Experiment No: 7.

Object: Assembling and Disassembling of Mobile Phones. Fault finding and troubleshooting of Ear piece, Microphone, Keypad and Display Sections of Mobile Phones.

Requirements: Mobile Phone, Various Components of mobile phones, PCB etc.

Disassembling a Mobile Phone-To disassemble is to take something apart or to break it down into pieces.

The following are the steps that you should take when disassembling a mobile phone:

- Switch off the phone
- Remove the battery cover
- Remove the battery, SIM card memory card (if any)
- Remove all the screws from the phone
- Lift back the cover with the help of a flat screwdriver
- Remove the strips (buzzer strip, display, camera, volume and speaker button strips)
- Remove the antennae wire from the outside
- Remove the motherboard and vibrator.

To successfully disassemble a phone, you need to understand the various internal sections of a mobile phone and how they are connected to the CPU.

Internal Parts of a Mobile Phone

Table below outlines the main sections and how they are connected.

Table: Internal parts of a mobile phone

Internal Section	**Connections**
SIM card section	SIM Card Interface section is directly connected with the CPU in most mobile cell phones. If there is no power supply in a mobile phone then the SIM section is connected with the CPU through the Power IC.
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 audio amplifier.
Speaker/Ringer 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 a NPN transistor or from the ground of any circuit.
Network Section	Antenna, External Antenna Socket, RX-Band Pass Filter, RF Crystal, FEM, PFO, TX-Band Pass Filter, RF IC, 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. The RF-CLK signal is given to the Bluetooth driver IC during signal processing.
Hands free (Earphone) 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.

Assembling a Mobile Phone-To assemble is to fit together all the separate pieces in order to form one whole.

The following are the steps that you should take when assembling a mobile phone:

- Fix the vibrator strips of speaker and volume button
- Fix the motherboard
- Connect the antenna with wire
- Place the camera and connect it
- Place the buzzer
- Put the camera cover
- Make sure that the LCD is working before you place the screen
- Put battery and battery cover

Fault finding and troubleshooting of Ear piece, Microphone, Keypad and Display Sections of Mobile Phones.

Fault-A fault is a defect (a failure in a circuit) or an electronic device.

Causes of faults or failures in mobile phones-Failures can be caused by any of the following:

- excess temperature, excess current or voltage,
- ionizing radiation,
- mechanical shock, stress or impact,
- contamination,
- mechanical stress,
- short circuits, imperfect connections,
- poor insulation or wiring caused by grounding.

Types of mobile phone faults:

- **Hardware faults:** occur due to hardware malfunctioning
- **Software faults:** occur due to problems with software
- **Settings faults:** occur due to wrong/invalid settings

Hardware Faults

There are many hardware faults that can occur in a mobile phone, but here we shall discuss the following:

- Sound Faults-Ear piece, ringer and microphone problem
- Keypad problems
- Display problems
- Touchscreen problems

Sound Faults-We shall consider the following types of sound faults:

- Earpiece or ear speaker problem
- Mobile phone speaker problem
- Ringer problem
- Vibration problem
- Microphone problem

Earpiece or Ear Speaker Problem-The Earpiece or speaker is the electronic component or part that helps us to listen to sound during a phone call. It is controlled by Audio IC or Power IC (UEM).

The common problems associated with the ear speaker are: No sound during phone call, Low sound during phone call, Sound has interruptions.

Figure: Ear Speaker

How to Solve Earpiece or Speaker Fault

1. Check the speaker volume during a phone call.
2. If speaker volume is fine, then check the earpiece by keeping the multimeter in buzzer mode. The value must be between 25~35 Ohm. If the value is not between 25~35 Ohm then change the earpiece.
3. If the problem is not solved then check the Circuit Track of the earpiece section. Do jumper wherever required.
4. If the problem persists heat, reball of change the UEM/Audio IC.
5. If the problem is still not solved then heat, reball or change the CPU.

Note: If the sound is low or not clear during a phone call, then you should change the speaker.

Ringer Problem-A Ringer is any type of electronic component that rings or plays a loud sound. It is also called the I.H.F Speaker, buzzer, melody, etc. Figure below shows a picture of a ringer.

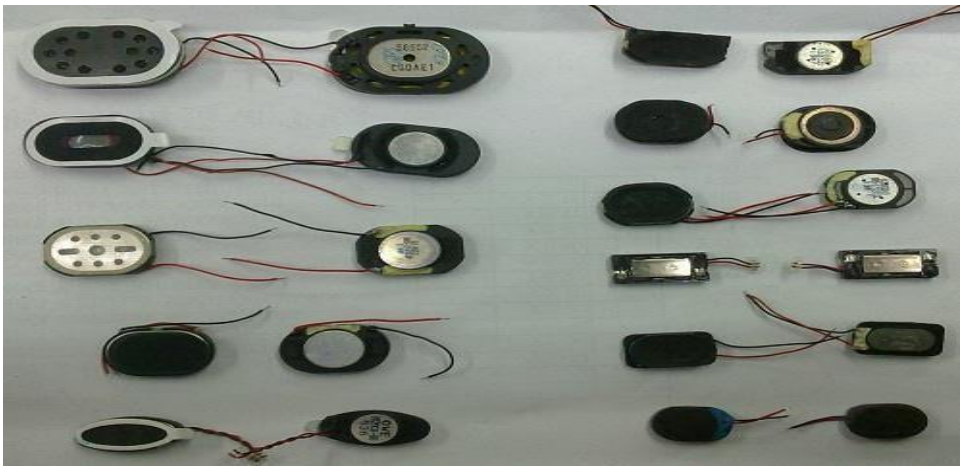


Figure: Cell phone ringers

The following are the types of problems associated with the ringer:

- Ringer not working
- Low sound from the Ringer
- Sound coming from Ringer but with interruption
- Sound not clear

How to Solve Ringer Faults

1. Check the ringer settings in the mobile phone. Check Ringer volume and silent mode. Adjust or change the volume and /or mode if required.
2. If the problem is not solved then open the mobile phone and clean the ringer point and ringer connector.
3. If the problem is not solved then check the ringer by keeping the multimeter in buzzer mode. The value must be between 8 ~ 10 Ohm. If the value is not between 8~10 Ohm then change the Ringer.
4. If the problem is not solved then check the track of ringer section. Do jumper wherever required.
5. If the problem is not solved then check the Ringer IC. Heat or change the IC.
6. If the problem is not solved then heat, reball or change the UEM / Logic IC.
7. If the problem is still not solved then heat, reball or change the CPU.

Note: If there is less sound from the Ringer then change the Ringer. If the problem is not solved then heat or change the Ringer IC.

Vibration Problem-The vibrator is an electronic device that generates vibrations. It is controlled by the Logic IC or Power IC.

The common types of faults associated with the vibrator are:

- Vibrator not working
- Vibration has an interruption
- Vibration Hangs.

How to solve Mobile Vibrator faults

1. Check the Vibrator settings in the mobile phone. Check if the Vibrator is ON or OFF.
2. If the problem is not solved then open the mobile cell phone and clean the vibrator tips and connector.
3. If the problem is not solved then check the vibrator with the multimeter in Buzzer Mode. The value must be between 8~16 Ohm. If the value is not between 8~16 Ohm then change the Vibrator or Motor.
4. If the problem is not solved then check the track of the vibrator section. Do jumper wherever required.
5. If the problem is not solved then heat, reball or change the UEM/Logic IC /Power IC.
6. If the problem is still not solved then heat, reball or change the CPU.

Microphone Problem-The Microphone is an electronic component that helps to transmit sound during phone call. A microphone is controlled by Audio IC or Power IC (UEM).

The common types of problems associated with the microphone are:

- Low sound during phone call
- Sound has interruption
- Change in sound.

How to Solve Microphone Fault

1. Check the Microphone settings.

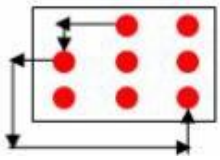


Figure: Jumper Setting For Microphone

2. If all the settings are normal, then check and clean the Microphone tips and connector.
3. If the problem is not solved then check the Microphone with the multimeter in Buzzer Mode. The value must be between 600~1800 Ohm. If the value is not in between that range, then change the Microphone. Note that only one side will give a value.
4. If the problem is not solved then check the track of the Microphone section. Do Jumper wherever required.
5. If the problem is not solved then heat or change the Microphone IC.

6. If the problem is not solved then heat, reball, or change the UEM / Audio IC /Power IC.
7. If the problem is still not solved then heat, reball or change the CPU.

Keypad Problems-The keypad enables you to enter data, such as, phone numbers and names in your mobile phone.

The main types of problems associated with the keypad are:

- Some keys not working.
- Keys need more pressure to work.
- When a key is pressed it works continuously.
- When one key is pressed, some other key works
- When one key is pressed, some other key works simultaneously.

How to Solve a Keypad Faults

1. Check the facial of the keypad.
2. Clean the keypad and keypad points shown in Figure below.

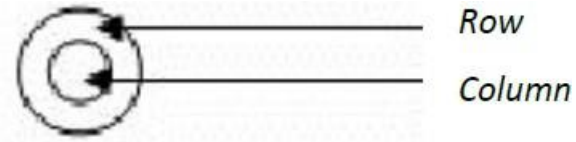


Figure: Keypads and keypad points

3. Using the multimeter in Buzzer Mode and check the Row and Column of the Keypad. If there is a beeping sound then the keypad is working.
4. If there is no improvement, heat or change the Keypad IC or the Interface IC.
5. If still no change, heat, reball or change the CPU.

Note: If you press a key and it takes a long time to work, then you should reload the software to solve this problem. In all Nokia mobile phones, if none or only a few keys are working, then you should change the keypad IC to solve the problem.

Display Not Working-This is the part that displays information in a mobile phone. It is controlled by the CPU. In some cell phones there is an Interface IC called the Display IC situated between the Display and the CPU.

The following are the common types of problems associated with the display:

- Display is blank.
- Display not working properly.
- Only half the display works.
- White display.
- Display is upside down.
- Display is broken.
- When the mobile phone is switched ON, the Logo appears and then the display disappears

How to Solve Display Faults in a Mobile Cell Phone

1. Clean the display tips and display connector.
2. Resold the display connector
3. Change the display
4. Check the display Track.
5. Resold or change the display IC.
6. Heat, reball or change the CPU.

Note:

- In the slider mobile phone handset, the display problem is mainly due to a faulty display track. Change the track to solve the problem.
- If the Display is upside down, broken or it displays information on half the screen then you should change the display
- If the Display is white even after changing it, then you should reload the software.

Phone Touch Screen (PDA) fault- A Touch Screen (PDA) is an electronic component that allows you to input data or control your mobile phone by touching the screen. It normally has 4 Points namely:

- (+),
- (-),
- (RX),
- (TX).

The touch screen is normally controlled by the CPU. In some mobile phones there is an Interface IC called PDA IC or Screen Touch IC.

The following are the faults associated with the Touch Screen

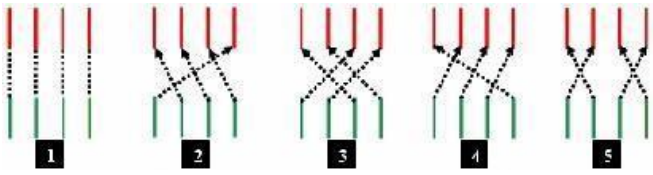
- Touch Screen not working.
- Only half the Touch Screen works.
- When one key is pressed another key works.

How to Solve Touch Screen (PDA) Faults

1. Check the settings if the mobile phone has both a keypad and a touch screen.
2. Clean and resold the PDA Tips and PDA connector.
3. Change the PDA.
4. Check the Track of the PDA section and Jumper if required.
5. Heat or change the PDA IC
6. Heat, reball or change the CPU

Note:

- If the PDA problem is not solved by hardware solutions, then reload the software to solve the problem.
- Any PDA of the same size will fit in any mobile phone. Any one of the 5 Jumper Settings shown in figure below will work:



5 Types of PDA jumper solution

Figure: Jumper settings for PDA

Result: As per above detailed laboratory exercise **Assembling** and **Disassembling** of **Mobile Phones**, **Fault finding and troubleshooting of Ear piece, Microphone, Keypad and Display Sections of Mobile Phones** are done successfully.