GSM-BASED WELL WATER LEVEL MONITOR

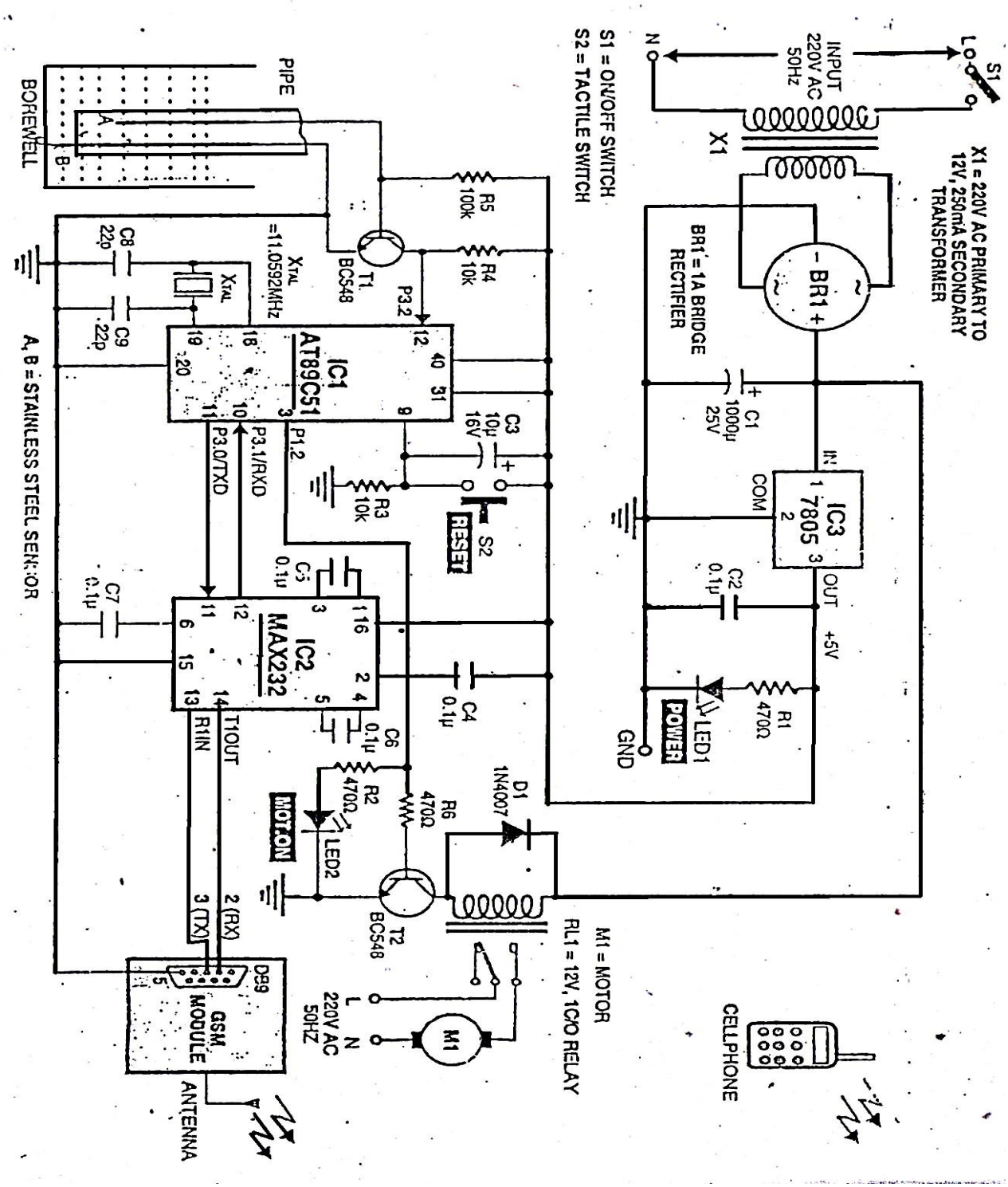
Introduction

If the water level in a borewell drops below the threshold level for pumping, its pump motor may get air-locked or even burn out due to dry running. It is inconvenient for farmers to walk all the way to their fields at night just to switch the pump motor 'off'. Besides, he may never get to know the problem.

This problem can be solved by using this GSM-based system that will automatically give the user a call on his mobile phone when the water level in the borewell drops below or rises to the threshold level for pumping.

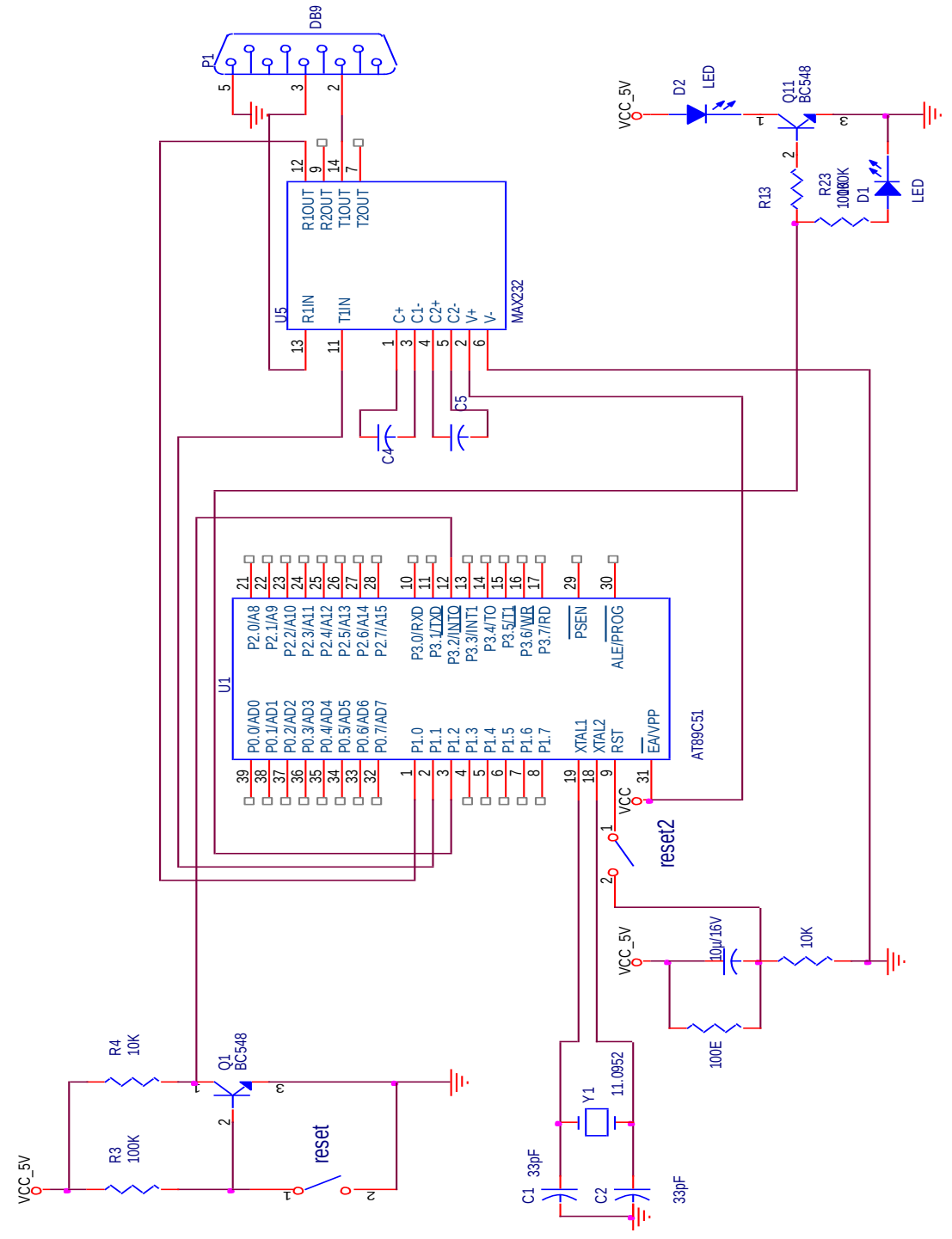
The user can also remotely switch on or switch off the pump motor by sending an SMS from his mobile phone. The system is simple, reliable, portable and affordable.

Circuit diagram



PCB Layout & Schematic

Schematic:



Circuit Description & Working

GSM-based monitor is shown in block diagram. It comprises the power supply section, sensor circuit, microcontroller, MAX232 driver, relay driver & GSM-modem. The GSM board has a valid SIM card with sufficient recharge amount to make outgoing calls.

The circuit is powered by regulated 5V DC. The 220V/AC mains are stepped down by transformer X1 to deliver a secondary output of 12V, 250mA. The transformer output is rectified by bridge rectifier BR1, filtered by capacitor C1 and regulated by IC-7805. Capacitor C2 bypasses ripples from the regulated power supply. LED1 acts as the power-'on' indicator.

The AT89C51 microcontroller is connected to the sensor circuit, relay driver and MAX232. The microcontroller is programmed to take necessary actions. The mobile number used in the GSM-modem is included in the code before burning the code into the microcontroller.

The sensor circuit comprises transistor T1 as sensor driver and sensor-A is dipped to the threshold point for pumping and sensor-B is dipped below the pipe to the bottom of the device.

When water in the borewell fills to the threshold level, it is sensed by sensor-A and you get a call on your mobile phone. Now you can turn the motor 'on' by sending the SMS "motor11 on" from your mobile phone to the SIM number in the GSM-modem. We can turn motor 'off' by sending the "motor11 off".

Sensor-A is connected to the base of transistor t1 (BC548). When there is a high voltage at the base, T1 conducts and a low voltage is available at its collector.

This low signal is fed to pin 12 of the MCU. Similarly, for a low voltage input at the base T1 stops conducting and a high voltage signal is available at its collector. So pin 12 of the MCU gets a high signal input. The high or low voltage signal at pin 12 is monitored and processed by the program in the MCU, and decision to turn the monitor 'off' taken when the water level dips below sensor-A.

Pin 3(port p1.2) of the MCU is the output pin. It is connected to relay-driver and LED2. T2 driver-relay RL1, witch, in turn, activates the motor transistor T2 and LED2 is on to indicate the motor is on status.

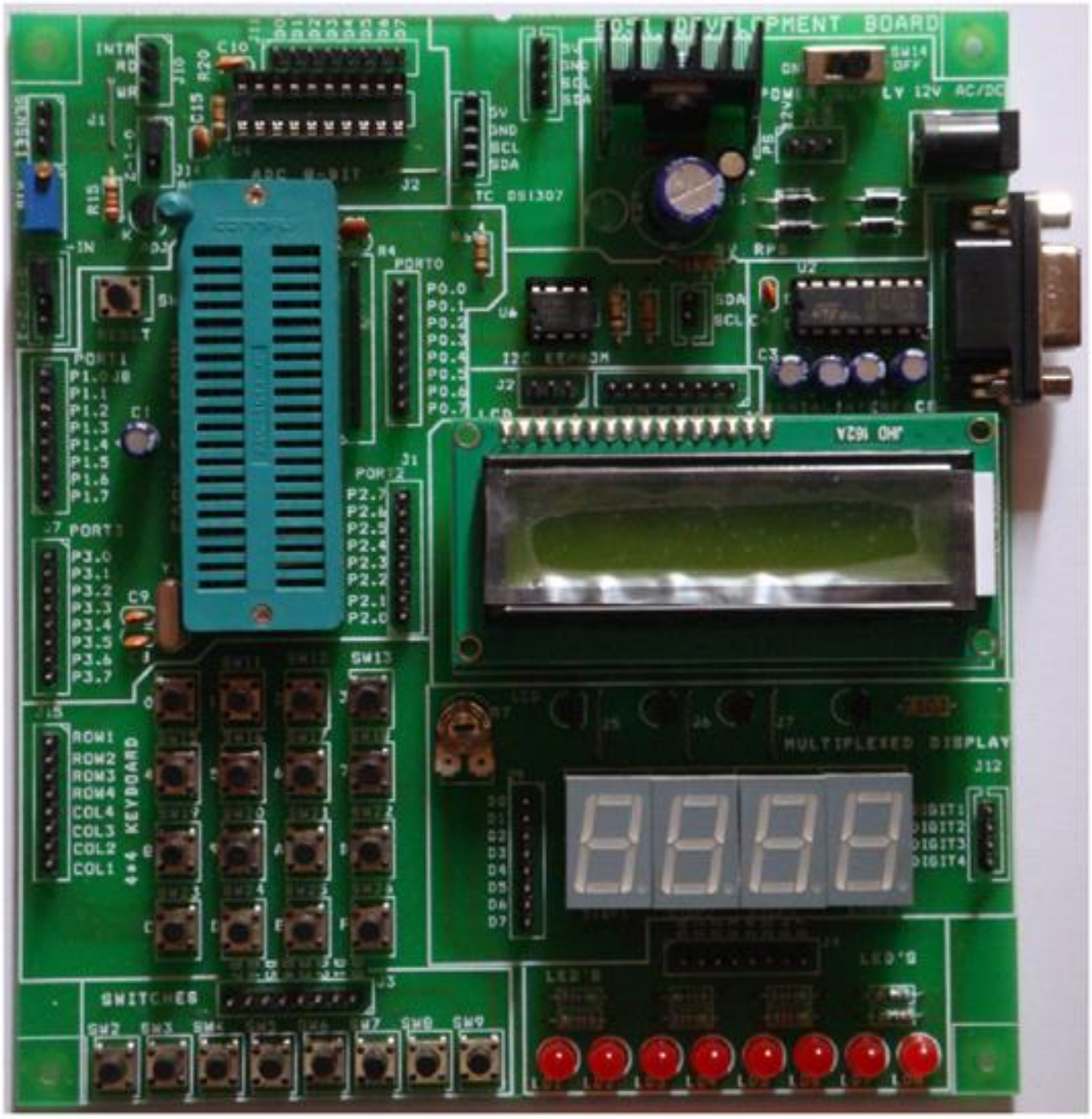
When water level in the borewell dips below sensors A and B breaks. Hence a signal is received by the microcontroller. The microcontroller turns the running motor 'off' and makes a call to the user's cellphone through GSM-modem to indicate that sensing is not connected to on the relay is switched off in this way the device is protected from damage the status of motor level and LED2 are shown in table1. The GSM-modem used in this project is SIM300/V7.03.

Photographs of Hardware Circuitry

- RS232 Cable

- Microcontroller P89V51RD2

- Microcontroller Board for 8051



Interfacing LCD with 8051

16×2 LCD module is a very common type of LCD module that is used in 8051 based embedded projects. It consists of 16 rows and 2 columns of 5×7 or 5×8 LCD dot matrices. The module are talking about here is type number JHD162A which is a very popular one. It is available in a 16 pin package with back light, contrast adjustment function and each dot matrix has 5×8 dot resolution. The pin numbers, their name and corresponding functions are shown in the table below.

Pin No:	Name	Function
1	VSS	This pin must be connected to the ground
2	VCC	Positive supply voltage pin (5V DC)
3	VEE	Contrast adjustment
4	RS	Register selection
5	R/W	Read or write
6	E	Enable
7	DB0	Data
8	DB1	Data
9	DB2	Data
10	DB3	Data
11	DB4	Data
12	DB5	Data
13	DB6	Data
14	DB7	Data
15	LED+	Back light LED+
16	LED-	Back light LED-

VEE pin is meant for adjusting the contrast of the LCD display and the contrast can be adjusted by varying the voltage at this pin. This is done by connecting one end of a POT to the Vcc (5V), other end to the Ground and connecting the center

terminal (wiper) of of the POT to the VEE pin. See the circuit diagram for better understanding.

The JHD162A has two built in registers namely data register and command register. Data register is for placing the data to be displayed, and the command register is to place the commands. The 16×2 LCD module has a set of commands each meant for doing a particular job with the display. We will discuss in detail about the commands later. High logic at the RS pin will select the data register and Low logic at the RS pin will select the command register. If we make the RS pin high and the put a data in the 8 bit data line (DB0 to DB7), the LCD module will recognize it as a data to be displayed. If we make RS pin low and put a data on the data line, the module will recognize it as a command.

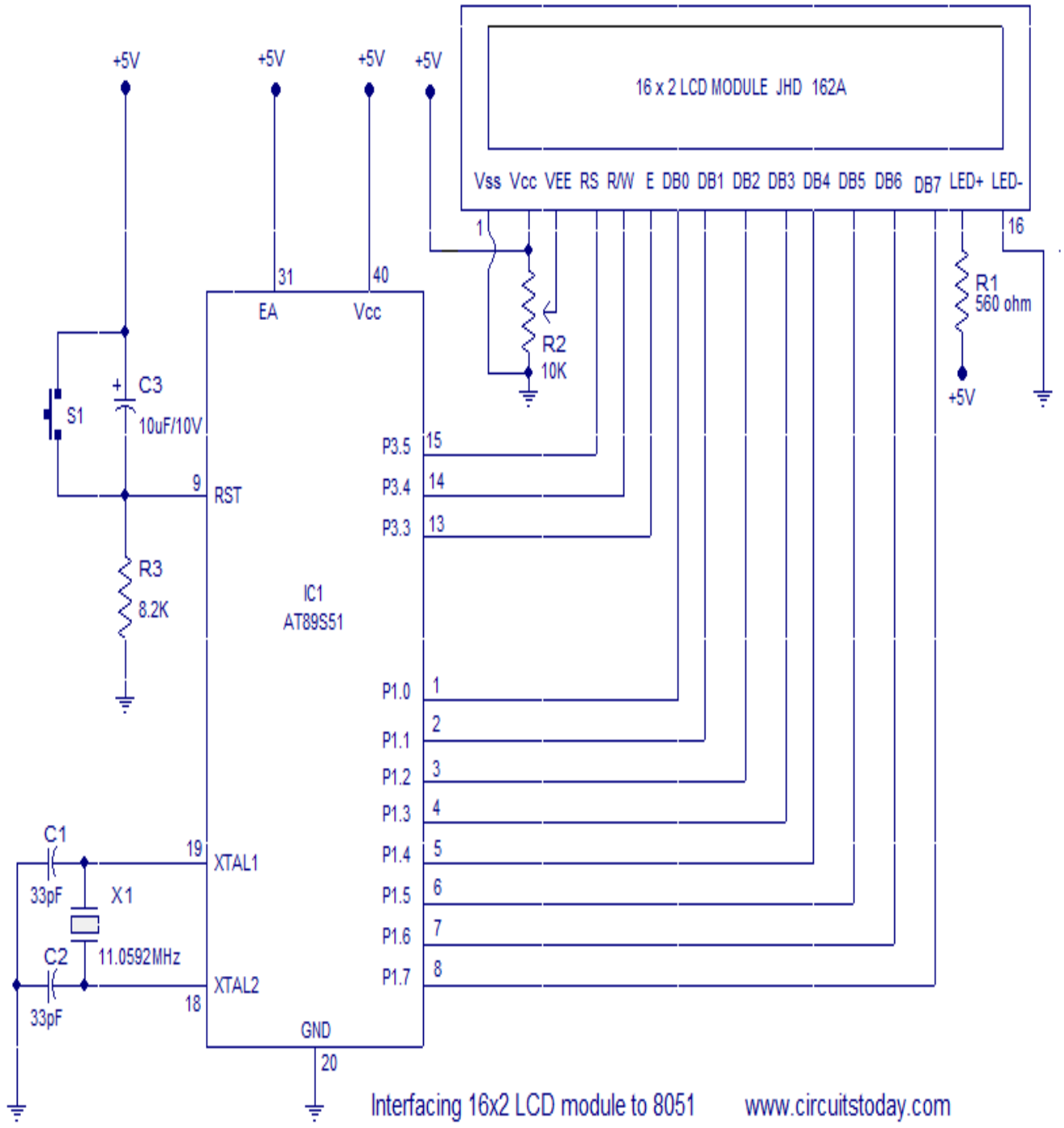
R/W pin is meant for selecting between read and write modes. High level at this pin enables read mode and low level at this pin enables write mode.

E pin is for enabling the module. A high to low transition at this pin will enable the module.

DB0 to DB7 are the data pins. The data to be displayed and the command instructions are placed on these pins.

LED+ is the anode of the back light LED and this pin must be connected to Vcc through a suitable series current limiting resistor. LED- is the cathode of the back light LED and this pin must be connected to ground.

Circuit diagram



GSM SIM 300 V7.03

The SIM300 is an all in one GSM/GPRS compact module. With an industry-standard serial interface, the SIM300 offers GSM/GPRS 900/1800/1900MHz performance for carrying out voice, SMS, data, and Fax operation all in one small sized module that is perfect for integration in any handheld device.

It can be used to make GSM based calls, send messages etc through a serial interface from a microcontroller or a computer.

The SIM 300 module comes with a wire antenna, which provide good performance and reception, for better reception an external antenna can be added to the breakout board by soldering an SMA connector to it.

The Module can be easily interfaced with AT commands over a TTL serial interface, which makes it easy to connect it to microcontrollers, computers and other devices.

Features of SIM 300:-

- Provides serial TTL interface for easy and direct interface to microcontrollers

- Can be used for GSM based Voice communications, Data/Fax, SMS,GPRS and TCP/IP stack

- Can be controlled through standard AT commands

- Comes with an onboard wire antenna for better reception. Board provides an option for adding an external antenna through an SMA connector
- The SIM300 allows an adjustable serial baudrate from 1200 to 115200 bps

Some AT Commands for SIM 300:-

a) To Dial a Number

- To dial a number you will have to send the command -> ATD NUM; where NUM is the number you want to dial.

  For instance to dial 9008620582, send the command ATD 9008620852;

- To disconnect the number use the command – ATH
- To redial a number use the command – ATDL

AT commands to change settings-

- To change the baud rate – AT+IPR=BAUDRATE(Ex 9600)
- To save the settings – AT&W
- To restore factory defaults type AT&F then save it by sending AT&W

Application of Project

GSM Based Monitor Controller for Hotels, Factories, Homes Apartments, Commercial Complexes, Drainage, etc.

It can be fixed for single phase motor, Single Phase Submersibles, Three Phase motors. & open well, Bore well and Sump. Many models available in different ranges.

Switching ON the Geyser or AC before arriving home.

GSM Based Monitor Controller for the Gate and Corridor Lights or a TV of an unoccupied house, to deter any house break.

Controlling industrial process pumps as per required timing.

Features

The system should have one registered GSM SIM.

The system can be made to control the pump starter through your mobile just by sending simple SMS of digit 1 to switch ON and 2 to switch OFF.

The system can be programmed to receive the control command from the single mobile only or from any mobile.

This system communicates with the mobile from which the command signal is sent and confirms the action taken, i.e. the sender will receive the confirmation SMS message as "PUMP ON" or "PUMP OFF" along with Date and Time.

The system can also be programmed to act as auto start system for agricultural pumps. (Auto start systems will automatically switch ON the Pumps always when there is availability of Power Supply.)

The system also comes with dry run preventer for any bore well pump.

These above features make the system also to be very useful in agricultural sector to operate the pump, which will usually be very far from the main house.

The system can also be used to control any other electrical equipment with GSM remote control concept.

In "Manual" mode the Pump or Load can be controlled directly and GSM controller gets completely shut down and bypassed.

Reference

These sites are supported for development of the project.

www.electronicsforu.com

www.alldatasheats.com

www.wikipedia.org

www.electronics-tutorials.ws

www.easy.com

www.circuitstoday.com