COMPONENTS AND ICs

❖ Water Tank

The water tank is the container in which the water is filled. It is monitored continuously for the level of the water, so that any wastage of water is avoided due to overflow or to make sure that the water does not go below a desired level, that's set.

❖ Transistor 2N2222

The **2N2222** is a common NPN bipolar junction transistor (BJT) used for general purpose low-power amplifying or switching applications. It is designed for low to medium current, low power, medium voltage, and can operate at moderately high speeds. It was originally made in the TO-18 metal can.

The 2N2222 is considered a very common transistor, and is used as an exemplar of an NPN transistor. It is frequently used as a small-signal transistor, and it remains a small general purpose transistor of enduring popularity.

The exact specifications depend on the manufacturer, case type, and variation. Therefore, it is important to refer to the datasheet for the exact part number and manufacturer.

Manufacturer	V_{ce}	I_c	P_D	f_T
ST Microelectronics[1] 2N2222A	40 V	800 mA	500 mW/1.8 W	300 MHz

❖ IC 8051- Microcontroller

The **Intel MCS-51** (commonly termed **8051**) is an internally Harvard architecture, complex instruction set computer (CISC) instruction set, single chip microcontroller (µC) series developed by Intel in 1980 for use in embedded

systems. Intel's original versions were popular in the 1980s and early 1990s and enhanced binary compatible derivatives remain popular today.

Intel's original MCS-51 family was developed using N-type metal-oxide-semiconductor (NMOS) technology like its predecessor Intel MCS-48, but later versions, identified by a letter C in their name (e.g., 80C51) used complementary metal–oxide–semiconductor (CMOS) technology and consume less power than their NMOS predecessors. This made them more suitable for battery-powered devices.

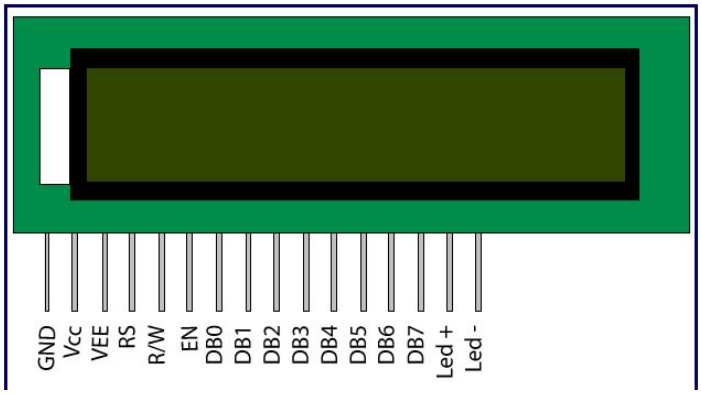
The 8051 architecture provides many functions (central processing unit (CPU), random access memory (RAM), (ROM), input/output (I/O), interrupt logic, timer, etc.) in one package:

- 8-bit arithmetic logic unit (ALU) and accumulator, 8-bit registers (one 16-bit register with special move instructions), 8-bit data bus and 2×16-bit address bus/program counter/data pointer and related 8/11/16-bit operations; hence it is mainly an 8-bit microcontroller
- Boolean processor with 17 instructions, 1-bit accumulator, 32 registers (4 bit-addressable 8-bit) and up to 144 special 1 bit-addressable RAM variables (18 bit-addressable 8-bit)[3]
- Multiply, divide and compare instructions
- 4 fast switchable register banks with 8 registers each (memory mapped)
- Fast interrupt with optional register bank switching
- Interrupts and threads with selectable priority[4]
- Dual 16-bit address bus – It can access 2 x 2^{16} memory locations – 64 KB (65,536 locations) each of RAM and ROM
- 128 bytes of on-chip RAM (IRAM)
- 4 KB of on-chip ROM, with a 16-bit (64 KB) address space (PMEM). Not included on 803X variants
- Four 8-bit bi-directional input/output port, bit addressable
- UART (serial port)
- Two 16-bit Counter/timers

❖ LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

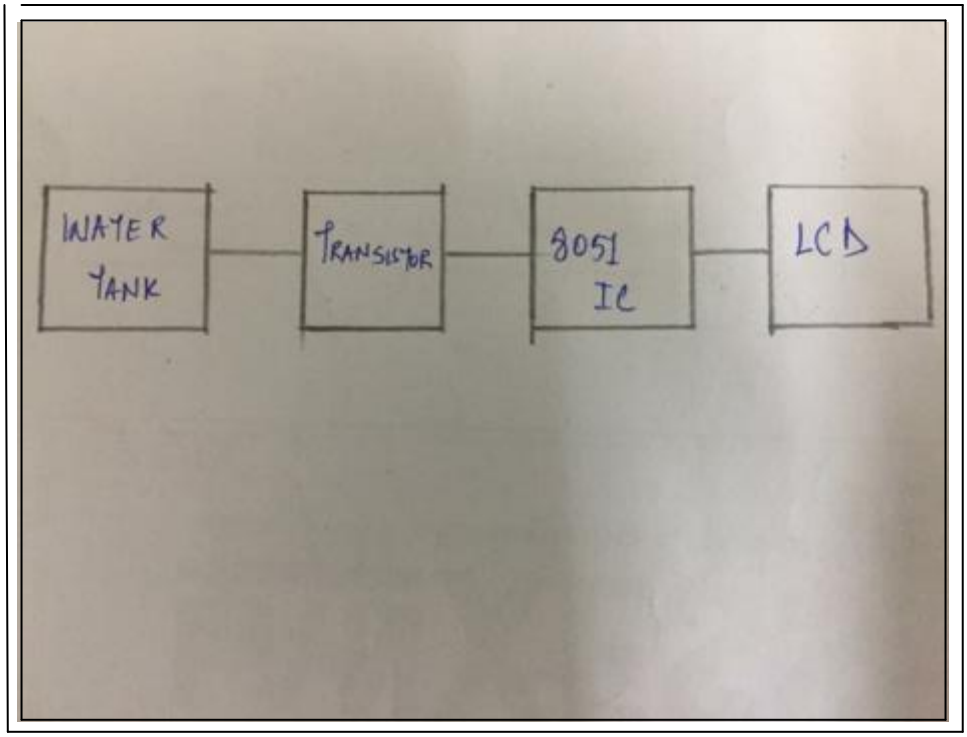
A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.



Pin Description:

Pin No	Function	Name
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V – 5.3V)	Vcc
3	Contrast adjustment; through a variable resistor	V_{EE}
4	Selects command register when low; and data register when high	Register Select
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given	Enable
7	8-bit data pins	DB0
8		DB1
9		DB2
10		DB3
11		DB4
12		DB5
13		DB6
14		DB7
15	Backlight V_{CC} (5V)	Led+
16	Backlight Ground (0V)	Led-

BLOCK DIAGRAM



THEORY

Importance of an Automatic Water Level Controller :

Water scarcity is a problem that is gripping the major metro cities of the world, the main culprit is not availability but undue wastage.

Most of the people who have easy access to resources like water have careless attitude toward this kind of issues but people who face this problem knows the worth of clean drinkable water. Some even say third world war will neither be fought for oil nor boundaries but water, many would not be live it but its the truth, it's already a polling agenda in developing countries like India.

Then the answer we seek is what is the solution to the problem, honestly not a single person can make a change, neither we can stop the consumption, because we are used to the lifestyle, but we can at least try to stop the wastage. The barrier on wastage not only gives us more financial savings, it also helps the environment and water cycle which in turn ensures that we save water for our future and what is the barrier, its none other than "Water Overflow Alarm". This Water level controllers Indicator is highly recommended for metro cities or areas where drinking water is supplied through pipelines which are further distributed in homes, hotels, societies etc.

At large these systems not only help us but our neighbors and society also as it reduces the wastage of water by cutting down any further overflow than what you need.
It is a must for big houses, bungalows, corporate, hospitals and multi storey buildings, especially in the metros where there is no fixed time for water supply.

The Advantages of Water Level Controller :

A water level controller is a device that manages water levels on a variety of systems such as water tanks, pumps and swimming pools. The basic function of a water level controller is to regulate water flow and optimize system performance. These devices have four main advantages.

Saves Power

Using a water level controller saves power. This is because water levels are controlled automatically, which limits the amount of electricity used. As a result, less water and power are used to regulate a water supply. In an age where energy conservation is of utmost importance, using one of these devices is very beneficial.

Saves Money

Since a water level controller conserves power, it saves money, as well. Basically, water regulation is optimized through these devices, which means that wasted electricity and wasted water is kept at a minimum. That saves a substantial amount of money over time.

Works Automatically

Another big advantage is that these devices can work on their own. Thanks to timer switches, there is no need to operate them manually. This means that the frustrations involved with monitoring something like a water tank is minimized, and the water levels will be where they should be.

Maximizes Water

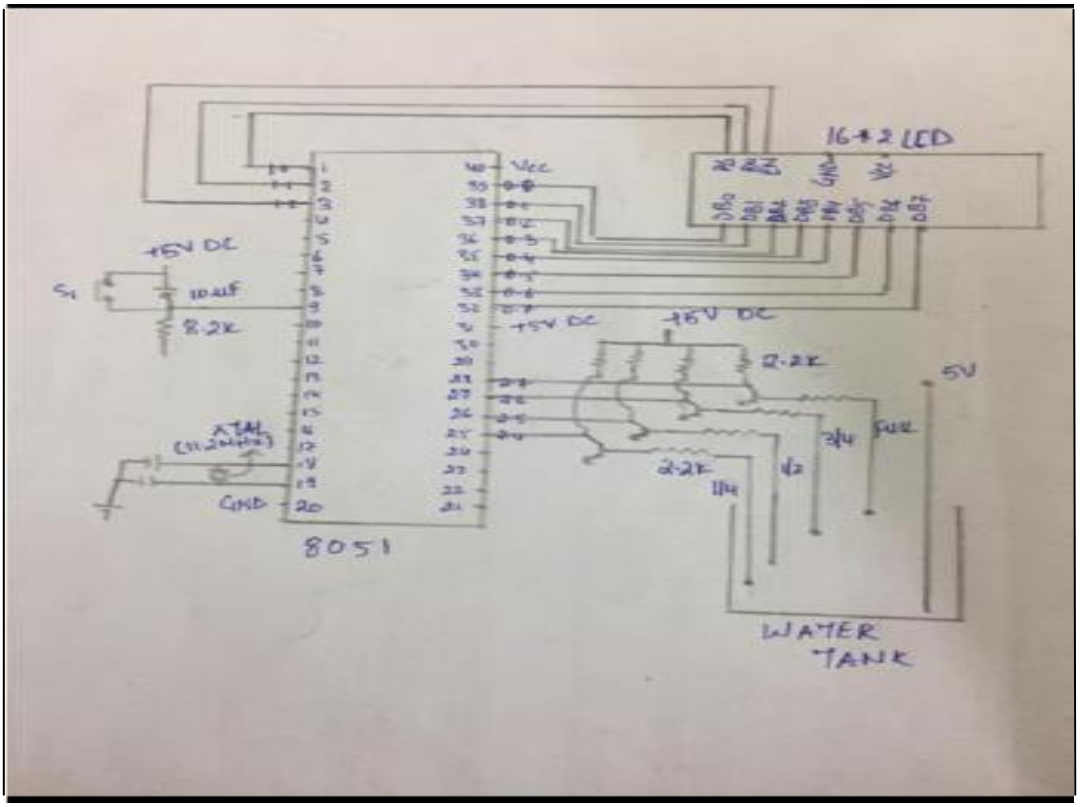
Additionally, water usage can be maximized with a water level controller. Often, water pumps get more use during the middle of the day. A water level controller is helpful because it automatically provides more water during the middle of the day and less water at night. As a result, water remains at its appropriate level at all times.

Brief Description:

A water level controller using 8051 is shown in this project. This water level controller monitors the level of the over head tank and automatically switches on the water pump when ever the level goes below a preset limit. The level of the over head tank is indicated using the LCD Display which is interfaced with the IC 8051 and the pump is switched OFF when the over head tank is full.

Four NPN transistors (2N2222A) and resistors are used in this project along with water level sensors for analyzing water level . This project can be further enhanced for controlling the motor pump which is used to pump water to the overhead water tank, which can be termed as automatic water level controller using 8051 microcontroller.

Circuit Diagram



Working

The level sensor probes for the overhead tank are interfaced to the port 2 of the microcontroller through transistors. Have a look at the sensor probe arrangement for the overhead tank in Fig1. A positive voltage supply probe goes to the down bottom of the tank. The probes for sensing 1/4, 1/2, 3/4 and FULL levels are placed with equal spacing one by one above the bottom positive probe. Consider the topmost (full level) probe, its other end is connected to the base of transistor Q4 through resistor R16. Whenever water rises to the full level current flows into the base of transistor Q4 which makes it ON and so its collector voltage goes low. The collector of Q4 is connected to P2.4 and a low voltage at P2.4 means the over head tank is not FULL. When water level goes below the full level probe, the base of Q2 becomes open making it OFF. Now its collector voltage goes high and high at P2.4 means the tank is not full. The same applies to other sensor probes (3/4, 1/2, 1/4) and the microprocessor understands the current level by scanning the port pins P2.4 ,P2.5, P2.6 and P2.7. All these port pin are high (all sensor probes are open) means the tank is empty.

Port pin P0.5 is used to control the pump. Whenever it is required start pumping, the controller makes P0.5 low which makes transistor Q6 ON which in turn activates the relay K1 that switches the pump. Also the LCD is interfaced with the 8051 microcontroller here, which indicates the current status of the water level in the tank. If all the port pins are high, ie the tank is empty then it displays the message on the screen “EMPTY” but when P2.4 gets a high voltage due to Q4 it becomes clear that the tank is full and so “FULL” is displayed on the interfaced LCD. The circuit diagram of the water level controller is shown in the figure above.