The objective of the present work is to study the design consideration of a microcontroller based data logger with user friendly controlling action. We have started the work with 8051 family microcontroller (μC) and finally concluded with PIC family μC. Emphasis in design is given to μC so as to have an effective and user friendly system. The physical parameters for the system are considered as temperature and light.

The physical parameter obtained from sensor is first digitized through Analog to Digital Converter (ADC) and then is given to the microcontroller. With proper calibration, data is displayed in its original form in an LCD as well as continuously sent to the computer through RS232 for storage. The system is also capable of initiating control action at desired level of the parameter which is a basic need of an embedded design. User is also capable of changing the desired level of the physical parameter externally without going into the depth of programming. In every phase of the development, we have concentrated to make the system user friendly and easy to operate.

Like any other system, our system has also three main components namely (i) Input (ii) Process and (iii) Output, where process mainly consists of embedded software and hardware. Input may be in the form of analog or digital. Appropriate ADC circuit is interfaced for conversion of input into digital form. Output may be through Liquid Crystal Display (LCD) or Computer Monitor.

In the first phase of development work is confined to develop a standalone data logger for monitoring and controlling temperature at a certain set value.

In the second phase of development the circuit was modified for monitoring and controlling light intensity and temperature simultaneously at a certain set value. The system is also capable of setting different values of the parameters as well as data transfer rate.

Features of the design—
- Controlling section consists of two parts—
  1. A key-pad to set the level of temperature and light intensity at which control has to be initiated.
  2. Relays to control hardware with a buzzer to notify the change.
• The transfer rate of data through RS232 to PC can also be varied through the key-pad instead of continuous transmission

Following devices and components are used in this phase:

- ATMEL 89S52 µC is used which is a member of 8051 family.
- ADC 0809 (8 channels) is used with reference voltage 2.5V. For reference voltage we have used TL431, which is a programmable shunt voltage reference with output voltage ranging 2.5V to 36V and operated like a zener diode. For the conversion, reference frequency was supplied from 555 IC in the form of astable oscillator.
- Transducers used were LM35 and LDR.
- For displaying sensed parameters 44780 LCD is used which has a 2x16 line display.
- µC is connected with relay through ULN2003 as it is required to amplify the current to drive the relay
- RS 232 was connected through MAX232 for serial communication with PC

In the third phase of development necessary circuitry have been developed to display light and temperature in real time. For safe data storage, in case of any computer failure, we used EEPROM, which essentially stores data at a certain interval. To make the system user friendly, we have added more features which can be listed as:

- User changeable data storage interval in EEPROM
- User changeable set values of physical parameter externally without going inside the programme.
- User definable hysteresis in set values.
- Display of EEPROM data in LCD at any time with user control.
- User modifiable Real Time Clock.

Following devices and components are used in this phase:

- ATMEL 89C51 µC is used which is a member of 8051 family.
- ADC 0809 (8 channels) is used with reference voltage 2.5V and. For reference voltage we have used TL431, which is a programmable shunt voltage reference with output voltage range of 2.5V to 36V and works like zener diode.
- Transducers used were LM35 and LDR.
- For displaying sensed parameters 44780 LCD is used which has a 2x16 line display.
- μC is connected with relay through ULN2003 as it is required to amplify the current to drive the relay
- RS 232 was connected through MAX232 for serial communication with PC

In the final phase of development we have moved to the RISC processor with the consideration of PIC family. The main advantages of using PIC are

1. High processing speed due to its 5 MHz internal clock (which is 2.7MHz in 8051).
2. Less number of instructions (35 only) which in case of 8051 were 255.
3. Inbuilt ADC.

The design concept is same as that of the third phase and change is only in the μC

The features of the design can be listed as:

- User changeable data storage interval in EEPROM
- User changeable set values of physical parameter externally without going inside the programme.
- User definable hysteresis in set values.
- Display of EEPROM data in LCD at any time with user control.
- User modifiable Real Time Clock.

Following devices and components are used in this phase:

- ATMEL 16F877 microcontroller is used which is a member of PIC family.
- Transducers used were LM35 and LDR.
- For displaying sensed parameters 44780 LCD is used which has a 2x16 line display.
- Microcontroller is connected with relay through ULN2003 as it is required to amplify the current to drive
- RS 232 was connected through MAX232 for serial communication with PC