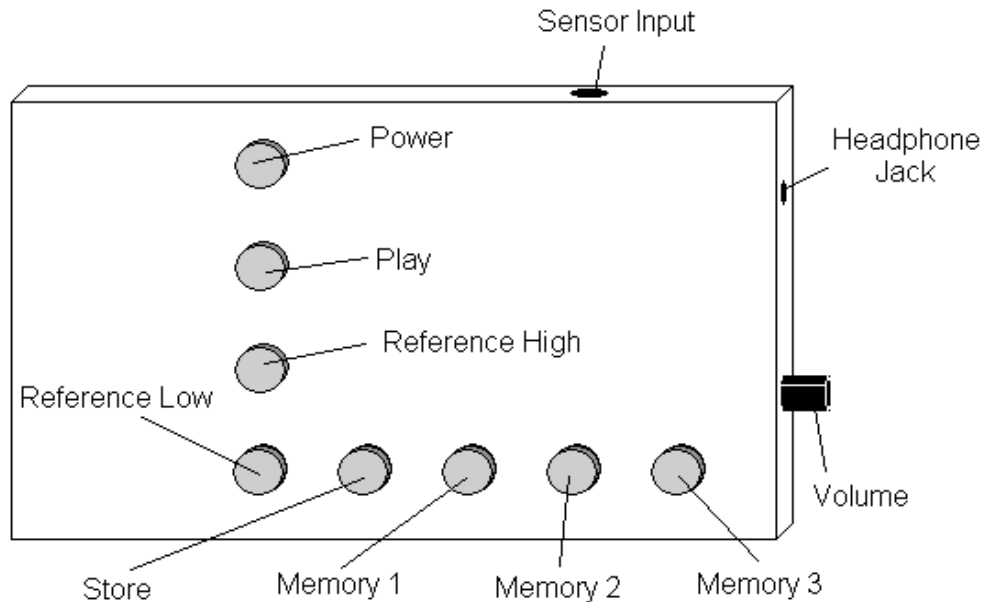


Submersible Audible Light Sensor User's Manual

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The Submersible Audible Light Sensor (SALS) detects light levels and produces an audio tone with a pitch corresponding to the intensity of the light. It includes a number of functions for storing tones in memory for comparison and for supplying the operator with the numerical value of the pitch using Morse code. If the user wishes to know the exact frequency of the tone, in Hertz, the SALS can produce this value, on command, using the Morse code interface.



Power

The power button turns the unit on or off. If the unit is off, pressing the power button will cause it to power on and announce "OK" (dah-dah-dah pause dah-dit-dah) in Morse code. If the unit is turned on when the power button is pressed, it will announce "PWR" (dit-dah-dah-dit pause dit-dah-dah pause dit-dah-dit) in Morse code and then turn off. To save batteries, the unit will automatically shut down if no buttons are pressed for 7 minutes. If such a time out has occurred, the unit will send "TIME" (dah pause dit-dit pause dah-dah pause dit) in Morse code before shutting itself off.

Playing a Tone

To play a tone corresponding to light intensity detected, insert the jack from the light sensor into the sensor input on the control box and press the "Play" button. The tone will be played as long as the button is held down. Pressing the "Reference High" button while holding "Play" will cause the tone to be played continuously even if "Play" is released. This feature was added so that it is not necessary to hold the "Play" button for long experiments. Pushing "Reference High" again stops the tone.

To use with a solution, place the tip of the sensor (encapsulated in its glass tube) into the solution. NOTE: Do not at any time allow the sensor or control box to come in direct contact with liquids. The SALS can now produce a real time reading of the light and is capable of providing the user with the numerical value of the frequency of the pitch (e.g. 440 Hz) in Morse code. To produce the Morse code of the tone, simply press the "Reference Low" button while holding "Play".

Reference Tones

The SALS can output its lowest possible tone and highest possible tone for use as references. Pressing the "Reference High" button outputs the highest tone and pressing the "Reference Low" button outputs the lowest tone. Holding "Reference High" and pressing "Reference Low" will output the frequency of the reference high tone in Morse code. Holding "Reference Low" and pressing "Reference High" will output the frequency of the reference low tone in Morse code.

Memory

Up to 7 tones may be held in the SALS memory for comparison purposes. To store a tone in memory, press the "Store" button, release the "Store" button, and then press the memory keys specifying the desired memory location. Note that it is not necessary to hold the "Play" button during memory capture and store. When storing data, The SALS simply reads the sensor input in the same manner as the "Play" button.

If the user presses the "Store" button without specifying a memory location in a few seconds, the SALS will output the letter "M" (dah-dah) in Morse code. This indicates a memory timeout error. If the memory keys are pressed in such a way that it is not clear which memory location is intended, the SALS will output the letter "R" (dit-dah-dit) to let the user know that the store attempt has been rejected. If the memory storage was successful, the SALS will produce the proper pitch after storing the value in memory.

Memory locations are specified as follows:

Location 1 - Press Memory 1

Location 2 - Press Memory 2

Location 3 - Press Memory 3

Location 4 - Press Memory 1 and Memory 2 simultaneously

Location 5 - Press Memory 1 and Memory 3 simultaneously

Location 6 - Press Memory 2 and Memory 3 simultaneously

Location 7 - Press Memory 1, Memory 2, and Memory 3 simultaneously

To play a tone stored in memory, press the memory buttons that specify the memory location where the tone is stored.

Dual Tone Mode

Dual tone mode causes the SALS to produce two alternating tones. This provides a very simple way to compare a stored tone with the current reading. The two tones must be a stored tone and the current tone. It is not possible to compare two stored tones with each other. If there is not a tone stored in the specified memory location, only the current tone will be played.

To turn dual tone mode on, hold "Play" and push "Power". The SALS will send a "D" (dah-dit-dit) to indicate dual tone mode in Morse code and switch to dual tone mode. To switch back to single tone mode, hold "Play" and press "Power" again. The SALS will revert to single tone mode and will produce an "S" (dit-dit-dit) for single tone mode.

As long as the dual tone mode is active, retrieving a tone stored in memory will produce two alternating tones. A power on sequence will cause the SALS to revert to single tone mode.

Conductivity Mode

The SALS sensor may also be used as electrical conductivity meter instead of a light detector. All of the functions specified by the control box are identical in either case. To use the SALS to detect conductivity, insert the conductivity sensor in the sensor input jack. Note that the reported conductivity will vary as a function of both the conductivity of the solution and the degree to which the sensor is submerged. Therefore, in order to eliminate an unwanted variable when measuring conductivity, users should keep the degree to which the conductivity sensor is submerged constant.

Table of Morse Code used in the SALS

D = -..
E = .
K = -.-
I = ..
M = --
O = ---
P = .--.
R = .-.
S = ...
T = -
W = .--
0 = -----
1 = .---
2 = ..---
3 = ...--
4 =-
5 =
6 = -....
7 = ---...
8 = ----..
9 = -----.