CHAPTER FOUR

Simulation And Hardware Implementation

4.1 preface

Programs for the AVR series of microcontrollers can be written in assembly (AVR ASM), C and BASIC. AVR Studio, WinAVR etc. are some free development software's for programming the AVR Microcontrollers. We are using winAVR for programming and AVR Studio for simulating (Simulation means debugging the code on software, one can virtually give the input and check the output for that code). In win avr programmers Notepad we write our C code, after compilation it generates **'.hex'** file that is a hardware level code.[22]

4.2 Block Diagram Of Basic Operation

The figure (4.1) shows the sending block diagram and the input of the switches coming from the electricity column. The output of the switch will be the input to the processing unit . Inside the process unit there are more operation . the GPS used to detected the location of the fault ,LCD used to shows the details or information of fault (lines, location) ,sensor power used to sensed the power in transmission line when any interruption occur it send signal to microcontroller .

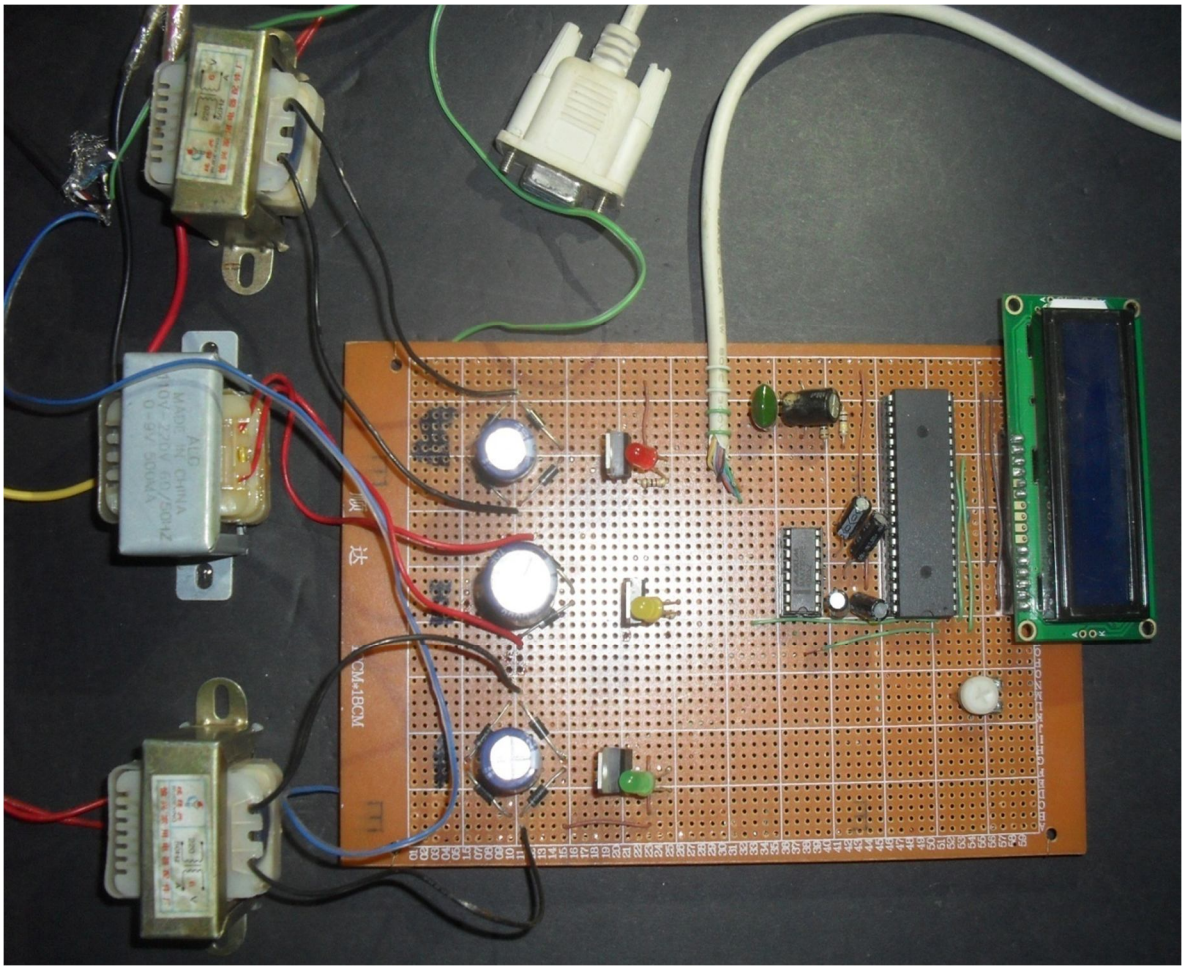

Figure (4.1)circuit diagram of sending(transmission) circuit

The figure (4. 2) shows the receiving block diagram and the output of the process unit it will be the input of receiving circuit after the fault occur the processing unit or sending circuit sent signal by using GSM to receiving unit represented by mobile this message includes the locations(map) and lines in which the error occurs

Figure (4.2) circuit diagram of receiving (GSM communicator)

4.3 Circuit Diagram of fault detection in transmission line

The diagram of the fault detection in transmission line shown in figure (4.3) this diagram can be divided according to their functions of works in two section .This two section work together to perform the functions

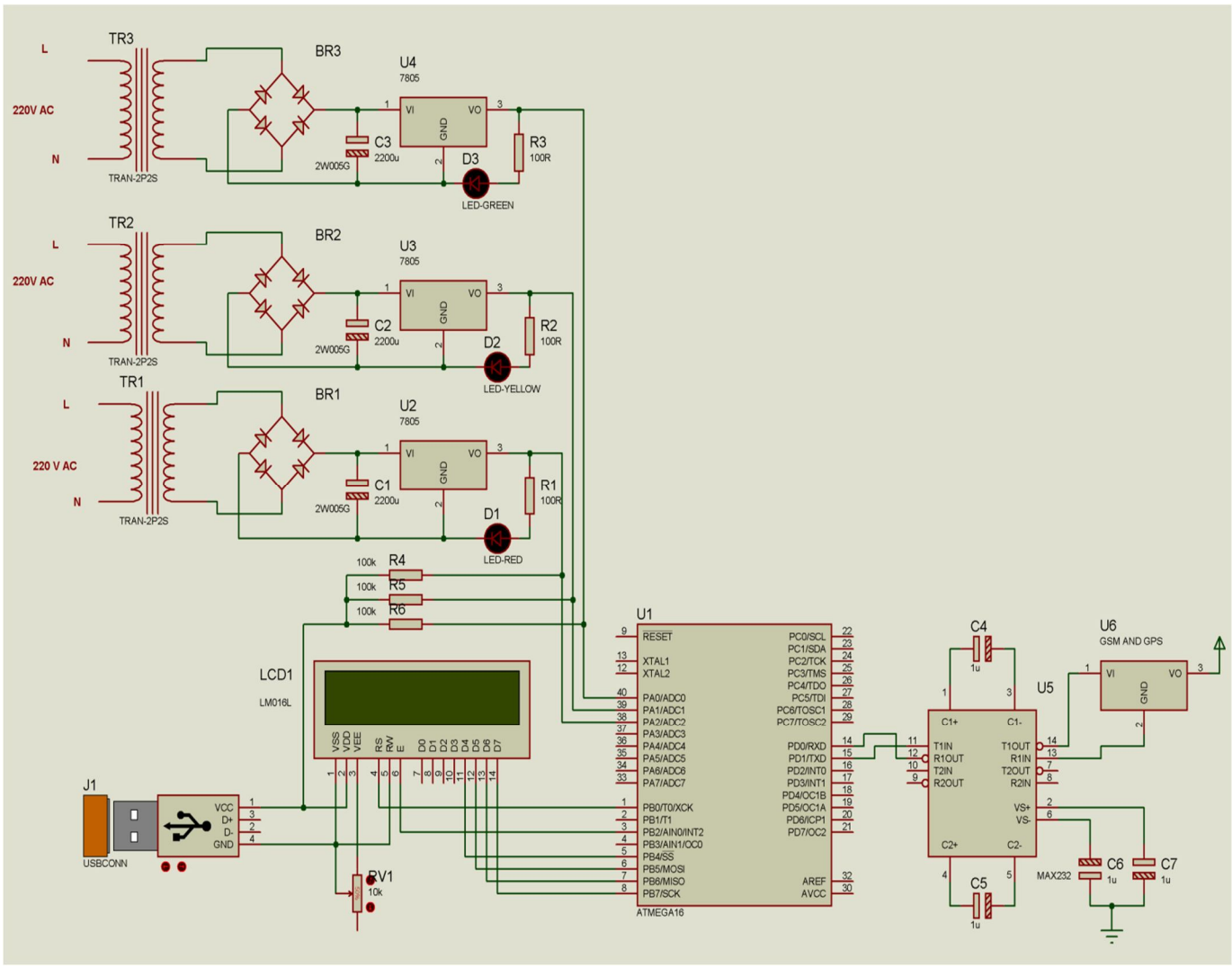

figure (4.3) the general design circuit

4.3.1 Processing Units

This units detect the fault and send a signal to another unit .Also function of this unit can be divided in four parts

4.3.1.1 power sensor

It is AC power sources which represent the transmission line, which supply input circuit .

This unit firstly used the step down transformer voltage from 220- 6v as shown in figure (4.4) and then converted this voltage to DC by using the Weston bridge and the output pass through to the capacitor to filter the noise. Finally the signal pass through regulator to protect the microcontroller fro any increase in voltage .The output of the power sensor its signal represent the weather of the transmission line and it s input of the microcontroller .

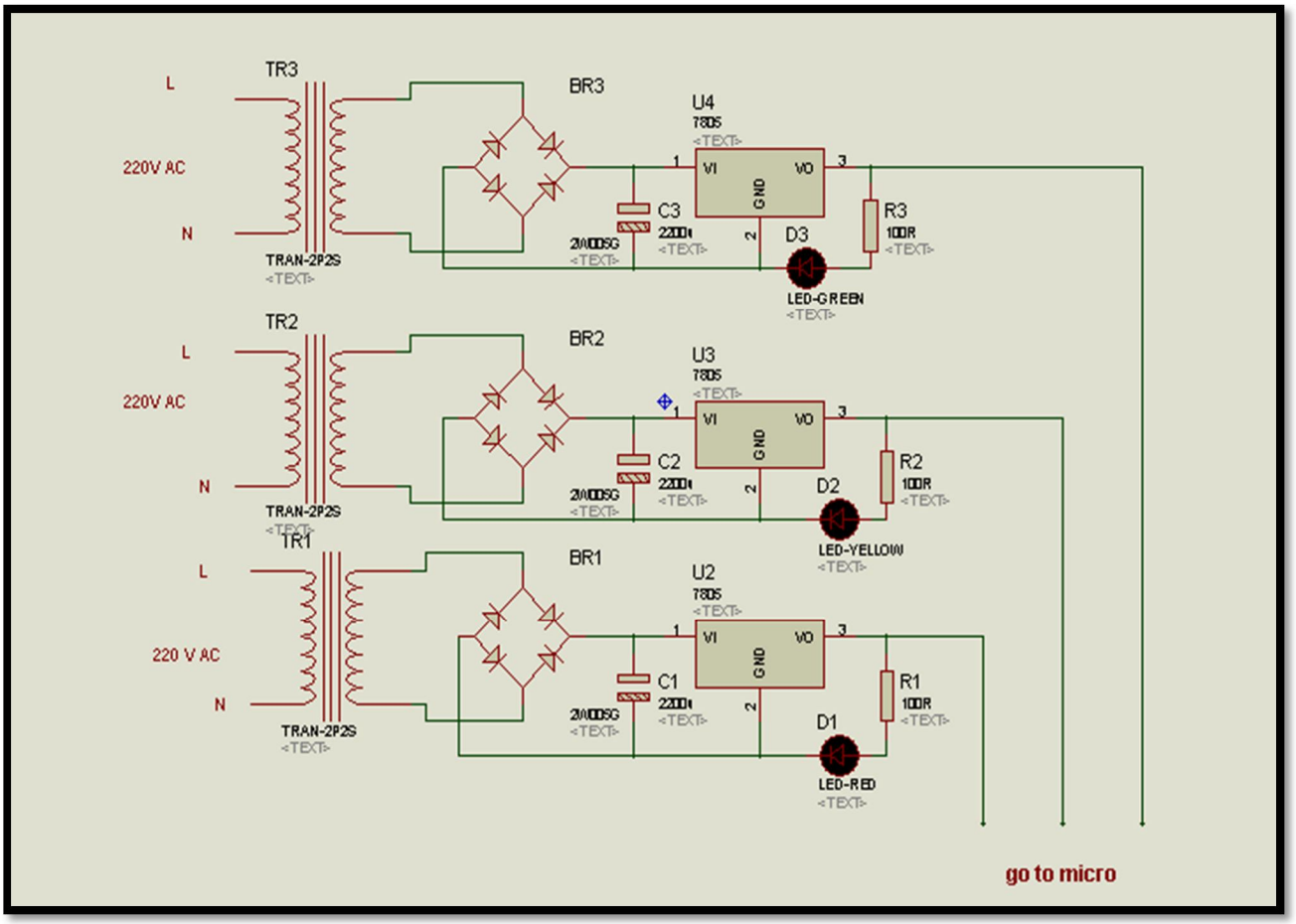

Figure (4.4) AC power sources

4.3.1.2 Control Unit (Microcontroller and LCD)

The output signal of the power sensor is an input to the microcontroller as shown in figure (4.5) ,this signal represent the voltage level at the transmission line . If the value of the signal is one the microcontroller understand there are no problem in the transmission line(normal case). When the value of the signal changed to the zero the microcontroller understand their problem according to the programming code (see appendix A) in this case the microcontroller sent signal to the MAX 232 and shows on the LCD in which line the error occurs

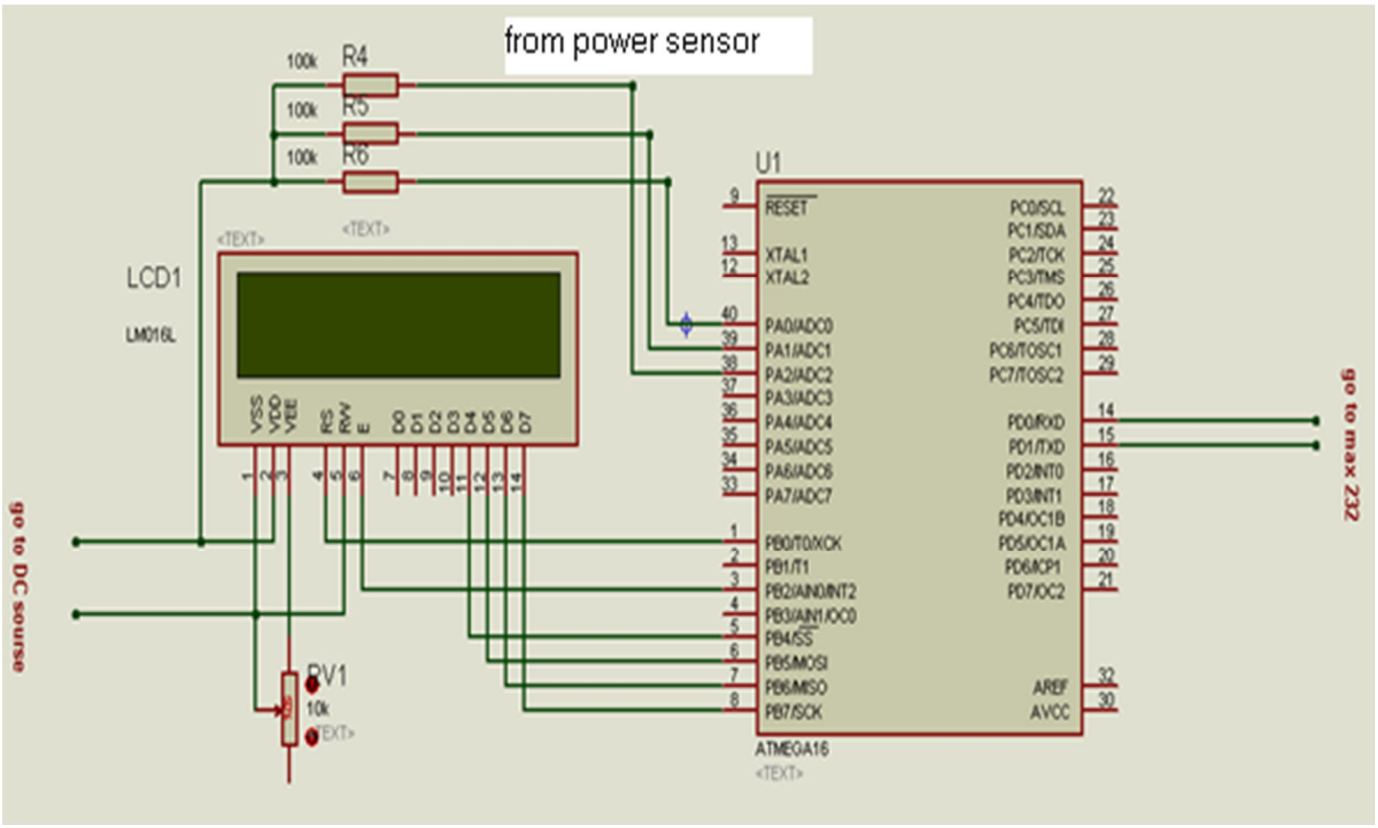

Figure (4.5) control unit circuit

4.3.1.3MAX232 Converter and RS232 cable

After the fault occur in transmission line. The microcontroller send signal

through to TXD bins in microcontroller to the MAX232 . The MAX232 voltage converter that convert the signal to be acceptable by GPS module . As shown in figure (4.6) .The RS232 Cable it connected to MAX232 and GPS.

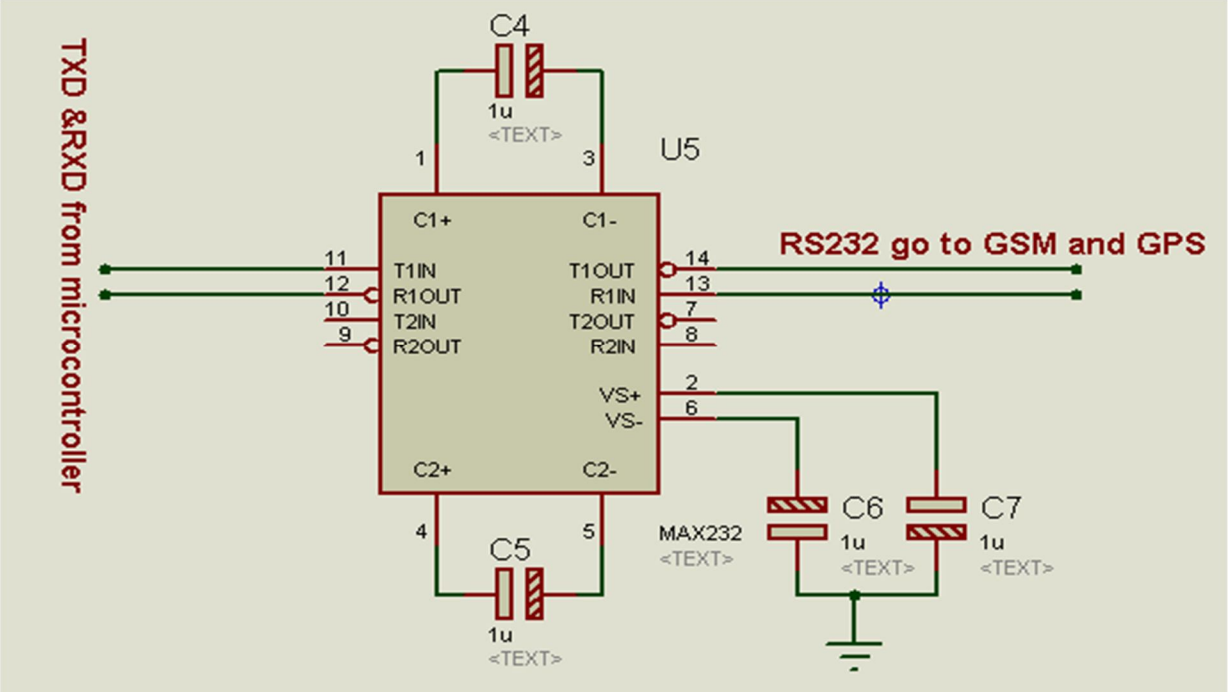

figure (4.6) MAX232 circuit and RS232 cable

4.3.1.4 DC power supply

In our system design we use solar energy to supply the LCD and the microprocessor (microcontroller).Figure (4.7)shows the block diagram of the DC power supply to our design .

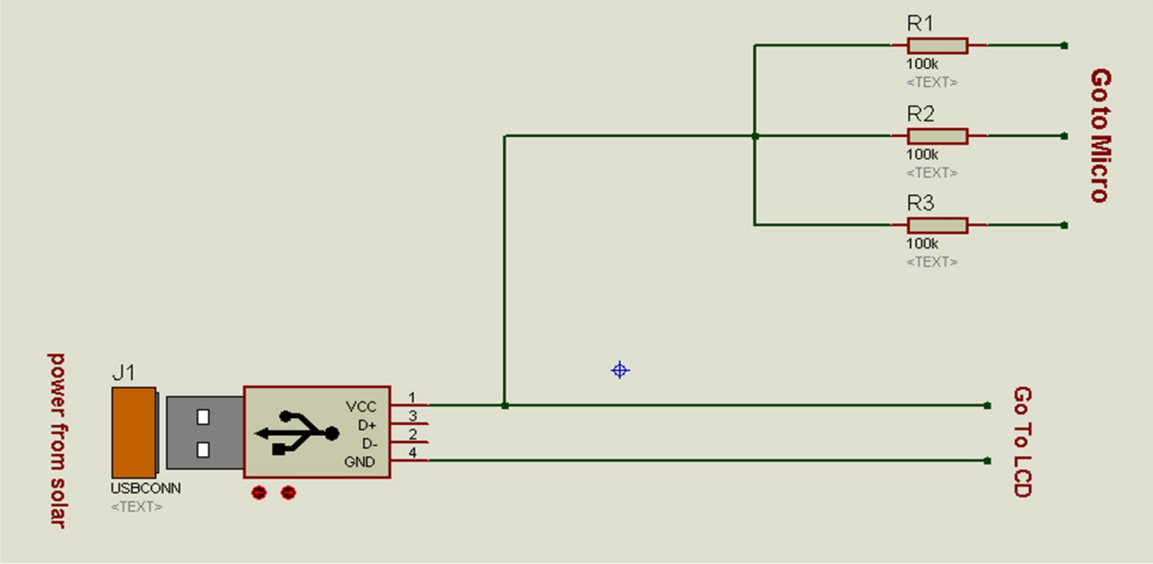

Figure (4.7) DC power supply(solar sources)

4.3.2 Sending and Detecting units

After receipt the signal comes from the MAX232 as shown in figure(4.8) bellow if there is an error in the transmission line than the GPS module determines the occurrence of the wrong location , after that a message is sent to the engineer contact person by the GSM module .

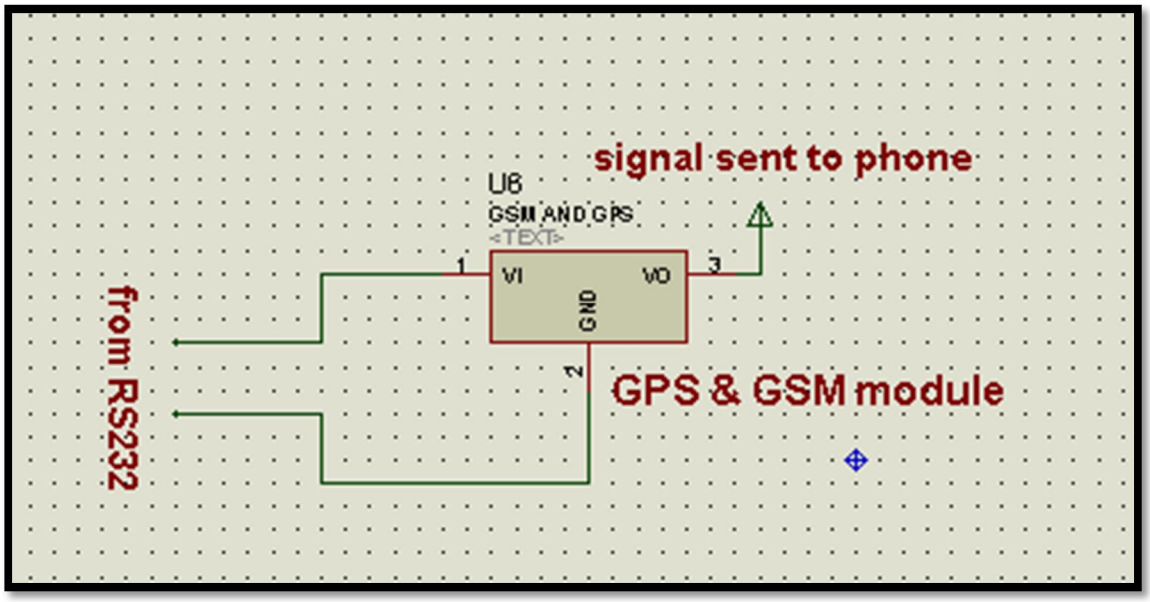

Figure (4.8) circuit of sending and location determination

4.4 Flow chart Sequences Operation

The sequences of the operation can shown on figure (4. 9) which shows the steps(flow chart) of design works , the work of system can be summarized in this sequences :

1- Initially the processing units make sure if their fault or not ,if there is not fault the system is ready this case is normal operation ,but if there was a fault the system go to next sequences.

2- shows the detail of faults on the LCD includes the lines which fault occurs .

3- the global positioning system detect the location of fault

4- finally the global system for mobile communication sent the message to the control room include the location of fault and number of line which error occur

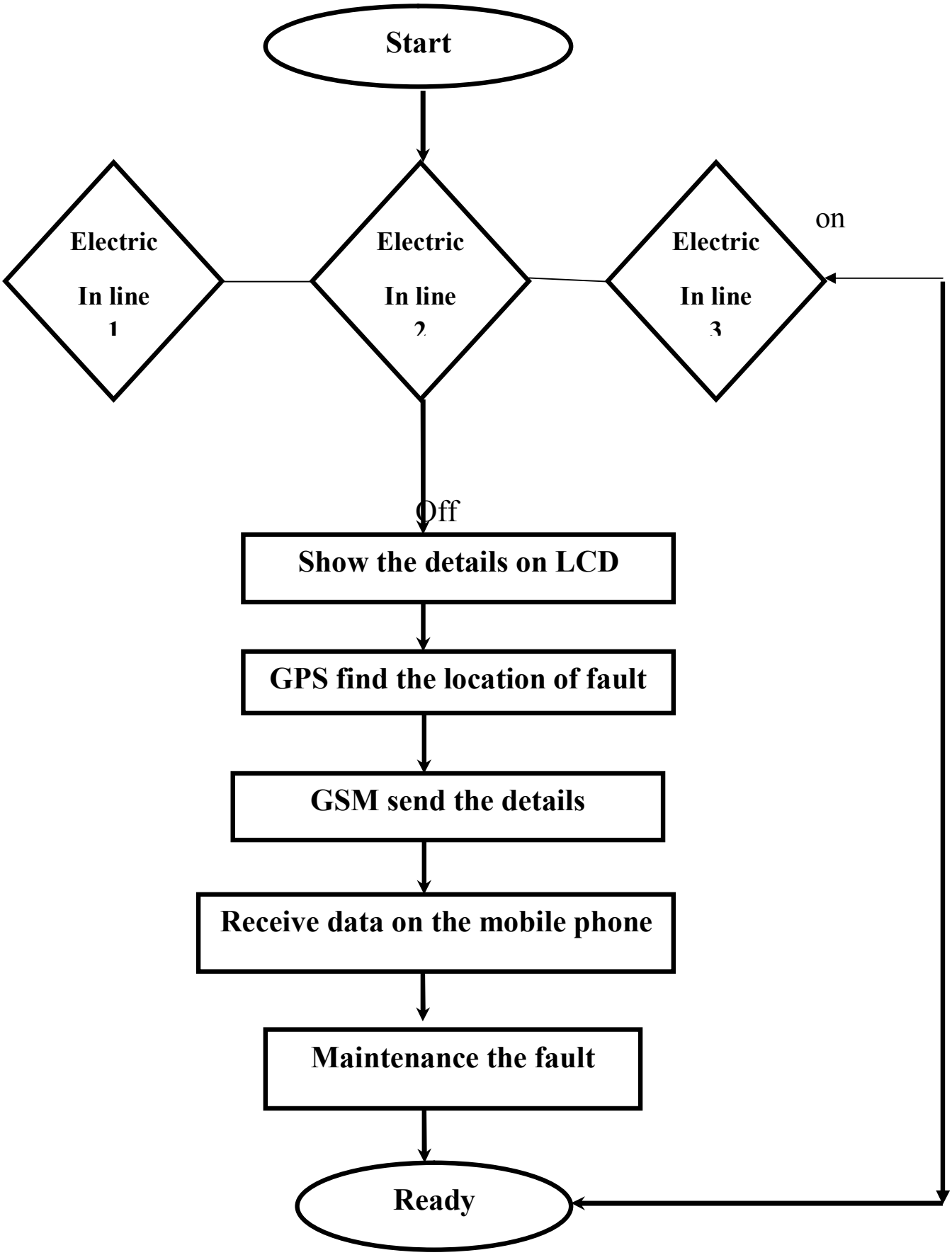

Figure (4.9) flow chart of sequences operation

4.5 Hardware Operation

The mode of operation is different from case to case depending on the situation of the system , here are some situations in the normal operation or when the fault occurs .

4.5.1 case 1 fault occur in line one

When the fault occurs in line 1as shows in the figure (4.10) the details shows on LCD It appears on the screen line that occurred error and then the GPS detect the location of the fault and then this data Transferred by the GSM and Received by the phone It contains the place where the error occurred and the line number.

Figure (4.10) describe when the fault occur in line 1

4.5.2 Case 2 fault occur in line 2

When the fault occurs in line 2 as shows in the figure (4.11) the details shows on LCD It appears on the screen line that occurred error and then the GPS detect the location of the fault and then this data Transferred by the GSM and Received by the phone It contains the place where the error occurred and the line number.

figure (4.11) describe when the fault occur in line2

4.5.3 Case 3 fault occur in line 3

When the fault occurs in line 3 shown in the figure (4.12) the details shows on LCD It appears on the screen line that occurred error and then the GPS detect the location of the fault and then this data Transferred by the GSM and Received by the phone It contains the place where the error occurred and the line number.

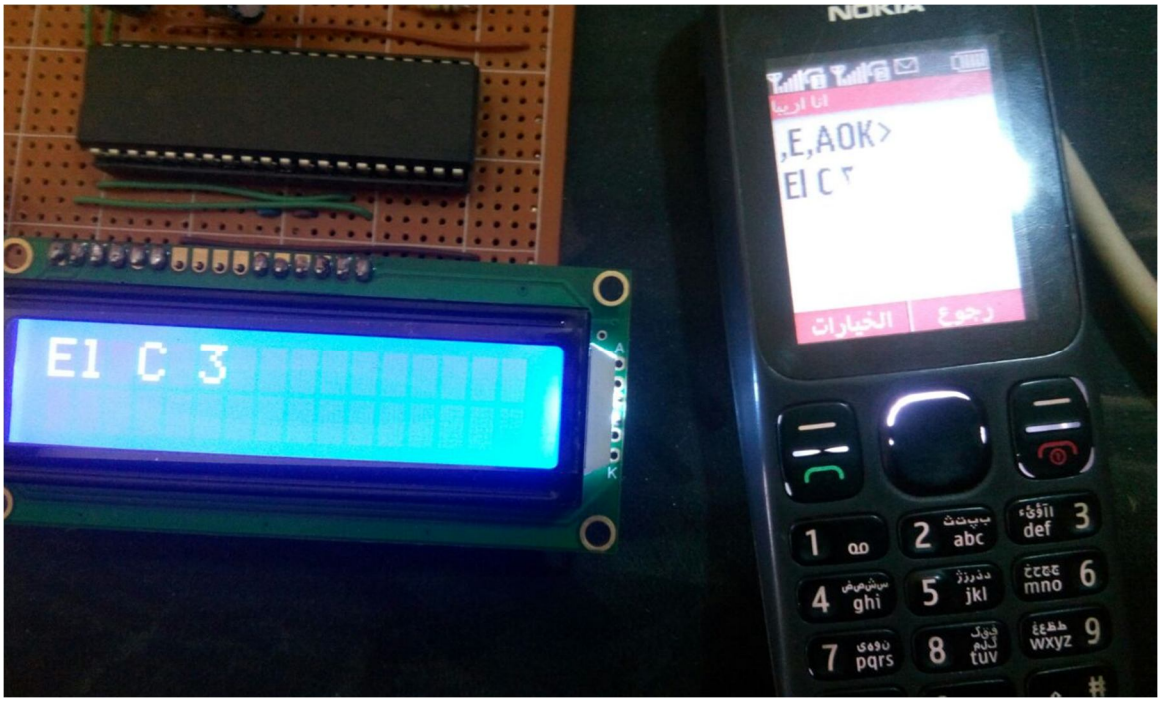

figure (4.12) describe when the fault occur in line3

4.5.4 Case 4 fault occur in line 2 and line 3

When the fault occurs in line 2 and line 3 as shows in the figure (4.13) the details shows on LCD It appears on the screen line that occurred error and then the GPS detect the location of the fault and then this data Transferred by the GSM and Received by the phone It contains the place where the error occurred and the line number.

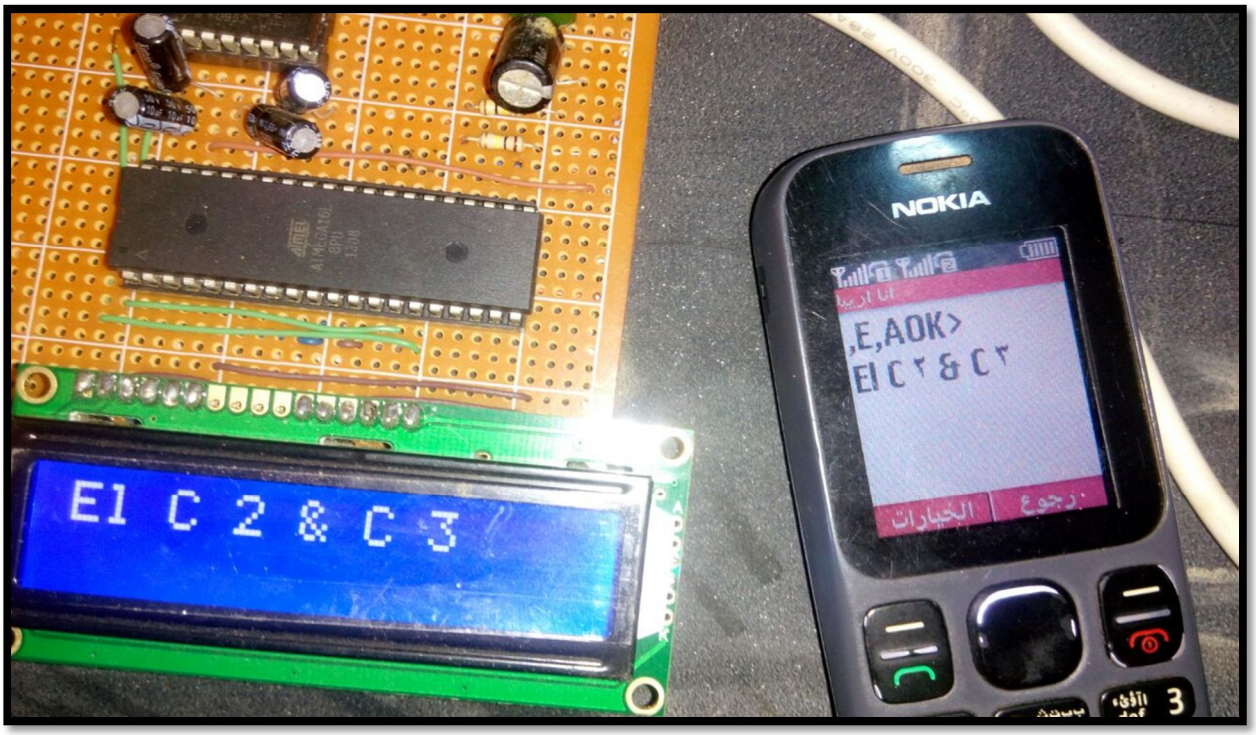

Figure (4.13) describe when the fault occur in line2 and line3

4.5.5 Case 5 fault occur in lin1,line2and line3

When the fault occurs in line 1, line 2 and line 3as shows in the figure (4.14) the details shows on LCD It appears on the screen line that occurred error and then the GPS detect the location of the fault and then this data Transferred by the GSM and Received by the phone It contains the place where the error occurred and the line number.

Figure (4.14) describe when the fault occur in line 1, line2 and line3

4.5.6 Case 6 in the normal operation

When there is No fault occurs in line 1, line2 and line3 they shown on LCD is READY and no data transferred to the phone this is normal case .

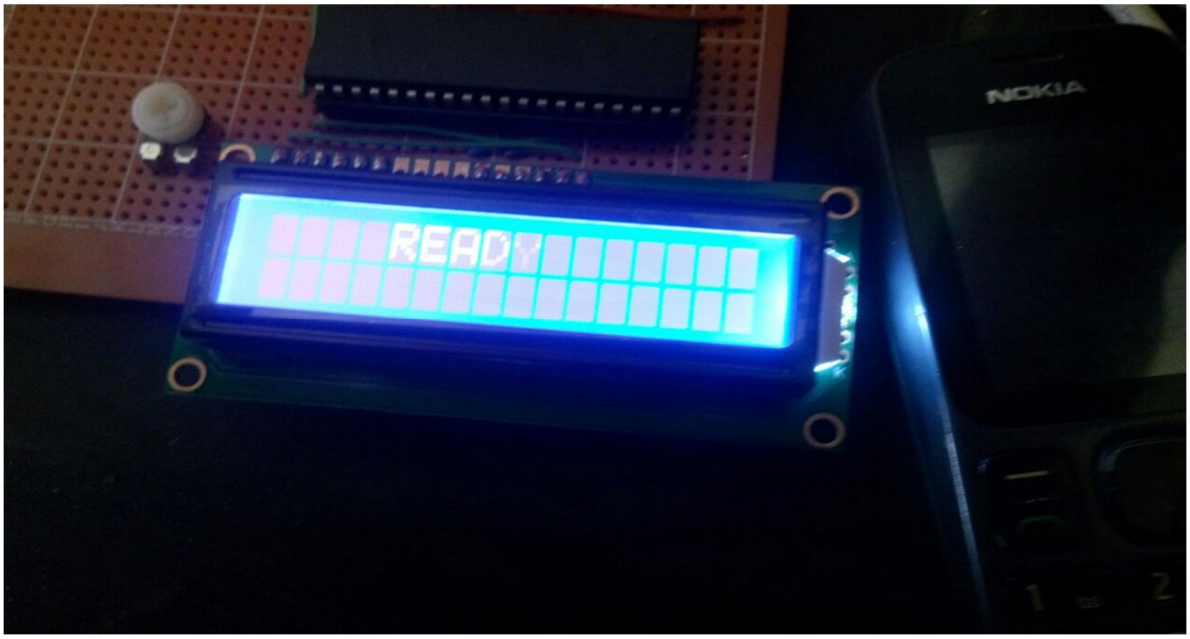

Figure (4.15) describe the normal operation

4.6 Testing and Resulting

Results can be summarized that we have acquired it from practical experience of the design work as shown on Table (4.1) the result of test

No	Test	Result (operation)
1	Fault in line 1	The details shows on LCD and data of location and fault where occur sent as message on mobile
2	Fault in line 2	The details shows on LCD and data of location and fault where occur sent as message on mobile
3	Fault in line 3	The details shows on LCD and data of location and fault where occur sent as message on mobile
4	Fault in line 1 &line2	The details shows on LCD and data of location and fault where occur sent as message on mobile
5	Fault in line 1&line 3	The details shows on LCD and data of location and fault where occur sent as message on mobile

6	Fault in line 2 & line 3	The details shows on LCD and data of location and fault where occur sent as message on mobile
7	Fault in line 1 & line2&line 3	The details shows on LCD and data of location and fault where occur sent as message on mobile
8	No fault	They shows on LCD READY and no data transferred to the phone cell (normal case)

4.7 Programming (Code):

Writing programs using BASCOM-AVR is four programs in one package, it is known as an IDE (integrated development environment); it includes the Program Editor, the Compiler, the Programmer and the Simulator all together. the code of this system shown on appendix A .[22]