

# DataLogger

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## Abstract

You can use DataLogger to read the digital value of a physical quantity at regular intervals. Data is stored in EEPROM and can be accessed for further processing. You will find the detailed description of the DataLogger in this document.

## 1 Introduction

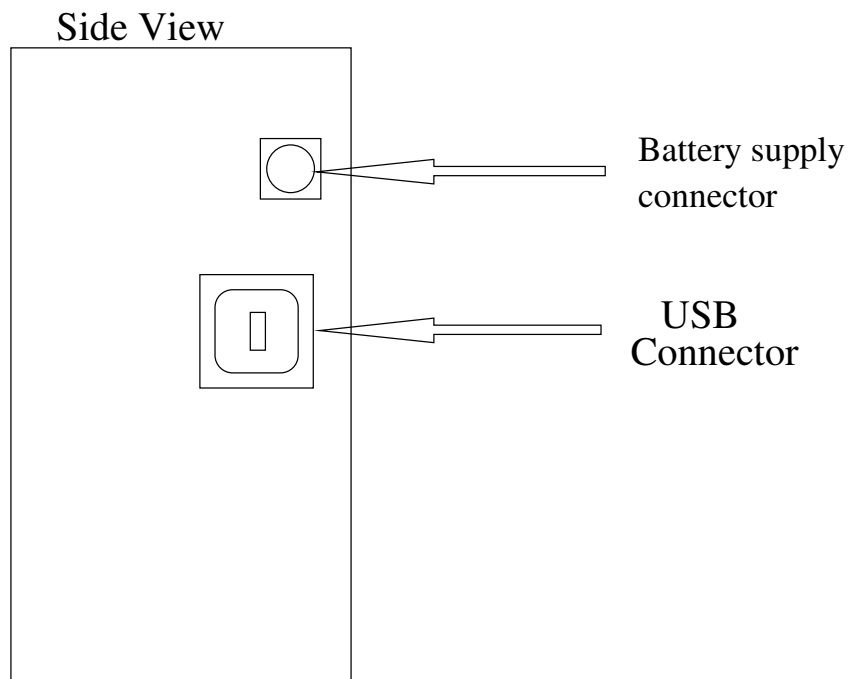
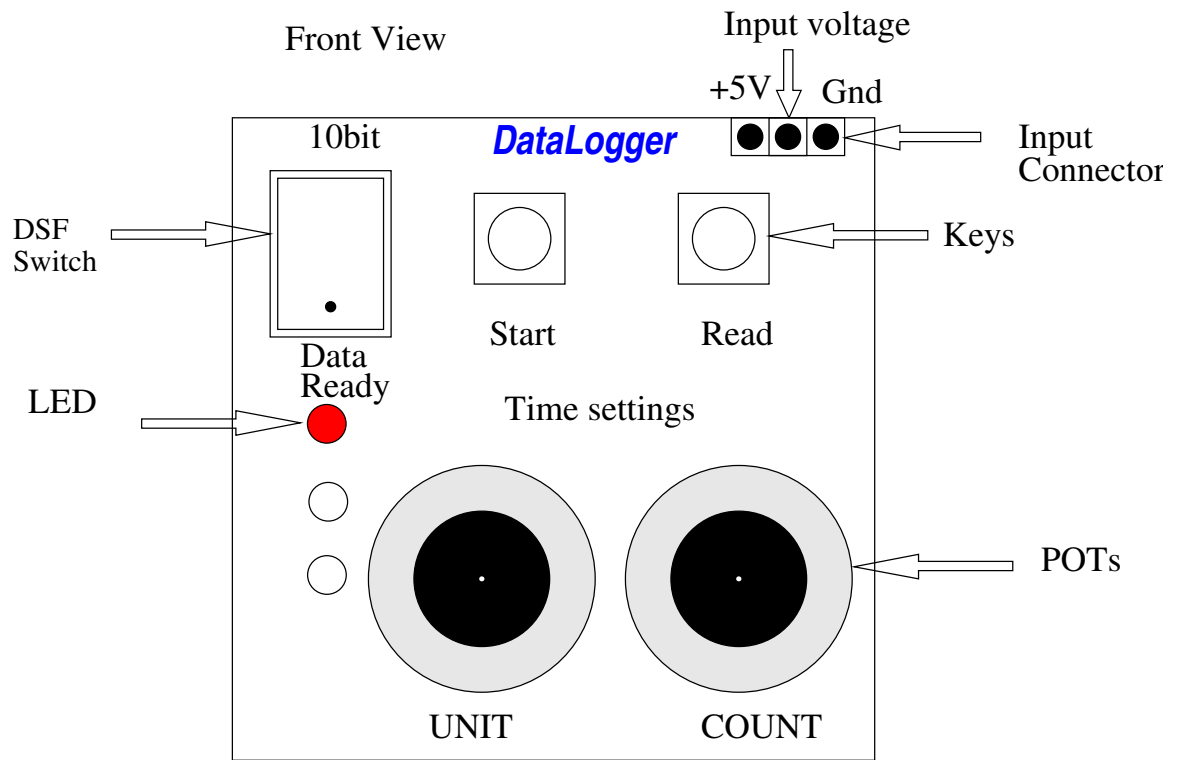
Datalogger is developed at Techno e School, Talegaon. DataLogger reads an analog input pin and stores the digital equivalent value in EEPROM. After a fixed time interval it will repeat the procedure. When a switch is pressed, it will send the stored data to computer through usb cable.

It was designed to take the readings of a moisture sensor after every 90 seconds. Any transducer producing 0 to 5v at its output can be used with the data logger. User can choose time interval between two successive readings.

## 2 Features

The main features of DataLogger are :

- Data storage format selection Switch : OFF=> 8bit and ON=>10 bit
- Two potentiometers for setting time delay within the range 250us to 9hrs.
- 1024 values for 8 bit storage and 512 values for 10 bit storage in EEPROM.
- Amplifier with variable gain for the transducer.
- START key and READ key
- Data ready indication LED
- USB connectivity



## 2.1 Data Storage Format selection Switch (DSF switch)

DataLogger offers two types of data storage formats. You can choose the data format using a switch (DSF) on the front panel.

1. 8-bit storage
2. 10-bit storage

### 2.1.1 8-bit storage

If DSF Switch is OFF, AVR converts the data from 10 bit to 8 bit. Due to 8 bit storage format, it takes 1024 readings since AVR controller has on-chip 1K EEPROM.

### 2.1.2 10-bit storage

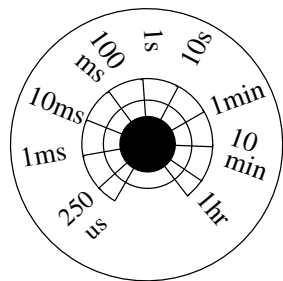
If DSF Switch is ON, AVR will store the data as it is. 10-bit data selection leads to only 512 readings since 10-bit will take 2 bytes to store a single 10-bit value. Whereas 10-bit data storage gives more accurate value than 8-bit storage.

## 2.2 Two potentiometers for setting time delay

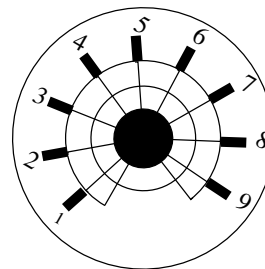
DataLogger allows users to decide the delay time between two readings. The lowest value of delay time is 250us and the highest value is 9hrs. For setting the delay time, two variable potentiometers are provided on the front panel of the DataLogger.

- Time Unit potentiometer
- Time Count potentiometer

### Time Settings



Time Unit



Time Count

### 2.2.1 Time Unit potentiometer

First potentiometer is for setting the time unit. For example, if you want to set the delay time in us, the pointer of the Time Unit potentiometer should point to 250us. This potentiometer has following Time Units

- 250 micro seconds
- 1 millisecond
- 10 milliseconds
- 100 milliseconds
- 1 second
- 10 seconds
- 1 minute
- 10 minutes
- 1 hour

### 2.2.2 Time Count potentiometer

This variable potentiometer allows you to select the time count. The count varies from 1 to 9 values. User can set the desired delay time using combinations of these two potentiometers. For example, if user wants to set the delay of 750 microseconds, the pointer of the Time Unit should point to 250 us and the pointer of the Time Count potentiometer should point to the value 3<sup>1</sup>.

## 2.3 1024 values for 8 bit storage and 512 values for 10 bit storage

AVR ATmega328 is used in DataLogger. ATmega328 has EEPROM memory of 1Kb<sup>2</sup>. If user is selecting 8 bit data storage mode, DataLogger can store upto 1024 values. Whereas in 10 bit data storage mode, it can store 512 values only.

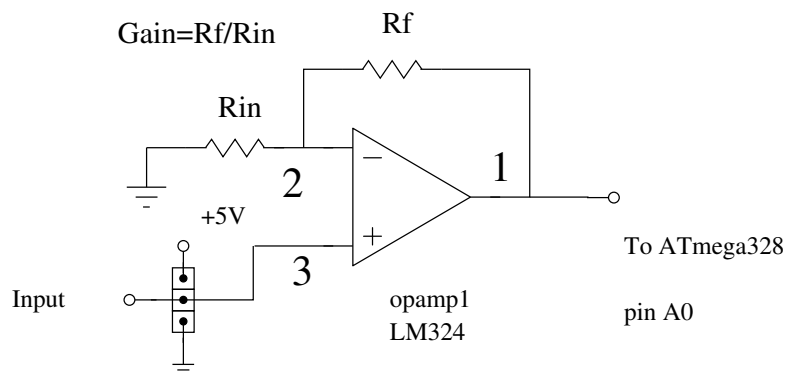
## 2.4 Amplifier with variable gain for the transducer.

The output of the transducer is applied to the amplifier with variable gain and then it is given to the analog input pin of AVR ATmega328.

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<sup>1</sup>since  $250 \times 3 = 750$

<sup>2</sup>1Kb=1024bytes



User has to do some calculations before applying the input to the opamp. The voltage at the analog pin of the AVR should not exceed the value 5.5V. Otherwise, the analog pin would damage. Design a input circuit in such a way that the output of the opamp should not exceed the value 5.5V<sup>3</sup>.

## 2.5 START key and READ key

If the input is given and the delay time is set, user can start taking the samples by pressing START key. If START key is pressed, controller starts taking the readings and after finishing the process it turns the red led ON. User can read the EEPROM data on serial line by pressing READ key. Before pressing READ key the DataLogger must be connected to your computer using USB cable.

## 2.6 Data ready indication LED

If the data is collected in the EEPROM memory, the controller will turn ON the RED LED. This indicates that the data is ready to share with computer or any other device.

## 2.7 USB connectivity

If READ key is pressed by the user, the data is read and transfer in CSV format<sup>4</sup> to the computer. User can use the USB cable to connect the DataLogger to Computer. There is USB connector provided on the board of the DataLogger.

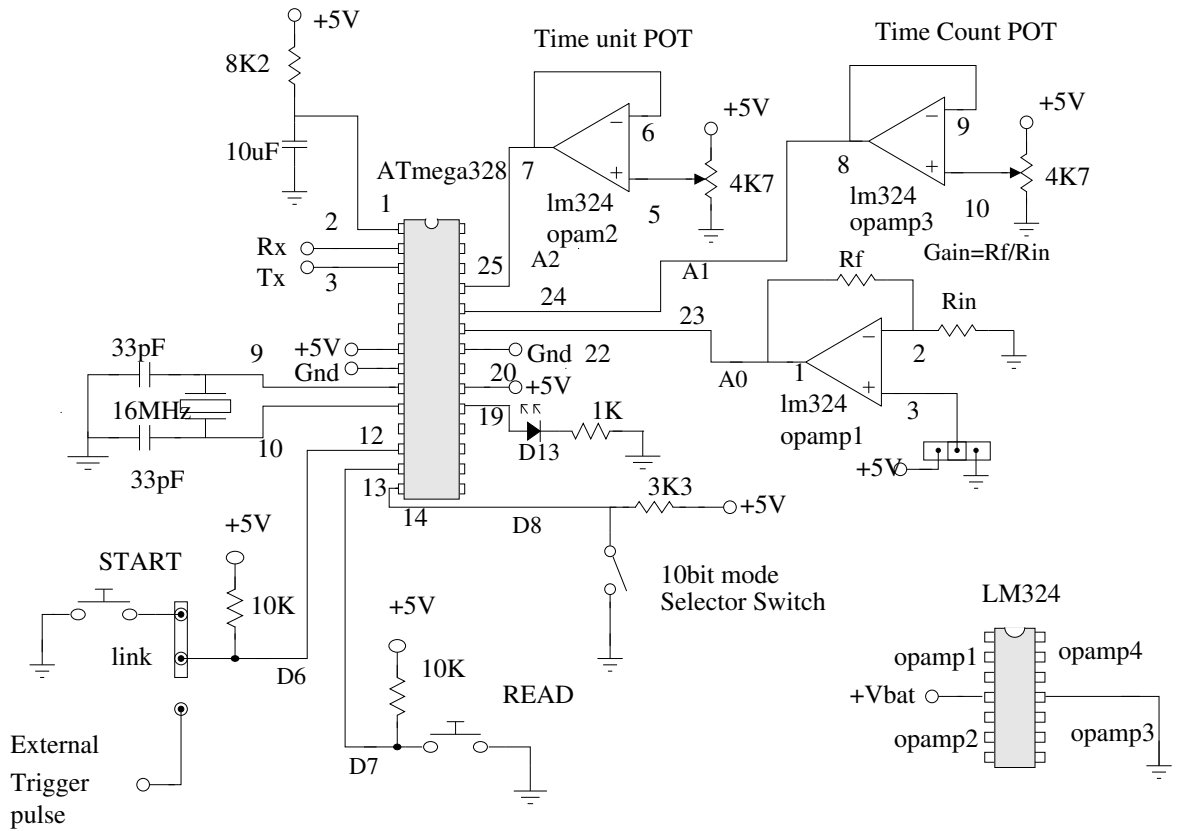
<sup>3</sup>Vout=Vin\*Gain should be less than 5.5V

<sup>4</sup>In CSV format the values are separated from each other by comma ','.

### 3 Hardware

#### 3.1 Circuit Diagram

DataLogger Circuit



### 4 Source code

The application is developed in Arduino language.

Source code is available at <http://technoeschool.in/micro/announcement.html>

## 5 Matrial list

Sr.No.	Component	Specifications	Quantity	Price
1	Arduino board	Arduino for ATmega328	1	
2	IC	ATmega328	1	
3	IC	LM324	1	
4	POT	4K7	2	
5	Keys	Toggle keys	2	
6	Resistor	1K	1	
7	LED	Red 5mm	1	
8	Connector	3 pin relimate	2	
9	Connector	2 pin relimate	3	
10	ON-OFF switch	22*16mm	1	
11	PCB	Designed or GPC	1	

## 6 Limitations of DataLogger

There are few limitations of the DataLogger. These limitations are listed below.

- User cannot set the delay value which is not in the multiple of the Time Unit provided on the dial of the potentiometer.
- It cannot accept the floating point values as a delay time.
- The EEPROM has limited write cycles. User has to replace the IC ATmega328 if the EEPROM write cycle exceeds value 100,000.

if you are interested in this open source project, feel free to discuss at the Forum on <http://technoeschool.in/micro/forum>