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Developing of the Mobile Phone Training Device for Industrial Secondary School Students: Case Study

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ABSTRACT

The Mobile phone is one of the most important devices affecting our daily lives. This study focuses on simulating mobile phone faults which affect the training device on the mobile phone. Department of electronics in industrial schools, such as(Screen failures, audio failures, SIM card failures, vibrator failures, ringing failures, battery failures, charging failures, power switch failures, and keyboard failures). A model was created to simulate mobile phone failures using PROTEUS / SIMULINK. Results show that when the failures are activated, the name of the faults appears on the simulator screen. The results showed that when the name of the failures appeared in writing, this affects the development of the skill of student's better regarding knowledge of failures.

Keywords: *Mobile phone training device, Simulation Model, Training development.*

1. INTRODUCTION

The development of the mobile phone training device is offered to the students of the electronics department in the industrial schools, because it is important in the educational process in practice, where the students are trained in mobile phone faults and knowledge of the form of faults. The device is made up of the main parts of the mobile phone (the screen, sim card, sound, buzzer, vibra, battery, charger, power switch, key pad). Each part has a set of keys, the key works in the case ON, In the case OFF, it activates its fault and shows the effect of the failure on the device. The device is composed of seventeen keys, the mobile phone training device suffers from several disadvantages. The most important of which is not showing the name of the fault during the activation of the fault. This defect was fixed using several tools, the simulation model design on the Proteus program, and its practical implementation on the plate of copper slides. The model contains seventeen compression buttons as an alternative to the key set used in the device. Use this research work microcontroller and artificial intelligence techniques and model simulation design. The source code for PIC Microcontroller is generated in mikroC. The source code is emulated by Proteus, and the program is loaded on PIC18F452. When activated of the first fault of the device by placing the first key in case OFF, the form of the failure appears on the device, and by pressing the first button in the simulation model, the name of the fault appears on screen LM016, and so on. Thus display form the fault and it name to the students at the same time.

2. THE PROBLEM OF MOBILE TRAINING DEVICE

The device consists of a set of keys called failures keys. When the key is placed on OFF mode. Key failure is activated. The effect of failures is shown on the device. But it is a defect not to display name of failures. This negatively affects the development of students' skill in knowing the name of the failures and mixing the faults together.

3 MOBILE PHONE TRAINING DEVICE DESCRIPTION

The mobile phone training device plays an important role in the development of the skills of students specializing in electronics in industrial schools. In theory to know how the communication between the transmitter and the receiver, and the usefulness of each stage in the process of communication, and in practice by knowing the shape of the signal of each stage through the test points on

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the oscilloscope screen, and activate the faults through the keys of each stage, and the emergence of the impact of the failure on the device, and It is useful students in the field of mobile phone maintenance, because the device is an integrated unit magnified for mobile phone.

Figure 1 shows mobile phone training unit showing the different internal parts, It consists of the main parts mentioned in Table I. In addition, there is a set of keys called the device faults keys. In each part of the device Table I shows faults keys and parts for these keys of a mobile phone training unit.

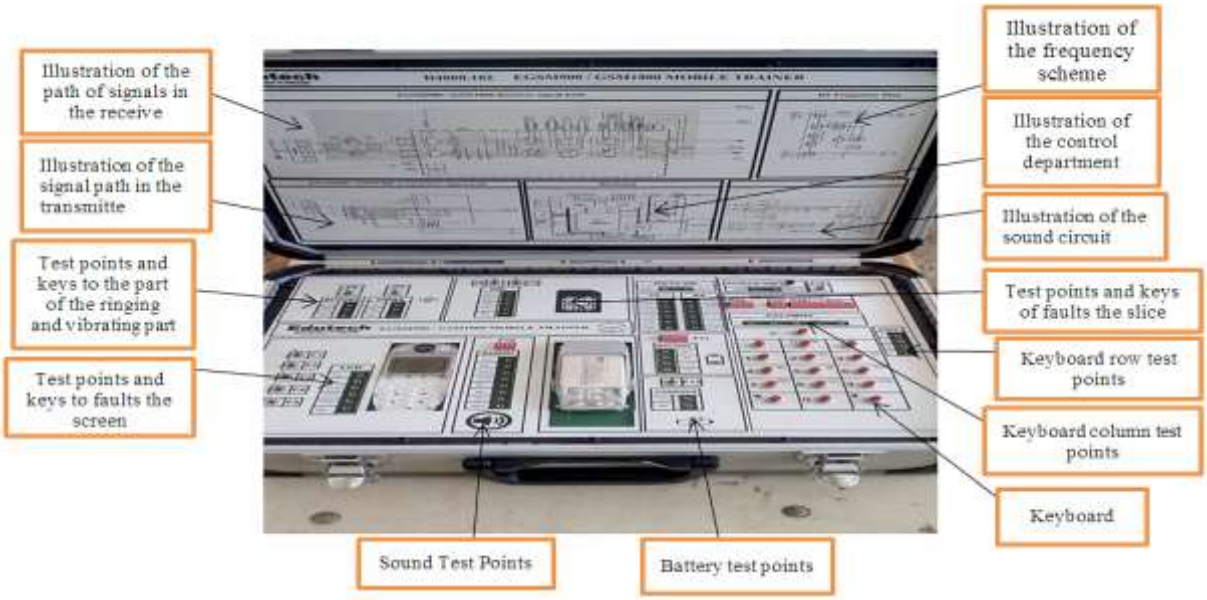

Figure 1 Mobile phone Training device contents

Table I The malfunctions keys and parts for these keys of a mobile phone training unit.

Malfunctions keys	Fault Description
F1,F2,F3,F4,F5	lcd
F6	buzzer
F7	vibra
F8, F9	sim card
F10	audio
F11	battery
F12	charger
F13	power switch
F14,F15,F16,F17	key pad

Figure 2 shows samples of faults signals which clears the type of fault in the mobile unit. There are different signals are related to different faults, these can be simulated by the trainer and indicated by the related signals which are displayed by oscilloscope.

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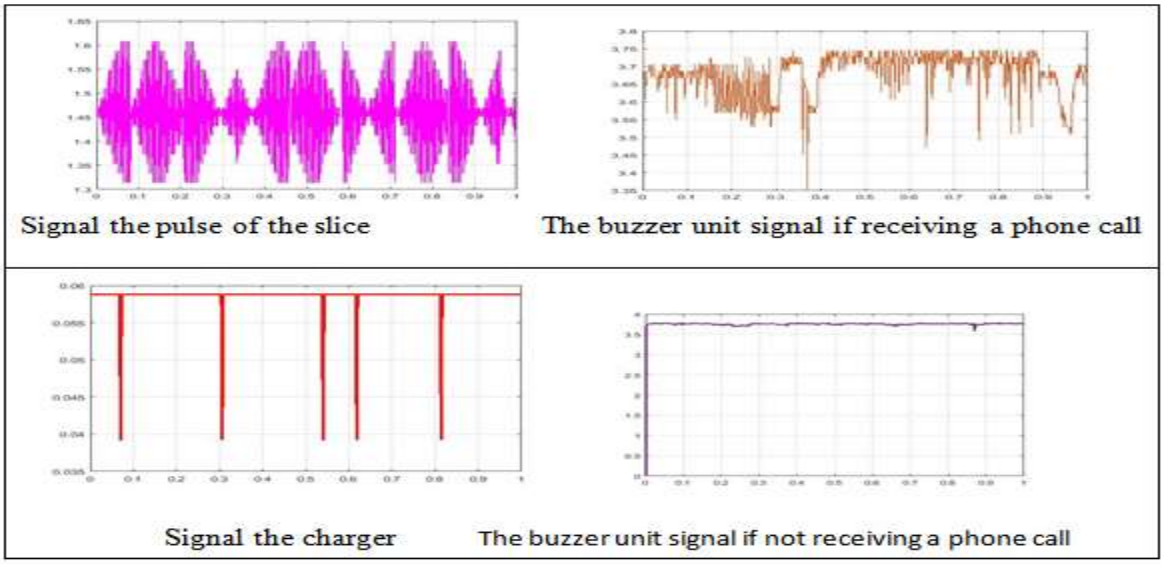

Figure 2 Samples of faults signals

3.1 **Samples of faults**

The screen voltage is small
Data line screen
Turn off the device
Signal transmission line or processor
Buzzer unit
Vibrator unit
Slice or slice house
Microphone
Battery
Charger socket
Key signal transmission power
Column key line
Row key line

Table II gives the main components of a mobile phone and their functions description [1].

Table II Mobile phone components and their functions

Component	Functions
Keypad	Used for inputting or entering data into the phone. It is connected directly to the CPU
Earpiece	Converts the electric signal to a sound signal
Mouthpiece	Transmits sound from one phone to another
Battery	Source of power supply to a mobile phone
Power switch	Switches the phone on and off
Power IC	It takes power from the battery and supplies to all other parts of a mobile phone
Oscillator	It creates frequency during outgoing calls
Screen	Displays data. It is connected to the CPU to receive the signals.
Flash IC	Stores the software and other programs installed in the mobile phone
Charging IC	Takes the current from the charger and charges the battery
CPU	Controls all sections of a mobile phone
Antenna	Receives and transmit radio frequencies and helps the phone to connect to the cellular network
SIM card section	SIM Card Interface section is directly connected to the CPU in most mobile cell phones. If there is no power supply in a mobile phone then the SIM section is connected to the CPU through the Power IC.

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Memory card section	In most phones the micro SD card holder is connected through an 8-pin socket. The memory card section is found inside the CPU
Ear Speaker Section	In modern mobile cell phones which have a separate ear speaker, the speaker is directly connected to the CPU. It receives sound via signals directly from the CPU of from the audio section inbuilt within the CPU. In some mobile phones, these sound signals are received via coil / resistance. Some mobile phones have audio IC in the audio section, while others have an audio amplifier.
Speaker Section	The ringer, buzzer or speaker in most mobile phones are connected to the audio amplifier IC to obtain loud sound. The amplifier IC amplifies the sound or audio signal received from the CPU of the audio section.
Key Backlight Section	LED Lights are connected according to the parallel circuit in the key backlight section. Anode ends of all the LEDS are connected to each other and all the cathode ends to each other. 3 to 3.3 V is supplied for the functioning of these key LED Lights.
LCD Backlight Section	LCD Backlight in mobile cell phones is made according to the series circuit. A boost voltage generator section is built for the supply of high voltage (10 to 18V) for the functioning of the LCD LED. Boost coil, Boost Volt Driver IC, Rectifier Diode are present in this section.
Vibrator Motor Section	Positive power supply is given to this section directly from the positive end of the battery. Negative power supply is given through an NPN the transistor or from the ground of any circuit.
Network Section	Antenna, External Antenna Socket, RX-Band Pass Filter, RF Crystal, PFO, TX-Band Pass Filter, RF IC, and CPU are connected in the Network Section.
Battery Charging Section	Charger and system interface connector is made together in most modern mobile cell phones. Regulator section is made separately for the battery charging section. In some mobile phones, the battery charging section is made inside the Power IC.
FM Radio Section	FM Radio Driver IC, FM Antenna, Signal and Supply Components are made in the FM Radio Section.
Bluetooth Section	Bluetooth Antenna, Bluetooth RF Signal Filter, Bluetooth Driver IC, Supply and Signal Components are found in this section. The Bluetooth section functions like the Network Section.
Hands-free Section:	The Hands-free jack, Hands-free MIC, speaker signal component and Hands-free audio amplifier are present in this section. Hands-free symbol is displayed after connecting the Hands-free jack.

3.2 Mobile phone training device Simulation

The simulation plays an important role in the implementation of the practical aspect to guarantee the proper connecting among the component of the simulation circuit and their proper results on Proteus. **Figure 3** shows the block diagram contents of Simulation circuit wiring.

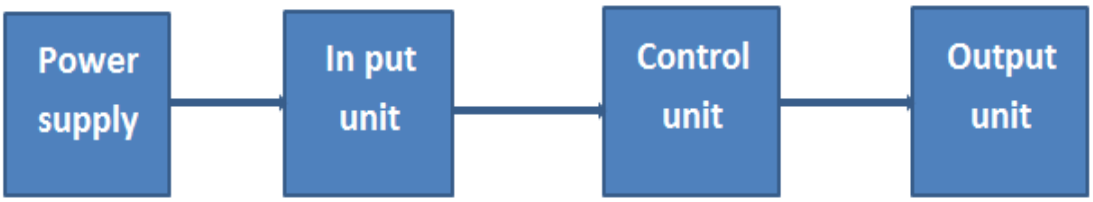

Figure 3 Main stages of the mobile phone training device block diagram.

The presented circuit components are shown in Figure 7 and 9. Which consists of First, the power supply unit which will provide source of 5v. Second, a group of switches that reflects the faults. Third, the control unit (pic18f452). fourth, the output unit which is a display screen (lm016l0).

1- Input unit:

Consists of a set of switches, each switch consists of a button connected to 5V and the other end with a resistance 10kΩ, the other end of resistance with a ground **as shown figure 4**.

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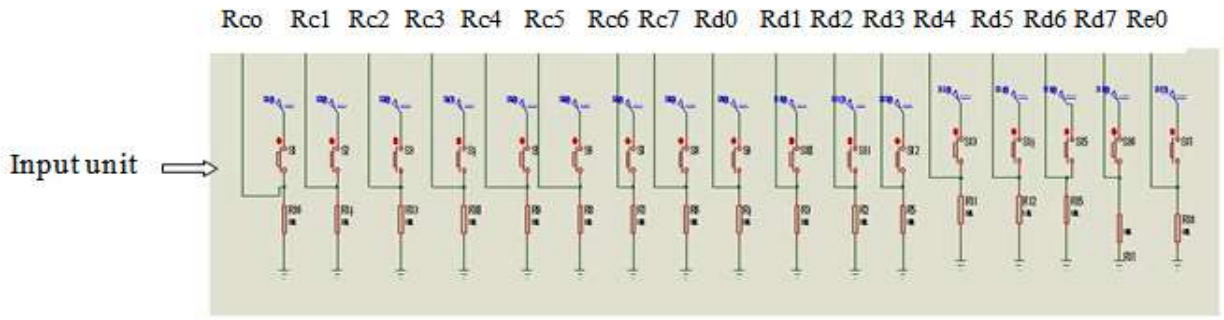

Figure4. Input Unit

2- Control unit:

Consists of Pic18f452. Connection input unit to control unit:

- S1 to Rc0 , S2 to Rc1, S3 to Rc2, S4 to Rc3,S5 to Rc4, S6 to Rc5, S7 to Rc6, S8 to Rc7, S9 to Rd0, S10 to Rd1, S11 to Rd2, S12 to Rd3, S13 to Rd4, S14 to Rd5, S15 to Rd6, S16 to Rd7,S17 to Re0 **as shown figure 5** .

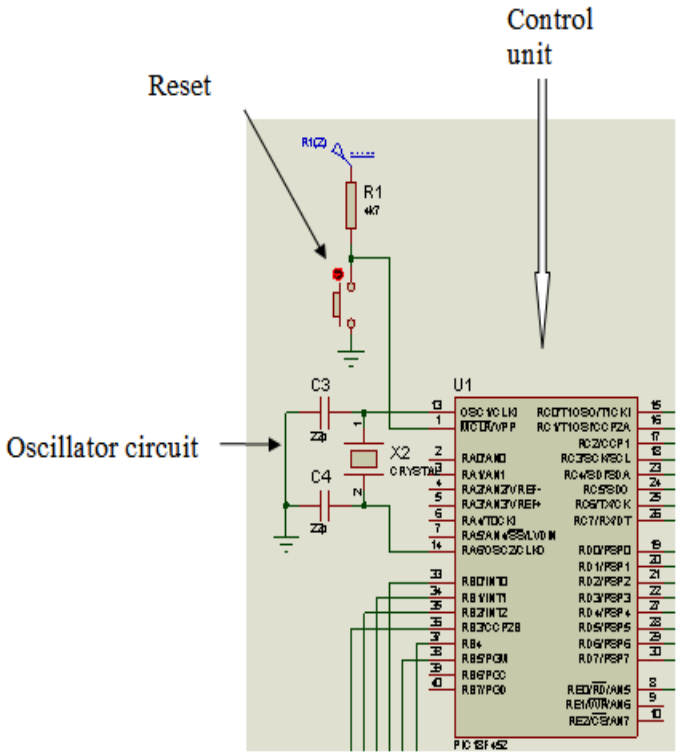

Figure 5. Control Unit

3- Output unit:

Consists of LMO16L. Connection output unit to control unit.

- D4 to Rb0, D5 to Rb1, D6 to Rb2, D7 to Rb3, RS to Rb4, Re to Rb5 **as shown figure 6**.

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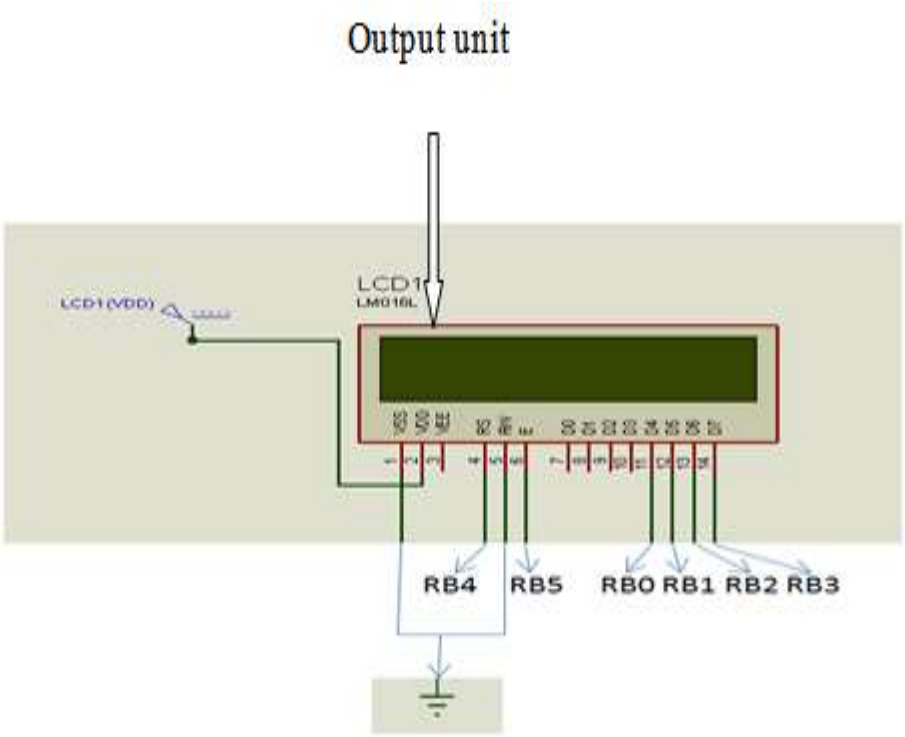

Figure6. Output Unit

● Simulation circuit wiring diagram as shown figure 7.

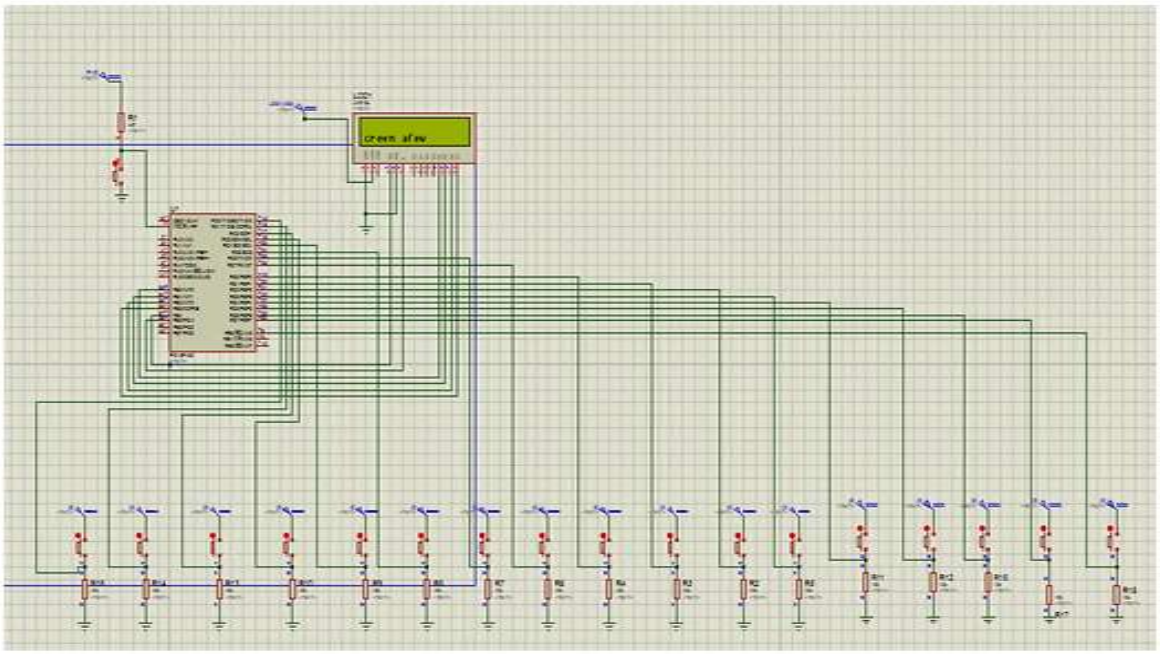

Figure 7 Simulation circuit wiring diagram

- The main components used in this system:
Microcontroller 18f452
LCD (LM016L)
- Other auxiliary components are:
BUTTON
RES 10K
RES 4K7
CAP 22PF
RES-VAR
CRYSTAL
DC 5V

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- Description of The main components system:

The Microcontroller part **as shown figure 8**:

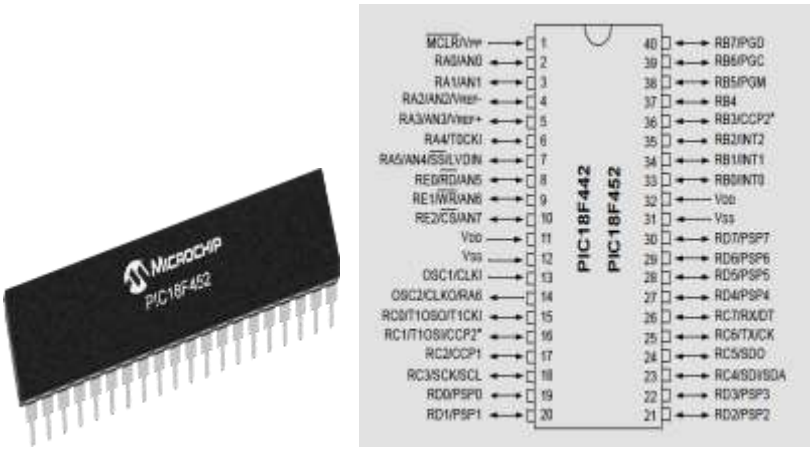

Figure 8 Main Component

It is an integrated chip that contains a small computer and some accessories such as sensors and switching from digital to analog. It is characterized by the controls that it is general purpose, cheap and consumes a small capacity. Control terminals can be used as input units or output units.

3.3 Practical circuit for simulation:

Practical circuit for simulation as shown in **figure 9**. Automatic trouble detection using Simulation model as shown in **figure 10**. Wiring diagram of the proposed system, connect the faults keys to the training device on the mobile phone with simulation model buttons as shown in **figure 11**.

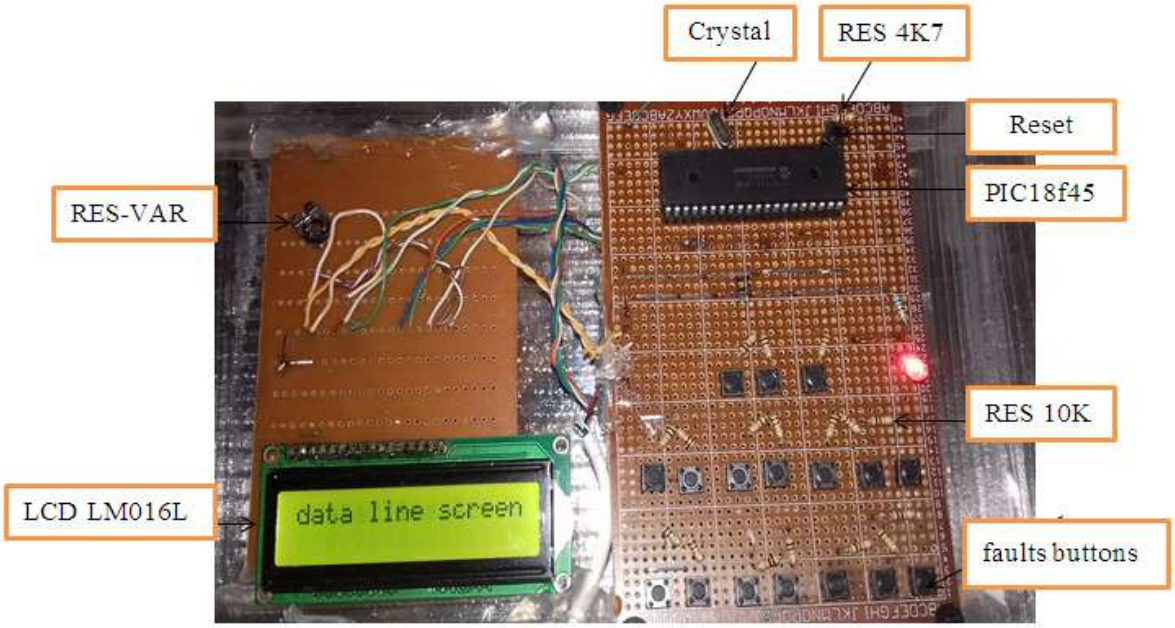

Figure 9 practical circuits for simulation

Figure 10 Automatic trouble detection using Simulation model

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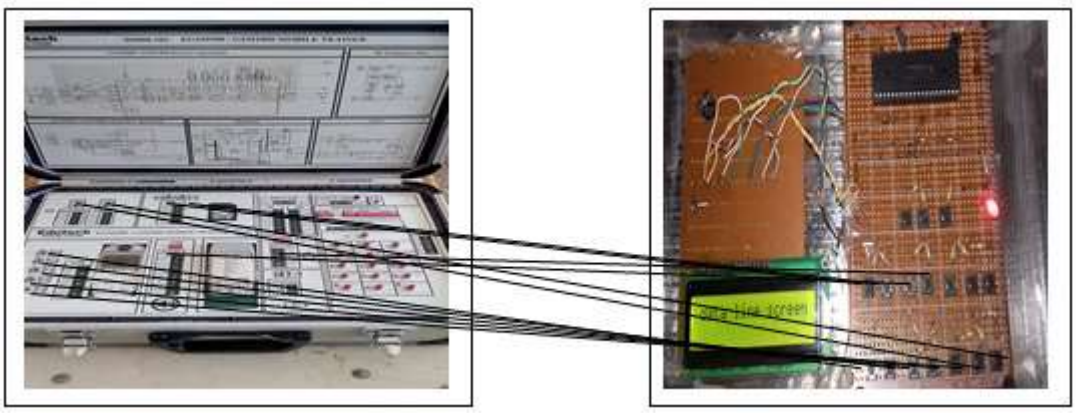

Figure 11 Wiring diagram of the proposed system

4 STEPS OF THE OPERATION MECHANISM OF THE SUBMITTED FORM

1- Simulate the circuit on the proteus program shown in Figure 5.
2- An appropriate program for the group of faults is written on the mikroC and loaded onto the (pic18f452).
3- Experiment the circuit on the proteus simulation program.
4- Perform the circuit practically on the copper slide plate shown in Figure 6.
5- Connect the faults keys to the mobile phone training device. With the keys of the simulation model designed practically.
6- Pressure buttons are connected to the practical simulation model, and the keys to the faults of the training device on the mobile phone.
7- Charge the battery of the mobile phone training device, and turn on the device via the power button.
8- When activating the first fault, place the key for the first fault on the Mobile training device "OFF status".
9- The fault name appears on the simulation model screen, after running the simulation model.

5 FEATURES OF PROTEUS PROGRAM

According to foregoing simulation , the hardware and software system was simulated and the whole design was successful [2]. According to the previous design, we used Proteus software to simulate the system circuit. Proteus is comprehensive function electronic design automation software, which can be used not only for analog and digital circuit simulation analysis but also is applied to the single-chip microcomputer and its peripheral circuit simulation. This software supported by the microprocessor chip [3]. ISIS also provides virtual signal sources, meters, voltage and current probes, logic analyzer, and counter/timer, as well as a graphing feature for analog and digital signals. Proteus VSM is continuously updated. New features components are added on a regular basis. Specifically, new MCUs are added as they released by the manufacturers. The simulation clock is displayed in the bottom schematic window. To check the period of the output a full-size version of the domain appears when running the simulation [4].

6 RESULTS

The results of the simulation results will be as:

1. When the first fault is activated, on pressing the button 1 in this case portc.b0==1 appears on the screen of the first disable voltage to screen a little.
2. When the second fault is activated, on pressing the button 2 in this case portc.b1==1 appears on the screen of the second disable data line screen.
3. When the third fault is activated, on pressing the button 3 in this case portc.b2==1 appears on the screen of the third disable turn off the device
4. When the fourth fault is activated, on pressing the button 4 in this case portc.b3==1 appears on the screen of the fourth disable signal transmission line or processor
5. When the fifth fault is activated, on pressing the button 5 in this case portc.b4==1 appears on the screen of the Fifth disable signal transmission line or processor
6. When the Sixth fault is activated, on pressing the button 6 in this case portc.b5==1 appears on the screen of the sixth disable buzzer unit
7. When the Seventh fault is activated, on pressing the button 7 in this case portc.b6==1 appears on the screen of the seventh disable vibrator unit

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8. When the Eighth fault is activated, on pressing the button 8 in this case portc.b7==1 appears on the screen of the eighth disable slice or slice house
9. When the Ninth fault is activated, on pressing the button 9 in this case portd.b0==1 appears on the screen of the ninth disable slice or slice house
10. When the tenth fault is activated, on pressing the button 10 in this case portd.b1==1 appears on the screen of the tenth disable microphone
11. When the Eleventh fault is activated, on pressing the button 11 in this case portd.b2==1 appears on the screen eleventh disable battery
12. - When the Twelfth fault is activated, on pressing the button 12 in this case portd.b3==1 appears on the screen twelfth disable charger socket
13. - When the Thirteenth fault is activated, on pressing the button 13 in this case portd.b4==1 appears on the screen Thirteenth disable key signal transmission power
14. When the Fourteenth fault is activated, on pressing the button 14 in this case portd.b5==1 appears on the screen fourteenth disable Line column keys.
15. When the Fifteenth fault is activated, on pressing the button 15 in this case portd.b6==1 appears on the screen Fifteenth disable Line row key.

7 CONCLUSIONS

The development of mobile phones is one of the most important necessities of life. Developing a mobile phone training device in the educational process is essential. In order to address the deficiencies in the device in order to reach a better level for our students in the field of mobile phone maintenance. The research paper will reinforce the teacher's ability to explain the practical part of students and identify mobile phone faults, So that the student can learn these mistakes and how to preserve them. Developing students' skills better in the practical aspect by knowing the name of the faults.

APPENDIX

Program code

```
// End LCD module connections
Sbit LCD_RS at Rb4_bit;
Sbit LCD_EN at Rb5_bit;
Sbit LCD_D4 at Rb0_bit;
Sbit LCD_D5 at Rb1_bit;
Sbit LCD_D6 at Rb2_bit;
Sbit LCD_D7 at Rb3_bit;
Sbit LCD_RS_Direction at TRISb4_bit;
Sbit LCD_EN_Direction at TRISb5_bit;
Sbit LCD_D4_Direction at TRISb0_bit;
Sbit LCD_D5_Direction at TRISb1_bit;
Sbit LCD_D6_Direction at TRISb2_bit;
Sbit LCD_D7_Direction at TRISb3_bit;
Void main () {
   lcd_init ();
  lcd_cmd (_lcd_cursor_off);
  While (1)
     {
If (portc.b0==1)
lcd_out (2, 1,"voltage to screen a few              ");
If (portc.b1==1)
lcd_out (1, 1,"disable data line screen            ");
If (portc.b2==1)
lcd_out (1, 1,"turn off the device                 ");
If (portc.b3==1)
lcd_out (1, 1,"signal transmission line or processor ");
If (portc.b4==1)
lcd_out (1, 1,"signal transmission line or processor ");
If (portc.b5==1)
```


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```
lcd_out (1, 1,"disable buzzer unit                ");
If (portc.b6==1)
lcd_out (1, 1,"disable vibrator unit              ");
If (portc.b7==1)
lcd_out (1, 1,"disable slice or slice house       ");
If (portd.b0==1)
lcd_out (1, 1,"disable slice or slice house       ");
If (portd.b1==1)
lcd_out (1, 1,"disable mic                        ");
If (portd.b2==1)
lcd_out (1, 1,"disable battery                    ");
If (portd.b3==1)
lcd_out (1, 1,"disable charger socket             ");
If (portd.b4==1)
lcd_out (1, 1,"disable key signal transmission power");
If (portd.b5==1)
lcd_out (1, 1,"disable column line                ");
If (portd.b6==1)
lcd_out (1, 1,"disable row line                   ");
lcd_cmd (_lcd_shift_left);
delay_ms (300);
}
}
```

REFERENCES

[1] Joan Mutero, Anthony Okuku, "REPAIR AND MAINTENANCE OF MOBILE CELL PHONES", Commonwealth of Learning © 2015 Commonwealth of Learning, 2015.

[2] Jun Li, Hui Chen, and Yingyun Dai, "Design of Calibrating Apparatus of Motorcycl Road Test Instrument Based on MSP430", Applied Mechanics and Materials, Vol. 333-335, pp 2371-2374, 2013.

[3] Xiao Chen, Dexin Yao, "Multiway Responder with Wireless Communication Technology", Applied Mechanics and Materials, Vol. 39, pp. 465-469, 2011.

[4] System Testing Using Proteus VSM, http://www.sciencedirect.com, 9-6-2017.

DOI: 10.31695/IJASRE.2018.32973