snap the battery firmly into the battery holder.
3. Replace the battery compartment cover, making sure that the sealing O-ring is lying flat on the battery holder. To prevent the EM-400 from accidentally being turned on due to vibration, please firmly tighten the two screws.

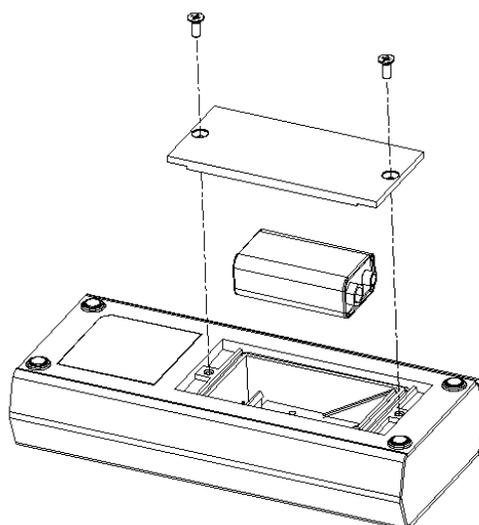


Figure 2 Install Battery

2.2 Description of the Control Keys

The EM-400 has three keys as shown in Figure 1. The left (<), right (>) and OK keys are used to launch an action indicated on the screen directly above the keys. Please note that the screen is not a tough screen. The labels above the keys indicate the function associated with the keys and can change according to the screen modes.

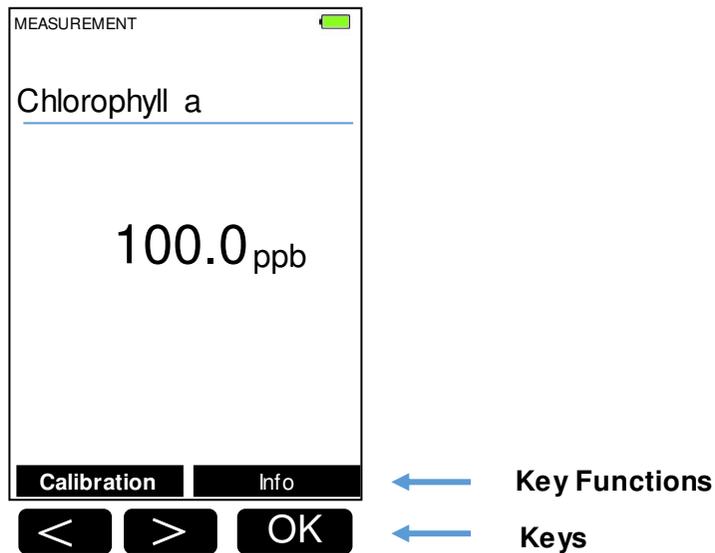


Figure 3 Keys and associated functions

2.3 Turning On/Off Pyxis EM-400

To turn on the EM-400, press OK momentarily and release.

To turn off the EM-400, press and hold the OK key. Release the OK key when the LCD display turns off (after about 3 seconds). The EM-400 will turn itself off after 60 seconds without user interaction through the keys.

3 CHLOROPHYLL-A Measurement

3.1 Measurement

When powered on, the EM-400 will be in the measurement (read) mode (see figure 3).

The water sample can be transferred to the measurement cell using a pipette or filled directly from a faucet, sample bottle, or sample valve.

The light shield should be in the closed position in order to measure CHLOROPHYLL-A. Allow 5 seconds for the EM-400 to reach stable CHLOROPHYLL-A readings. For a sample containing 100 ppb CHLOROPHYLL-A, the measured CHLOROPHYLL-A should be stabilized within the range of 98 to 102 ppb.

The EM-400 does not need to be turned off between measurements of two samples. Rinsing the measurement cell several times is recommended.

3.2 High Color and Turbidity Warning

The EM-400 has extra channels to measure sample turbidity and color to automatically compensate sample color and turbidity interference. If sample turbidity and color values determined are too high, a CHLOROPHYLL-A measurement warning will be displayed. In such a case, the user should dilute the sample for CHLOROPHYLL-A measurement.

4 Calibration

The EM-400 fluorimeter was calibrated using a laboratory cultured live algae sample. The chlorophyll-a concentration in the standard sample was determined by the standard extraction and spectrophotometry procedure. Since chlorophyll-a in different algae species has different fluorescent properties, the user must calibrate EM-400 with the real sample under investigation in order to measure an absolute (versus relative) algae concentration. The chlorophyll-a concentration in the real sample can be determined with the extraction method.

Alternatively, EM-400 can be calibrated with using a simulated standard. The standard does not contain live algae. Instead, the standard contains a fluorophore that emits a 675 nm fluorescence when it is excited by a 470 nm light. This calibration ensures that any change in fluorescent signal strength caused by drift in electronics or in optics is eliminated.

Calibration Process as follows:

1. Rinse sample cell with DI water three times. Fill the sample with DI water near full and close the light shield. In emergency, “non-chlorophyll-a” water, such as city water, may be used, but re-calibrate using DI water for the zero set step as soon as it is available.
2. Power on by a press of OK key. Allow 5-10 seconds for meter to stabilize.
3. A Screen similar to Figure 4 appears. The value will be very low if DI water is used; chlorophyll a should be near zero. A low non-zero value (e.g. 0.1 or 0.2, etc.) is not problematic.

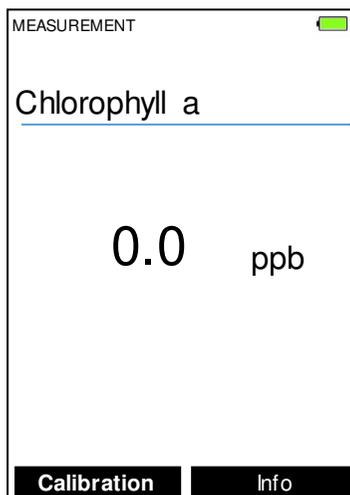


Figure 4

4. Press Calibration key (<).
5. Figure 5, the first screen of the CHLOROPHYLL-A calibration appears.



Figure 5

6. Press Zero labeled key (<) to set the zero point.
7. After successful zero set, a checkmark symbol will appear next to “Press Zero Button” to confirm success. The screen will also update to show the Slope steps, as in Figure 6. The Cycle command replaces Zero on the black bar and the possible chlorophyll a selection is displayed in red. The default is 100 ppb. If the displayed Target numeric value is not that desired, use the - and + labeled keys (< or >) to adjust the value to that desired. Ensure the value selected matches the standard actually present.



Figure 6

8. Rinse the sample cell out thoroughly (twice) with the desired chlorophyll a standard and with the measurement cell near full, close the light shield. (If the screen darkens, promptly press any key to re-set the timer for auto shutdown. The key pressed does not perform its activity, only re-sets timer. The screen then re-lights.)
9. Press the Slope labeled key (>) to set the slope of the standard desired and complete chlorophyll a calibration.
10. If calibration is successful, the message Calibration Succeed will appear, as in figure 7.



Figure 7

11. Press the Exit labeled key (OK) to return to the basic read screen. The screen will be similar to Figure 4. Slight variance in the chlorophyll a value is not problematic. If Exit is done before the second checkmark appears, the calibration will not be completed and must be re-done. After a successful calibration, the unit does not automatically return to the read (Measurement) mode. If Exit is held down too long the unit will power down rather than returning to the read mode.

5 Device Information and Diagnosis

The device information is shown when the Info labeled OK key in the measurement mode is pressed momentarily (Figure 3). The screen contains the device serial number, software version, and hardware version (Figure 8). The battery life as a percentage and the standard that were used in the last calibration are also shown.

Press the diagnosis labeled key to switch to the diagnosis screen where raw measurement data are displayed (Figure 9). The information has no use for normal operation. Please provide an image of both the device information screen and the diagnosis screen when you contact Pyxis (service@pyxis-lab.com) for troubleshooting your device.

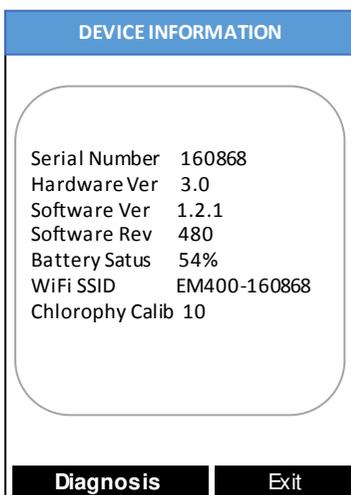


Figure 8

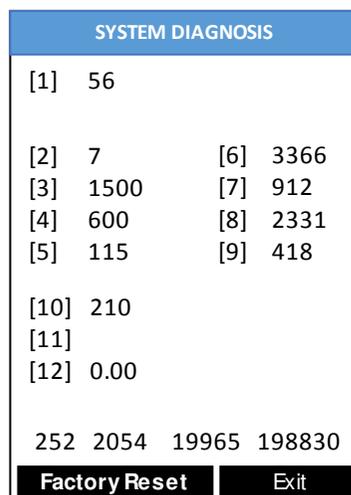


Figure 9

6 Wireless Connection

The Pyxis EM-400 can be connected to a smart phone or a computer via WIFI or Bluetooth for upgrading the device software. The EM-400 can be wirelessly paired with other Pyxis devices for exchanging data. In the normal operation modes, the wireless function is turned off. If you want to explore the EM-400 wireless functions, please contact Pyxis Lab Inc. (service@pyxis-lab.com)