



CTFC



Descriptive report

DESCRIPTIVE REPORT

The LOGCAVE CTFC recorder is a low-power and long-range device that allows us to record light, temperature, humidity and comfort temperature data, with a timestamp, initially designed for the detection of human presence in caves, although its uses can be diverse in all those fields where a record of light variations within a configurable range is required

Key features. -

- ✓ Record data on microSD memory card and access it directly via Bluetooth with a mobile app. Quick query of events caused by exceeding the preset threshold, recorded in the LUXFILE file. .CSV
- ✓ On-site configurable upper and lower light detection thresholds in a range of 600M:1, starting at 188 uLux
- ✓ Periodic records of temperature, humidity, comfort temperature and battery voltage, at configurable time intervals, LOGFILE file. .CSV
- ✓ File Error Log (ERRFILE. CSV) and visual code warning
- ✓ Powered by interchangeable Lipo rechargeable batteries. Periodic recording of your voltage in the LOGFILE. .CSV
- ✓ Low-cost device (\$50 in components, year 2021)

Product specifications. –

- ✓ Power consumption
 - 2 mW in sleep mode
 - 50 mW in active mode
- ✓ Battery life
 - Up to one year, depending on triggers and number of batteries
- ✓ Batteries
 - 1 to 4, 18650 Rechargeable Lipo batteries, 2500 mA/ut
- ✓ Enclosure
 - 115*90*55 cms, with “ears” for easier mounting
 - IP65

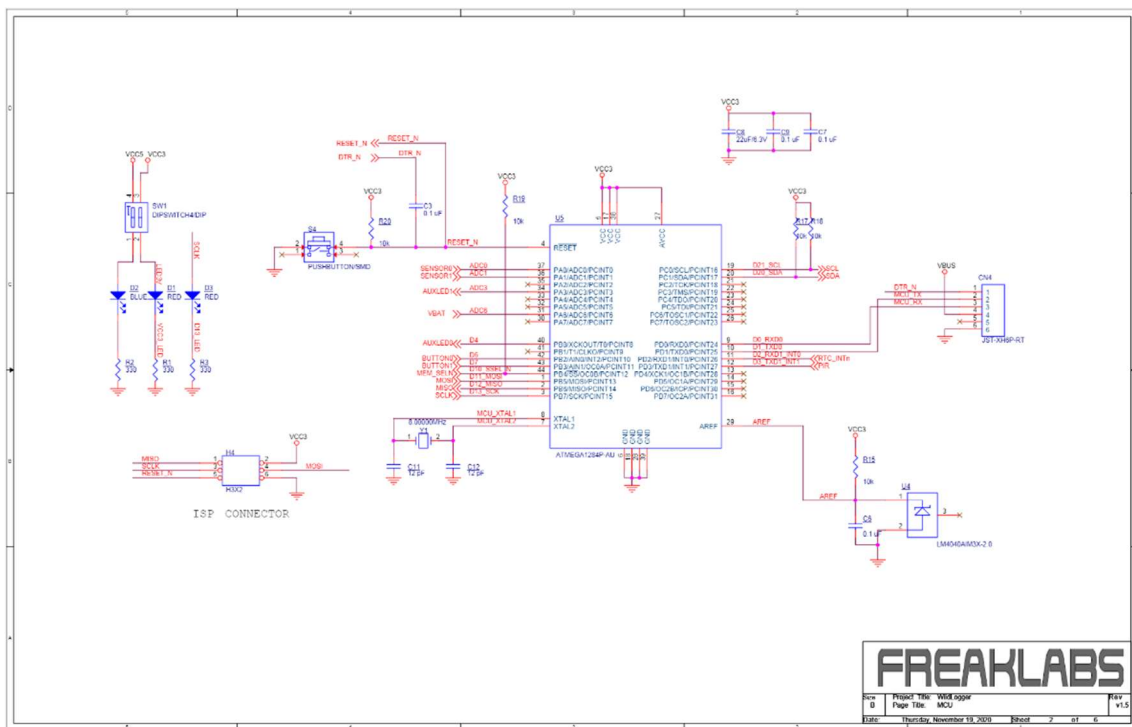
Operation. -

Hardware. –

The list of elements that compose it is,

- Wildlogger Open Source Data Logger Board with AT MCUMega 1284P, https://freaklabsstore.com/index.php?main_page=product_info&cPath=42&products_id=230
- Ambient light sensor TSL2591, <https://ams.com/tsl25911#tab/description>
- Temperature & Humidity Sensor, <https://pdf1.alldatasheet.com/datasheet-pdf/view/1132459/ETC2/DHT22.html>
- HM-10 Low Energy BLE Module, https://acoptex.com/uploads/bluetooth40_en.pdf
- Lipo 18650 4-battery battery holder with protective charge-discharge circuit

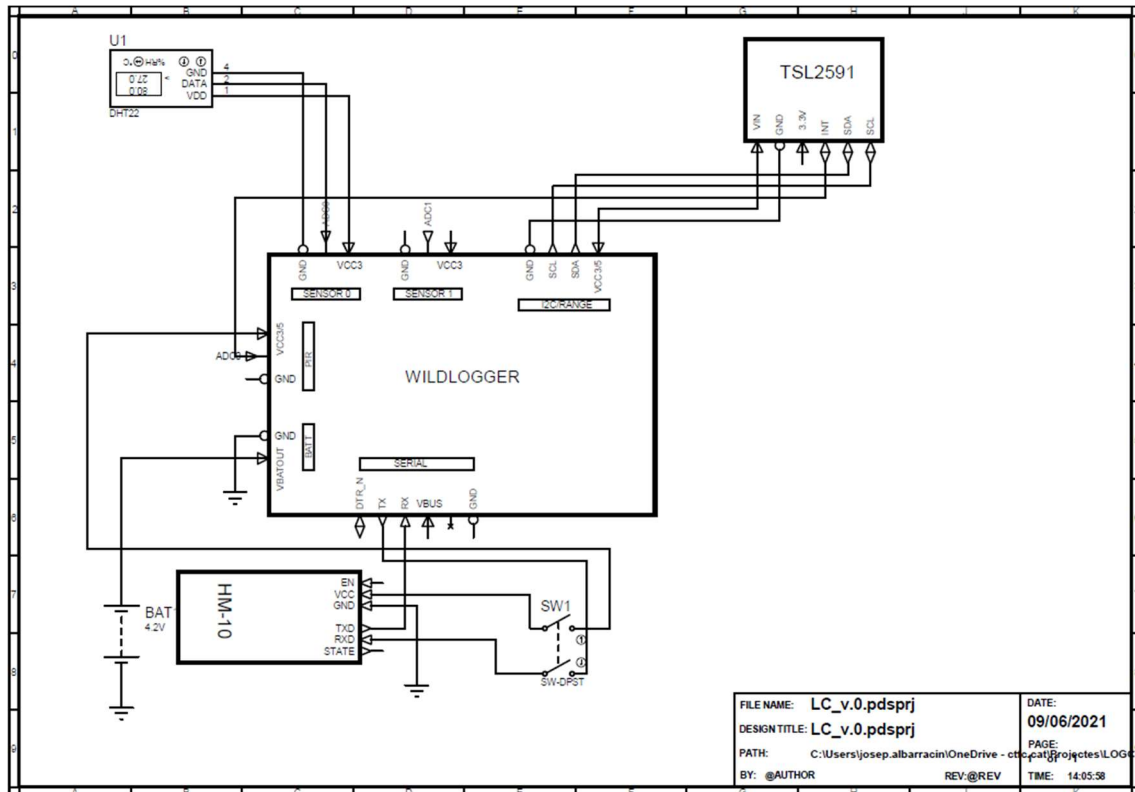
We use the WILDLOGGER data logger, an open-source data logger on the market, and aimed at wildlife conservationists. This board, based on the ATmega 1284P, has 2 digital/analog inputs, 1 digital input, built-in RTC, serial and I2C port communications, and microSD card



The sensors used are,

- TSL 2591 Digital Ambient Light Sensor (ALS), among others, with the following features required for this device,
 - High sensitivity, from 188 uLux. Essential for detecting subtle changes in luminance inside caves
 - I2C Communication
 - Configurable top and bottom trigger thresholds
 - Programmable interrupt function according to upper and lower threshold overflow

- DHT22 Digital Temperature and Humidity Sensor, with the following features,
 - Operation Range: Temperature -40~+80°C; Humidity 0~100%RH
 - Accuracy: Temperature +/- 0.5°C; H +/-2%RH

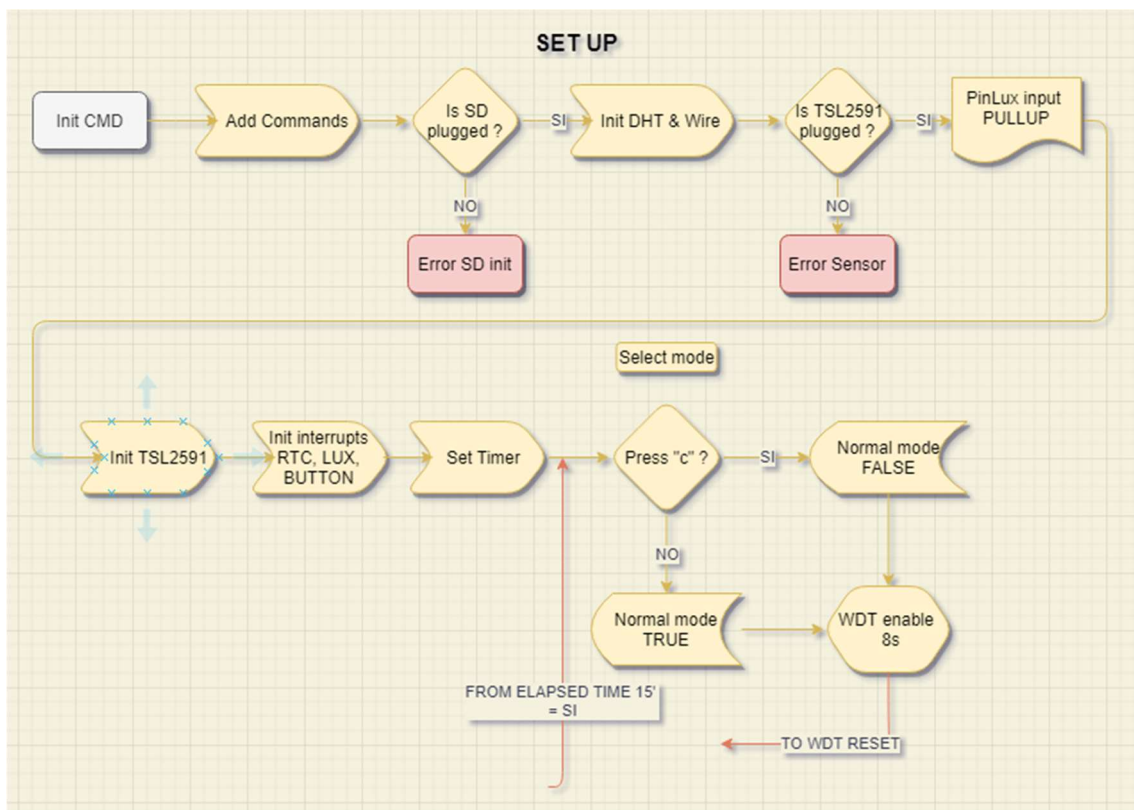


Software. -

Libraries used:

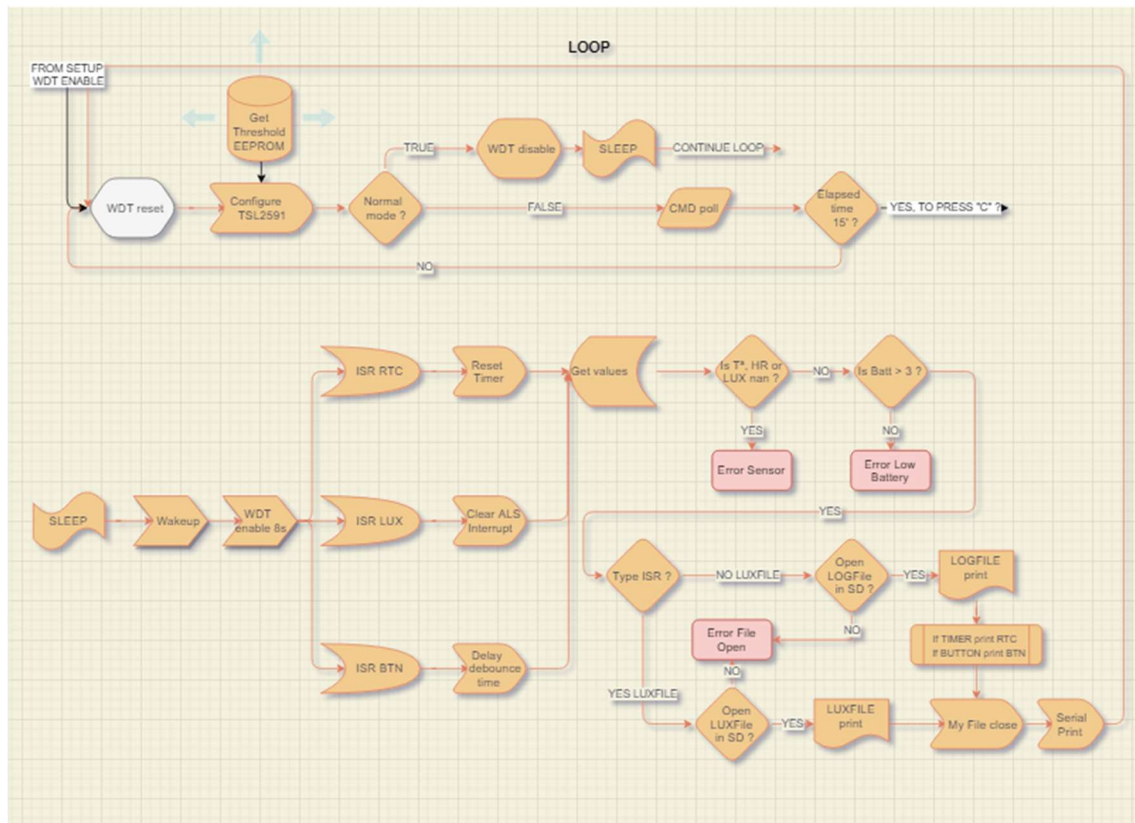
- Arduino, from Arduino Team
- DHT, from Adafruit Industries
- Rtc_Pcf8563, by Joe Robertson
- SdFat, by Bill Greiman
- Wire, by Nicholas Zambetti
- TSL2591I2C by Gregor Cristandl
- cmdArduino, from Freaklabs
- EEPROM, by David A. Mellis
- LowPower, de LowPowerLab
- Wdt, by Eric B. Weddington
- Limits, de Free Software Foundation

The normal mode of the program is to remain in a deep sleep (DEEP_SLEEP), to maintain a minimum consumption, waking up only in the event of an interruption, either by a time flag, or by an overflow of the preset threshold of light, or by the pressing of a button



The program initially loads the necessary commands to communicate with the MCU into the SETUP, and then performs a routine to start the sensors and SD card, generating error messages in the case of erroneous readings, connection failures or absence of SD. After these initial routines, interrupts are initiated, the timer, and the option is given for a predetermined time (5 s), to delay the "SLEEP" mode by entering the letter "c" through the serial port. This option allows us to maintain this communications port for the time necessary (15 min) to perform the initial calibration, or the subsequent reading of the stored data. After this time and once in sleep mode, the serial port will be closed and it will only be possible to reopen it by rebooting the system

The Watch Dog Timer (WDT) is set to 8s, and will allow us to restart the system automatically in the event that the loop cannot be completed after that time, due to a failure in the system, and thus avoid unwanted hangings



Next, we enter the loop. First we restart the WDT and then configure the parameters of the TSL2591, loading the upper overflow threshold, which we have previously configured in the memory position of the EEPROM

The program checks whether the normal mode is false or true, entering sleep mode in the second case, or entering standby command mode in the first case

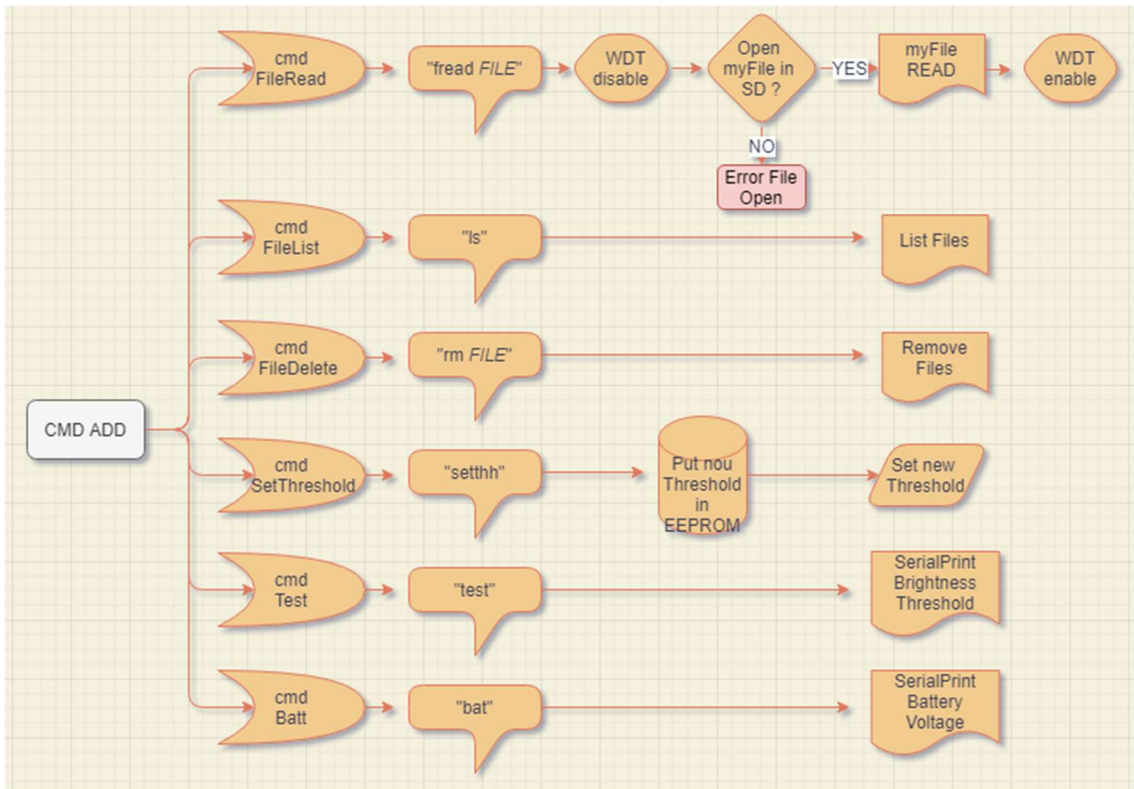
In standby command mode, as we have already mentioned, the serial port remains open and through a series of commands we will be able to perform, among other things, the initial calibration, or the reading of recorded data, later.

Communication via serial port

A fundamental feature of this device is the possibility of being able to calibrate the maximum overflow threshold of the light sensor, according to the specific conditions of the place where it will be placed, and at the time it is carried out, in the most comfortable way possible

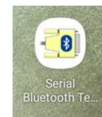
An on-site calibration process is planned for this purpose, by entering Bluetooth commands via the serial port. The commands used are as follows,

- "ls": list the existing files on the SD
- "RM": Delete file
- "fread": read file
- "test": Illumination reading and current upper threshold
- setthh: Upper threshold setting (Max 0.02 – Min 0.00002)
- "bat": Battery Current Voltage



As you can see, through the serial port, you can also access the reading of the files created to be able to quickly check the result of your follow-up

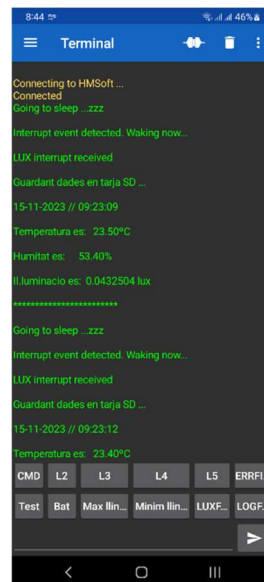
The application used for this communication will be the "Serial Bluetooth Terminal" which also allows us to configure the command buttons to facilitate the process.



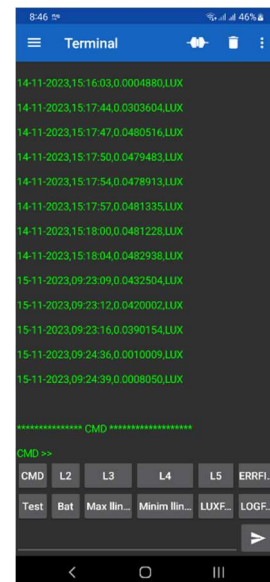
Calibration mode window



Battery & Test window



Reading window



Reading LUXFILE



Error messages

Electronic devices that have to work outdoors, exposed to adverse weather conditions and for prolonged periods of time without supervision, are exposed to the possibility of various types of failures. It is for this reason that we considered it interesting to introduce error detection routines that would visually notify the type of error, as well as record it in a specific file, ERRFILE. CSV, the type of error that occurred, and the time it occurred

The errors contemplated and their visual identification are as follows:

- 2 LED flash: SD Start Failed
- 3 LED flash: Low battery error (< 3V)
- 4 LED flash: Error Opening SD File
- 5 LED flash: Sensor error

