Skill India

GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP

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Transforming the skill landscape

Telecom Sector Skill Council

Participant Handbook

Sector
Telecom

Sub-Sector
Handset

Occupation
Customer Service-Handset

Segment

Reference ID: **TEL/Q2201, Version 4.0**
NSQF Level 4

Handheld Devices (Handset & Tablet) Technician

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This book is sponsored by

Telecom Sector Skill Council of India

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Shri Narendra Modi
Prime Minister of India

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COMPLIANCE TO QUALIFICATIONPACK–NATIONALOCCUPATIONAL STANDARDS

is hereby issued by the

TELECOM SECTOR SKILL COUNCIL

for

SKILLING CONTENT: PARTICIPANT HANDBOOK

Complying to National Occupational Standards of
Job Role/ Qualification Pack: 'Handheld Devices (Handset & Tablet) Technician'
QP No. '**TEL/Q2201 NSQF Level 4**'

Date of Issuance: **Aug 26th 2022**

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Authorised Signatory
(Telecom Skill Development Council)

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The preparation of this Handbook would not have been possible without the Telecom Industry's support. Industry feedback has been extremely encouraging from inception to conclusion and it is with their input that we have tried to bridge the skill gaps existing today in the Industry.

This Participant Handbook is dedicated to the aspiring youth who desire to achieve special skills which will be a lifelong asset for their future endeavours.

About this book

India is the second-largest telecom market in the world, with over 1.16 billion (116 crores) subscribers, and by 2025 it is expected to grow to 0.95 billion which is (92 crores).
The sector employed over 2.2 million (22 lakhs 20) employees directly and 1.8 million(18lakhs) indirectly as of 2021, and it is expected to grow with the introduction of 5G network services.
As on date, this sector is in the top five employment opportunity generators in the country.
The sector currently employs over 2.08 million employees and is slated to employ more than 4.16 million employees by 2022. This implies additional creation of ~2.1 million jobs in the nine-year period.

This Participant book is designed to impart theoretical and practical skill training to students for becoming a Handheld Devices (Handset & Tablet) Repair Technician.

Individuals at this job are responsible for repairing a handset both hardware and software components, testing the handset after repairs for adequacy and ensuring availability of adequate inventory of the hardware components.

This Participant Handbook is based on Handheld Devices (Handset & Tablet) Repair Technician Qualification Pack (TEL/Q2201) & includes the following National Occupational Standards (NOSs):

1. Repair and Test Handsets-TEL/N2213
2. Repair and Test Tablets-TEL/N2214
3. Carry out chip level repair in mobile phone-ELE/N4631
4. Organise work and Resources as per Health and Safety Standards-TEL/N9101
5. Interact effectively with team members and customers-TEL/N9102

The Key Learning Outcomes and the skills gained by the participant are defined in their respective units.

Post this training, the participant will be able to repair hardware and software components of a handset and also test it for adequacy of repair.

We hope that this Participant Handbook will provide a sound learning support to our young friends to build an attractive career in the telecom industry.

Symbols Used


Key Learning Outcomes


Steps


Exercise


Tips


Notes


Unit Objectives

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1. Role and Responsibilities of a Handheld Devices- (Handset & Tablet) Technician

Telecom Sector Skill Council

Unit 1.1 – About the Telecom Industry

Unit 1.2 – About the Cell phones

Unit 1.3 – Organizational Policies and Standards

Key Learning Outcomes

At the end of this module, you will be able to:

1. Outline the telecom market in the country and some mobile phone vendors
2. Explain about the evolution of cell phones
3. Explain and outline how mobile communication and cell phones work
4. Explain and outline the role of a Handheld Devices(Handset & Tablet) Technician

UNIT 1.1: About the Telecom Industry

Unit Objectives

At the end of this unit, you will be able to:

1. Explain and outline the growth and opportunities in the Indian telecom industry
2. List some popular mobile phone vendors in the country
3. Explain and outline the role of a Handheld Devices(Handset & Tablet) Technician

1.1.1 Telecom Industry at a Glance

India today is the second fastest growing economy of the world. The economic reforms over the last three decades has led to liberalisation of the Indian economy and its closer integration to the world economy. This has led to a paradigm change in the Indian economy from being a closed, centralized economic model to a market-oriented model. The improved business climate has resulted in the emergence of India as an economic power house.

Indian telecom is on a tremendous growth path. In terms of socioeconomic development, connecting a diverse and thriving economy of over a billion people with the rest of the world is an unparalled achievement.

Fig. 1.1.1: A common sight in India today

1.1.1 Telecom Industry at a Glance (Continued)

The transformation of the Indian telecom industry from a monopoly to a decentralised competitive model has been challenging. The National Telecom Policy (NTP) of 1994 with its aim of "telephone on demand", making all leading class services available at a reasonable price, transforming India into a major manufacturing and export hub for telecom equipment and provision of basic telephony services to all villages marked the first steps toward this new model.

The revised NTP was issued by the Government of India in 1999. This policy has had a major role in reshaping the sector by overhauling the policy structure as it existed till then. India achieved the set targets and goals well ahead of schedule and is a thriving market today.

India can today boast of over 1103 million subscribers and overall tele-density in excess of 86 per cent.

The true potential of the telecom sector is only now being unleashed with the large number of GOI initiatives to make the Indian Iociety more inclusive. A robust policy framework is necessary to exploit the full potential of the telecom sector in the country's progress.

1.1.2 A Few Handset Vendors in India

Samsung India Electronics is a leading provider of Consumer Electronics, IT and Telecom products in the Indian market. Three research labs and two manufacturing plants in the country drives innovation in the company. It has a large employee base. The company has also focussed on capability building and skilling of its workforce by having a modern training facility with in its manufacturing premises . The Media Solutions Centre division of the company is its prime teaching facility offering interactive study material through its Smart Learning solution.

1.1.2 A Few Handset Vendors in India (Contd.)

The facilities on offer aim to supplement the knowledge gained by millions of students in formal classes in CBSE board and also those targeting competitive examinations. Samsung has plans to extend similar solutions to other boards in the country, higher education as also develop skill content.

Micromax Informatics Limited is a leading consumer electronics company in India. It is also one of the major manufacturers of mobile handsets. It has revolutionized the mobile space in India being the first to bring in cost effective devices and technology into the Indian markets and thus enabling absorption of technology at a large scale

Micromax is currently one of the top smartphone company in India with a manufacturing facility in Hyderabad with a capacity to manufacture one million mobile phone devices per month.

LAVA International Ltd is another leading player in the mobile handsets space. The company has made a mark for itself in a short time-frame and has an innovative policy that endeavours to make a niche space for itself across the spectrum that includes every field namely Product, After-Sales Service and Distribution. Being one of the key players in the Indian handset manufacturing industry, Lava stands to greatly benefit from the Make in India campaign. The company plans to invest Rs. 1200 crores in phases in its Noida plant so as to gradually increase the production up to 10 million phones in a month which will help in generating employment for 1 lakh people.

Intex Technologies (India) Ltd., is another player in consumer durables, IT accessories and handsets. The mobile business has been a key driver of growth. Its forays into international business began with its forays into Nepal by marketing its mobile phones there. The company now has an established presence in the Middle-East, ASEAN, SAARC region as also number of African nations.

1.1.2 A Few Handset Vendors in India (Contd.)

The company has set up its R&D facilities in India and China. The facility caters for product design and development needs of the company. It employs a highly skilled and experienced workforce and has all modern equipments and facilities necessary for such a complex and high ended job. The company presently operates four modern facilities at Jammu, Himachal Pradesh (Baddi) and Uttar Pradesh (NOIDA) manufacturing diverse products. A large ultra modern manufacturing facility is coming up in Greater Noida. The company aims to have a world class manufacturing facility there that would cater for its national as also international clients. It gives employment to over 14000 people all over the country and has established its presence pan-India by having a large marketing and maintenance network comprising stock and sales offices and a large No of service touch points. Intex is an ISO 9001:2008 certified company.

Celkon Mobiles is another leading telecom company in India into handset manufacturing. It introduced mobile phone solutions as also wireless technologies in India.

It has attempted to establish its USP to be providing personalised service to all its customers and manufacture customized phones with a host of features for its users. It has an all India presence with over 800 service centres and a repair center in Hyderabad, Banglore & Delhi. The company's business plans include setting up an R&D and design house and today is one of the major domestic employers within the country.

Karbonn Mobiles started its operations in 2009.It aims to bring smartphone technollogies to the masses.It is a joint venture of the Jaina Group and UTL Group based based at Delhi and Banglore repectively. Karbonn offers a large variety of devices that meet his customer needs.

With over 90 percent penetration, Karbonn has its presence all over the country. It also plans to expand and makes its presence beyond the country in countries of the Middle East, Africa, CIS, Eastern Europe, South Asia and South East Asia. To ensure effective after sales service, the company has a chain of service and maintenance centres across India as also 12 international centres in different countries.

1.1.3 Responsibilities of a Handheld Devices (Handset & Tablet) Technician

With the growth in Indian Telecom industry the demand for various professionals such as Handheld Devices(Handset & Tablet) Technician, Telecom Engineer, etc., is bound to increase. Over the next five years this sector has an overall potential to create in excess of 40 lakh direct and indirect jobs.

Job description: The Handheld Devices(Handset & Tablet) Technician is expected to repair a faulty handset irrespective of the fault being in the handset's software or hardware. The first step for a Handheld Devices(Handset & Tablet) Technician is to carefully listen to and understand the customer's description of the problem. Then he/she is required to run test diagnostics and assess functionality of the device before opening it up. Components that may require replacement like antenna, battery, LCD screens, keypads, buttons and camera would require examination. Skillfulness and maintaining a clean, static-free work environment is a pre-requisite for the job.

Basic written and communication skills, clear eyesight and strong reading and analytical abilities are essential qualities in a Handheld Devices(Handset & Tablet) Technician. The individual is expected to be analytical and capable of handling high pressure situations to fulfill his assigned responsibilities.

KRAs of Handheld Devices(Handset & Tablet) Technician:

- Performing efficient, high quality diagnoses and repairs.
- actively maintain and update knowledge on the subject.
- Perform tasks associated with workshop operations.
- Maintain service record details

UNIT 1.2: About Cell Phones

Unit Objectives

At the end of this unit, you will be able to:

1. List and outline the changes in technology of a cell phone over the years
2. Explain and outline how a mobile phone work over a network
3. Explain what goes on inside the handset during mobile communication
4. List and explain common features and uses of mobile phone
5. List and explain some popular mobile phone platforms

1.2.1 Evolution of the Cell Phone

Evolution of smartphones last twodecades	
1994	IBM brought out the Simon which had a touchscreen and a very early form of what we all know today as 'Apps'. It cost $899 and only worked in 15 states in the US.
1996	The first ever phone with the 'slider' form factor came in the shape of the Nokia 8110. It had the nickname the banana phone due to its shape and even made an appearance on the big screen in the
1999	WAP launches on the Nokia 7110 making it the first phone capable of browsing the web albeit a trimmed down version which didn't provide the full HTML experience we know today.
2000	The Sharp J-SH04 becomes the first camera phone on the market but only available in Japan. BlackBerry launch their 857 which support email and web browsing signifying the start of BlackBerry's
2001	Full-colour displays start to hit the market first with the Mitsubishi Trium Eclipse but the Ericcson T68i.
2002	Europe's first camera phone, the Nokia 7650, was released.
2003	The Finnish giant's best-selling phone of all time, the Nokia 1100, hit the shelves and has since sold over 200 million units
2005	Android, the mobile operating system was acquired by Google which sent the message the Mountain View giant was serious about mobile technology.
2006	The Nokia N95 launched providing the first real smartphone experience. It ran on Symbian, had 160mb of RAM, the world's first 5-megapixel phone camera, Bluetooth and Wi-Fi.
2007	June 2007 saw the launch of the 1st generation iPhone, unveiled by Steve Jobs.
2008	The first Android phone is released called the G1. It has a limited touchscreen and a slide out keyboard
2010	Google release the Nexus One.
2011	Samsung cements their place as the biggest global smartphone vendor thanks to the Galaxy S II which packs an 8MP camera and an AMOLED display.
2012	iPhone 5 was launched, selling 5 million units within a week.
2013	Fingerprint scanning went mainstream when it launched on the iPhone 5S via the touch button
2015	Chinese firms Huawei and Xiaomi make strides in Western Markets, but both Samsung and Apple continue to dominate with the Galaxy S5 and iPhone 6S respectively holding 38% of the global market share between them.
2016	Google ditch their Nexus branding and replace it with the Pixel.
2017	Microsoft ended support for the Windows Phone OS.
2018	Chinese manufacturer Ulefone launches the Power 5 incorporating a 13,000 mAh battery, the largest ever seen in a mobile phone.
2019	The UK & US begin to deploy 5G network, initial indications point to real-world data transfer speeds 10 times faster than 4G.
2020	Samsung launches the Samsung Galaxy S20, with a 108 megapixels camera.

The future of smartphones will have 5G wireless with 10times faster data transfer, fold-able screens that can fold to reduce its size with out compromising on integrity, immersive Tech with augmented reality and virtual reality

Table 1.2.1: A timeline of mobile handset development

1.2.2 How Cell Phones Work?

Fig. 1.2.2(i): Mobile communication at work

Fig 1.2.2 depicts the basic working principle of a mobile phone. When we make a call to another number, our voice is converted into an electrical signal by the phone and then transmitted as radio waves. On receiving this electrical energy, the receiving mobile converts it back into sound.

Mobile phones are required to be very compact for ease of carriage. They therefore are designed to use minimum power and have compact antennas. This means that a mobile phone has very limited range. To increase range, the entire coverage area is divided into a group of hexagonal 'cells' –with its own large antenna and transmitting equipment or base station fixed on ground. These cell antenna pick up signal from our phone and send it onwards to the nearest cell from the call recipient. While on the move, the call is switched from cell to cell without any interruptiion.

One major advantage of such a small cell structure is that frequencies can be re-used beyond the adjacent cells. This a important due to limited availability of frequencies. The cell size depends on factors like user density and power of the transmitting base station.

You must have noticed bars on top of your phone that keep changing in numbers. More bars mean a stronger signal and is a measure of the magnitude of the signal received from the cell tower. The magnitude of the received signal is called "signal strength". Poor signal strength indicates either your signal is being blocked by some obstruction like a building or the cell tower you are connected to is far away. In case of poor signal strength, a cell phone transmits a stronger signal so as to connect to the tower, consuming greater power thus draining the battery faster.

1.2.2 How Cell Phones Work? (Contd)

Frequency-Division Multiple Access (FDMA), Time-Division Multiple Access (TDMA) and Code-Division Multiple Access(CDMA) are the three technologies used in mobile communications

FDMA puts each call on a separate frequency. It is used mainly in analog systems and is not in much use now due to inherent limitations.

TDMA is used in the global communication system for mobile communication (GSM). In this access system, a cell is assigned a certain portion of time on a specified frequency by a process called "Sampling". Voice data is compressed to digital information at the cell and is more efficient than FDMA system.

CDMA is a truly digital access technique. It gives a unique code to each call and using "Spread Spectrum" technology spreads it over the available frequencies. Each phone transmits on all allotted frequencies and uses the global positioning system (GPS) to get positional information.

Fig. 1.2.2(ii): A telecom tower

1.2.3 Common Features of Mobile Phone

Fig. 1.2.2(iii): Common features of a cell phone

1.2.3 Common Features of Mobile Phone (Continued)

Voice: Refers to the phone calls that we make to other cell phones and the calls we receive on our handset.

SMS: Abbreviation for short message service. SMS is the transmission of short text messages to and from a mobile phone or other similar devices. Messages must be no longer than 160 alpha-numeric characters and contain no images or graphics.

Fig. 1.2.3: Popular applications of a smartphone

USSD (Unstructured Supplementary Service Data). This is a communication technology used in the global system for mobile (GSM) system. It is used to send text between a mobile phone and an application program in the network. Prepaid roaming or mobile chatting are typical examples.

Internet: The Internet is a global network connecting millions of computers across the globe capable of exchanging data.

Email (electronic mail): The transmission of messages from one device to another (one or more recipients) by electronic means over a communications network is called Email.

Camera: Used to take pictures or shoot videos. The camera is now increasingly used by other mobile applications such as QR Reader, Bar Code Reader, etc.

Wallet: A means to provide credit or debit card information on your mobile in digital form. You can then make a payment electronically using an application on your handset.

Alarm Clock: As the name suggests, this app help sets alarms that ring at specific time for you.

1.2.4 Popular Uses of Mobile Phone

Mobile Banking

Mobile banking is extension of net banking services provided by a bank or other financial institutions on a mobile. Using a software provided by a bank, called an app, customers can carry out financial transactions using any mobile device like a mobile phone or tablet. Mobile banking is usually available on a 24-hour basis. The financial transactions that a customer may carry out depends on the app of a particular financial institution and is made as per the policy of the regulatory framework. Common services offered are obtaining account balances, electronic bill payments. latest transactions detail , transfer funds to previously registered clients etc. ICICI's POCKETS, ICICI mobile, SBI's Buddy etc are some examples of mobile banking apps.

Fig. 1.2.4(i): Mobile banking

Mobile Learning

mLearning or mobile learning is a form of distance education that uses mobile / personal devices. It permits learning at the learner's convenience using mobile device educational technologies and therefore becomes an important component of informal learning. Wikipedia defines it as "learning across multiple contexts, through social and content interactions, using personal electronic devices". Handheld computers, notebooks, tablets, mobile phones, MP3 players etc are common mLearning technologies.
Thus, it can be seen that mLearning focuses on mobility of the learner and interactions with portable technologies. Using mobile tools for creating learning aids and materials, mLearning becomes an important part of informal learning.

Fig. 1.2.4(ii): Mobile Learning

1.2.4 Popular Uses of Mobile Phone (Continued)

Mobile Health (mHealth)

mHealth (or m-health) has emerged as a sub-field of eHealth. eHealth implies use of Information and Communication technologies (ICT) for health services and improving availability of medical information. Thus eHealth implies use of computers, satellite communications, patient monitors etc. mHealth on the other hand came to the fore with greater availability of the smart phone. It implies the practice of medicine and public health supported by mobile devices such as mobile phones, tablet and PDAs at the client end. mHealth applications include collecting community and clinical health data, making healthcare information available to practitioners, researchers and patients, monitoring the vital signs of a patient, transmit these these to a specialist and also direct provision of care (via mobile telemedicine).

Fig. 1.2.4(iii): Mobile health

Mobile Agriculture

The easy availability of portable, wireless devices and developments in mobile technologies has led to many innovative services and applications being made available in the field of agricultural across the value chain in both developed and developing countries. Due to greater mechanization and consequently a smaller agricultural workforce in the developed world, mobile agricultural applications are generally used at the higher end of the value chain like consumers and processors. As against this, in the developing world large part of the total working population is involved in Agriculture. Mobile applications therefore generally target producers and traders to deliver services

Fig. 1.2.4(iv): Mobile agriculture

1.2.5 Popular Mobile Platforms

iOS

iOS (previously iPhone OS) is a mobile operating system (OS) developed and distributed by Apple Inc. Originally unveiled in 2007 for the iPhone, presently the the company's mobile devices, including the iPhone, iPad, and iPod Touch operate on the iOS operating system. iOS is not licensed by Apple for use on non-Apple hardware. iOS applications can be found in Apple's App Store. It contains more than 1 million such applications.

Android

Android, developed by Google, is the most popular mobile operating system today. It is based on the Linux kernel and developers need to also have a good knowledge of JAVA. It has primarily been designed for mobile devices like smartphones and tablets that use touchscreen. The user interface is primarily based on direct manipulation, is highly intuitive in that the touch gestures to manipulate on- screen objects correspond to real-world actions, such as swiping, tapping and zooming, along with a virtual keyboard for text input. Each version of Android is named after a dessert, and the most recent version is Android 7.0 "Nougat" released in August 2016.

Blackberry

BlackBerry OS is a proprietary operating system developed by BlackBerry Ltd formerly known as Research in Motion (RIM) for its BlackBerry line of handheld smartphone devices. The OS provides multitasking and supports specialised input devices like the track wheel, trackball, the track pad and touchscreen that have been adapted by the company for its mobile devices. The best known feature of the OS is its native support of corporate email. Blackberry Z30, Blackberry Passport, Blackberry Q10 and Blackberry DTEK 60 are some phones powered by Blackberry OS.

Windows

Windows Phone, developed by Microsoft, is a mobile operating systems family for smartphones and Pocket PCs that is a replacement of Windows Mobile and Zune. Standard features include multitasking and ability to navigate Windows 9x & Windows NT type file system. It is targeted towards the consumer rather than the enterprise user. A set of applications to perform basic tasks like Internet Explorer Mobile, Windows Media Player and MS Office mobile ar bundled with the OS to act as the default browser, media player and office suite respectively. Microsoft & Nokia Lumia series, Samsung ATIV S, VIVO 8.1 & HTC 8X are some phones running on Windows Phone OS.

UNIT 1.3: Organization Policies and Standards

Unit Objectives

At the end of this unit, you will be able to:

1. Understand the policies on incentives
2. Explain the delivery standards defined by the organization
3. Explain the standards for personal management
4. Understand the norms for public relations

1.3.1 Organizational policies

Incentives

Offering people, a reward for good work will motivate them to put in extra effort. If you provide subpar work, the result is frequently that you will be dismissed and have to lose your benefits as well as your salary. But how can one inspire (or reward) someone to produce their finest work? The answer is based on the company's culture, the person's needs or preferences, and the options available.

Most of the companies these days link the performance of the employees to incentives to motivate them and encourage them to give their best to the organization. Cumulative effort from the entire team would make a great impact on the organisation's business goals.

Characteristics of Incentive Plan:

a) There is a direct link between incentives and performance.
b) Rewards encourage employees to achieve at their highest possible level as opposed to their current level.
c) It boosts productivity by assisting in the advancement of technology.
d) Financial measurements can be made of incentives.
e) The inception of effective incentive plans, including the timing, precision, and frequency of incentives.
f) An incentive program boosts attendance and lowers absenteeism.
g) According to each individual's performance, incentives differ.
h) All employees are entitled to the minimum wage.

Written codes of behaviour known as customer service policies provide personnel with rules to abide by in a variety of customer service situations. For instance, you might have a policy for how to handle refunds or how to respond to consumer inquiries. Written policies are established to instruct your staff on customer service procedures and the right actions to take in different circumstances.

Customer service rules assist your employees in adhering to a regular procedure, such as determining the most expedient way to fix problems or respond to frequently requested queries (FAQs). They assist you in continuously enhancing your customer service while keeping everything as structured and efficient as they can be.

1.3.1 Customer Service Desk

Customer service policies may include a number of details based on your industry and needs. Typical examples are:

- Product and service description: Describe the goods and services your business provides in general terms. You can include illustrative videos, written explanations, and articles that are updated frequently.
- Workflows for customer service: What is acceptable and what is not? What steps are involved in on boarding a new customer? These workflows are defined and laid out in detail by your customer service policies. They are essentially instructions for usage for customer care agents.
- Benchmarks for customer service include: A customer service policy incorporates industry-recognized standards to aspire for, as was previously said.
- Customer service commitments: These represent the guiding principles of your business. When you are honest about the services you provide, your customers will trust you more.
- The administrative task of assessing and categorizing the human resource requirements for achieving organizational objectives through the interaction of individuals at work is known as **personnel management.**

The following are some examples of the broad range of personnel management:

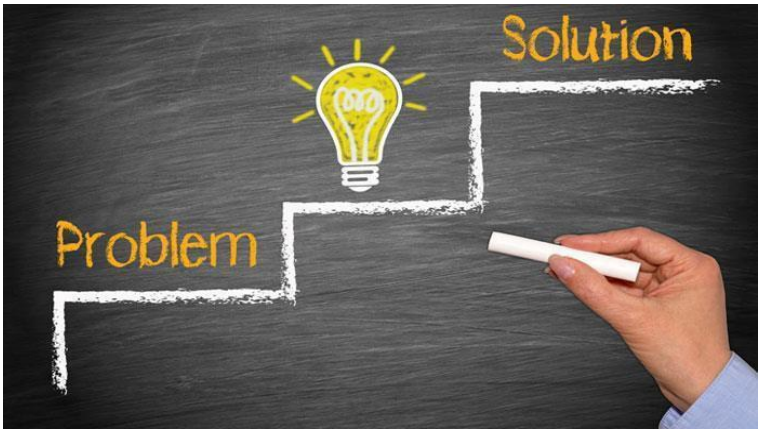
- Organizational Planning and Development
- Staffing and Employment
- Training and Development
- Compensation, Wage and Salary Administration
- Employee Services and Benefits
- Employee Records
- Labour Relations, and
- Personnel Research and Personnel Audit

Public relations (PR) refer to the range of actions taken by a business to advance and safeguard the public's perception of the business, its policies, and its products. Thus, it seeks to control how the public perceives the organization.
Public Relations should not only be an addition to advertising but also a significant yet understated component of the promotional mix.

The following are the most significant gains:

- Credibility – The credibility element is significantly increased if the public learns about the advantages of a company's products through an independent source that is not receiving payment from the company in question.
- Greater readership – When perusing a newspaper, adverts rarely receive the majority of the reader's attention. Editorial or news sections receive a lot more attention. Similar to this, when advertising are on television, viewers are more inclined to turn away and do something else.
- Contain more information – The public can learn more from public relations than from advertisements. An advertisement typically just receives a cursory glance, but when presented as news, public relations receive more attention and is therefore able to provide much more extensive information.
- Cost benefits – The media is not paid directly for public relations work. Obviously, there are expenditures involved, but budgets for PR are much smaller than those for advertising.
- Speed – The advantage of public relations is its quickness. An important development's information can frequently be released and publicized in a short period of time. Additionally adaptable and responsive are public relations.

Escalations can be scary. Often, when people hear of a customer issue being escalated, they can't help but think of churn. In today's customer-focused economy, unhappy customers can quickly move on to a new product or service. This leaves many companies looking for a quick solution to customer issues. As scary as escalations can be, they can also be beneficial.



When it comes to escalations, your main priority should be how to leverage the circumstance to win over clients' trust and faith. In a perfect world, you would reduce the number of escalations, rapidly settle open escalations, and maintain customer confidence both during and after the escalation.

1. **Be prepared for the inevitable.** You know hot situations are going to happen, so get the process in place as best you can, line up all the right people and organizations that you anticipate you're going to need to help out. Make them part of that build, do a dry run review, document it and make sure the process is ready and you're ready for when it happens. That way you'll be well rehearsed and understand what to do.

2. **Be proactive.** A lot of escalations come from either panic or the unknown, so prepare your customers by introducing the people that will handle their issues ahead of time, and let them know that you have a process in place for when issues do arise.

3. **Have a closed loop mechanism and drive continuous improvement.** Rarely are escalations a one-off problem. Be sure you have a process in place to review what happened, what you can do better in the future, and what you can do to make sure it doesn't happen again, both for your customers' sake and so you're not burning out internal team members on firefighting.

4. **Empathize, apologize, remediate, communicate, and follow up.** Communication is key when dealing with escalations. Be sure you're talking to your customers about what is happening, and how you're fixing it. And be sure after the issue is resolved, to follow up with what your organization is doing to make sure it doesn't happen again in the future.

5. **Get and share context.** Find out from your customers why the issue is creating such a problem for them. Not only will this give you important information about how urgent it really is, you can share this context about the business impact internally to help drive remediation.

6. **Use escalations as an opportunity to build trust.** When handled correctly, escalations will show your customers that they can trust you, which will increase retention rates.

Exercises

1. Which of the following phone uses iOS:

a. iPhone 6s

b. iPhone 6s Plus

c. iPhone SE

d. All of the above

2. Which is not a mobile handset vendor in the list below:

a. Maruti

b. Samsung

c. Micromax

d. Intex

3. The National Telecom Policy aimed at making available:

a. Telephone on demand

b. Food on demand

c. Water on demand

d. Education on demand

4. Which of the following attributes are required for a Handheld Devices(Handset & Tablet) Technician

a. Analytical

b. Ability to handle pressure

c. Practical approach

d. All of the above

5. Handheld Devices(Handset & Tablet) Technician is responsible for:

a. Hardware and software repair

b. Post repair testing

c. Selling phones

d. Both a & b

Exercises (Cont.)

6. Which of these is not part of the KRA of a Handheld Devices(Handset & Tablet) Technician:

a. Perform repairs

b. Pay customer bills

c. Update subject knowledge

d. Maintain service record details

7. What gets affected in a handset because of poor network connectivity:

a. Display

b. Battery

c. Ringer

d. Storage

8. Identify the incorrect statement about SMS:

a. Max permissible length is 160 characters

b. Contains images

c. Contains no graphics

d. None of the above

9. Which of the following is true about TDMA:

a. Each cell is put on a separate frequency

b. A certain portion of time is assigned to each cell on a designated frequency

c. Gives a unique code to each call and spreads it over the available frequencies

d. All of the above

10. Which of the following is true about CDMA:

a. Puts each cell on a separate frequency

b. assigns each cell a certain portion of time on a designated frequency

c. Spreads each call over the available frequencies after giving it a unique code.

d. None of the above

Exercises (Cont.)

11. Mention the KRAs of a Handheld Devices(Handset & Tablet) Technician.

12. Explain the concept of CDMA.

13. What happens when we make a mobile call?

14. Write briefly about the four popular mobile platforms.

Exercises (Cont.)

15. Explain the concept of TDMA.

16. Name a few mobile phone vendors in India.

17. What is mobile banking?

18. Write about some features of a cell phone.

Tips

- In large towns and cities cells will invariably be smaller in size due to the larger number of users in the area. Thus, more base stations are needed for high population density areas.

Notes

Click the QR Code to view the video on Basic Understanding of a Smartphone

2. Repairing Handsets

Telecom Sector Skill Council

Key Learning Outcomes

At the end of this module, you will be able to:

1. Repair a handset
2. Outline and explain the basic electronics of a cell phone
3. Outline and explain the various parts and components that makes up a mobile handset
4. Identify and make use of common handset repair tools
5. Disassemble a mobile phone
6. Troubleshoot common handset problems
7. Understand and follow standard safety precautions while repairing a handset
8. List and outline radiation safety laws for mobile handsets in India

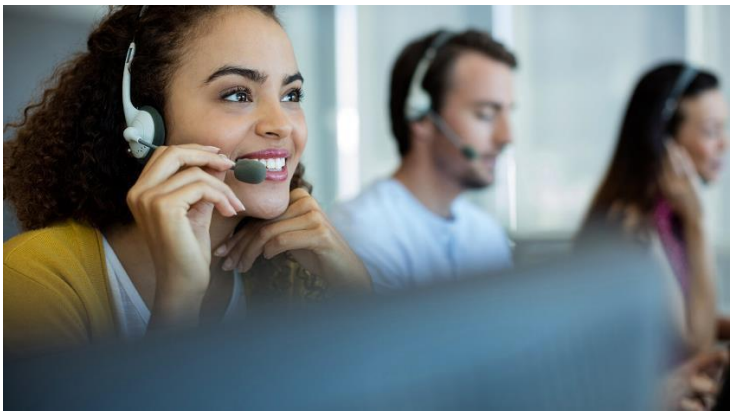
UNIT 2.1 Prepare for repairing a handset

Unit Objectives

At the end of this unit, you will be able to:

1. Identify the faulty devices
2. Assist your supervisor in analyzing problems reported by the customer team
3. Understand the importance of adhering to the SLA
4. Identify the costs of repair
5. Understand the formation of alternating and direct current

2.1.1 Identify the faulty handheld devices from the customer care executives or front-end executives



Customer Service Executives are the backbone of businesses that frequently interact with their clients. These specialists assist businesses in creating and upholding reliable relationships with clients and customers. In addition, they go by the name front-end executives.

The handheld device must be collected for repair after the Handheld Devices(Handset & Tablet) Technician has recorded the details of the malfunction.

The following Standard Repair Procedure are important for on the job performance:

- Adhere to the recommended practises listed by the mobile phone manufacturer for each model.
- Wear ESD wrist straps or aprons and take anti-static precautions before working.
- When handling hardware modules, adhere to standard operating procedures, such as handling PCB with ESD standards.
- Use the brand's suggested tools for the particular job.
- By adhering to standard operating procedure, keep material handling defects to a minimum.

2.1.2 Analyse issues reported by the customer/front-end team

Fig 2.1.2. Customer Interaction

The supervisor's responsibility is to keep an eye on the workers and ensure that they are carrying out all job responsibilities.

The supervisor's overall responsibilities include communicating organisational needs, monitoring employee performance, offering direction and support, identifying areas for development, and managing the mutually beneficial relationship between staff and the organisation to ensure that both parties succeed.

Handsets Repair Engineer needs to assist Supervisor in followings:

- Respond to walk-in consumers' questions about mobile phone repairs.
- Assist clients in inspecting and troubleshooting their mobile devices and providing any solutions (such as repairing of phones).
- Run test machinery and/or upgrade software.
- Assist clients in attaching their accessories (such as screen protectors and phone covers).
- Use and maintain tools and equipment for repairs.
- Making sure there are enough tools and equipment for repairs - ordering tools as needed.

Supervisor also do supervise of Staff/Handsets Repair Engineer as per below:

- Verify that staff is taking care of clients.
- Verify that the service offered by the technician and personnel is satisfactory.
- Supervising phone technicians' timely completion of repairs on clients' mobile phones.
- Planning and setting up staff and technician work schedules.
- Assume the responsibilities of any absent technicians or workers.

2.1.3 Importance of Service Level Agreement (SLA)

Fig 2.1.3 SLA Format

The term "service-level agreement" (SLA) refers to a legal agreement between a service provider and its clients that outlines the services they will deliver and the service standards they are required to uphold.

An SLA is a more comprehensive and generalized term for a service-level commitment (SLC). An SLA has two teams and is bidirectional, therefore the two are different. An SLC, on the other hand, is a single-directional commitment that specifies what a team may always promise its clients.

Why are SLAs important?
Service providers require SLAs to manage customer expectations, specify the severity levels, and spell out the conditions in which they are not responsible for outages or poor performance. Customers can also gain from SLAs because the agreement outlines the service's performance parameters, which can be compared to those of competing suppliers, and specifies how service problems will be resolved.

One of the two fundamental contracts that service providers have with their clients is often the SLA. A master service agreement is frequently created by service providers to lay out the fundamental guidelines under which they will conduct business with clients.

The master service agreement of the service provider frequently includes the SLA by reference. The SLA provides more detail to the services offered and the criteria that will be used to assess their performance compared to the other two service contracts. The services that are part of the service offering are specified in service commitments.

Although it is believed that SLAs were first utilised by network service providers, they are now often used in a variety of IT-related fields. IT service providers, managed service providers, cloud computing providers, and internet service providers are a few examples of industries that set SLAs.

A customer service-level agreement includes:

- exact details of the service expected by the customer;
- provisions of the service availability;
- standards for each level of service;
- each party's responsibilities;
- escalation procedures; and
- terms for cancellation.

A company's internal customer, which could be another company, department, or site, is the subject of an internal SLA.

2.1.4 Plan and prioritize activities related to delivery timeline

While the severity levels of the defects are defined by the QA engineer, the priority of the faults is decided in cooperation with the manager or customer. While severity is driven by functionality, priority is driven by commercial value.

Impact gauges how a situation has affected operational procedures. We can assess the effect using a number of factors. number of impacted users and possible financial losses number of affected services lack of laws and regulations business reputation other.

The period of time it takes for a situation to significantly affect company is known as the **urgency.**

- A period where a system is considered as more critical
- When some systems are identified critical with a high availability level

Priority, which determines when activities must be taken, is based on impact and urgency.

- The allocation of a priority code determines how the incident is being taken care of by the tool and the support staff.

A priority matrix can help you sort your to-do list by things like urgency, importance, or impact.

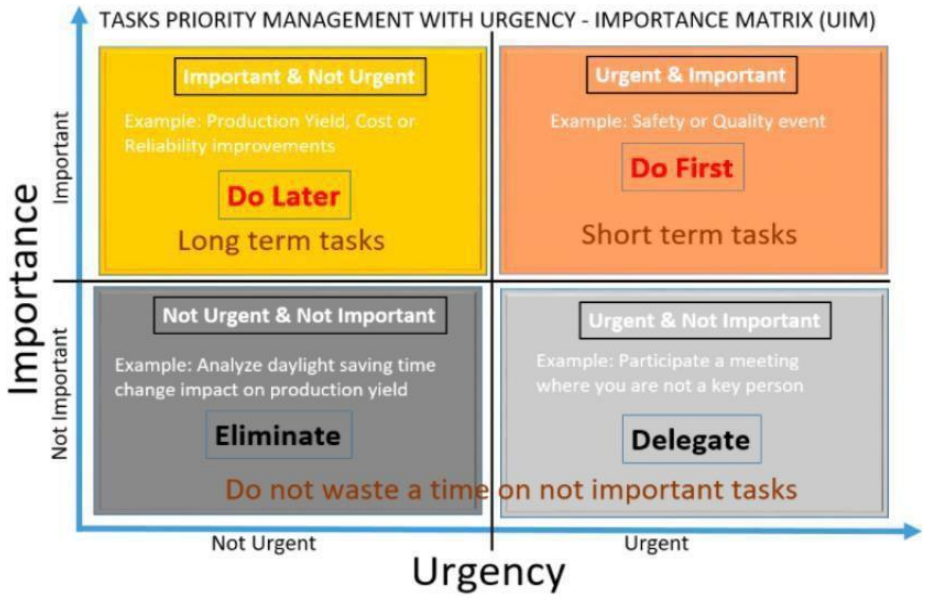


Fig 2.1.4 Task Priority Matrix

In a four-quadrant priority matrix, your task may fall into four categories. For example, your quadrants may be:

- High impact and high effort
- High impact and low effort
- Low impact and high effort
- Low impact and low effort

By mapping your tasks along a priority matrix, you can determine how and when to tackle each to-do.

2.1.5 Identify the cost of repair and verify if it is within Beyond Economic Repair (BER)

Price standardization refers to charging all consumers the same amount for the same mobile issue. The cost may change depending on the repaired parts, the brand and model of the equipment, etc. The standardization of prices is a crucial element that demonstrates the professionalism of the handset repair service provider.

A corporation can use information from a **Beyond Economic Repair (BER) analysis** to assist decide if mending a product is more cost-effective than replacing it. BER compares the cost of repairing a part or assembly with the cost of replacing it.

- Using data from a BER analysis, repair methods can be created such that, after a certain amount of time has been spent trying to fix a product unsuccessfully, it can then be replaced, using the extra time to do so rather than making additional repair attempts.
- A BER analysis begins as a prediction utilizing expected repair costs for a new product to determine how many hours are spent doing repairs before giving up and replacing the product.
- Actual repair hours and the economical repair yield (the proportion of failed assemblies of each type that are successfully and inexpensively repaired) for a product can both be recorded as individual product units are sent back to the company for repair.

2.1.6 Formation of alternating and direct Current

When an electrical current continually runs in a single direction, it is said to be in **direct current**. Rectifiers, batteries, generators with commutators, and fuel cells all generate direct current. A flashlight or an appliance powered by batteries, for instance, both use direct current. Electroplating is the most popular and necessary application of direct current. For normal commercial power, alternating current (AC) currents have taken the place of direct current.

A form of electrical current known as an **alternating current**, sometimes known as an AC current, is one in which the direction of electron flow changes periodically. The current that flows via home electrical cables and outlets is a common illustration of an AC current. Any electrical item that complies with India's standard voltage and frequency requirements of 230 Volts and 50 Hertz may be used there.

The fact that the alternating current frequency ranges from 50 to 60 Hertz distinguishes AC current from DC current. In contrast, the frequency of direct current stays zero in accordance with national standards.

Depending on the situation, the DC and AC current are frequently interconverted. A rectifier changes an alternating current into a direct current, while an inverter changes a direct current into an alternating current.

Applications for AC-DC current are numerous. While DC is mostly employed in flash lighting, electrolysis, electronic equipment, hybrid vehicles, and other applications, AC currents are used in factories, households, and enterprises.

- DC sources
    - Battery
    - Dynamo
    - Fuel cell
    - Solar panels
    - Wind turbines
    - Rectified AC
    - Thermocouple
    - Energy from bacteria

- AC sources
    - Generators
    - Alternator
    - LC Oscillator
    - Crystal oscillator
    - Inverters

Our phones require DC power to charge, but the charger's source current is AC, thus it must be converted to DC using a component known as a rectifier circuit.
The charger really provides an AC supply to the phone, converting the AC to DC using converters built into the device. The charger's circuit additionally steps down the voltage using a transformer and a few minor loads.

2.1.7 Importance of recording customer details

Fig 2.1.7 Customer Service Center

These are merely documents that outline the details of your interactions with customers on a business-to-business basis. These data include your clients' full name, company name, address, phone number, email address, fax number, and website, among other information. Birthdays, spending habits, employment history, and any other business data you consider appropriate may also be included.

Two difficult jobs come with maintaining client records. Creating a client database that meets your demands is the first step. The second is continuing your commitment to regularly collecting and updating client information.

You can create a customer database to keep your customer information. For those unfamiliar with MS Excel, this client database may be challenging. If you're skilled at it, you could create a database that captures all the vital consumer data you require.

There are many ways to collect information on your customers, including:

- order forms
- enquiries
- complaints
- warranty cards
- customer rewards programs
- customer satisfaction surveys
- feedback cards
- customer competitions
- your website

Keep in mind that client information is private and needs to be kept safe. Make a plan for the storage of client information and distribute it to all employees.

Only current customer information is helpful. It's crucial to constantly review the correctness of your clients' information and make any required updates.

2.1.8 Inspect the repair table and area for cleanliness

Cleaning up the workplace not only makes it healthier for workers, but it also typically aids businesses in becoming more productive and effective.

2.1.8 Technician at work

Desk clutter, unfinished meals, and waste paper are just a few of the most typical things that make a workstation messy.

Repairing mobile devices is a delicate art. To ensure that you can work comfortably, a table and chair of the suitable height are necessary.

Although it is true that fixing cell phones is a mentally taxing and stressful profession, this does not excuse you from exercising caution and maintaining a tidy work area. Keep all of your regular tools close at hand and in the proper location so that over time you become so familiar with the area that when the need comes for a specific item, your hand automatically reaches out to it and you do not even need to use your eyes to find it.

Because a person's character and habits are reflected in the state and settings of their workspace, it is imperative that you keep your workspace spotless and never let it get crowded.

Phone repair service generally includes:

- Attending to walk-in customers for any mobile phone repair queries
- Assisting customers to check and troubleshoot their mobile phones to offer any solutions (such as repairing of phones)
- Operating test equipment and/or upgrading of software
- Assisting customers with fixing on their accessories (such as screen protectors and phone covers)
- Maintaining and using repair tools and equipment.
- Ensuring tools and equipment for repairs are sufficient - order tools if required

The quick flow of electricity between two electrically charged items brought on by any touch between them is known as an **ESD (Electro Static Discharge).** Since it varies from device to device, the intensity of this current is impossible to predict.

Fig 2.1.8 ESD protection wrist strap

Your safety does not require ESD protection. The motherboard's electronic components' security is the reason.
You need to use an anti-static wrist strap for ESD protection. Any static accumulation in the body is grounded by the anti-static wrist strap.
You can also use anti-static gloves, a mat to reduce static electricity, and ESD-safe tools.

2.1.9 Equipment calibration process as per tablet manufacturer

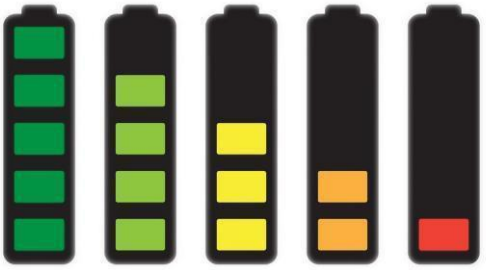


Fig 2.1.9 Battery level indicator

Your battery and charge levels must be tracked by the Android operating system so that it can alert you when they are full or empty. The issue is that it can occasionally become corrupted and begin showing false data, leading, for instance, to the phone shutting off before it reaches 0% battery life. The ageing of the data may possibly be the reason of this disparity.

All batteries deteriorate over time, and an older battery is unable to maintain a charge as long as it once could. However, when showing the battery condition on the screen, the software that runs on your phone typically does not take this degradation into consideration.

To calibrate your Android battery, all you have to do is ask the Android OS to update this data to reflect your real battery levels once more. It's critical to realise that the battery itself is not calibrated (or enhanced) throughout this process. Additionally, battery calibration does not lengthen your phone's battery life. It will merely make the phone's battery statistics more correctly displayed.

The situations where calibrating your battery might be a good idea are listed below.

- Even though your smartphone said there was adequate battery remaining, it shuts down unexpectedly.
- If billing percentage is consistently stuck at a particular value.
- Why you believe the shown battery statistics are wrong because your smartphone is quite old.

Android smartphone batteries should be calibrated:

- Discharge your phone fully until it turns itself off.
- Turn it on again and let it turn itself off.
- Plug your phone into a charger and, without turning it on, let it charge until the on-screen or LED indicator says 100 percent.
- Unplug your charger.
- Turn your phone on. It's likely that the battery indicator won't say 100 percent, so plug the charger back in (leave your phone on) and continue charging until it says 100 percent on-screen as well.
- Unplug your phone and restart it. If it doesn't say 100 percent, plug the charger back in until it says 100 percent on screen.
- Repeat this cycle until it says 100 percent (or as close as you think it's going to get) when you start it up without it being plugged in.
- Now, let your battery discharge all the way down to 0 percent and let your phone turn off again.
- Fully charge the battery one more time without interruption and you should have reset the Android system's battery percentage.

The best way to calibrate a battery:

- **For phones and tablets:**
  - Charge it to 100%, and keep charging it for at least 2 more hours.
  - Use your device until it shuts off due to low battery.
  - Charge it uninterrupted to 100%.
- **For laptops:**
  - Charge it to 100%, and keep charging it for at least two more hours.
  - Unplug your laptop and use it normally to drain the battery.
  - Protect your work when you see the low battery warning.
  - Keep your laptop on until it goes to sleep due to low battery.
  - Wait at least 5 hours, then charge your laptop uninterrupted to 100%.

2.1.10 Software version/modules and basic software commands for data

The European Telecommunications Standards Institute (ETSI) created the GSM (Global System for Mobile Communications) standard (ETSI).

On the global system for mobile communications used by the 2G and 3G cellular communication systems, General Packet Radio Service (GPRS) is a packet-oriented mobile data service (GSM).

A chip or circuit known as a GSM module or GPRS module is used to establish communication between a mobile device or computer and a GSM or GPRS system. In this case, the modem (modulator-demodulator) is essential.

These modules include a GPRS or GSM modem that is powered by a power supply circuit as well as computer connection interfaces (such as RS-232, USB 2.0, and others). A GSM modem can be a standalone modem with a serial, USB, or Bluetooth connection, or it can be a mobile phone with GSM modem functionality.

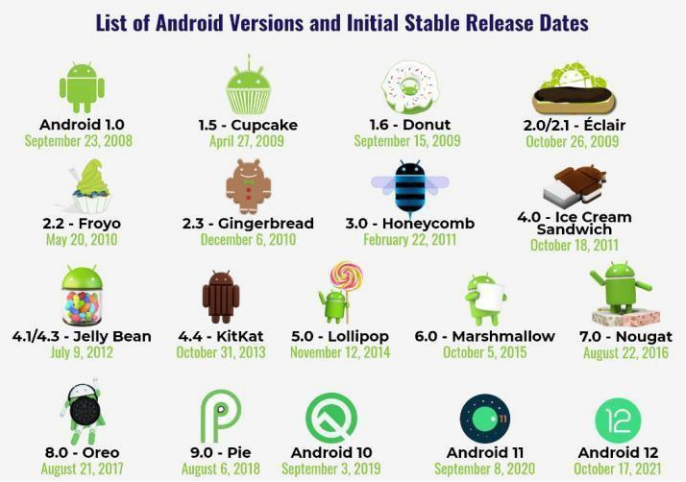


Fig 2.1.10 Android Versions

Understanding Modems: In order to establish communication, wireless modems produce, transmit, or decode data from a cellular network.

A type of wireless modem known as a GSM/GPRS modem is created for use with the GSM and GPRS networks. Similar to mobile phones, it needs a SIM (Subscriber Identity Module) card to start communicating with the network. Additionally, they can be identified by an IMEI (International Mobile Equipment Identity) number, just like mobile phones.

- The MODEM requires AT commands to interact with the controller or processor, which are transmitted via serial communication.
- The controller/processor is the source of these commands.
- The MODEM responds to commands by returning a result.
- To communicate with the GSM and GPRS cellular networks, the processor, controller, or computer can send any of the AT commands that the MODEM supports.

Its functions include:

- Read, write and delete SMS messages.
- Send SMS messages.
- Monitor the signal strength.
- Monitor the charging status and charge level of the battery.
- Read, write and search phone book entries.

UNIT 2.2: Basic Electronics of a Mobile Phone

Unit Objectives

At the end of this unit, you will be able to:

1. Identify and classify various electronic components that are used in mobile handsets

2.2.1 Architecture of a Mobile Handset

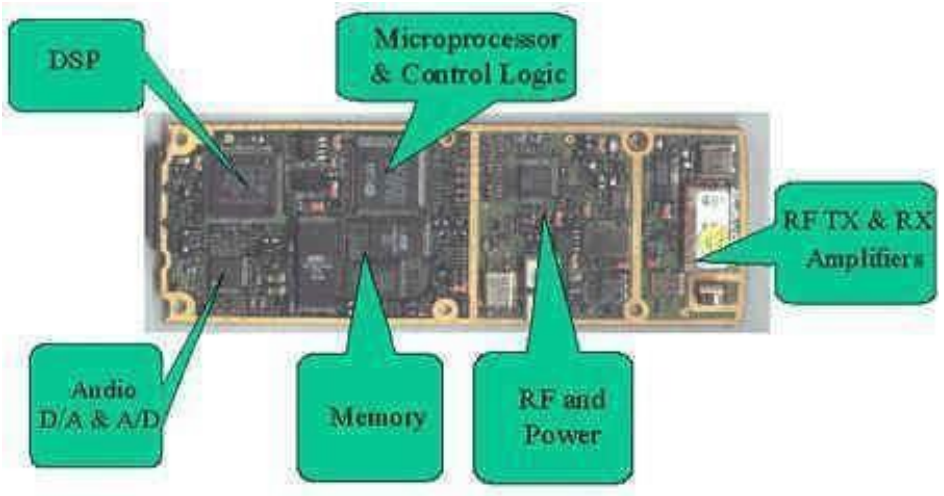


Fig. 2.2.1: A sample circuit board of a mobile handset

2.2.1 Architecture of a Mobile Handset (Continued)

- EEPROMs (electronically-erasable programmable read-only memory) are used to store system data in handsets.
- Physical access to memory chips is not required by Service Providers to reprogram a phone.
- Read Only Memory (ROM), being nonvolatile memory, is used to store the phone OS.
- Subscriber identity module (SIM) cards are included as part of a handset.
- Handsets use *embedded processors,* examples include:
  - BlackBerry 8700, uses Intel PXA901 chip
  - iPhone, uses Samsung ARM 1100 chip
  - Low power use and code size are crucial
- Microprocessor vendors often package *all* the chip's functionality in a single chip (*package-on-package*) for maximum flexibility.
- A microprocessor and EEPROM (16 KB to 4 MB) are within a SIM card and come in two sizes. Its portability (easy move from one phone to another) makes it highly versatile. A SIM card stores: -
  - Identity of the subscriber to enable recognition by a network.
  - Personal information, messages, information about services on offer, address books etc.
- Besides the SIM, handsets also include peripheral memory cards like:-
  - Compact Flash
  - Multimedia Card
  - Secure Digital (SD) Card
- Handsets synchronize with a computer. Nowadays, computers include slots of various sizes to hold these memory cards.

2.2.2 The Printed Circuit Board or PCB

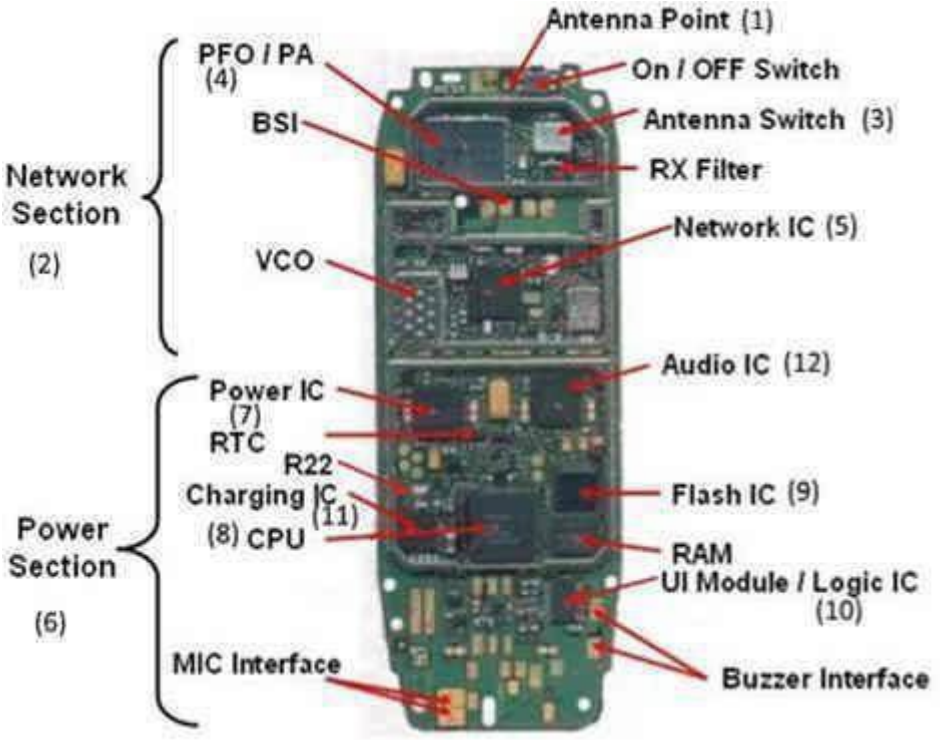


Fig. 2.2.2: The PCB of a mobile phone

The detailed location of various parts and sections of a mobile (refer Fig 2.2.2 for the labels below)**:**

- Antenna Point (1) is the point where the antenna is connected.
- Network Section (2) is above the power section and just below the antenna point.
- Antenna Switch (3) is found in the network section.
- Power frequency oscillator (4)(PFO) is located adjacent to the antenna switch.
- Network IC or integrated chip (5) is adjacent to or below the antenna switch and PFO.
- Power Section (6) is below the Network Section.
- Power IC (7) is located in the Power Section and can be identified by the several capacitors (brown coloured) that are around it.
- CPU or central processing unit (8) is the largest IC located in the power section.
- Flash IC (9) is located adjacent to the CPU.
- Logic IC (10) is the IC with 20 legs.
- Charging IC (11) is the IC beside R22 in the Power Section.
- Audio IC (12) is the IC parallel to Power IC.
- SMD are electronic components (Resistor, Capacitor, Coil and Transformer) that are very compact and can be easily mounted on the PCB surface. As they save space, their use has led to significant reduction in the size of mobile phones.

2.2.2 The PCB (Continued)

How each section is connected and how do they get power, etc.:

- In all cell phones the *Keyboard section is* directly connected to the CPU.
- *Display section* is directly connected with the CPU to receive following signals – LCD (liquid crystal display) data signal, LCD reset signal, LCD WR signal, LCD RD signal, LCD FLM signal, etc.
- *SIM card section* is directly connected with the CPU in most mobile cell phones.
- An 8 pin socket connects the Micro SD card to the micro card section
- *MIC (microphone) interface section* is directly connected with the CPU in most mobile phones.
- *Ear speaker section* is directly connected to the CPU.
- In most cell phones in order to obtain a loud sound, the ringer, buzzer or speaker are connected with the audio amplifier IC.
- The key backlight section contains the LED (light emitting diode) lights that are connected in parallel to get uniform voltage.
- *LCD backlight section* is made according to the series circuit.
- *Vibrator motor section* is connected to the battery positive terminal for power supply.
- The external antenna socket, antenna, RF IC, RX & TX Bandpass filter, RF Crystal FEM, PFO and the CPU comprise the *Network Section.*
- *Battery Charging Section*- It comprises of the charger and system interface connector. In most mobile phones these are integrated into the PCB itself.
- *FM Radio Section- Comprises of* the FM antenna, radio driver IC, signal and supply components.
- *Bluetooth Section*- Comprises of the antenna, RF signal filter, driver IC, supply and signal components for bluetooth frequencies.
- *Power ON Section*- Comprises of Flash IC, CPU, Power IC, RF-CLK, Crystal, RF-IF, etc.
- The *earphone section* includes hands-free MIC, speaker jack, speaker signal component and audio Amplifier.

2.2.3 Card Level Parts

- The front cover in the housing of a mobile phone is called the Front Fascia.
- The back cover in the housing of a mobile phone is called the Back Fascia.
- The internal skeleton of a mobile phone is called the Internal Fascia
- Ringer or loudspeaker plays loud sound and music in mobiles.

Fig. 2.2.3(i): Cover, ringer and skeleton of a mobile

- Speaker also called earpiece helps in hearing the sound from sender.
- Microphone is a transducer and converts a speaker's sound in a phone call to electrical signals that can then be transmitted.
- Vibrator creates vibration when vibration mode is activated in a cell.

Fig. 2.2.3(ii): Speaker, microphone and vibrator of a mobile

- Light Emitting Diode (LED) produces light in a mobile phone.
- Charging connector is mounted on the PCB and helps to connect the charger of a mobile phone to the battery in order to charge it.
- Headphone/earphone connector helps to connect, headphone to the mobile phone via jack.

Fig. 2.2.3(iii): LED, charging connector and earphone of a mobile

2.2.3 Card Level Parts (Continued)

- Data Cable Connector enables interconnecting the mobile to another device such as a computer and helps in interchange of stored data.
- A Battery is the source of DC supply to the mobile phone.
- A battery connector connects the battery to the internal wirings of a PCB of the cell phone.
- SIM Card or Subscriber Identification Module Card is a small rectangular chip with circuit and information of user of the card.
- SIM Card Connector holds the SIM card connecting it to the PCB of a mobile phone.
- Memory Card stores user data like documents, images, videos, music etc.
- The Memory Card (MC) Connector interconnects the PCB of a mobile phone to the memory card.
- Camera captures still images and also records videos.
- Camera Connector interconnects the PCB of the mobile phone and the camera.

2.2.4 The Big Parts & Functions

- Antenna Switch is found in the Network Section of a mobile phone. It searches network and passes forward after tuning.
- The power frequency oscillator (PFO) is found near the antenna switch. It filters and amplifies network frequency and selects the home network.

Fig. 2.2.4(i): Antenna switch and PFO of a mobile

- RF (radio frequency) IC / Network IC is found near the PFO and works as transmitter and receiver of audio and radio waves, as per instructions from the CPU.
- 26 MHz Crystal Oscillator is found near the PFO and creates frequency during outgoing calls.

Fig. 2.2.4(ii): Network IC and 26 MHz crystal oscillator of a mobile

- VCO (voltage-controlled oscillator) is found near the Network IC and sends time, date and voltage to the RF IC and the CPU.
- RX Filter is found in the Network Section of a mobile phone and filters frequency during incoming calls.

Fig. 2.2.4(iii): VCO and RX Filter of a mobile

2.2.4 The Big Parts & Functions (Continued)

Fig. 2.2.4(iv): TX filter, RAM, ROM and flash IC of a mobile

- TX Filter is found in the Network Section of a Mobile Phone and filters frequency during outgoing calls.

- ROM is found in the Power Section of a Mobile Phone and loads current operating program in a Mobile Phone.

- RAM is found in the Power Section of a Mobile Phone - sends and receives commands of the operating program in a mobile phone.

- Flash IC is found in the Power Section of a Mobile Phone. Mobile phone software is installed in the Flash IC.

- Power IC, found in the Power Section, reduce the space requirement. It takes power from the battery and carries out power management as it supplies power to all sections of a cell phone.

- Charging IC is found in the Power Section near R22. It regulates charging of the battery when a charger is connected to a mobile phone.

Fig. 2.2.4(v): Power & charging IC, RTC, CPU and logic & audio IC of a mobile

- RTC (real time clock) is found in the Power Section near Power IC. It helps to run date and time in a mobile phone.
- CPU is found in the Power Section and controls all sections of a mobile phone.
- Logic IC / UI IC is found in any section of a mobile phone and controls the Ringer, Vibrator and LED.
- Audio IC is found in Power Section of a mobile phone and controls Speaker and Microphone of a mobile phone.

2.2.5 Small Parts & Functions

- Coils in a mobile phone:
  - Coil is found in any section of a mobile phone - filters & decreases Current, Voltage.
  - Boost Coil is a little bigger than coil, its function is to increase current.
  - Coupler is found in the Network Section of a Mobile Phone & filters network.

Fig. 2.2.5(i): Coil, coupler and capacitor of a mobile

- Capacitors in a mobile phone are of 3 types:
  - Non-Electrolytic Capacitor is found in any section of a mobile phone and filters DC current.
  - Electrolytic Capacitor is found in any section of a mobile phone & filters and stores current.
  - Network Capacitor is found in any section of a mobile phone.
- Diodes in a mobile phone are of 4 types:
  - Rectifier Diode is found in black color and converts AC Current to DC Current.
  - LED is found in white or light yellow color and emits light.
  - Zener Diode is found in charging section and acts as voltage regulator.
  - Photo Diode is used for Infrared.

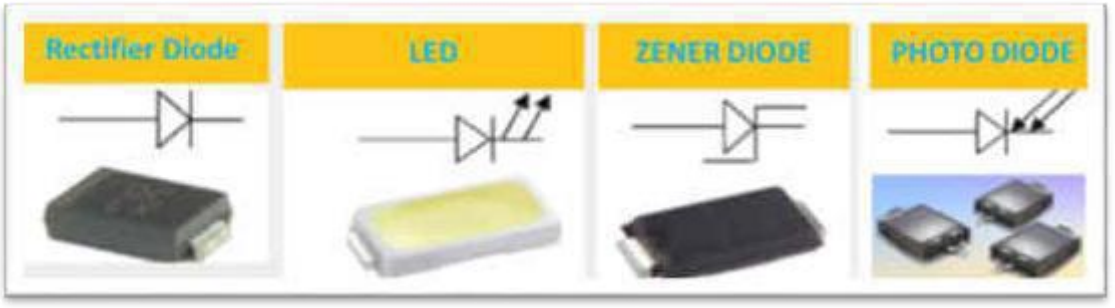


Fig. 2.2.5(ii): Various diodes and LED of a mobile

2.2.5 Small Parts & Functions (Continued)

- Resistances on a mobile PCB are of 2 types:
  - Chip Resistance is found in any section of a mobile phone. It decreases current & passes forward.
  - Network Resistance can be found in any section of a mobile phone.

Fig. 2.2.5(iii): Resistor of a mobile

- Regulator component:
  - Regulator component is found in any section of a mobile phone. It filters current and regulates voltage.
  - Transistor an electronic component is found in any section of a mobile phone and does the work of switching.

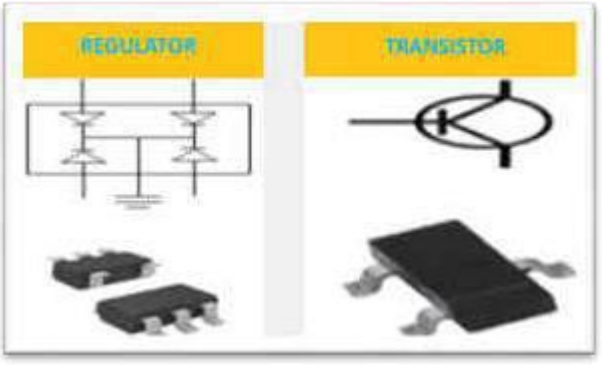


Fig. 2.2.5(iv): Regulator and transistor of a mobile

2.2.6 Electric Circuit and its Types

The path taken by the current as it flows consuming electricity is called an electric circuit.
There are typically five types of electric circuits:

1. **Close circuit:** When the circuit loop is complete and load performs its function, the circuit is said to be a closed circuit.

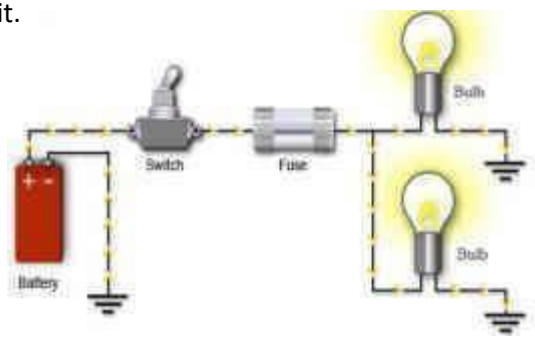


Fig. 2.2.6(i): A close circuit

2. **Open circuit:** When there is a break in the circuit either because it is switched OFF or a wire is broken or some other component is faulty and not allowing the current to flow, the circuit is called open circuit.

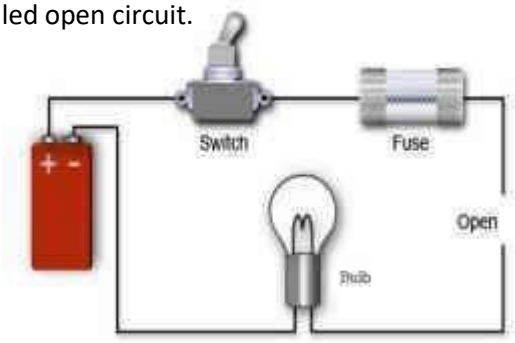


Fig. 2.2.6(ii): An open circuit

3. **Short Circuit:** When the two terminals of voltage source get interconnected without any load in-between, a very large current flows and it is called short circuit.

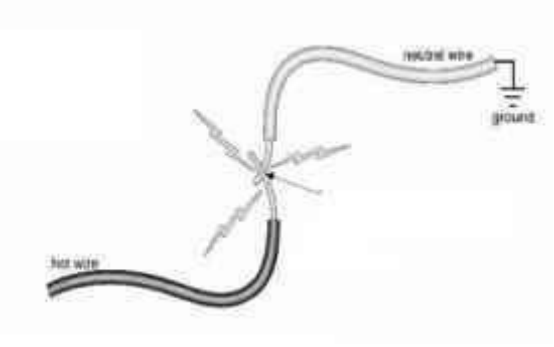


Fig. 2.2.6(iii): A short circuit

2.2.6 Electric Circuit and its Types (Contd)

4. Series Circuit: When two or more loads are connected one after another in such a manner that the positive terminal of one device is connected to a negatve terminal of another device, it is called a series connection.

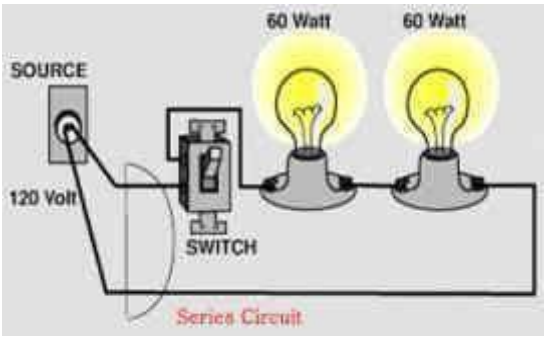


Fig. 2.2.6(iv): A series circuit

5. Parallel Circuit: When two or more loads are interconnected in such a manner that one common terminal of all the loads is connected to one terminal (Positive or negative) of the input supply and the other end of the load to the other terminal of the input supply, the circuit is called parallel circuit.

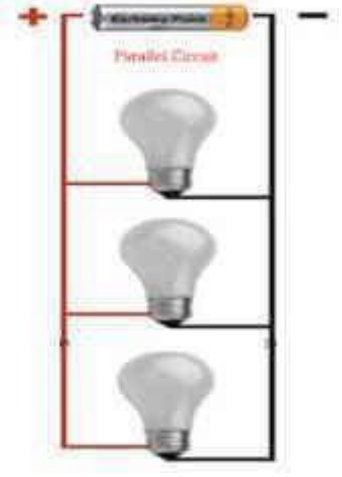


Fig. 2.2.6(v): A parallel circuit

2.2.7 SMD (Surface Mounted Device) Resistor

- **Resistance** is the obstruction to the flow of electric current in any material. Unit of resistance is Ohm and its power rating Watt. Fig 2.1.7 shows a few SMD resistors.
- Importance things to remember:
  - A resistor can never get shorted.
  - Resistor can get open, that is have a break thus preventing any current flow.
  - Value of resistor can vary from a few ohms to a very high figure.
  - Resistor may or may not come with a code (mostly without code in mobile phones).

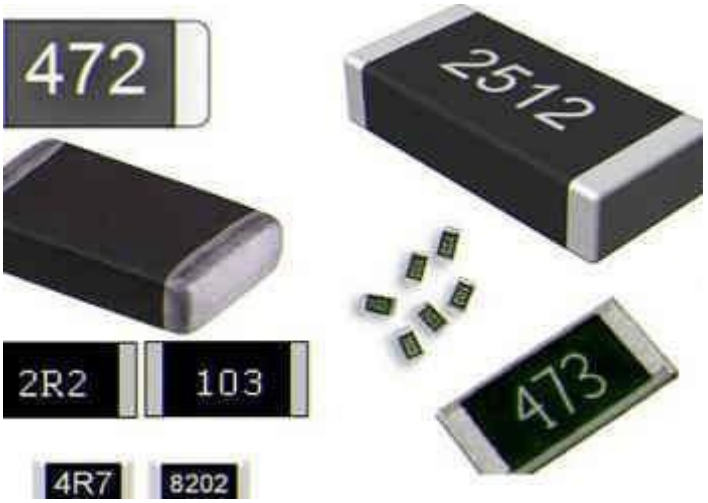


Fig. 2.2.7(i): SMD resistors

2.2.7.1 Resistor Rating

Resistances rating are marked and interpreted in the following manner:

- < 1000 ohms or 1K with an ''R'' indicates a decimal point - "ʻ":
  - 5ʻ6 = 5.6Ω
  - 8ʻ8 = 8.8Ω
- It is also rated and interpreted in the following manner:
  - 200Ω = 200 ohms
  - 320Ω = 300 ohms
  - 4.7K = 4.7 kilo ohms
- Resistors have a three-digit code marked, the first two represent two significant digits and the third digit represents power of 10, e.g.:
  - 564 = 56 × 10,000 Ω = 560 kΩ
  - 422 = 42 × 100 Ω = 4.2 kΩ
  - 473 = 47 × 1,000 Ω = 47 kΩ
  - 205 = 20 × 100,000 Ω = 2 MΩ
- "000" and "0000" are sometimes marked on surface-mount zero-ohm links, to signify that they have (approximately) zero resistance
- Resistances less than 100 ohms are written: 100, 220, 470. The final zero represents ten to the power zero, which is, e.g.:
  - 200 = 10 × 1 Ω = 10 Ω
  - 320 = 22 × 1 Ω = 22 Ω
- Resistances < 10 ohms use the symbol 'R' to indicate decimal point's position, e.g.:
  - 5ʻ6 = 5.6 Ω
  - 0ʻ32 = 0.32 Ω
  - 0ʻ01 = 0.01 Ω
- Precision resistors use a four-digit code, with the first three digits representing significant digits and fourth is the power of 10, e.g.:
  - 2001 = 200 × 10 ohms = 1 kΩ
  - 3992 = 399 × 100 ohms = 39.9 kΩ
  - 4000 = 400 × 1 ohm = 400 Ω

2.2.8 SMD Capacitor

- A **capacitor** is a passive electronic device used to store electrical energy (charge). It is made up of two conductors separated by an insulator. Air, paper, mica and electrolyte capacitors are the most commonly used SMD capacitors. Fig 2.1.8 shows a capacitor.
  - Its main function is to store the electrical energy and re-supply.
  - Unit of 'Capacitor' is Farad.
  - They are polarised and non-polarised type.

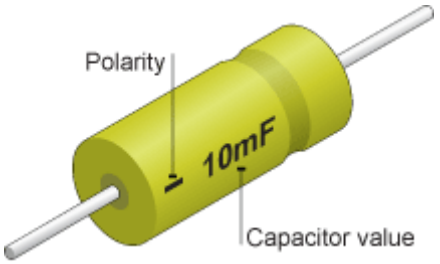


Fig. 2.2.8: An axially (on its side) mounted capacitor

- Polarised capacitors are used in DC circuits with following characteristics:
  - Values range from 0.1uF to 470uF.
  - They are used to smoothen large voltage variations , such as in DC line filtering to reduce the ripple (voltage variation) seen after rectification from AC source to DC.
  - Commonly capacity is measured in microfarads. Connecting with correct Polarity, that is + & - marking of plates is essential for correct functioning.
  - Both, capacity (farad marking) and max voltage rating (usually double the circuit voltage used), is specified on a capacitor body.
- Non-Polarised capacitors are used in DC circuits with following characteristics:
  - Similar metal conductor plates (Unlike in polarised caps) are used in Non-polarised caps.
  - Typically used in AC and DC circuits where low voltages exist.
  - Polarity of the plates is not critical in their functioning.
  - Typically, capacity is in pico farads (10^{-9} farad)

2.2.9 Integrated Circuit or IC

- An IC is an electronic component made up of combination of several other electronic components like resistor, capacitor, transistor etc. It is mainly of two types:
  - Leg-Type IC: This type of IC has legs or pins.
  - Ball-Type IC: This type of IC has BGA (Ball Grid Array) underneath the IC.
- Counting of leg-type IC starts in numerical digit in anticlockwise direction starting from the Nose Point or Cut Point as shown in Fig 2.1.9(i).

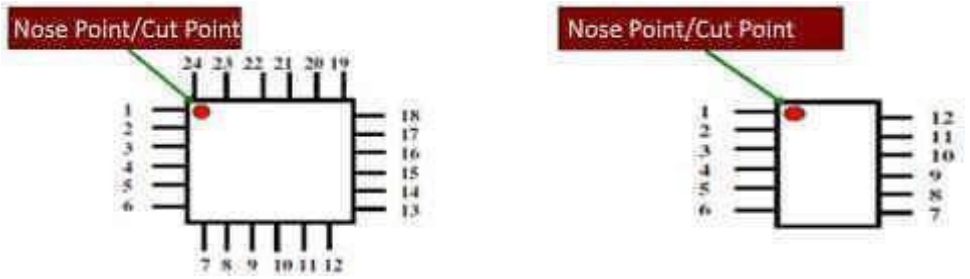


Fig. 2.2.9(i): Counting of Leg-type IC

- Counting of Ball-type IC is done in both clockwise and anti-clockwise direction as shown in Fig 2.1.9(ii). ʻows are counted in digits (1, 2, 3,…) clockwise and columns in alphabet (A, B, C, D…) anti-clockwise.
- When counting Columns, "I" and "O" are omitted because they look like "1" and "0".

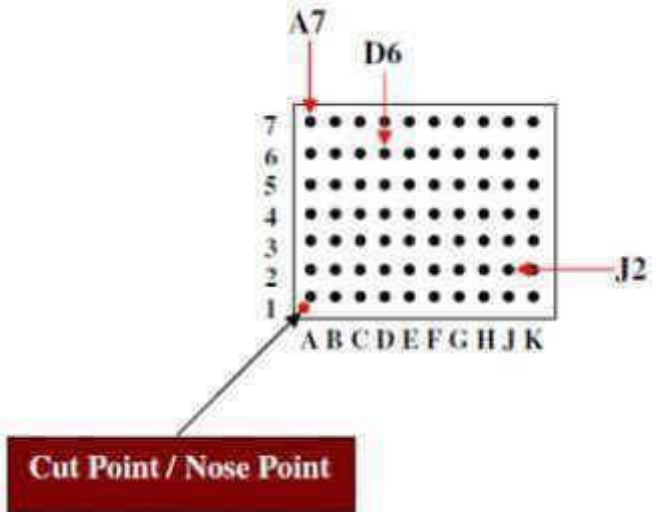


Fig. 2.2.9(ii): Counting of Ball-type IC

2.2.10 Filters

Filters are analog circuits that can reject unwanted signal frequency componebts, allow wanted frequencies to pass through and also, in some cases, enhance them. Mobile handsets normally use four types of filters:

- **Low-Pass Filter** allows all frequencies below a threshold to pass through. All frequencies above this threshold are stopped or rejected.
- **High-Pass Filter** is opposite of a low pass filter. It allows all frequencies above a threshold to pass through while stopping or rejecting all frequencies below it.

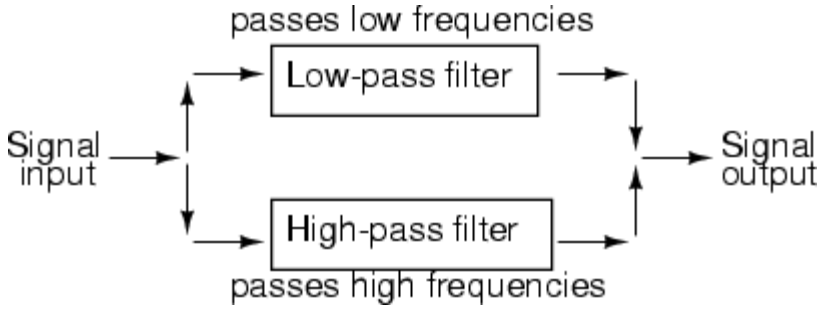


Fig. 2.2.10(i): A representation of low- and high-pass filters

- **Band-Pass-Filter** allows only a designed frequency band to pass through. Frequencies above or below this band are stopped or rejected by the filter.
- **Band-Stop Filter** is opposite of a Band-Pass Filter. It stops or rejects a designed frequency band to pass through but allows all other higher or lower frequencies to pass through.

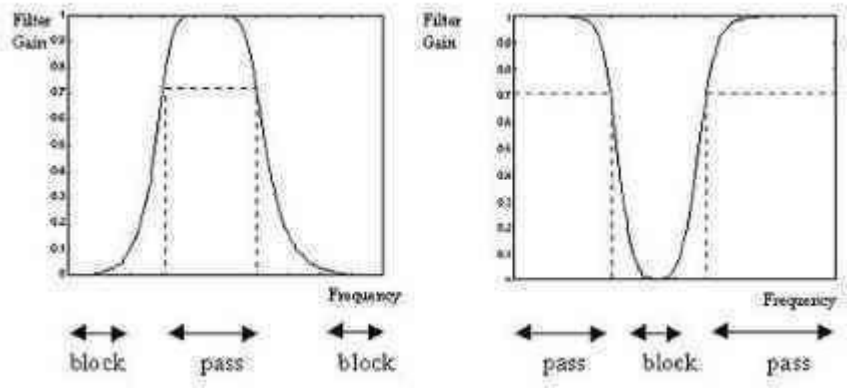


Fig. 2.2.10(ii): A representation of band-pass and -stop filters

2.2.11 Identifying Circuit Symbols

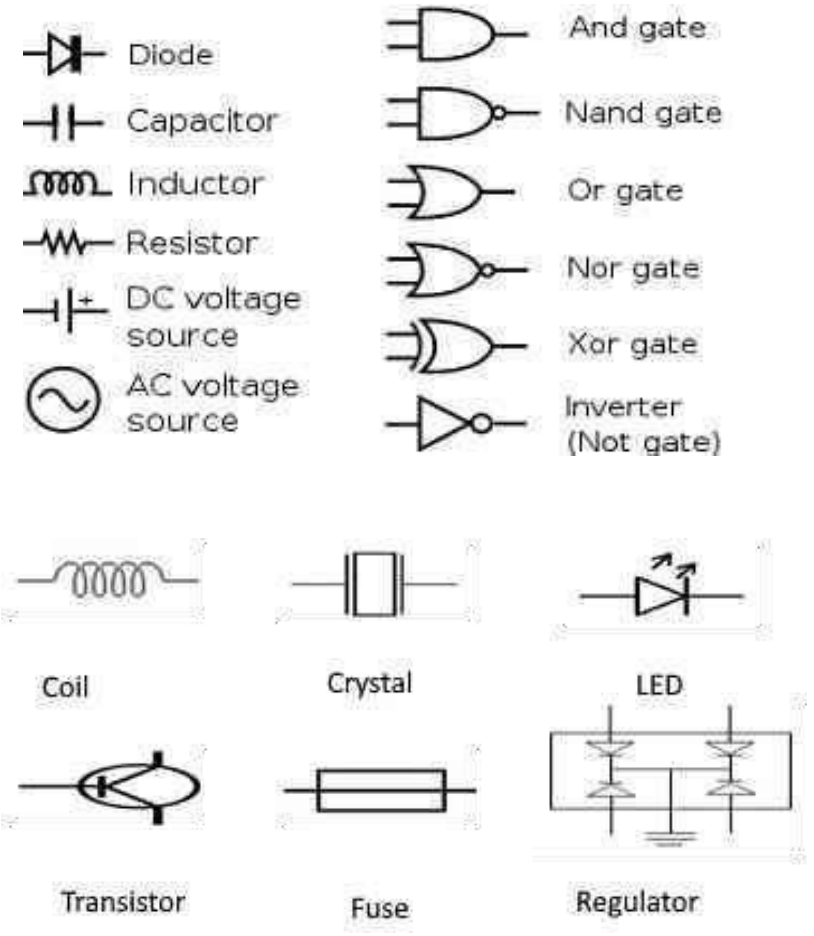


Fig. 2.2.11: Common circuit symbols

2.2.12 Electric Power and Earthing

Electric Power is the capacity to do work. It is the rate of transfer of electrical energy in a circuit. It is the product of voltage (in volts) and current (measured in amperes). The unit of measure of power is Watts (W). In other words, Power is given by

P = V * I

Three-pin plugs as shown in Fig 2.1.13 are used in electrical appliances such as computers, mobile phones, and AC. Two pins are used for phase (Red wire) and neutral (Black wire), the third pin (middle top centre - green wire) is used for **earthing**. Earthing pin is used to protect the operator, as also the connected device, as it sends any leakage current into the earth.

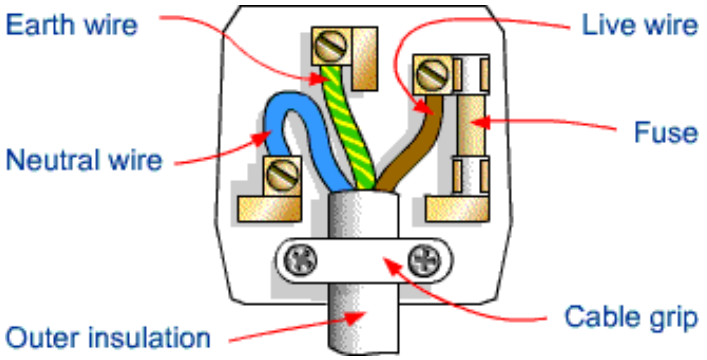


Fig. 2.2.12: Inside a typical 3-pin plug

2.2.13 Diode-Function, Symbol, Denoting letter, Identification of Solid Transistor-Basics, Types, Symbol, PNP and NPN

Diode:

Fig 2.2.13(i) Diode

A polarised device having two terminals, a diode is represented by the letter D. One terminal of a diode is positive (anode), and the other is negative (cathode). An anode is the base of a triangle, while the closed side is its cathode.

A horizontal isosceles triangle pressed up against a line connecting two terminals forms the shape of a diode. The diode operates in the forward bias situation, or we may say that the diode will permit current flow in this circumstance.

It is crucial to remember that the diode's positive terminal (anode) connects to the positive pole of the battery and its negative terminal (cathode) connects to the negative terminal.

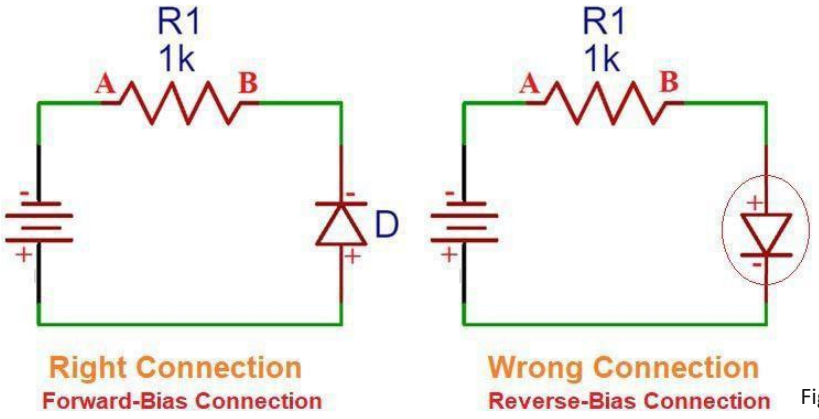


Fig 2.2.13(ii) Diode Connections

Other diodes with more detailed characteristics and features are described below. Check the functioning of several diodes here as well.

Light Emitting Diode (LED):

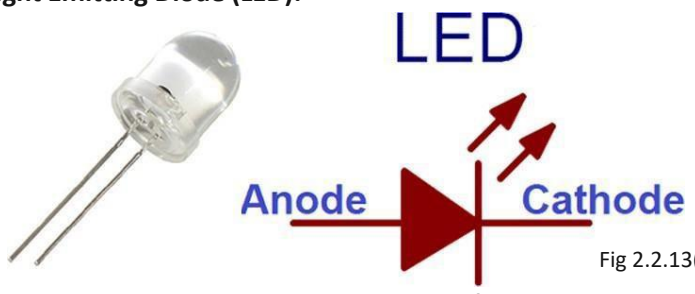


Fig 2.2.13(iii) Light Emitting Diode

Light-emitting diode is what it stands for. With more arrows, the LED symbol resembles the diode symbol. These arrows appear to radiate out from the triangle and point in the opposite direction. Anode and cathode connections are found on polarised components like LEDs.

Photodiode:

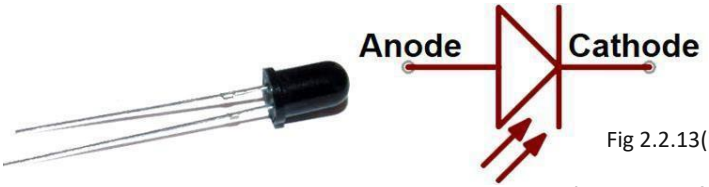


Fig 2.2.13(iv) Photodiode

In contrast to the LED Symbol, the photodiode's symbol features arrows striking the diode. Photons, or light, are represented by arrows that hit the diode. Anode and cathode are the names of the two terminals on the photodiode. Light is converted into electrical current using a photodiode.

Zener Diode:

Fig 2.2.13(iv) Zener Diode

It functions similarly to a standard forward diode and, when the applied voltage reaches the breakdown voltage, also permits reverse current. When a specific voltage is attained, the diode's unique, severely doped P-N junction is programmed to work in the other manner.

Schottky Diode:

A metal-semiconductor diode, the Schottky diode has a lower forward voltage drop than the PN junction diode. Applications requiring high-speed switching can use it. Due to the fact that electrons are the predominant carriers on both sides of the junction, the Schottky diode is a unipolar device.

As a result, electrons are unable to get across the Schottky barrier. An electron on the N side is given additional energy to pass the barrier and enter the metal under the forward biassed situation. Consequently, the diode is referred to as a hot carrier diode. The electrons are also referred to as hot charge carriers as a result.

Types of Diode in Mobile Phone and their Function:

1. Signal Diode: This kind of diode is utilized for signal detection. Glass is used to create these diodes. The cathode of the terminal is indicated by a red ring. The following numbers for these diodes are available: IN4 148, IN34, OA79, etc. SMD signal diodes are also offered in black.

2. Zener Diode: This particular silicon-based diode is utilized to maintain the stability of the output supply. In order to stabilize voltage, Zener diodes are utilized. "Z" is used to signify it.

Zener diode is recognized by its “Zener Volt” like 3.0VZ, 3.9VZ, 5.1VZ, 6.2VZ etc.

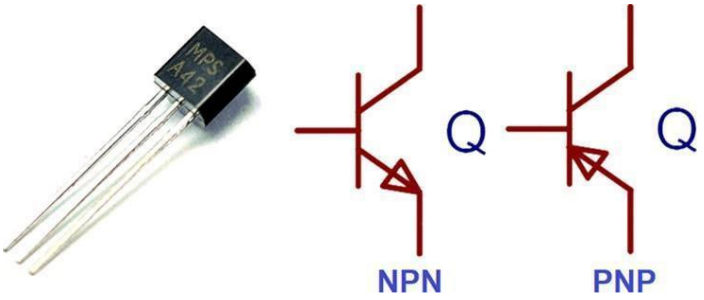
3. Varacter Diode: This diode has a changeable capacitance and works similarly to a variable capacitor. These diodes operate within a specific capacity range. Varactor diodes come in capacitance ranges of 1 to 500 pf and 10 to 100 V. These are employed in the circuits for transmitting signals.

4. Tunnel Diode: These diodes are employed for switching at microwave frequency levels and for processing the characteristics of negative resistance.

LED or Light Emitting Diode:
These are diodes that after getting forward biasing start to emit light. They are utilized in mobile phones to illuminate the display or keypad.

Transistors:
Different transistors, such as BJTs or MOSFETs, are available in schematics. The transistor is a three-terminal electronic component that switches or amplifies electrical power and electronic impulses.

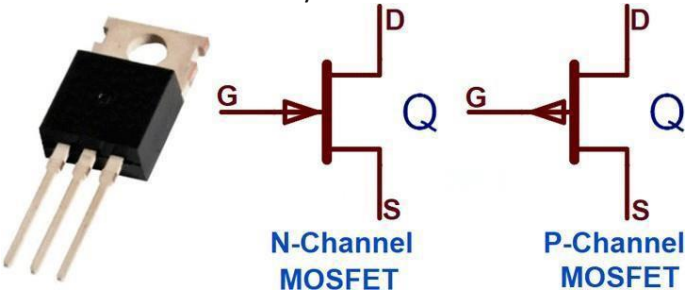
Bipolar Junction Transistor (BJT): A BJT is a bipolar transistor with emitter (E), base (B), and collector connections (C). The emitter and collector are lined up for the BJT symbol, while the base is positioned vertically. There are two types of BJTs: NPN and PNP.



In the BJT symbol, the emitter has an arrow and the arrow's direction tells whether it's a PNP or NPN transistor. If the arrow points inward, it is a PNP, and if the arrow points outward, it is an NPN.

To remember the configuration you can learn it like this- "NPN: Not Pointing In"

MOSFET: Metal Oxide Field Effect Transistor (MOSFET) terminals have three terminals: Source (S), Drain (D), and Gate (G). There are two different MOSFET symbol types: n-channel and p-channel MOSFET. Learn more about the many MOSFET kinds available here.



Just like BJT, in MOSFET, the direction of the arrow is used to distinguish between n-channel and p-channel MOSFET. If the arrow at the center of the symbol is pointing IN, it is an n-channel MOSFET and if the arrow is pointing OUT, it is a p-channel MOSFET.

You can remember the configuration like this. "n is IN"

UNIT 2.3: Resetting a Phone

Unit Objectives

At the end of this unit, you will be able to:

1. Recall and demonstrate steps to reset a phone to its original factory settings
2. Recall and demonstrate steps to download apps and set-up email accounts on a handset

2.3.1 The Need to Reset a Mobile Phone

Fig. 3.1.1: Sometimes resetting a phone is the only option

- You may need to reset cell phone to correct malfunctions e.g., freezing, slowness, etc., to restore the phone to its original state.
- Steps for resetting a mobile will vary based on the make and model of the mobile.
- All personal data will invariably be removed if a mobile is reset.
- It will restore the phone back to its original factory settings.

2.3.2 Steps: How to Reset Phones?

Apple iPhone

Step 1– At the home screen tap on "settings".

Step 2– Tap "General Settings" from the list of options.

Step 3– Tap on "Reset". Your iPhone will take several minutes to restore depending on the memory capacity of your device.

Android Phone

Step 1– Select "Settings" from your application menu.

Step 2– Access the option for "Factory Data Reset" based on the make & model of your Android device, this option will be located in either the folder labelled "Privacy" or "“D & Phone “Storage".

Step 3– “Select "‘Reset Phone".

Step 4– Select "Erase Everything" when shown the warning that a reset will erase all personal data from your device.

Blackberry Phone

Step 1– Select "Options" from your Blackberry's main menu.

Step 2– Select the icon labelled "Security" or "Security Options".

Step 3– Choose either "Wipe Handheld" or "Security Wipe" from the options provided.

Step 4– Select the appropriate option to confirm the reset process; Enter "blackberry" when prompted for reset password.

Click/Scan this QR code tos view the video of Resetting an android phone

2.3.2 Steps: How to Reset Phones? (Continued)

Windows iPhone

Step 1– Access "Settings" from the Start menu or programs list of your Windows mobile device.

Step 2– Select "Clear Storage" or "Hard Reset" from the options provided. On some Windows mobile phones, you may need to access these options from the "System" folder.

Step 3– Type "1234" when prompted to enter a password for the reset.

Step 4– Answer "Yes" when prompted to confirm that you want to reset your

Windows mobile cell phone.

LG Phone

Step 1– Remove the SIM card from the mobile.

Step 2– Type 2945#*#.

Step 3– “elect the "ʻE“ET" option.

Motorola Phone

Step 1– Remove the SIM card from the mobile.

Step 2– Type *#**367628# and call.

Step 3– After one minute type *#**778337#.

Nokia Phone

Step 1– For soft formatting type *#7370# followed by 12345.

Step 2– For hard formatting type *#7780# followed by 12345.

2.3.3 Steps: How to Install Apps?

A phone reset takes a mobile handset to its original settings with a fixed set of apps. All user apps and email accounts are to be set up again.

Installing mobile Apps on popular platforms-

- **Android**

Step 1– On the Home screen tap the Play Store (also Android Market or Google Play).

Step 2– If this is the first time then you'll be asked to accept the terms of service.

Step 3– Type Mobile APP's name in the search above. A list pops up as you write. Select the one you want and tap Install.

Step 4– Tap on the desired APP's icon in your App list. Log in with your details.

- **Blackberry**

Step 1– Scroll to BlackBerry App World and click.

Step 2– Tap on the search Icon and type in mobile App's name.

Step 3– Select the desired App from the list below.

Step 4– Tap Download. Provide the Blackberry ID and password once prompted.

Step 5– Tap Ok.

Step 6– Tap on the desired icon in your App list. Log in with your details.

2.3.3 Steps: How to Install Apps? (Continued)

- **iPhone**

Step 1– Make sure you've an Apple ID before the installation.

Step 2– Tap App Store.

Step 3– Tap Search and type in mobile App's name.

Step 4– Tap App's name. Tap Free. Tap Install. You may be prompted to put in the password for your Apple ID.

Step 5– Tap on the desired icon in your App list. Log in with your details.

- **Windows Mobile**

Step 1– Scroll the Home screen to go to the second screen.

Step 2– Tap on Store.

Step 3– Tap on the search icon and type Mobile APP's name in the search bar.

Step 4– Select the one you want and tap Install.

Step 5– Tap Allow to give the application access to location.

Step 6– Tap on desired icon in your App list. Log in with your details.

2.3.4 Steps: How to Set-up Emails?

Fig. 2.3.4(i): Email is a popular mobile application

- **On Android Phones**

Step 1– Tap Email.

Step 2– Tap Add account.

Step 3– Type your email and password.

Step 4– Select the account type.

Step 5– Type your full email address in the Username field, related password in the Password field, for POP3 type in *pop.<your domain>.com* into the POP3 server field and for IMAP type in *imap.<your domain>.com* into the IMAP server field.

Step 6– Type *smtp.<your domain>.com* in the SMTP Server field, check 'Require sign-in' box, fill in your full email address in the Username field and password, in the Password field.

Step 7– Select the email checking frequency settings.

Step 8– Check 'Send email from this account by default' if you want to use this email account as default for sending emails.

Step 9– Fill in a name for the email account and your name that will appear on outgoing emails.

- **On Blackberry**

Step 1– Go to Home menu and select setup.

Step 2– Select email settings.

2.3.4 Steps: How to Set-up Emails? (Continued)

Step 3– Enter your Blackberry Service username and password as provided by your mobile network provider.

Step 4– Enter your Blackberry Service username and password as provided by your mobile network provider.

Step 5– “elect 'Add My Existing Email Account'.

Step 6– Select your mail service provider and type in your relevant account details, select Other to set up the email manually.

- **On iPhone**

Step 1–Tap Settings.

Step 2–Scroll down and tap Mail, Contacts, Calendars.

Step 3–Tap Add Account.

Step 4–Select your Email provider. If not present then select 'Other'. Follow the instructions and provide the necessary information to configure your Email account.

- **On Windows Phones**

Step 1–In the App List tap settings.

Step 2–Tap Email + accounts.

Step 3– Tap Add an account.

Step 4– Select your Email provider. If not present then select 'Other Account'. Follow instructions and provide the necessary information to configure your Email account. If you are adding an account manually then select 'Advanced setup'.

Step 5– Enter your email address and password.

Step 6– Tap Internet email.

2.3.4 Steps: How to Set-up Emails? (Contd)

Fig. 2.3.4(ii): Email send / receive error

- **Do the following in case you are unable to send/receive mails:**

Step 1– Verify if the Phone is connected to a data or Wi-Fi network using the mobile browser.

Step 2– If network present then verify the email address and password again. You may need to re-enter the password if it was changed recently.

Step 3– Check mail account server settings if Step 2 fails.

Step 4– If nothing works then delete the mail account and set it up again.

UNIT 2.4: Fixing the Firmware

Unit Objectives

At the end of this unit, you will be able to:

1. Outline and explain the role of firmware in a handset
2. Recall and demonstrate steps to install a new firmware

2.4.1 Understanding Firmware and How to Fix it

Firmware is a software that controls individual parts of the phone. Each mobile phones has a unique firmware version and a specific software is used to access it. Sometimes the mobile phone does not power on, hangs frequently, or keep restarting. In such cases the phone's Firmware could have been damaged and needs to be installed.

Flashing or installing a new firmware to a cell phone flash memory requires the following:

- A computer to run the software program, with a USB port.
- A flashing device that synchronizes mobile phone and computer.
- Flashing software.
- A USB cable, a flashing cable, which connects a mobile phone to the flashing device that also connects to the computer.
- Flash files and firmware collection. Programmed data used in phones.

2.4.2 Steps: How to Flash a Mobile Phone?

Fig. 2.4.2: Flashing a mobile phone

Step 1– Search and download the flashing program for your phone onto your computer.

Step 2– Unzip the files and read the instructions carefully, make sure your phone is updated and has all the latest drivers.

Step 3– Be ready with answers about your original carrier, what you're flashing to, and your phone's make and model. The software will also prompt you to choose between a "half flash" and a "full flash." A "half flash" is just talk and text.

Step 4– Know your MEID (mobile equipment identifier) and ESN (electronic serial number). This information can be found underneath your phone's battery. The program you are using to flash can also give you all this information. The MEID will be 18 digits (starting with 2) if it is MEID Dec or 15 numbers and letters if it is MEID Hex. The ESN will be 8 numbers long and possibly labelled PESN.

Step 5– Detect your phone using the software. It will determine the COM port for you. In case there is a problem, you can manually find the port through Device Manager.

Step 6– Select "write" and confirm. On selecting "yes", phone will get flashed and automatically reboot when successful.

UNIT 2.5: Hardware Repair Tools

Unit Objectives

At the end of this unit, you will be able to:

1. Identify and make use of common mobile handsets repair tools

2.5.1 List of Common Repair Tools

Following are the popular repair tools:

- Soldering Iron, Soldering Station, Solder Wire.
- PCB Cleaner, Jumper Wire, Blade Cutter, Point Cutter, Nose Cutter.
- Precision screwdriver, Tweezers, Brush, Multi-meter, Battery Booster, Ultrasonic Cleaner.
- Magnifying Lamp, Mobile Opener, DC Power Supply, Liquid Flux & Paste Flux, Solder Paste.
- Cleaning Sponge, De-soldering Wire, Screwdriver Kit, LCD Tester, Microscope, Test JIG Box.
- Wrist Strap, antistatic Hand Gloves, Antistatic Mat & Apron, Smoke Absorber, Battery tester.

2.5.2 Soldering Iron

A **soldering iron** is used to fix passive components like resistor, capacitor as also active components like diode, transistor, microphone, speaker, regulator, speaker, display, etc. to the PCB. For most mobile phone repairs a 50 watt soldering iron is adequate..

Fig. 2.5.2: A soldering iron in use

2.5.3 Use of lead-free soldering tools

The power of Soldering Stations is always sufficient to melt through thick solder layers. Do not allow your patience to be melted by a subpar soldering station. Lead-free, infrared, and hot air gun soldering stations are the three different types of soldering stations.

When purchasing a soldering station, additional factors to take into account include digital or analogue, wattage rating, variable temperature, replaceable Soldering Iron Tip, and accessories.

Lead-Free Soldering Stations:

Fig 2.5.3(i) Lead free soldering station

Lead's detrimental health effects, such as anaemia, weakness, kidney, and brain damage, have sparked a movement in the electronic industry to develop lead-free solders.

Lead-free solder may not melt at a high enough temperature in standard leaded machines, or if it does, the tips will frequently burn out soon.
The soldering iron head's temperature can climb in just two seconds thanks to the single-chip microcomputer control system. The C210 Iron Handle will be in a sleeping mode while it is positioned on its holder, which can increase the heating element's lifespan.

The temperature of each of the three memory channels—CH1, CH2, and CH3—can be independently controlled for both storage and recall.

Infrared Soldering Stations:
By directing the laser directly at the component, you may heat the component rather than the joint.

Additionally, since the laser doesn't blow components around like a hot air soldering machine can, there is less possibility of incorrect soldering.

Fig 2.5.3(ii) Infrared Soldering Stations

A speedier method, both in setup and heating, an infrared station uses a laser to heat the joint. Therefore, infrared stations are typically more expensive.

Hot Air Gun Soldering Station:
Similar to infrared soldering stations, hot air soldering stations function by having the user pour a soldering mixture between the junction and then heating it to form a connection.

Fig 2.5.3(iii) Hot air Gun Soldering Stations

2.5.4.1 Steps: Soldering

Soldering is a process of permanently joining two or more metals (generally wires) by melting a relatively lower melting point filler metal into the joint of the two metals. The filler metal on cooling makes the joint permanent.

Step 1– Ensure the tip of the soldering iron tip is absolutely clean. If it is not shining clean, melt solder on the solder tip and wipe it clean using a damp cloth or sponge till it starts shining.

Step 2– Heat the connector pins and the circuit board trace evenly for a few seconds ensuring that the soldering iron tip touches them together.

Step 3– Get the solder wire to touch the heated connection quickly in order to melt it and let it flow onto the joint. The solder wire should not directly touch the soldering iron.

Step 4– Let the connection cool, blowing on it if faster cooling is desired.

Step 5– Excess flux or residue at the joint soldered should be removed using a solvent and a non-metallic brush .

2.5.4.2 Steps: Desoldering

Desoldering is the opposite of soldering. It involves removing of the solder so as to remove the components from a printed circuit board for troubleshooting or replacement. It is done in the following steps:

Step 1– Clean the soldering iron as in case of soldering. Now heat it for a few seconds and then touch the joint to be de-soldered until the solder melts.

Step 2– Use a solder pump or a wick (finely braided copper) to remove the excess solder from the joint on the PCB

Note– Ensure only the joint to be de-soldered on the solder side of the PCB is touched and the component side of the PCB does not come in contact with the soldering iron.

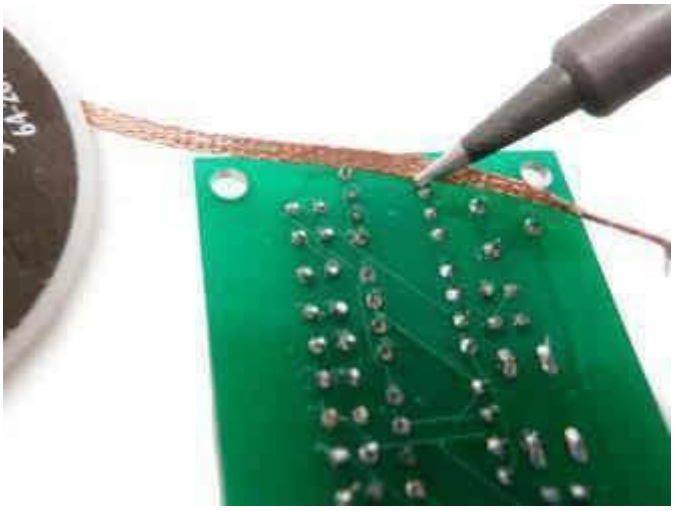


Fig. 2.5.4.2: Desoldering in action

Click the QR code to view the video on how to replace motherboard in a smartphone

2.5.5 Access, Cutting and Cleaning Tools

A **PCB** (Printed Circuit Board) **Holder** as shown in Fig 2.2.3(i) is used to hold the PCB of a mobile phone while soldering or repairing.

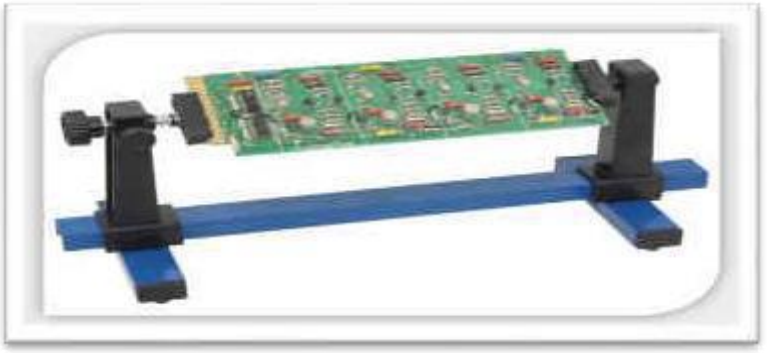


Fig. 2.5.5(i): PCB holder

Blade Cutter is mostly used to expose the wire by removing the insulation from a jumper wire (refer Fig 2.5.5(ii)).

Point Cutter (refer Fig 2.5.5(ii)) and a Nose Cutter (refer Fig 2.5.5(ii)) are used to cut a wire. They can be of different types and are designed to access awkward places and grip, bend or turn wires.

Fig. 2.5.5(ii): Various cutting tools

2.5.5 Access, Cutting and Cleaning Tools (Contd)

Precision Screwdriver is used to tighten or loosen screws while assembling and dissembling a mobile phone (refer Fig 2.5.5(iii)). Precision screwdrivers of sizes T4, T5, T6 and forehead are good for most mobile repairing job.

Tweezers are used to hold electronic components like ICs, jumper wire, etc., while soldering and de-soldering (refer Fig 2.5.5(iii)).

Brush is used to cleaning the PCB of a mobile phone while repairing. Care should be taken that it is ESD (electrostatic discharge) safe (refer Fig 2.5.5(iii)).

Fig. 2.5.5(iii): Screwdriver, tweezer and brush

2.5.6 Multimeter

Multimeter is a combination of a voltmeter, ammeter and an ohm-meter. It can measure voltage, current and resistance by changing a switch. Various parts and components of a cell phone are checked using a multimeter. All multimeters have two wires called probes as shown in Fig 2.2.4. The red probe is positive (+), while the black probe is negative (-), a standard convention in electronics

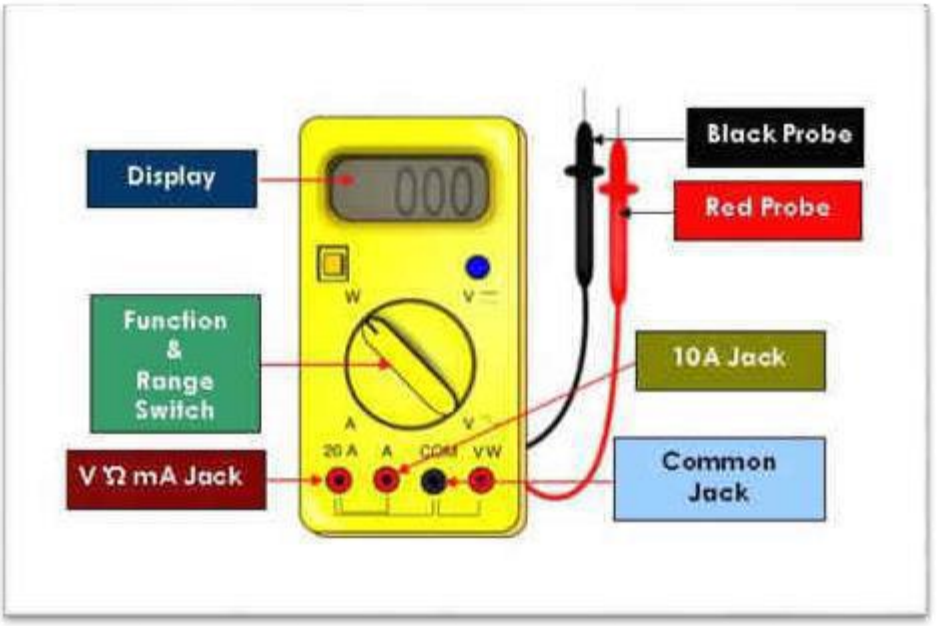


Fig. 2.5.6: A typical multimeter

Following precautions must be taken while measuring multimeter:

- If the multimeter is showing faulty readings check the battery, probes and the fuse.
- Voltage is always measured between two points of a circuit. To obtain an accurate reading, ensure the multimeter is properly connected across two points in a circuit.
- While measuring voltage ensure you do not touch the probe tips together as this will result in a short-circuit.
- The resistance (impedance) of a circuit changes when energized. Therefore, for Continuity testing (or finding circuit resistance) with a multimeter ensure the circuit is NOT energized.

2.5.6.1 Steps: Checking Battery with a Multimeter?

In case the phone is not powering on or the battery drains quickly.

Step 1– Remove the battery of the cell phone after ensuring it is switched off.

Step 2– Note the battery voltage as given in its label. Generally, cell phone and tablet batteries are of 3.7V or 3.8V.

Step 3– Place the battery in such a way that the terminals are easily accessible to you.

Step 4– Set the multimeter to read DC Volts. The switch position would point to DCV or just V with a straight line and 3 dots below it. Depending on the range, there will be settings varying from few mV (milli Volts) to 1000 V. The multimeter switch setting should be on a number that is above the battery voltage noted by you in Step 1. Mostly, setting of 10V or 20V is adequate.

Step 5– Place the red probe tip on the positive (+) terminal of the battery and black probe tip on the negative (-) terminal as shown in Fig 2.2.4.1.

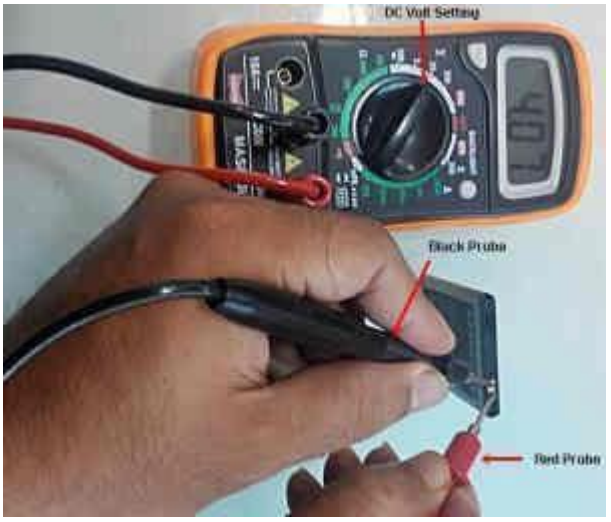


Fig. 2.5.6.1: Checking the battery with a multimeter

Step 6– Keep the probes firmly pressed on both the terminals till the reading on the multimeter display is stable. The following can be inferred from the voltage reading for a battery of 3.7V: -

- Reading 3.7V or more - Battery Fully Charged
- Reading 0V or < 3.7V - Battery to be Charged

If there is no change in the voltage reading even after charging for a long time, then the battery is dead and needs to be replaced with a new one. Batteries can not be repaired.

2.5.6.2 Steps: Measuring DC Current

Step 1– Place BLACK probe in the COM (common) plug and RED (+) probe in mÃ/Ã plug.

Step 2– Set the rotary selector switch for reading current in DCA range.

Step 3– De-energize the circuit by switching OFF the power supply.

Step 4– Connect the probe tips of the multimeter with the circuit in series (Red to positive and Black to negative of the circuit .

Step 5– Switch ON the power supply and read the display for the ampere value.

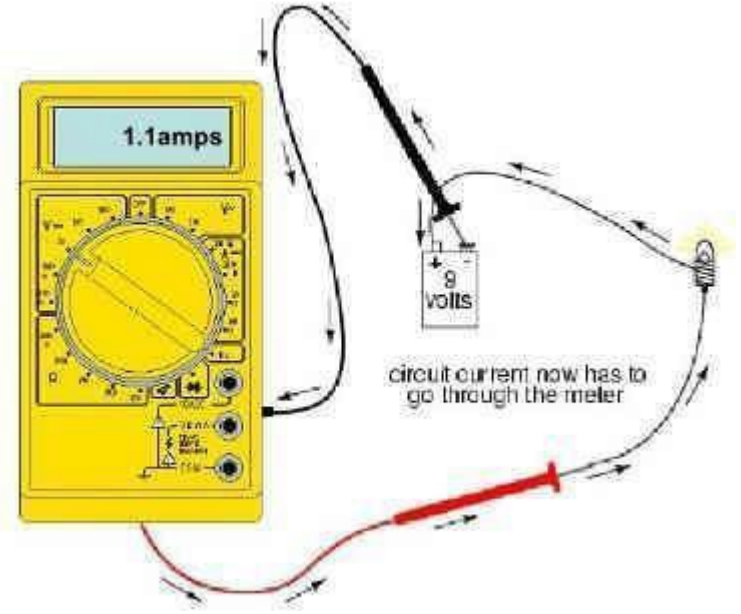


Fig. 2.5.6.2: Measuring current with multimeter

2.5.6.3 Steps: Check Shorting problems

In case of a dead mobile phone.

Step 1– Set the multimeter rotary switch on continuity (also called diode setting).

Step 2– Place the PCB in such a way that the battery connector is easily accessible. The positive terminal will have a (+) mark called vBat (Battery Voltage) pin. The negative terminal will have (-) mark called GND (Ground) pin. Correctly identify the battery connectors.

Step 3– Place the red (+) and Black (-) probe of the multimeter on the vBat and GND pins of the battery connector firmly.

Step 4– If there is a continuous beep sound that is heard or there is some reading in the multimeter, then the motherboard (i.e., the mobile phone) is short. Otherwise, in the absence of either of these i.e., no multimeter reading nor a continuous beep sound, the board is not short.

Note– In case of an analog multimeter, short can be identified by measuring the resistance. The rotary selector switch should be set to ohms (x10) position. If the needle moves even slightly then the motherboard (or cell phone) is short.

Fig. 2.5.6.3: Checking shorting with multimeter

2.5.6.4 Steps: Check Ringer Problem

In case of a faulty ringer:

Step 1– Switch off the phone and dismantle it.

Step 2– Remove the ringer.

Step 3– Keep the multimeter on continuity setting.

Step 4– Touch the red and black probe tips of the multimeter to the ringer's two terminal pins. If the multimeter shows some reading or a beep sound is heard, the ringer is functional, else If there is no reading and also no beep sound, then the ringer is faulty.

2.5.6.5 Steps: Check Microphone

Used in case the other party is unable to hear your voice in a mobile call.

Step 1– Switch off the phone and dismantle it.

Step 2– Remove the mic.

Step 3– Set the rotary selector switch of the multimeter on resistance (symbol Ω, setting 20KΩ).

Step 4– Touch the Red and Black probe tips of the multimeter to the two mic terminals. Now blow air into the mic membrane (hole) by bringing your mouth close to it. If the reading on the screen increases rapidly, the mic is functioning properly. If the reading does not change, the microphone is faulty.

2.5.6.6 Steps: Measure Frequency & Logic?

For Frequency

Step 1– Put the BLACK probe into the COM plug and RED probe into the V plug.

Step 2– Set the rotary selector switch of the multimeter to KHz range.

Step 3– Place the probe tips at the point where we want to check the frequency.

Step 4– Note the frequency value on the display.

Fig 2.5.6.6 Measuring Frequency

For Logic

Step 1– Put the BLACK probe into the COM plug and RED probe into the V plug.

Step 2– Set the rotary selector switch of the multimeter to Logic range.

Step 3– Place the BLACK probe tip on the GND terminal of the PCB and RED probe tip at the point where you want to check the logic

Step 4– The multimeter display willl show High in case of logic 1 and low for logic 0

2.5.7 Steps: Working with a Hot Air Rework Station

Hot Air Rework Station is used to remove any IC from a PCB and then solder another one. It has controls to regulate the temperature and flow of hot air.

For using a hot air SMD rework station to remove any IC from a PCB and then solder it carry out the following steps:

Step 1– Set the control of the Hot Air Rework Station to the desired temperature and air flow.

Step 2– Gradually give hot air to the faulty IC.

Step 3– Pull out the faulty IC slowly using an IC pick up tool or a tweezer.

Step 4– Properly clean the track before applying fresh solder paste on the track. The new IC should thereafter be placed on the PCB.

Step 5– Place the hand piece of the air blower at a height and point to the soldering point, gradually lower the height to increase the temperature.

Step 6– Remove the blower once the solder melts. Thereafter solder the new IC.

Fig. 2.5.7: A Hot Air Rework Station

2.5.8 Other Tools

Battery Booster is used to increase the battery power in a cell phone.

Fig. 2.5.8(i): A battery booster with a hand crank

To analyze the condition or status of a cell phone battery a **Battery tester** is used.

Fig. 2.5.8(ii): A battery tester in action

The PCB of a mobile phone and electronic components on it can be cleaned using a **Ultrasonic Cleaner.**

Fig. 2.5.8(iii): An ultrasonic cleaner

2.5.8 Other Tools (Contd)

Magnifying Lamp is used to see an enlarged (magnified) view of the mobile phone PCB.

Fig. 2.5.8(iv): A magnifying glass

DC Power Supply is used to supply regulated Direct Current (DC) power supply to a mobile phone when it is under test.

Fig. 2.5.8(v): A DC power supply

A magnified view of a PCB or electronic components on it are seen by using a **Microscope.** A microscope can also be connected to a computer these days and come with varying zooming options.

Fig. 2.5.8(vi): A microscope

2.5.8 Other Tools (Contd)

Liquid Flux is used while soldering to clean the legs/pins of electronic components or PCB track.

Paste Flux is used while soldering.

Solder Paste is solder in molted semi-solid form and is used while re-balling the ICs.

Fig. 2.5.8(vii): Liquid & paste flux, and solder paste

De-soldering Wire is used to remove excess solder from the PCB tracks.

Screwdriver Kit has number of screwdrivers of different shapes and sizes to assemble or dissemble a mobile phone.

Wrist Strap is put in the wrist of the person repairing a mobile phone and is used to protect the electronic components by discharging any electrostatic charge at the work station.

Fig. 2.5.8(viii): Soldering wire, screwdriver kit and a wrist strap

2.5.8 Other Tools (Contd)

Torque screwdriver

- It is a special type of screwdriver that has components to ensure that only a specified torque is applied tightening to a specified torque, neither excessive nor deficient.
- The Torque screwdriver prevents excessive tightening that may damage the PCB or insufficient tightening that may result in loosening while in operation.
- Once a pre-set torque is reached, the torque-limiting clutch in the Torque screwdriver disengages ensuring application of only the desired torque.
- Their use helps in ensuring quality assurance.

Fig. 2.5.8(ix): A torque screwdriver

To clean the soldering iron tip while soldering a **Cleaning Sponge** is used.

Antistatic Hand Gloves are Electrostatic Discharge (ESD) safe and therefore should be used to prevent damage to the components.

Mobile Opener is used to open the body or housing of a mobile phone.

Fig. 2.5.8(x): A cleaning sponge, ESD-safe gloves and mobile opener

2.5.8 Other Tools (Contd)

Antistatic Mat is put on top of the workbench where a mobile is being repaired.

Antistatic Apron is a dress worn by people who repair mobile phones. Like the antistatic mat, it helps saves the mobile handsets from dangerous static electricity.

Smoke Absorber helps in filtering smoke and acts like an exhaust fan.

2.5.9 Concepts of Embedded Multimedia Card (EMMC) chip off, Re-balling and Soldering

Embedded Multimedia Card, sometimes known as eMMC, is a type of flash memory used by mobile applications.

Flash memory is almost often used to store content in embedded applications such as digital cameras, smartphones, and tablets nowadays.

The non-volatile storage found in smartphones, tablets, and mini PCs is called eMMC. Usually, it might be 8 GB, 16 GB, 32 GB, or even 64 GB.

It typically resides in a tiny integrated circuit that is directly soldered to the motherboards of the devices.

This memory houses the operating system, any downloaded apps, settings, and data including contacts, text messages, pictures, music, and videos, among other things. Although many phones allow you to install a micro-SD card, some phones may also allow you to store some apps on this card in addition to music, photographs, and videos.

Additionally, the phone will feature volatile memory (RAM), which is used to store temporary data that will be lost when the phone is turned off.

The emmc chip at least found in a samsung is a 14 by 14 pins which only about 1/3 of it's pins are critical, the respite are dummy and do not worry if they eventually get removed, while removing the chip or cleaning the board after desoldering prior installing the new chip.

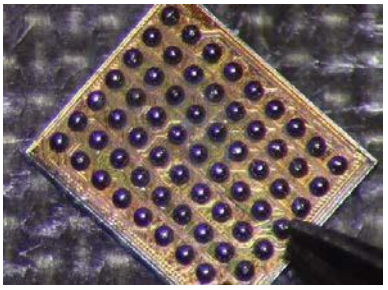
Some tips on reworking:

- Always cover important glued components, such as the baseband processor, which is typically XGOLD found in Samsung and the CPU + POP (package on package) RAM.
- Before attempting to remove the chip glue, clean the area around it by heating it to about 25^0C and using a needle to scrape the adhesive.

To avoid further harm to the motherboard's built-in tracks, do not remove the real chip at temperatures above 35^0C.

The BGA Reballing Procedure and Supplies:

Reballing requires a number of tools, as well as significant knowledge and technical skill, which is why BGA reballing is typically done by professionals. However, BGA rework equipment and kits are offered for sale on the market.



You will need a soldering iron to reball a BGA. A hand-held tool called a soldering iron is created specifically for soldering projects. The solder metal will get heat in order to melt and improve flow into the damaged junctions between the electronic component and the PCB. Each soldering iron is made with a properly insulated handle and a metal tip that has been heated to the proper temperature.

Soldering paste or wire will also be needed and is used to affix circuit board pads to surface-mounted components. It is frequently used by manufacturers in order to manufacture various printed circuit boards and is very useful for attaching solder balls or electronic components onto the mounting area.

Desoldering wire, which can be used to desolder or solder wick, is also necessary. It is available on the market in roll form and is typically braided with copper wire that is 18 to 42 AWG and is insulated with leading-edge rosin flux. By soaking the metal solder in the desoldering wire, the solder is intended to be removed from the joint.

Reballed chips will also need a holding stand, which you can get on the market for a reasonable price in a BGA chip container. A chip stencil, which is essentially a metal sheet with several holes so that solder balls may be inserted, is also necessary. Made with very high-quality steel, it can be heated either with the BGA machine itself or a hot air gun if desired. Regardless of which option you go with, the end result is that the ball soldering process will be both quick and easy.

Solder balls will also be needed, and consist of small balls of solder that are strewn about the SMT board surface in an arbitrary manner. The purpose of solder balls is to provide a point of contact between the multichip modules and the stacked packages, as well as between the PCB and the chip package.

Finally, a top-of-the-line BGA reworking machine that can produce a lot of heat will be required to complete the BGA reballing operation. Additionally, it can be applied to attach or remove BGA chips.

UNIT 2.6: Basic troubleshooting

Unit Objectives

At the end of this unit, you will be able to:

- Open up or disassemble a mobile phone using the common hardware repair tools
- Identify and troubleshoot common handset problems
- Identify and troubleshoot common software related issues in phones
- Create back up data from the handset

2.6.1 Disassembling a Mobile Phone

The process of taking a cell phone apart is basically the same but can vary slightly depending on the type and model of phone that you have.

Tools required

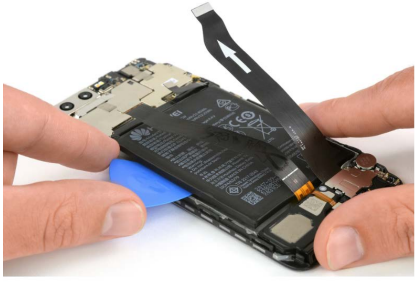
1. A mobile opener
2. A screwdriver

Fig. 2.6.1: Tools required to dismantle a mobile phone

2.6.1.1 Steps: Disassemble a phone

Step 1– Using a mobile opener, first remove the back cover of the mobile. Thereafter remove the exposed battery, SIM card and the memory card. Remove the Screws (circled in the figure) next.

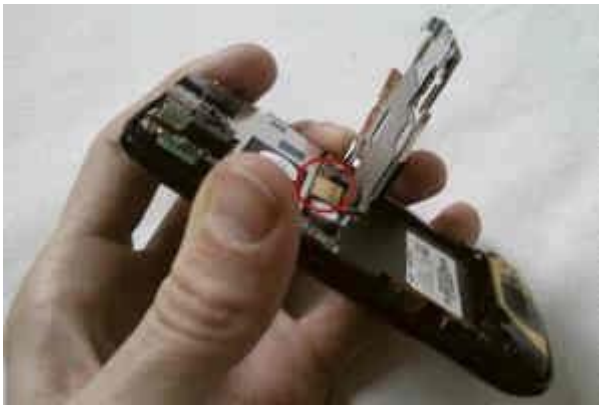
Step 2– Pull off the battery compartment. The camera and volume buttons will also loosen and the circled screws can now be removed.



Step 3– The lock (left circle) button and volume (right circle) button micro switches should be peeled away carefully from the phone side ensuring they remain attached to the circuit board.

2.6.1.1 Steps: Disassemble a phone (Contd)

Step 4– The exposed circuit board should now be pulled towards yourself making the ribbon connector (circled in figure below) visible. To make the circuit board free unplug the ribbon connector by levering it upwards, away from the mobile.



Step 5– The three ribbons circled in green and red in the figure below are to be detached. The red circled ribbons can be levered up to be unplugged.The green circled part is attached by a double sided tape to the phone housing on one side and the circuit board on the other. To release carefully lever it up.

Step 6– The circuit board is now lifted away from the phone and removed. At this stage another ribbon connector, circled in green on the figure below, will be disconnected. Now unscrew the blue circled screw in the figure. Remove the antenna by prying along the dotted line in the figure. Another connector (red circle in figure) is then removed by levering it upwards.

2.6.1.1 Steps: Disassemble a phone (Contd)

Step 7– The identification sticker is now to be peeled off carefully. To release the keypad on the other side, push a screwdriver into the points circled in the figure below.

Step 8– Another ribbon connector circled below gets exposed. To remove this connector flick the black latch up in a direction opposite to the side of the socket into which the ribbon enters. The ribbon will now be loose. To separate the cover from the black metal plate (shown by dotted line in the below figure) pull the front cover along the direction of the arrows.

2.6.1.1 Steps: Disassemble a phone (Contd)

Step 9– Carefully peel the identification sticker off and push your screwdriver into the circled points. This will release the keypad on the other side.

Step 10– The connector circled below connects in a slightly different way. Just flick the black latch up, opposite to the side the ribbon enters its socket. The ribbon will now be loose. Now pull the front cover in the direction shown by the arrows so that the front cover separates from the black metal plate, indicated by the dotted line.

2.6.1.1 Steps: Disassemble a phone (Contd)

Step 11– Now release the LCD screen by sliding a mobile opener tool under it. Remove the LCD screen therafter.

Step 5– To reassemble the mobile phone to its original state repeat the whole process in reverse.

2.6.2 Steps: Solution to Battery Related Problems

Fig. 2.6.2: A malfunctioning battery

In case of battery complaints of it not charging, low back up time, fast draining or low battery the following steps can be tried: -

Step 1– Check the charger plug point and the battery connector for any fault.

Step 2– Check for corrosion in the battery connector, any broken pin and dust particles. All these points should be cleaned using cleaning swabs.

Step 3– Check the interface connector for any dust and clean it if dust exists. Replacement of the the interface connector can also be done.

Step 4– If the problem persists, upgrade to the latest version the system software and the operating system.

Step 5– If the above steps do not solve the problem then check the current being consumed by the phone.

Step 6– Check for any short-circuit.

Step 7– If there is a board level problem, it is desirable to replace the complete logic-board.

2.6.3 Steps: Solution to Network Not Working

Fig. 2.6.3: No network issue

For signal related problems in a mobile like weak signal, signal present intermittently or no network the following steps can be tried: -

Step 1– Search for the network manually. If the 'no network' indication continues, then there the antenna switch is faulty and needs to be repaired or replaced.

Step 2– After the manual searc, if the network is visible but the home network is not getting selected, then the PFO has gone faulty and needs to be repaired or changed.

Step 3– If the problem pertains to network disconnection when a phone call is in progress, the the network IC is faulty and should be repaired or changed.

Step 4– Clean the antenna tips and point.

Step 5– Change the 26MHz crystal oscillator if the problem has not yet been addressed.

Step 6– Change the antenna switch thereafter. If the antenna switch is not available carry out jumpering.

Step 7– If the problem persists, heat, change or jumper the PFO. network IC, power IC and finally the CPU - in that order - if the problem still persists.

Step 8– Heat, re-ball or change the network IC, power IC and finally the CPU - in that order - if the problem still persists.

2.6.4 Steps: Solution to Network Signal and Call Drops

In case of network problems and call drops the following steps can be tried: -

Step 1– Remove the SIM card and insert it into another cell phone to see if the problem persists.

Step 2– You can also try to put the some other serviceable SIM card inside the mobile phone that has reported the to rule out a problem with the mobile.

Step 3– Change the SIM card if the source of the problem is not the mobile phone.

Step 4– Upgrade to the latest version of the operating system if no other problem is identified.

Step 5– Change the mobile phone if none of the above steps work.

2.6.5 Steps: Solution to Mobile Phone Overheating

Fig. 2.6.5: A high temperature message

In case there is a report a mobile overheating either indide or outside the body, run the trouble shooting software.

If the software troubleshooting fails to resolve the issue, then change the PCB or logic-board as there is some internal circuitry problem.

2.6.6 Steps: Solution to Earpiece Problem

Fig. 2.6.6: Poor audio quality in a call

The following steps can be tried in case there is a report on no sound being heard during a phone call. low volume or sound 0r speech has interuptions.:

Step 1– The speaker volume should be first checked when a call is in progress.

Step 2– If there is no problem with the speaker volume, then check the earpiece by keeping the multimeter in buzzer mode with resistance setting as 25~35 Ohm. Change the earpiece if the resistance reading is not between 25 to 35 Ohm.

Step 3– Thereafter, test the circuit track of the earpiece section. Jumper as and when necessary.

Step 4– Heat, reball or change the UEM/Audio IC if the problem persists.

Step 5– The last thing left if all others fail is to heat, reball or change the CPU.

2.6.7 Steps: Solution to Ringer Problem

Fig. 2.6.7: A faulty ringer

The faults reported for a faulty ringer could be that it does not ring, it gives a low sound, interrupted sound or it lacks clarity. The following steps can be tried to rectify a faulty ringer :

Step 1– Examine the phone settings for the ringer. Ringer volume and silent mode setting be verified. In case the fault is a setting problem, adjust the volume or the mode as applicable.

Step 2– Open the cell phone , access the ringer and clean the ringer point and connector.

Step 3– Check the ringer for serviceability using the multimeter. Put it in buzzer mode with the resistance set between 8 to 10 Ohm. The ringer is OK if the reading is between 8 to 10 Ohms. If it is outside this range, change the Ringer.

Step 4– Check track of the ringer section if the problem is not resolved.. Jumper wherever found to be necessary.

Step 5– Check the ringer IC for serviceability. Heat or change the ringer IC if found to be unserviceable.

Step 6– If the fault persists heat, reball or change the UEM / Logic IC and finally the CPU if the fault has still not been solved.

2.6.8 Steps: Solution to Vibrator Problem

Fig. 2.6.8: A faulty vibrator

The faults reported for a faulty vibrator could be that it does notwork, works with interruption it hangs. The following steps can be tried to rectify the vibrator :

Step 1– Examine the phone settings for the vibrator and confirm that the "On-Off" setting is set to ON.

Step 2– Open the cell phone , access the vibrator and clean the vibrator point and connector.

Step 3– Check the vibrator for serviceability using the multimeter. Put it in buzzer mode with the resistance set between 8 to 16 Ohm. The vibrator is OK if the reading is between 8 to 16 Ohms. If it is outside this range, change the vibrator or motor.

Step 4– Check track of the vibrator section if the problem is not resolved. Jumper wherever found to be necessary.

Step 5– Check if the fault persists. If it does heat, reball or change the UEM / Logic IC / Power IC

Step 6– Finally, if the fault persists, heat, reball or change the CPU.

2.6.9 Steps: Solution to Microphone Problem

Fig. 2.6.9(i): A faulty microphone

The faults reported for a microphone could be that it has low sound, has interruptions or there is a change in the sound. These can be addressed by following the steps as under.

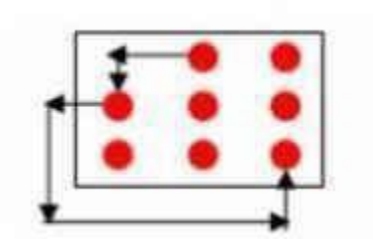


Fig. 2.6.9(ii): Jumper setting for microphone

Step 1– Examine the phone settings for the microphone and confirm that they are normal.

Step 2– Open the cell phone if settings are ok , access the mic and clean the mic point and connector.

Step 3– Check the mic for serviceability using the multimeter. Put it in buzzer mode with the resistance set between 600 to 1800 Ohm. The microphone is OK if the reading is between 600 to 1800 Ohms. If it is outside this range, change the microphone. Only one side of the microphone will give value

Step 4- Check track of the microphone section if the problem is not resolved. Jumper wherever found to be necessary

Step 5– Check if the fault has been rectified else heat or change the IC.

Step 6– Check if the fault persists. If it does heat, reball or change the UEM / Logic IC / Power IC

Step 7– Finally, if the fault persists, heat, reball or change the CPU.

2.6.10 Steps: Solution to Display Problem

Fig. 2.6.10: A faulty display

The followingfaults can be reported in case of displays:

- Display is blank or white or working improperly.
- Only partial portion of the display is proper.
- Inverted display.
- Display is broken.
- On switching ON the cell phone, after initially the logo is visible but thereafter the display disappears.

Carry out the following steps to rectify the problems:

Step 1– Open the cell phone, access the display and clean the display tips and connector.

Step 2– If not resolved, solder the display connector.

Step 3– Check if display functional, else change the display.

Step 4– If problem persists, the display track should be checked.

Step 5– If there is no change in status - solder or replace the display IC.

Step 6– Finally if everything fails, heat, reball or change the CPU.

2.6.11 Steps: Solution to LED Problem

Fig. 2.6.11: A faulty LED

The following LED related faults may be reported by the customer:

- No LED is glowing .
- Only the keyboard or display LED is glowing.
- Partial functioning / non functioning of the lights.

Carry out the following steps to rectify the above problems.

Step 1– Check the phone settings for light display and check all OK.

Step 2– If all OK in the settings resolder all the LEDs.

Step 3– Change the screen or the display if the problem persists

Step 4– Set "buzzer mode" in the multimeter and test all LEDs. The serviceable LEDs will glow and the faulty ones will not.

Step 5– Jumper or replace the faulty LEDs that have been identified above.

Step 6– If the fault persists verify the track of the light section and jumper if required.

Step 7– If no fault is detected till this stage, the boosting coil should be checked and replaced if necessary.

Step 8– Heat or replace the Light IC if the above steps do not solve the problem.

Step 9– Finally, if every thing else fails then heat, reball or replace the Power IC.

2.6.12 Steps: Solution to Touchscreen Problem

Fig. 2.6.12(i): A faulty touchscreen

The following touchscreen related faults may be reported by the customer:

- Touch does not have any effect.
- Half touchscreen only functional.
- Wrong key displayed on pressing some keys.

Carry out the following steps to rectify the above problems.

Step 1– If the cell phone also has a keypad besides the touchscreen, verify the phone settings for correctness.

Step 2– If settings are in order, open the cell phone clean PDA Tips and connector and resolder them if required.

Step 3– If the fault persists, replace the PDA.

Step 4– If the fault persists verify the track of the PDA section and jumper if necessary (refer Fig 2.3.12).

Step 5– If the above steps do not resolve the fault, Heat or replace the PDA IC.

Step 6– Finally if everything fails, heat, reball or replace the CPU.

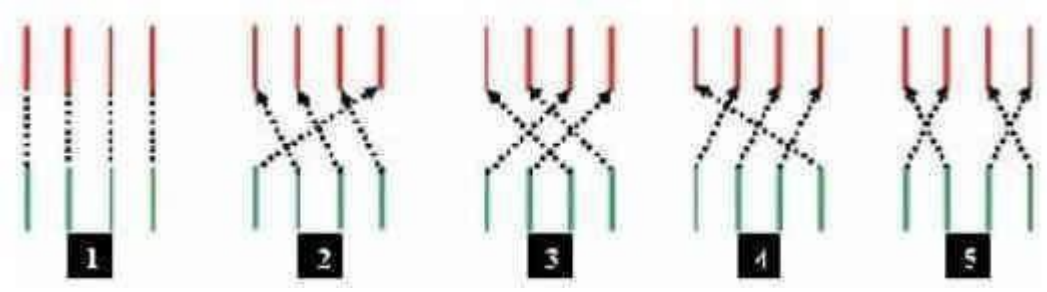
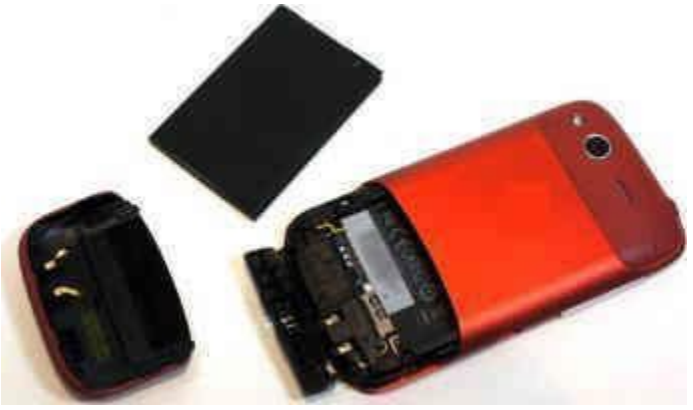


Fig. 2.6.12(ii): Jumper settings for PDA

2.6.12.1 Steps: Replacing a Touchscreen

In case the touchscreen have excessive scratches that require its replacements or the touchscreen is broken, the following steps can be tried:

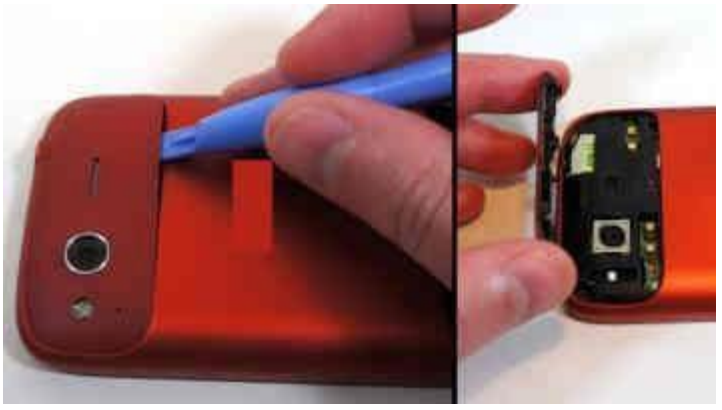
Step 1– Open up the mobile cover and remove the battery, all SIM cards and the SD cards.



Step 2– To access the touchscreen the screws at the base around the battery cover are removed. Photograph the device as a reference whenever in doubt.

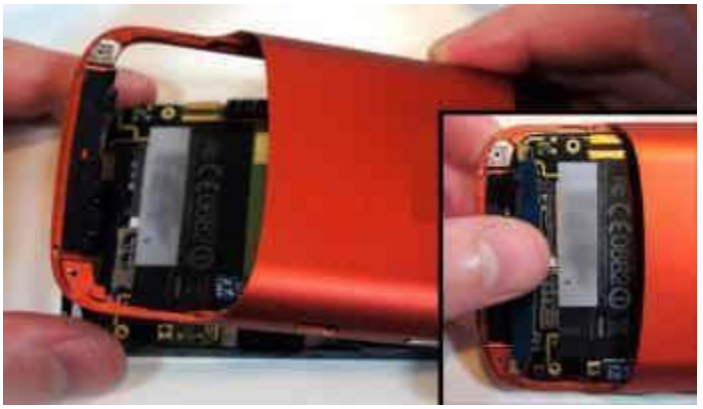
Step 3– Take the pry tool and pry open the back cover. Starting from the corner take the tool under the edge carefully. Pop out the clips once the tool reaches the edge and lift the cover. In the particular model shown above, only the top cover of the camera needs the pry tool.

2.6.12.1 Steps: Replacing a Touchscreen (Contd)



Step 4– Unclip any other visible connections and any screws that are visible.

Step 5– The main device is now carefully "pushed" without using any excessive force such that it is detached from the metal chassis. Be careful to bend up the lower PCB, lest it gets caught in the rear of the chassis.

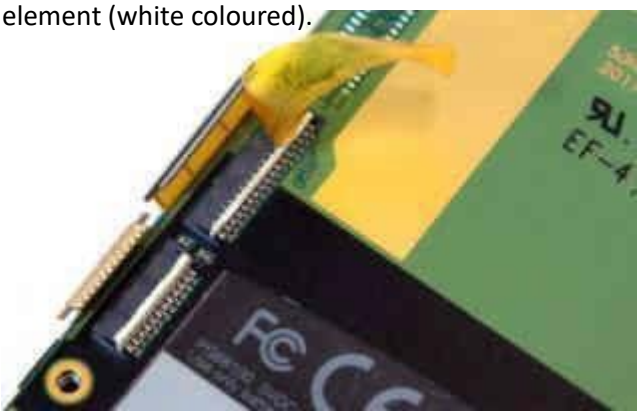


2.6.12.1 Steps: Replacing a Touchscreen (Contd)

Step 6– From the top or bottom unscrew any additional screws that are visible. Simply lift the plastic bracket that now gets released.

Step 7– The display elements have to be separated from the motherboard of the mobile. The digitiser and display connections would vary from model to model. In the model here these connections are seen as two ribbon cables coming in to the side of the model.

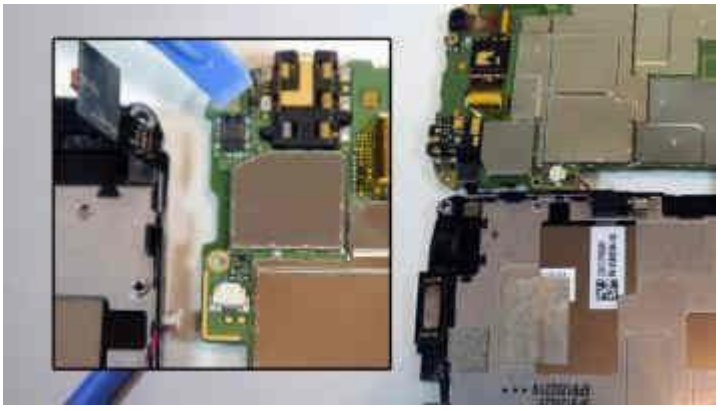
Remove and save the tape using the pry tool. Remove the ribbons using a suitable screw driver after lifting the locking element (white coloured).



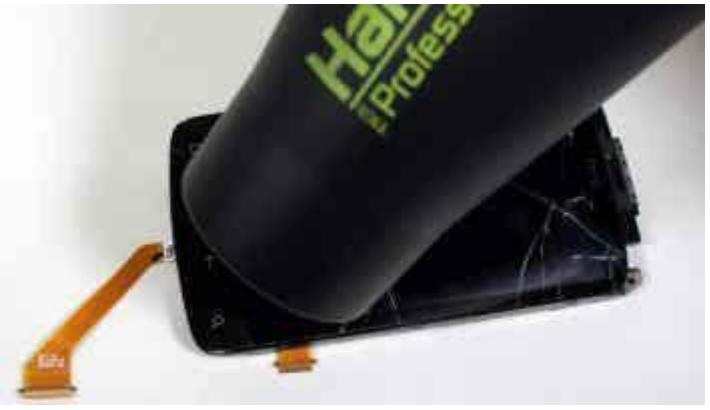
Step 8– Using a pry tool work carefully around the edges of the exposed parts to separate the display and the motherboard that are invariably glued together.

2.6.12.1 Steps: Replacing a Touchscreen (Contd)

Step 9– To gain access to the display section and the motherboard section, fold open the mobile carefully and disconnect the last of the two connecting elements.



Step 10– The digitiser is bound to the display chassis by an adhesive gasket. Using a hot-air gun, set at the lowest temperature, heat the joint continuously moving the gun to loosen the adhesive. Thereafter separate the digitiser from the display by using a pry tool.



2.6.12.1 Steps: Replacing a Touchscreen (Continued)

Step 11– The screen should be removed a part at a time. Start from the least broken portion or from the the bottom edge. Test the "stickiness" of the adhesive using a pry tool and heat it again. Repeat the process until they start separating. Continue the entire process small section at a time till the entire digitiser can be lifted out. Save the adhesive gasket as far as possible.

Step 12– Be very careful in the entire process because if any portion of the digitiser comes in contact with the display or chassis it will short and false-positive touches will be encountered. If you have damaged the adhesive gasket, replace it with 1mm or 2mm adhesive tape designed for phones.

Step 13– Remove any protective film on either side, feed the new digitiser's ribbon through the lower hole and carefully from the base, angle it back into place firmly pushing it down to make sure the adhesive holds well.

2.6.12.1 Steps: Replacing a Touchscreen (Contd)

Feed the ribbon along the back of the display and reverse this process to carefully rebuild your phone.

Step 14– Check the mobile by powering it on and test that the faults reported have been addressed.

2.6.13 Steps: Solution to Keypad Problem

Fig. 2.6.13(i): A faulty keypad

The following keypad faults can be reported by a customer:

- Certain keys not functional.
- More pressure is required to be applied on some or all keys.
- Some key works continuously when pressed.
- Another key functions when some other key is pressed.
- Simultaneous working of a key when some other key is pressed.

Carry out the following steps to rectify the above problems.

Step 1– Physically inspect the face of the keypad.

Step 2– The keypad and its contact points (refer Fig 2.3.13.) are cleaned using a cleansing liquid.

Fig. 2.6.13(ii): Keypad cleaning points

Step 3– If the problem is not resolved, set the multimeter's rotary switch in buzzer Mode and check for continuity the rows and columns of the Keypad. The keypad is functioning properly if a beeping sound is heard.

Step 4– Heat or replace the Keypad / interface IC if the problem persists.

Step 5– Finally, if the problem persists heat, reball or replace the CPU.

2.6.14 Steps: Solution to SIM Problem

Fig. 2.6.14: A faulty SIM card

The following steps can be tried in case:

- SIM is inserted but the message says "Insert “IM".
- The mobile phone goes OFFLINE when the SIM card is inserted.
- The SIM works for some time and then stops working.
- There is a message that says "Invalid “IM".

Carry out the following steps to rectify the above problems.

Step 1– Check settings and see if the mobile phone is in Flight Mode. If it is in 'Flight Mode' then change it to Normal mode.

Step 2– Clean the SIM card tips and SIM connector.

Step 3– If the problem is not solved then change the SIM card and check.

Step 4– If the problem remains then change the SIM connector.

Step 5– If you still do not find a solution to the problem, check the track of the SIM section.

Step 6– If the problem is still not solved then heat or change the SIM IC.

Step 7– Finally, if there is no change, heat, reball or change the Power IC.

2.6.15 Common Software Problems and Solutions

Battery issues

Sometimes resource hungry apps drain the mobile battery and also cause the phone to become slow. Search and locate such apps and delete if not important.

Bluetooth issues

Try switching the phone off and on. If it doesn't work, go to Settings > Apps > Scroll over to All > Select Bluetooth Share > Clear Cache (Android phones)

Cellular Data Issues

This is a common problem amongst Android phones. To fix this problem, simply go to Settings-> More-> Cellular networks. Turn it back on after 30 seconds or so and see if the connection is back. If it is not, try rebooting your smartphone.

Camera Glitches

Try to reset your device and make sure the OS is up to date. Rebooting the device may fix the problem and the camera might start functioning again.

2.6.16 Steps: Updating a smartphone

Fig. 3.3.2: A mobile phone update notification

It is a good practice to back up your data such as contacts and photos before a phone upgrade.

Android

Step 1– Go to and select the Settings menu of the mobile.

Step 2– Scroll down and click on 'About Phone'. In case of a tabbed settings menu this will be found in the 'general' section.

Step 3– Select 'Software Update' or a similar option.

Step 4– The mobile software is programmed to automatically search the company web site for an update. Some applications may take you to another menu and display the updates and expect you to check a button displayed in front of the software name. A confirmation will be taken before downloading the update, if available. On confirmation the update is downloaded, installed and the mobile rebooted.

iPhone

From the phone directly

Step 1– Plug your phone in to power and connect to the Internet with Wi-Fi.

Step 2– Tap Settings > General > Software Update.

Step 3– Tap Download and Install.

Step 4– To update now, tap Install.

Step 5– If prompted, enter your passcode.

2.6.16 Steps: Updating a smartphone(Contd)

Through iTunes

Step 1– The latest version of iTunes is first installed on a PC.

Step 2– Connect the phone to your computer.

Step 3– Open iTunes and select your iPhone.

Step 4– Click “ummary, then click 'Check for Update'.

Step 5– Click Download and Update.

Windows

Step 1– Tap Settings.

Step 2– Tap 'phone update'.

Step 3– Tap the button 'check for updates'.

Step 4– You can choose to install the update immediately or postpone the update for a more convenient time.

Blackberry

Step 1– Visit the http://www.blackberry.com/update web site.

Step 2– Click 'Check for Updates'.

Step 3– Follow the on-screen instructions to reload the software.

2.6.17 Steps: Mobile Data Transfer

Using USB Cable

Step 1– Use the USB cable provided along with the mobile to connect the mobile and your computer.

Step 2– Find the icon of a removable drive (your mobile) on your computer under My Computer or Finder if a pop-up window does not open.

Step 3– Drag and drop the relevant files you want to copy from the cell phone to the PC (or vice-versa).

Step 4– When you are finished, close the window and disconnect the USB cable.

Using Bluetooth

Step 1– Turn Bluetooth on in both the mobile and your PC. You can activate it in your phone by looking under Settings or Controls. In case of a Mac, the Bluetooth symbol (a white B on a blue background) is seen on the right side of the upper toolbar left of where the Date and Time is displayed - click on it to turn bluetooth on. In Windows it should be under the Control Panel.

Step 2– Make sure that the phone is not too far away from the computer.

Step 3– Find and select the file (phone) that you want to transfer.

Step 4– Select Copy or Send in the menu.

Step 5– Choose the Bluetooth option.

Step 6– Select the "Look for Devices" or a similar option in the Bluetooth menu that pops up.

Step 7– Select your device (computer).

Step 8– Request would be sent to the device to accept the file.

Step 9– Accept request & data will be sent from mobile to computer and vice-versa.

2.6.17 Steps: Mobile Data Transfer (Contd)

Using Memory Card Reader

Step 1– Plug in your memory card into a memory card reader. If it's a micro SD card then insert into an adapter and then insert the adapter into the reader.

Step 2– Insert the card reader into the USB port of your PC if it does not have a built in card reader.

Step 3– Look for the card as a removable device on your computer under My Computer or Finder if a pop-up window does not open. Drag and drop the data you want to copy on your local drive. In case of a Mac, open iPhoto, select Import to library option under file menu option & select the desired photos from memory Card.

Using iTunes

Step 1– Connect iPhone to computer using a USB cable. iTunes should open automatically, if not go to the applications folder and open it from the Start Menu.

Step 2– Select your iPhone from the list under Devices button (upper right corner of iTunes window).

Step 3– Choose the media (Apps, Music, Movies, etc.) that you want to sync. Select the "Sync" checkbox and click on individual tab to be added to your device. You can also choose to sync all media of that type, or just specific files.

Fig. 2.6.17: Backing up data in an iPhone using iTunes

UNIT 2.7: Safety Guidelines

Unit Objectives

At the end of this unit, you will be able to:

1. Understand and follow standard safety precautions while repairing a handset
2. Understand and follow radiation compliance standards for mobile phones in India

2.7.1 Safety Tips and Precautions

- Repairing of any mobile handset must always be done on an ESD-Safe Mat.
- The person doing the repairing job should also be wearing ESD-Safe Clothing like ESD-Safe Apron, ESD-Safe Slippers, ESD-Safe Hand Gloves and Anti-static wrist strap. This prevents the gadget or mobile phone from any potential damage to sensitive electronic components mainly SMD due to static electricity.
- The workstations should be well equipped so that all your tools of regular use are within your arms reach and at appropriate place.
- Use only dedicated tools for particular device you want to repair and fix.
- Make sure the LCD does not get any scratches. Handle connectors and connecting cables carefully as they are very delicate.
- Hot air machine and soldering iron or soldering station must be used and handled carefully. They can damage the gadget and even harm you. Hot air machine produces hot air with very high temperature. Make sure the direction of the nozzle is where it should be. Switch it OFF when not in use.
- Use a Solder with care. Always place the iron in an iron stand and do not put it on the table.
- In case you have to perform a factory reset in a mobile phone, make sure to backup all data first.
- Software troubleshooting of any mobile handset must always be done on an ESD-Safe Mat.

The person doing the repairing job should also be wearing ESD-Safe Clothing like ESD- Safe apron, ESD-Safe Slippers, ESD-Safe Hand Gloves and Anti-static wrist strap. This prevents the gadget or mobile phone from any potential damage to sensitive electronic components mainly SMD due to static electricity.

- The workstations should be well equipped so that all your tools of regular use are within your arms reach and at appropriate place.
- Make sure the LCD does not get any scratches. Handle connectors and connecting cables carefully as they are very delicate.
- In case you have to reinstall the operating system in a mobile phone, make sure to backup all data first.

2.7.2 Radiation Compliance for Mobile Handsets

The measures taken by the Department of Telecommunications, Government of India, against **Electro Magnetic Field (EMF)** exposure are:

- Stringent international norms for mobile handsets have been notified by India.
- The maximum level allowed by the FCC is 1.6 watts per one kilogram of bodyweight.
- The earlier versions of mobile handsets that complied with the earlier standard of 2.0 W/kg averaged over 10 gram of human tissue have been discontinued from 1st Sept. 2013.
- As in case of the International Mobile Equipment Identity (IMEI) display the SAR value is also required to be displayed in all mobiles. SAR values related information is also to be made available at the point of sale to all consumers.
- Mobile hand set manufactured and sold in India or imported from other countries are checked on random basis for compliance of SAR limit at the TEC SAR Laboratory.
- All cell phones available in India have to comply with laid down standards and are compulsorily to be available in hand free mode.

UNIT 2.8: Report and Document Daily Activities

Unit Objectives

At the end of this unit, you will be able to:

1. Identify and fill up a job-card, a daily activity report, and a customer feedback form

2.8.1 A Repair Job-Card

A job-card is an important piece of document that the Handheld Devices(Handset & Tablet) Technician needs to fill. It records all information related to a repair work viz., customer details, product details and the problem needing a fix.

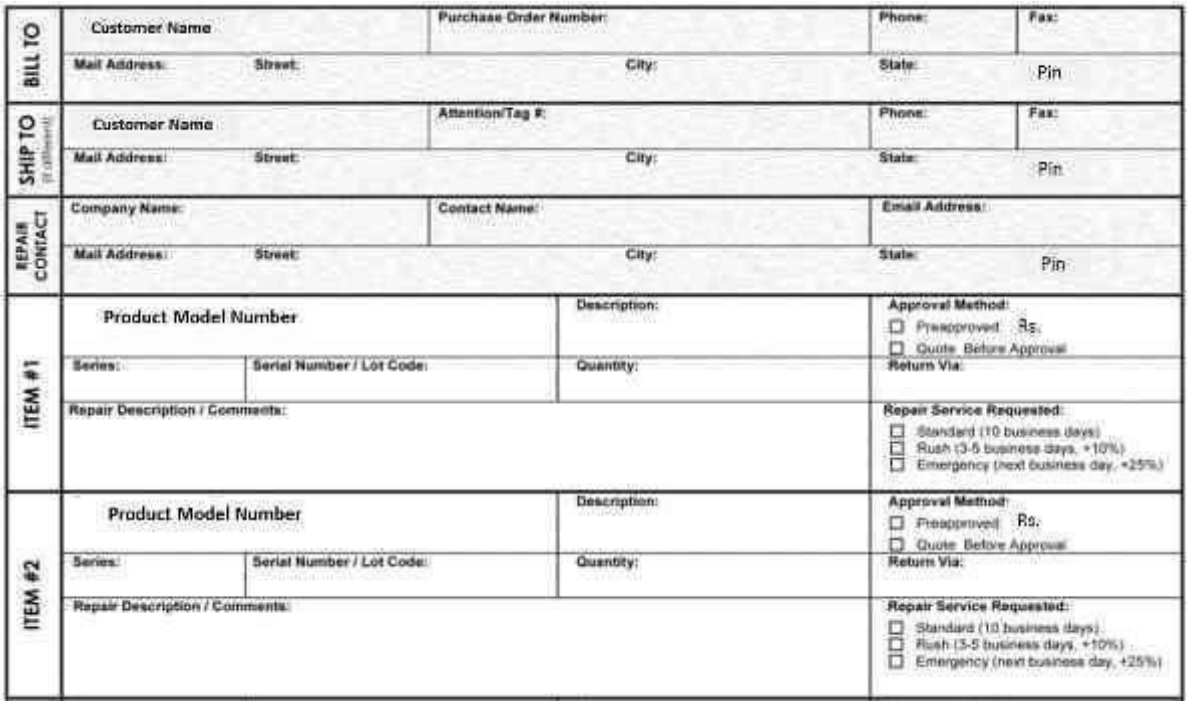


Fig. 2.8.1: A sample repair job-card format

2.8.2 Daily Activity Report

The daily activity report is used the record the tasks undertaken by the Handheld Devices(Handset & Tablet) Technician on a daily basis. It helps the management monitor the overall process.

Daily Activity Report

S No	Customer's Name	MODLL	Contact Number	Address	Symptom	Cause	Action	Parts Replaced	Cost Incurred	Time to Completion

Fig. 2.8.2: A sample daily activity report format

2.8.3 Customer Feedback Form

A customer feedback form gets customer's response on the service offered by the Handheld Devices(Handset & Tablet) Technician. It's a good indicator on the quality of work performed by them

BASIC DETAILS		CUSTOMER FEEDBACK Rating Scale : 1- Very Poor, 2 - Poor, 3 - Nutral, 4 - Good, 5 - Ecellent				
		Quality of Service	Politeness of Staff	Wait Time	Cleanliness	On Time Delivery
Customer Name						
Cstomer Details						
Product Model						
Warranty (Yes / No)						
Date of Visit						

Fig. 2.8.3: A sample customer feedback form format

Exercises

1. What identifies a mobile subscriber to a network:

a. SIM Card

b. Memory card

c. Processor

d. All of the above

2. SIM card does the following:

a.Stores service-related information.

b. Identifies the subscriber to the network.

c. Stores personal information, address books, messages

d. All of the above

3. Compact Flash, Multimedia Card, Secure Digital are types of:

a. Memory card

b. PCMCIA Card

c. Graphic Card

d. None of the above

4. Earthing pin, connected with the body of the equipment:

a. Passes current leakage to the earth

b. Protects people from accidents caused by electrical shock.

c. Both a & b

d. None of the above

5. Which of the following is antistatic clothing :

a. ESD-Safe Apron

b. ESD-Safe Slippers

c. ESD-Safe Hand Gloves

d. All of the above

Exercises (Cont.)

6. Please identify the right statement:

a. A resistor never gets short

b. Resistor can be open

c. Value of resistor can be high

d. All of the above

7. Which of the following is not an electric circuit:

a. Close circuit

b. Short circuit

c. Blocked circuit

d. Series circuit

8. If the mobile phone overheats, change:

a. PCB or logic-board

b. ringer

c. microphone

d. Keypad

9. Removal of solder and components from a PCB is known as:

a. Soldering

b. Shorting

c. Desoldering

d. None of the above

10. If the Multimeter is showing faulty reading what all should you check?

a. Battery

b. Probes

c. Fuse

d. All of the above

Exercises (Cont.)

You may need to reset cell phone to:

a. Correct malfunctions

b. Stop freezing, slowness, etc.

c. To restore the phone to its original state

d. All of the above

12. Resetting a cell phone:

a. Is a tedious and an unnecessary process

b. May often remove and erase all of your personal data from the device

c. Will restore the phone to its original state

d. Both b & c

13. One of the most important precautions that we should undertake while resetting a mobile phone is:

a. That we should do it when we have time

b. We should do it after plugging out the charger

c. Take a back-up of the data (mandatory) to avoid losing it

d. None of the above

14. What all medium can you use to transfer data between mobile and a computer:

a. USB cable

b. Bluetooth

c. Memory card reader

d. All of the above

15. A damaged firmware in a mobile phone means it will:

a. Not power on

b. Hang frequently

c. Keep restarting

d. All of the above

Exercises (Cont.)

16. "Half Flash" & "Full Flash" are terms related to:

a. Flashing:

b. Data Transfer

c. Email

d. Social networking

17. Steps to reset iPhone are:

a. Tap on "Settings" from home screen->Tap "General Settings" from options listed->Tap on "Reset"

b. Tap on "Settings" from home screen->Tap on "Reset"

c. Tap "General Settings" from options listed->Tap on "Reset"

d. Both b & c

18. Which of the following is antistatic clothing :

a. ESD-Safe Apron

b. ESD-Safe Slippers

c. ESD-Safe Hand Gloves

d. All of the above

19. For Soft Formatting of your Nokia Mobile type:

a. *#7370# followed by 12345

b. *#7370# followed by 12346

c. *#73 followed by "password"

d. None of the above

20. For Hard Formatting of your Nokia Mobile type:

a. *#7780# followed by 12345

b. *#7370# followed by 12345

c. *#73 followed by "password"

d. *#7780# followed by "password"

Exercises

21. Reporting helps:

a. Supervisor get a detailed status of a Handheld devices (Handset & Tablet) Technician (HRE) work

b. HRE to solve installation related problems

c. organisation to make more money

d. Both a & b

22. Reporting is a:

a. A formal accounting of the procedures and transactions

b. Software

c. Hardware tool

d. Repair process

Exercises (Cont.)

23. **Mention a few parts on a mobile phone PCB.**

24. **What all constitutes a hands-free section?**

25. **Briefly explain the soldering process.**

26. **What steps are involved in checking a faulty ringer with a multimeter?**

Exercises (Cont.)

27. What is a PFO?

28. What is the role of an RX Filter?

29. What is a Power IC?

30. What is the difference between low-pass filter and high-pass filter?

Exercises (Cont.)

31. List steps to reset an iPhone.

32. List steps to reset a Windows phone.

33. What steps are involved to install apps on a Blackberry?

34. List steps to update an Android phone.

Exercises (Cont.)

35. Why do we need to reset phones?

36. List steps to reset an Android phone.

37. What steps are involved to install apps on an iPhone?

38. List steps to set-up email on an iPhone.

Tips

- While measuring circuit resistance always turn off the power supply to the circuit.
- **How to power on a non-responsive Windows phone:**
  To restart a non-responsive Windows Phone, keep pressing the Volume Down and the Power button simultaneously till you see the phone shut down or you feel the phone vibrate. You can then release the buttons and then press the power button to start the phone again.
- Make sure to keep a notepad handy while doing the repair jobs, it will help in filling up the daily activity report

Notes

Skill India

GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

3. Repairing Tablet

Telecom
Sector
Skill
Council

TEL/N2214

Key Learning Outcomes

At the end of this module, you will be able to:

1. Outline and explain electronic tablets
2. Recall and demonstrate steps to replace common hardware used in a tablet
3. Recall and demonstrate steps to troubleshoot common software and hardware issues in a tablet

UNIT 3.1: Introduction to Tablets

Unit Objectives

At the end of this unit, you will be able to:

1. Outline and explain a tablet and compare it with a traditional computer

3.1.1 Introduction to Tablets

Fig. 3.1.1(i): A range of mobile tablets

Tablets are devices that work like bigger screen smartphones. In spite of their size, they do a lot of the things that a computer can. Unlike a traditional computer that is controlled with a mouse and keyboard, you control a tablet by touching elements on the screen. Touching an icon on the screen is like clicking that icon with the mouse on a computer. If you need to type text, an onscreen keyboard pops up.

3.1.1 Introduction to Tablets (Contd)

Tablets can do lots of things, including:

- Browsing the web
- Sending email and social networking
- Playing games
- Watching movies
- Reading eBooks
- Listening to music
- Video and voice chatting
- Viewing photos

- You can install new programs, called apps (short for applications), any time.
- Most tablets have cameras built in.
- They come in different sizes, and are usually described by the size of their screen. Common tablets have a 7-inch or 10-inch screen (diagonal length).
- Tablets can access the internet using a WiFi network or 3G / 4G mobile data service.

Tablet Models

Tablets like computer, too, come in different flavours. The main difference is in the operating system. The operating system is the base software that controls the tablet. Most of the Tablets today typically use either iOS (on the Apple iPad) or Android. A few tablets run on Windows. In both iOS and Android, the main screen has a number of icons (refer Fig 4.1.1), and each icon starts a different application.

Fig. 3.1.1(ii): An Android tablet home screen

3.1.2 Common brand of tablets and their functions

Tablet Computers, also known as Tablet PCs or Tablets, are mobile devices that are flat, thin, and equipped with touchscreen displays and rechargeable batteries. Due to their fantastic features, niche programmes, and portability, tablet PCs have grown immensely in popularity over the past few years. Operating systems and chips vary among tablets. The two companies that produce the majority of tablet processors are Apple and Intel. While the iPad tablets from Apple run iOS, other tablets run Android OS, while others run Windows OS.

Applications for various kinds of work are pre-installed on tablets. Apps for tablets typically leverage touchscreen effects to provide an experience not available on standard desktops. In addition to using an easy touchscreen control method, computer tablets offer a unique computing experience. Some tablets include an additional, connectable, portable keyboard that can be used for quick typing. Tablet computers can be used to capture images, make phone calls, send messages, record movies, and accomplish other functions that a smartphone can also perform. In some respects, they resemble smartphones.

Many tablets are made with consumers in mind. Military and industrial uses are also possible with these and other customised tablets. Before making a purchase, it's critical to understand the tablet's intended usage because the use will determine the specifications needed.

Some applications of tablet computers include:

- Personal use
- Research
- Construction
- Manufacturing
- Transportation and logistics
- Forestry
- Utilities
- Emergency personnel
- Healthcare and medical
- Military

There are various tablet computer configurations available. One can be merely a tablet, while another might have a keyboard attached or be built to function in harsh environments.
Tablet configurations: slate, convertible, booklet, and rugged.

Fig 3.1.2 Tablet Configurations

The battery life of a tablet computer depends on a number of factors. Battery life can be influenced by:

- Battery size
- Screen backlight brightness
- Operating system efficiency
- Sleep mode vs. powering down the tablet
- App usage
- Browsing the web
- Streaming video

Many tablets advertise 6 to 11 hours of battery life.

Inputs, Outputs, and Accessories

While connection ports and buttons vary between tablet manufacturers, most devices come with the following:

- On/off button
- Power connector
- 3.5 mm headphone jack
- Speaker
- Volume controls and mute switch

Tablet computers may also include:

- microSD card slot
- USB port
- Docking port
- HDMI out

Security

Tablets come with features for data security, virus protection, and theft prevention. These capabilities might be physically included in the tablet or accessible as add-on programmes. Some features that may be available on a tablet include:

- Password or PIN code
- Fingerprint reader
- Virtual private network (VPN) connectivity
- Encryption
- Device location
- Remote data freezing and deletion
- Anti-virus

Small Tablets (7" to 8")

MFG/Model	Apple iPad mini 4	Samsung Galaxy Tab 4 7.0	Kindle Fire HD 7
Operating System	iOS 9	Android 4.4	Fire OS 3.0 Mojito
Size/Weight	8.00"x5.31"x0.24" 0.65 lb	7.36"x4.25"x0.35" 0.61 lb	7.5"x5.0"x0.42" 0.74 lb
Processor	Apple A8 1.3 GHz	Cortex A9 1.2 GHz Dual-Core	Snapdragon 800 1.5 GHz Quad-Core
Storage	16 GB - 128GB	8 GB - 32 GB	8 GB - 16 GB
Battery Life (est)	10 hours	10 hours	8 hours
Resolution/PPI	2048 x 1536 326 PPI	1280 x 800 170 PPI	1280 x 800 216 PPI
Camera(s)	Front - 1.2 MP Back - 8 MP	Front - 1.3 MP Back - 3 MP	Front - VGA Back - 2 MP
Internet Connection	WiFi, LTE	WiFi, LTE	WiFi
Ports	3.5 mm audio Lightning	3.5 mm audio microSD, IR-port	3.5 mm audio microUSB
Material	Enclosure - Aluminum Screen - Glass	Enclosure - Magnesium alloy	
Starting Price	$399	$120	

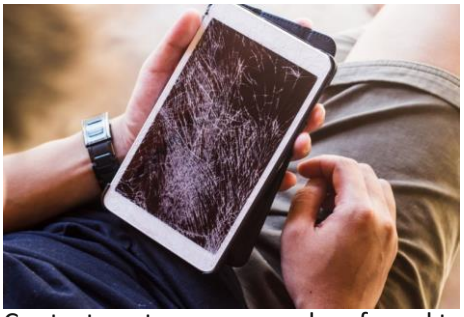
Standard Tablets (9" to 13")

MFG/Model	Apple iPad Pro 12.9-inch Display	Samsung Galaxy Tab S 10.5	Google Pixel C	Microsoft Surface Pro 4
Operating System	iOS 9	Android 4.4	Android 6.0	Windows 10
Size/Weight	12"x 8.68"x0.27" 1.57 lbs	9.73"x6.98"x0.26 " 1.03 lbs	9.53"x 7.05" x 0.28" 1.14 lbs	11.50"x7.93"x 0.33" 1.69 lbs
Processor	A9X	Exynos 5 Octa 1.3 GHz Octa-Core	Quad-Core NVIDIA Tegra x1 with Maxwell GPU 1.9 GHz	6th Gen Intel® Core™ m3, i5, or i7
Storage	32 GB - 256GB	16 GB - 64 GB	32 GB - 64 GB	128 GB - 1 TB
Battery Life (est)	10 hours	9 hours	10 hours	9 hours
Resolution/PPI	2732 x 2048 264 PPI	2560x1600 288 PPI	2560 x 1800 308 PPI	2736 x 1824
Camera(s)	Front 1.2 MP Back - 8 MP	Front - 2.1 MP Back - 3 MP	Front - 2 MP Back - 8 MP	Front - 5 MP Back - 8 MP
Internet Connection	WiFi, LTE	WiFi, LTE	WiFi, LTE	WiFi
Ports	3.5 mm audio Lightning	3.5 mm audio 30-pin dock connector	3.5 mm audio USB Type-C	3.5 mm audio USB, microSD, HD video out
Material	Enclosure - Aluminum	Enclosure - Plastic	Enclosure - Aluminum	Enclosure - Magnesium

Rugged Tablets

MFG/Model	Fujitsu Stylistic M532	Motion J3600	Panasonic ToughPad A1	Xplore iX104C5
Operating System	Android 4.0	Windows 7	Android 4.0	Windows 7
Size/Weight	10.34"x6.9"x0.34" 1.1 lbs	12.7"x9.09"x0.9" 3.6 lbs	10.5"x8.4"x0.7" 2.1 lbs	11.2"x8.25"x1.6" 5.4 lbs
Processor	NVIDIA Tegra 3 1.4 GHz Quad-Core	Intel Core i7 2 GHz	Marvell Armada PXA2128 1.2 GHz Dual-Core	Intel Core i7 1.06 GHz
Storage	32 GB - 64 GB	16 GB - 256 GB	16 GB	80 GB
Battery Life (est)	8 hours	4 hours	10 hours	6 hours
Resolution	1280 x 800	1280 x 800	1024 x 768	1024 x 768
Camera(s)	Front - 2 MP Back - 8 MP	3 MP	Front - 2 MP Back - 5 MP	3 MP
Internet Connection	WiFi	WiFi, LTE	WiFi, LTE	WiFi, LTE
Ports	3.5 mm audio microUSB, docking, SIM	numerous ports	microSD, microUSB, microHDMI	numerous ports
Durability Features	Not waterproof	MIL-STD-810G, water-resistant, Gorilla glass, shock-dampening, magnesium-alloy frame	MIL-STD-810G, all-weather, dust- and water-resistant	MIL-STD-810G, drop protection, extreme temps, thermal shock, debris
Starting Price	$449	$1,818	$1,600	$5,299

3.1.3 Identify faulty tablets from the customer care executives or front-end executives



Contact centres, commonly referred to as customer service centres, are a particular type of company.

The workers at the centre are customer service representatives.

Customer service is typically pro-active, meaning that it seeks to foresee and address any issues before they even arise.

For instance, a customer care agent might volunteer to assist someone shopping in a store before they ask for assistance.

Most Common Android Tablets Problems & Solutions:

- **The tablet won't turn on or off:** When this happens, simply press and hold the lock/power key for roughly 8 seconds to switch the tablet on or off, depending on its current status. The Android tablet will occasionally hang, freeze, or lock up, refusing to turn on or off. If the method does not work, simply wait up to 12 minutes after turning off your smartphone before turning it back on.
- **Tablet isn't charging:** The primary issue if your tablet won't charge properly is that you can't use it properly, therefore you need to identify the root of the issue before it becomes too late. If you are using a USB cable to power the tablet, make sure that it is not damaged before moving on to the next step in troubleshooting. Check the power socket switch to see if it is switched ON. Try charging from a different power source or changing the cord to resolve this kind of problem.
- **The Touchscreen doesn't work properly:** A tablet cannot be used if the touch screen doesn't function properly because it is the main feature of a tablet and requires adequate interaction from a human hand. The issue could be brought on by cracked displays or flaws in the touching sensor, and it can be fixed by switching out the old screen for a new one or the touching sensor.
- **App problems:** Our tablets' software programmes can cause problems, such as freezing the screen or refusing to shut off. You only need to press the force close button to end an app if your device notifies you that it is malfunctioning. Open the app that is causing the issue now and see if it is functioning properly. If it doesn't function properly, look for app news updates. If an update is available from the app development team, please install it. This will stop the app from crashing.
- **If the music is continuously playing:** This is the most annoying issue encountered by Android users. If you experience the same problem, try the following solutions. To stop the unpleasant music, try going back into the music application and pressing the hit or pause button. If that doesn't work, try manipulating the buttons in the lock area or notification area.
- **Stuck in portrait mode:** You would set your video orientation to portrait if you wanted to view your favourite shows on your tablet. Try to alter the options and make sure that the orientation lock is not ON. If you turn off the rotation lock option, the screen will shift back to normal if you still can't switch from portrait to normal landscape format even after closing the shows.

- **WI-FI problems:** Even after attempting numerous techniques, if you still have trouble connecting your tablet to the WI-FI, there may be an issue with the tablet's WI-FI connection settings. Reset the WI-FI network connection settings or activate aeroplane mode for 30 seconds to fix this problem.
- **The Screen is too difficult to see:** If the screen brightness is too low, it is difficult to view the tablet's screen. If this problem is annoying you, don't worry; it can be fixed in a few minutes. The problem can be fixed by simply turning up the tablet's brightness in the settings. Android tablets typically have a light sensor on the front that detects day and night lighting; if this sensor malfunctions, battery life will be wasted. Make sure the tablet illuminated sensor is not covered to avoid this issue, or else try manually adjusting the brightness using the brightness option.
- **Battery draining too quickly:** This is the most frequent problem with tablets, and it prevents the gadget from functioning properly. Every electronic device's primary power source is its battery, and if the battery has any issues, the device will quickly run out of power. Follow some tips to resolve this kind of problem, such as reducing tablet brightness, turning off location service when not in use because it is one of the features that consumes the most power, and activating power saving mode when the tablet is not in use.
- **If the tablets get too hot:** The tablet gets hotter from constant use or from overcharging, which can also lead to significant problems like explosions and unexpected fires. It is a problem that affects the majority of tablets frequently, but it may be fixed by just pausing usage sometimes. The running of numerous applications may also be the cause of the heat problem, which can be fixed if the undesired applications are uninstalled.
- **Google Play not working properly:** You cannot download apps or install updates if the play store is not functioning properly. If it is loading slowly, you must clear the cache data to prevent data corruption. Follow the directions to resolve this kind of problem.
    - Click apps in settings.
    - After that, select All apps, and then select Google Play.

3.1.4 Tablet related problems and their possible solution

Additionally, solder balls, which are little solder balls scattered randomly throughout the surface of the SMT board, will be required. Solder balls serve as a point of contact between the PCB and the chip package, as well as between the multichip modules and the stacked packages.

Problem #1 – Occasionally slow and laggy keyboard

Users may experience keyboard slowness when using iMessage or typing emails. Even though iOS 8 supports the use of third-party keyboards, this problem still exists.

Potential Solutions:

- Guided Access, an accessibility mode, sometimes interferes with some keyboards. Go into Settings – General – Accessibility – Guided Access, and make sure that the button is off.
- Go to Settings – iCloud – Documents and Data, and turn it off. If the issue goes away, you should be able to turn this back on again without the problem coming back.
- You can also try resetting all settings by going to Settings – General – Reset all Settings.
- Adding or removing third-party keyboards is now possible by going to Settings – General – Keyboards. Swiping a keyboard name to the left will reveal a delete button. Tap on "Add New Keyboard…" for other available options.

Problem #2 – Interface orientation stays stuck to landscape or portrait

When the iPad is rotated, some users have discovered that the user interfaces are stuck in either the landscape or portrait orientations.

Potential Solutions:

- Tap the power button to turn the display off, and press it again to wake it up again. If that doesn't work, press and hold the power button and the physical home button for 15 seconds to restart the tablet.
- Go Settings – General – Use Side Switch, and check to see whether it is set to "Lock Rotation" and turn it off.
- If this happens when using a particular application, double tap the home button to open the multitasking screen, and slide the app window up.
- You can also try resetting all settings by going to Settings – General – Reset all Settings.

Problem #3 – Performance issues, crashing, and random rebooting

Many users of earlier vintage iPads have experienced speed issues after updating to iOS 8 and above. Slowdowns, freezing, and haphazard reboots can all happen.

Potential Solutions:

- While the animations and transitions on iOS 8 may look good, older hardware may have a difficult time keeping up. Reducing animation and transition effects may help alleviate any problems with enactment. Go to Settings – General – Accessibility – Reduce Motion to reduce animations, and Settings – General – Accessibility – Increase contrast – Reduce transparency to reduce transparency.
- When a slow down is evident, double tap the home button and close all the apps running in the background by swiping the windows up.
- If crashing and random rebooting are the problem, a rogue application may be the problem. Try uninstalling them one by one, or factory resetting the device and installing them. Go to Settings – General – Reset – Reset all Settings and Content.

Problem #4 – Connectivity Issues
Since the update to iOS 8, many iPad users have experienced problems with Wi-Fi network connection and maintenance, Bluetooth pairing, and for the devices that support it, cellular network troubles.

Potential Solutions:

- If your Wi-Fi connection saves dropping or doesn't connect, try restarting the router by turn it off for 30 seconds, and then turning it back on. Then, go to Settings – General – Reset – Reset Network Settings and add the information from scratch.
- If pairing your iPad with a Bluetooth device is an issue, go to Settings – Bluetooth and turn it off, and back on again.
- For data connectivity issues, go to Cellular – Cellular Data and turn it off and on again.
- If these problems continue, go to Settings – General – Reset and Reset All Settings.

Problem #5 – Safari keeps crashing
Numerous customers have reported that the Safari programme frequently shuts down unexpectedly, especially when several tabs are active or even when they are trying to start another tab.

Potential Solutions:

- Go to Settings – Safari and tap on "Clear History" and "Clear Cookies and Data."
- If this issue becomes too much to handle, a factory reset may be the only solution. Make sure that you back up any important data, and then go to Settings – General – Reset – Erase All Content and Settings.
- Using a third-party browser such as Google Chrome or Opera may help.

Problem #6 – Issues with AirDrop
Although AirDrop is a convenient way to transfer data across devices, people have reported various difficulties using it since iOS 8+ was released.

Potential Solutions:
Pull up the Control Center from the bottom of the screen, and change the AirDrop settings from "Off" or "Contacts Only" to "Everyone," and the feature should start working.

Problem #7 – Camera application crashes
Some users have reported that the camera programme crashes or doesn't load at all.

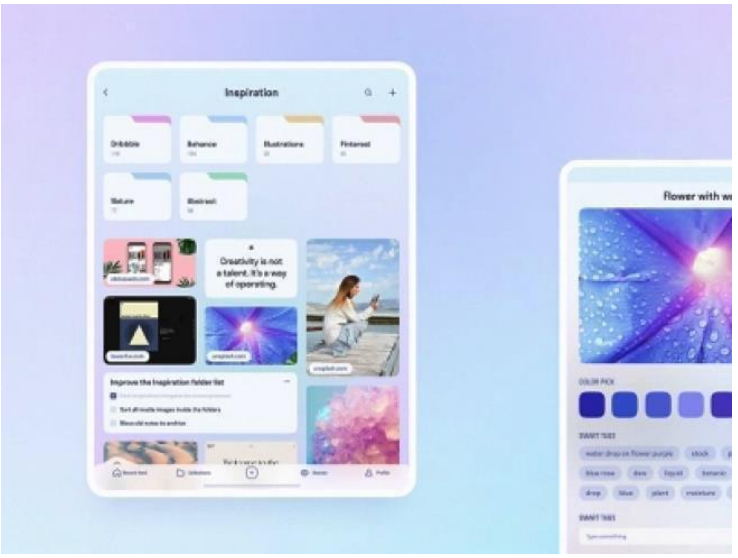
Potential Solutions:

- Double tap the Home button, and swipe up the Camera app and any extra app that uses the camera to close them. Start the app again to see if it is now working.
- Go into Settings – General – Restrictions and check to see whether the camera app is allowed.
- Resetting the settings may help. You can do so by going to Settings – General – Reset – Reset All Settings.
- A rogue third-party application that uses the camera may be the culprit. You can try deleting these apps one by one to see if the issue is fixed, or performing a factory reset being careful about what you install.

3.1.5 Operating system and user interface of popular tablets

An operating system for mobile devices includes smartphones, tablets, smart watches, 2-in-1 computers, smart speakers, and other mobile gadgets. The operating systems that are used on "mobile" computers, like standard laptops, are typically not termed mobile operating systems because they were initially created for desktop computers, which historically did not have or require specific mobile functionality. Due to the fact that current hardware has evolved to be smaller and more portable than older gear, the line separating mobile and other forms has blurred in recent years. The introduction of laptops that are lightweight and computer tablets are two major factors blurring this divide.

Operating systems contain and manage all the programs and applications that a computer or mobile device is able to run, which means managing the device's software and hardware functions. The functions of an OS include:

- **Booting:** Booting is the process of turning on the computer and powering up the system.
- **Memory management:** This feature controls and coordinates the computer applications while allocating space for programs.
- **Loading and execution:** Your OS will load, or start up, a program and then execute the program so that it opens and runs.
- **Data security:** A good OS includes features that keep your data safe and computer programs secure. Security features are set up to keep unwanted cyber attackers at bay.
- **Disk management:** This manages all the drives installed in a computer, including hard drives, optical disk drives, and flash drives. Disk management can also be used to divide disks, format drives, and more.
- **Process management:** Your OS is designed to allocate resources to different computer processes, enable the processes to share information, protect them, and synchronize them.
- **Device controlling:** Your OS will allow you to open or block access to devices like removable devices, CD/DVDs, data transfer devices, USBs, and more.
- **Printing controlling:** As an extension of device controlling, your OS takes control of the printers that are connected to the computer, and the materials that need to be printed.
- **User interface:** Also referred to as a UI, this is the part of the OS that allows a user to enter and receive information. This can be done with typed commands, code, and other formats.
- 

UNIT 3.2: Replacing Common Parts

Unit Objectives

At the end of this unit, you will be able to:

1. Recall and demonstrate steps to replace parts like battery, camera and LCD in a tablet

3.2.1 Repairing Tablets

Repairs for most tablet computers because of their small size and frequent use of adhesive, is often more involved than laptop repair.

Before starting the repair process, it is a good idea to make a note of the most common tools used.

Tools required

- Set of screwdrivers
- Spudger
- Mobile opener
- Tweezers

Fig. 3.2.1: Most used tablet repair tools

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5.2.2 Steps: Replace Tablet Battery

Step 1– Carefully pry open the front panel by inserting the metal spudger in the gap between the rear case near the USB connector and outer ring made of rubber on the front panel.

Step 2– Repeat the above process along the long edge on the volume button side until there is a gap between the rear case and the front panel.

Step 3– Along the top edge pry open the front panel.

3.2.2 Steps: Replace Tablet Battery(Contd)

Step 4– The front panel should now be pried up along the edge closest to the home screen button.

Step 5– Release the plastic retaining clips holding the front panel before lifting its free side up from the rear case.

Step 6– Lift the front panel assembly away from the rear case.

3.2.2 Steps: Replace a Tablet Battery(Contd)

Step 7– Pull the display data cable upwards from the socket on the motherboard using the attached black tab.

Step 8– Use your fingernail to flick up the retaining flaps on the two digitizer ribbon cable ZIF sockets. The digitizer ribbon cable on two sockets on the motherboard is then pulled straight out.

Step 9– Remove the front panel assembly.

3.2.2 Steps: Replace Tablet Battery(Contd)

Step 10– The two pieces of copper tape that cover the USB connector board near the battery and the motherboard are peeled up using a plastic opening tool.

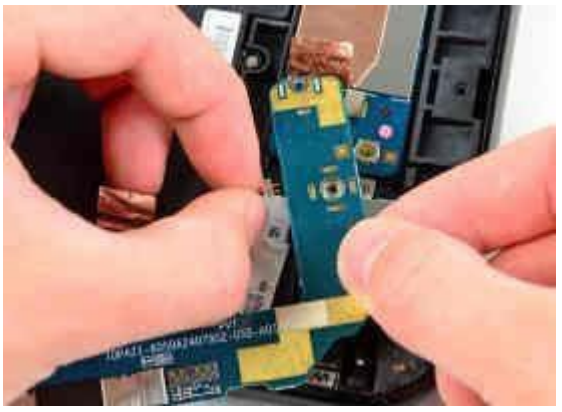
Step 11–Remove the screws that secure the rear case and the USB connector board.

Step 12–Disconnect the USB Connector board from its socket by prying open its upper end.

3.2.2 Steps: Replace Tablet Battery(Contd)

Step 13–Pull the USB connector board away from the bottom edge of the rear case and lift, do not remove it completely.

Step 14– Completely remove the USB connector board after pulling the vibrator motor from its socket on the USB connector board.



Step 15– Remove (if present) the two pieces of tape boxed in red.

3.2.2 Steps: Replace Tablet Battery(Contd)

Step 16– Flick up the retaining flap on the volume control/power button ribbon cable socket using the plastic opening tool and pull out the cable.

Step 17– Using a plastic opening tool lift the camera connector up & out of its socket, bend camera cable away from the motherboard.

Step 18– Flick up the retaining flap on microphone cable socket and pull out the microphone cable.

3.2.2 Steps: Replace Tablet Battery(Contd)

Step 19– Using a plastic opening tool pry the upper antenna connector up from its socket.

Step 20– Pry up the retaining flap on the headphone jack ribbon cable socket and pull the headphone jack ribbon cable out.

Step 21– Pry (from beneath the wires) the speaker cable connector up from its socket on the motherboard.

3.2.2 Steps: Replace Tablet Battery(Contd)

Step 22– Using a plastic opening tool flip up the retaining flap on the digitiser board ribbon cable socket and pull it out.

Step 23– Pry up the lower antenna cable connector from its socket.

Step 24– De-route the antenna cable, carefully pulling it out from under its retaining clip near the top right corner of the battery.

3.2.2 Steps: Replace a Tablet Battery(Contd)

Step 25– Remove screws securing battery, motherboard to the rear case.

Step 26– Using a plastic opening tool pry the battery up from the tape securing it to the rear case.

Step 27– Lift the motherboard assembly out of the rear case, carefully avoiding any cables.

3.2.2 Steps: Replace Tablet Battery(contd)

Step 28– Remove the battery by pulling it away from the motherboard to disconnect its cable.

Step 29– Battery remains.

Replacing Battery in an android phone

3.2.3 Steps: Replace Tablet Camera

For Steps 1-9 refer to images in 4.2.1.

Step 1– Insert the metal spudger in the gap between the rubber outer ring on the front panel and the rear case near the USB connector. Pry the front panel up carefully.

Step 2– Repeat the above process along the long edge on the volume button side until there is a gap between the front panel and the rear case.

Step 3– Pry up the front panel along the top edge.

Step 4– Pry up the front panel along the edge closest to the home screen button.

Step 5– Before lifting the free side of the front panel up from the rear case release it from the plastic retaining clips.

Step 6– Lift the front panel assembly away from the rear case.

Step 7– Using the attached black tab pull the display data cable upwards from the socket on the motherboard.

Step 8– Pull the digitiser ribbon cable straight out of its two sockets on the motherboard.

Step 9– Remove the front panel assembly.

Step 10– Use a plastic opening tool to lift the camera connector up and out of its socket.

Step 11– Using a plastic opening tool move the camera upwards to dislodge it from its recess in the rear case. Lift the camera out.

3.2.3 Steps: Replace Tablet Camera (Contd)

Step 12– Using a plastic opening tool move the camera upwards to dislodge it from its recess in the rear case. Lift the camera out.

Step 13– Lift the camera out.

3.2.4 Steps: Replacing Control Button Assembly (CMA)

For Steps 1-9 refer to images in 4.2.1.

Step 1– Insert the metal spudger in the gap between the rubber outer ring on the front panel and the rear case near the USB connector. Pry the front panel up carefully.

Step 2– Repeat the above process along the long edge on the volume button side until there is a gap between the front panel and the rear case.

Step 3– Pry up the front panel along the top edge.

Step 4– Pry up the front panel along the edge closest to the home screen button.

Step 5– Before lifting the free side of the front panel up from the rear case release it from the plastic retaining clips.

Step 6– Lift the front panel assembly away from the rear case.

Step 7– Using the attached black tab pull the display data cable upwards from the socket on the motherboard.

Step 8– Pull the digitiser ribbon cable straight out of its two sockets on the motherboard.

Step 9– Remove the front panel assembly.

Step 10– Using a plastic opening tool flip up the retaining flap on the control button cable ZIF socket, and pull the control button ribbon cable straight out of its socket.

3.2.4 Steps: Replacing CMA (Contd)

Step 11– Use a plastic opening tool to peel the ambient light sensor off the body of the control button assembly, and find hidden screws.

Step 12– Remove the screws securing the control button assembly to the rear case.

Step 13– Use a plastic opening tool to lift the control button assembly up from its housing, and remove it completely.

3.2.5 Steps: Replacing Digitiser Control Board (DCB)

For Steps 1-9 refer to images in 4.2.1.

Step 1– Insert the metal spudger in the gap between the rubber outer ring on the front panel and the rear case near the USB connector. Pry the front panel up carefully.

Step 2– Repeat the above process along the long edge on the volume button side until there is a gap between the front panel and the rear case.

Step 3– Pry up the front panel along the top edge.

Step 4– Pry up the front panel along the edge closest to the home screen button.

Step 5– Before lifting the free side of the front panel up from the rear case release it from the plastic retaining clips.

Step 6– Lift the front panel assembly away from the rear case.

Step 7– Using the attached black tab pull the display data cable upwards from the socket on the motherboard.

Step 8– Pull the digitiser ribbon cable straight out of its two sockets on the motherboard.

Step 9– Remove the front panel assembly.

Step 10– Remove screws securing the digitiser control board to the rear case.

3.2.5 Steps: Replacing DCB (Contd)

Step 11– Carefully lift (not remove) the digitiser control board as it is still connected to the motherboard by the digitiser control board ribbon cable.

Step 12– Using the edge of a plastic opening tool, carefully flip up the retaining flap on the digitiser control board ribbon cable ZIF socket, and pull out the digitiser control board ribbon cable.

Step 13– Now safely remove the digitiser control board.

3.2.6 Steps: Replacing Display Data Cable (DDC)

For Steps 1-9 refer to images in 4.2.1.

Step 1– Insert the metal spudger in the gap between the rubber outer ring on the front panel and the rear case near the USB connector. Pry the front panel up carefully.

Step 2– Repeat the above process along the long edge on the volume button side until there is a gap between the front panel and the rear case.

Step 3– Pry up the front panel along the top edge.

Step 4– Pry up the front panel along the edge closest to the home screen button.

Step 5– Before lifting the free side of the front panel up from the rear case release it from the plastic retaining clips.

Step 6– Lift the front panel assembly away from the rear case.

Step 7– Using the attached black tab pull the display data cable upwards from the socket on the motherboard.

Step 8– Pull the digitiser ribbon cable straight out of its two sockets on the motherboard.

Step 9– Remove the front panel assembly.

Step 10– Using a plastic opening tool peel up the self-adhesive pull tab stuck to the display data cable.

3.2.6 Steps: Replacing DDC (Contd)

Step 11– Pull the tab up to unlock the display data cable connector from its socket on the LCD.

Step 12– Pull the display data cable out of its socket.

3.2.7 Steps: Replacing Front Panel

For Steps 1-9 refer to images in 4.2.1.

Step 1– Insert the metal spudger in the gap between the rubber outer ring on the front panel and the rear case near the USB connector. Pry the front panel up carefully.

Step 2– Repeat the above process along the long edge on the volume button side until there is a gap between the front panel and the rear case.

Step 3– Pry up the front panel along the top edge.

Step 4– Pry up the front panel along the edge closest to the home screen button.

Step 5– Before lifting the free side of the front panel up from the rear case release it from the plastic retaining clips.

Step 6– Lift the front panel assembly away from the rear case.

Step 7– Using the attached black tab pull the display data cable upwards from the socket on the motherboard.

Step 8– Pull the digitiser ribbon cable straight out of its two sockets on the motherboard.

Step 9– Remove the front panel assembly.

Step 10– Remove screws securing the LCD to the front panel.

3.2.7 Steps: Replacing Front Panel (Contd)

Step 11– Lift up and remove the LCD assembly from the front panel.

Step 12– Front panel remains.

3.2.8 Steps: Replacing Head Phone Jack

For Steps 1-9 refer to images in 4.2.1.

Step 1– Insert the metal spudger in the gap between the rubber outer ring on the front panel and the rear case near the USB connector. Pry the front panel up carefully.

Step 2– Repeat the above process along the long edge on the volume button side until there is a gap between the front panel and the rear case.

Step 3– Pry up the front panel along the top edge.

Step 4– Pry up the front panel along the edge closest to the home screen button.

Step 5– Before lifting the free side of the front panel up from the rear case release it from the plastic retaining clips.

Step 6– Lift the front panel assembly away from the rear case.

Step 7– Using the attached black tab pull the display data cable upwards from the socket on the motherboard.

Step 8– Pull the digitiser ribbon cable straight out of its two sockets on the motherboard.

Step 9– Remove the front panel assembly.

Step 10– Using a plastic opening tool flip up the retaining flap on the headphone jack ribbon cable ZIF socket and pull the headphone jack ribbon cable out of its socket.

3.2.8 Steps: Replacing Head Phone Jack (Contd)

Step 11– Remove screws securing the headphone jack to the rear case.

Step 12– Using a plastic opening tool remove the headphone jack away from the adhesive securing it to the rear case.

3.2.9 Steps: Replace Home Button Board

For Steps 1-9 refer to images in 4.2.1.

Step 1– Insert the metal spudger in the gap between the rubber outer ring on the front panel and the rear case near the USB connector. Pry the front panel up carefully.

Step 2– Repeat the above process along the long edge on the volume button side until there is a gap between the front panel and the rear case.

Step 3– Pry up the front panel along the top edge.

Step 4– Pry up the front panel along the edge closest to the home screen button.

Step 5– Before lifting the free side of the front panel up from the rear case release it from the plastic retaining clips.

Step 6– Lift the front panel assembly away from the rear case.

Step 7– Using the attached black tab pull the display data cable upwards from the socket on the motherboard.

Step 8– Pull the digitiser ribbon cable straight out of its two sockets on the motherboard.

Step 9– Remove the front panel assembly.

Step 10– Using a plastic opening tool carefully pry the home button board off the adhesive securing it to the front panel.

3.2.10 Steps: Replace the LCD

For Steps 1-11 refer to images in 4.2.6.

Step 1– Insert the metal spudger in the gap between the rubber outer ring on the front panel and the rear case near the USB connector. Pry the front panel up carefully.

Step 2– Repeat the above process along the long edge on the volume button side until there is a gap between the front panel and the rear case.

Step 3– Pry up the front panel along the top edge.

Step 4– Pry up the front panel along the edge closest to the home screen button.

Step 5– Before lifting the free side of the front panel up from the rear case release it from the plastic retaining clips.

Step 6– Lift the front panel assembly away from the rear case.

Step 7– Using the attached black tab pull the display data cable upwards from the socket on the motherboard.

Step 8– Pull the digitiser ribbon cable straight out of its two sockets on the motherboard.

Step 9– Remove the front panel assembly.

Step 10– Remove screws securing the LCD to the front panel.

Step 11– Lift up and remove the LCD assembly from the front panel.

Step 12– Using a plastic opening tool peel up the self-adhesive pull tab stuck to the display data cable.

3.2.10 Steps: Replace the LCD(Contd)

Step 13– Pull the tab up to unlock the display data cable connector from its socket on the LCD. Pull the display data cable (parallel to the LCD) out of its socket.

Step 14– LCD remains.

3.2.11 Steps: Replacing Lower Antenna

Step 1– Insert the metal spudger in the gap between the rubber outer ring on the front panel and the rear case near the USB connector. Pry the front panel up carefully.

Step 2– Repeat the above process along the long edge on the volume button side until there is a gap between the front panel and the rear case.

Step 3– Pry up the front panel along the top edge.

Step 4– Pry up the front panel along the edge closest to the home screen button.

Step 5– Before lifting the free side of the front panel up from the rear case release it from the plastic retaining clips.

Step 6– Lift the front panel assembly away from the rear case.

Step 7– Using the attached black tab pull the display data cable upwards from the socket on the motherboard.

Step 8– Pull the digitiser ribbon cable straight out of its two sockets on the motherboard.

Step 9– Remove the front panel assembly.

Step 10–Using a plastic opening tool peel up the two pieces of copper tape covering the USB connector board near the battery and the motherboard.

Step 11–Remove screws securing the USB connector board to the rear case.

Step 12–Pry the upper end of the USB connector board upwards to disconnect it from its socket.

Step 13–Pull the USB connector board away from the bottom edge of the rear case and lift, do not remove it completely.

Step 14–Pull the vibrator motor from its socket on the USB connector board, and completely remove the USB connector board. (In case the vibrator motor is soldered on to the USB Board, the motor is to be removed along with the board.)

Step 15– Remove (if present) the two pieces of tape boxed in red.

3.2.11 Steps: Replacing Lower Antenna (Contd)

Step 16– Using a plastic opening tool pry the lower antenna connector up from its socket.

Step 17– De-route the antenna cable, carefully pulling it out from under its retaining clip near the top right corner of the battery.

Step 18– Pull the lower antenna cable out of the plastic retaining clip.

3.2.11 Steps: Replacing Lower Antenna (Contd)

Step 19– Using a plastic opening tool peel the lower antenna off the adhesive securing it to the rear case.

Step 20– Peel the foil tape attached to the lower antenna and remove the antenna completely.

3.2.12 Steps: Replacing a Microphone

Step 1– Insert the metal spudger in the gap between the rubber outer ring on the front panel and the rear case near the USB connector. Pry the front panel up carefully.

Step 2– Repeat the above process along the long edge on the volume button side until there is a gap between the front panel and the rear case.

Step 3– Pry up the front panel along the top edge.

Step 4– Pry up the front panel along the edge closest to the home screen button.

Step 5– Before lifting the free side of the front panel up from the rear case release it from the plastic retaining clips.

Step 6– Lift the front panel assembly away from the rear case.

Step 7– Using the attached black tab pull the display data cable upwards from the socket on the motherboard.

Step 8– Pull the digitiser ribbon cable straight out of its two sockets on the motherboard.

Step 9– Remove the front panel assembly.

Step 10– Using a plastic opening tool flip up the microphone ribbon cable retaining flap. Use a pair of tweezers to pull the microphone cable out of its socket on the motherboard.

3.2.12 Steps: Replacing a Microphone (Contd)

Step 11– Using your tweezer remove the black rubber fastener between the microphone and rear case.

Step 12– Using a plastic opening tool pry the microphone away from the rear case right above the camera.

Step 13– Remove the microphone.

3.2.13 Steps: Replacing Upper Antenna

Step 1– Insert the metal spudger in the gap between the rubber outer ring on the front panel and the rear case near the USB connector. Pry the front panel up carefully.

Step 2– Repeat the above process along the long edge on the volume button side until there is a gap between the front panel and the rear case.

Step 3– Pry up the front panel along the top edge.

Step 4– Pry up the front panel along the edge closest to the home screen button.

Step 5– Before lifting the free side of the front panel up from the rear case release it from the plastic retaining clips.

Step 6– Lift the front panel assembly away from the rear case.

Step 7– Using the attached black tab pull the display data cable upwards from the socket on the motherboard.

Step 8– Pull the digitiser ribbon cable straight out of its two sockets on the motherboard.

Step 9– Remove the front panel assembly.

Step 10– Use the edge of a plastic opening tool to flip up the retaining flap on the headphone jack ribbon cable ZIF socket. Pull the headphone jack ribbon cable out of its socket and bend the cable away from the large piece of EMI foil stuck to the top speaker.

3.2.13 Steps: Replacing Upper Antenna (Contd)

Step 11–Using a plastic opening tool pry the upper antenna connector up from its socket.

Step 12–Using a plastic opening tool peel the upper antenna off the adhesive securing it to the top speaker.

Step 13–Carefully peel the foil tape attached to the upper antenna off the top speaker and remove the upper antenna.

3.2.14 Steps: How to Replace USB Connector Board?

Step 1– Insert the metal spudger in the gap between the rubber outer ring on the front panel and the rear case near the USB connector. Pry the front panel up carefully.

Step 2– Repeat the above process along the long edge on the volume button side until there is a gap between the front panel and the rear case.

Step 3– Pry up the front panel along the top edge.

Step 4– Pry up the front panel along the edge closest to the home screen button.

Step 5– Before lifting the free side of the front panel up from the rear case release it from the plastic retaining clips.

Step 6– Lift the front panel assembly away from the rear case.

Step 7– Using the attached black tab pull the display data cable upwards from the socket on the motherboard.

Step 8– Pull the digitiser ribbon cable straight out of its two sockets on the motherboard.

Step 9– Remove the front panel assembly.

Step 10–Using a plastic opening tool peel up the two pieces of copper tape covering the USB connector board near the battery and the motherboard.

Step 11–Remove the four 3.2 mm screws securing the USB connector board to the rear case. **Step 12–**Pry the upper end of the USB connector board upwards to disconnect it from its socket.

Step 13–Pull the USB connector board away from the bottom edge of the rear case and lift, do not remove it completely.

Step 14–Pull the vibrator motor from its socket on the USB connector board, and completely remove the USB connector board.

3.2.15 Steps: Replace Vibrator Motor

Step 1– Insert the metal spudger in the gap between the rubber outer ring on the front panel and the rear case near the USB connector. Pry the front panel up carefully.

Step 2– Repeat the above process along the long edge on the volume button side until there is a gap between the front panel and the rear case.

Step 3– Pry up the front panel along the top edge.

Step 4– Pry up the front panel along the edge closest to the home screen button.

Step 5– Before lifting the free side of the front panel up from the rear case release it from the plastic retaining clips.

Step 6– Lift the front panel assembly away from the rear case.

Step 7– Using the attached black tab pull the display data cable upwards from the socket on the motherboard.

Step 8– Pull the digitiser ribbon cable straight out of its two sockets on the motherboard.

Step 9– Remove the front panel assembly.

Step 10–Using a pair of tweezers carefully pull the vibrator motor Out of its recess.

Step 11–Pull the vibrator motor connector away from its socket.

Step 12– Safely remove the vibrator motor from the rear case.

3.2.16 Steps: Replace a Motherboard

Step 1– Insert the metal spudger in the gap between the rubber outer ring on the front panel and the rear case near the USB connector. Pry the front panel up carefully.

Step 2– Repeat the above process along the long edge on the volume button side until there is a gap between the front panel and the rear case.

Step 3– Pry up the front panel along the top edge.

Step 4– Pry up the front panel along the edge closest to the home screen button.

Step 5– Before lifting the free side of the front panel up from the rear case release it from the plastic retaining clips.

Step 6– Lift the front panel assembly away from the rear case.

Step 7– Using the attached black tab pull the display data cable upwards from the socket on the motherboard.

Step 8– Use your fingernail to carefully flip up the retaining flaps on the two digitiser ribbon cable ZIF sockets. Now pull the digitiser ribbon cable straight out of its two sockets on the motherboard.

Step 9– Remove the front panel assembly.

Step 10–Using a plastic opening tool peel up the two pieces of copper tape covering the USB connector board near the battery and the motherboard.

Step 11–Remove the screws securing the USB connector board to the rear case.

Step 12–Pry the upper end of the USB connector board upwards to disconnect it from its socket.

Step 13–Pull the USB connector board away from the bottom edge of the rear case and lift, do not remove it completely.

Step 14–Pull the vibrator motor from its socket on the USB connector board, and completely remove the USB connector board.

Step 15– Remove (if present) the two pieces of tape boxed in red.

Step 16– Using a plastic opening tool flip up the retaining flap on the volume control/power button ribbon cable socket and pull out the cable.

3.2.16 Steps: Replace a Motherboard(Contd)

Step 17– Using a plastic opening tool lift the camera connector up & out of its socket, bend camera cable away from the motherboard.

Step 18– Flip up the retaining flap on microphone cable socket and pull out the microphone cable.

Step 19– Using your plastic opening tool pry the upper antenna connector up from its socket.

Step 20– Pry up the retaining flap on the headphone jack ribbon cable socket and pull the headphone jack ribbon cable out.

Step 21– Pry (from beneath the wires) the speaker cable connector up from its socket on the motherboard.

Step 22– Using a plastic opening tool flip up the retaining flap on the digitiser board ribbon cable socket and pull it out.

Step 23– Pry up the lower antenna cable connector from its socket.

Step 24– De-route the antenna cable, carefully pulling it out from under its retaining clip near the top right corner of the battery.

Step 25– Remove screws securing battery, motherboard to the rear case.

Step 26– Using a plastic opening tool pry the battery up from the tape securing it to the rear case.

Step 27– Lift the motherboard assembly out of the rear case, carefully avoiding any cables.

Step 28– Remove the battery by pulling it away from the motherboard to disconnect its cable.

Step 29– Battery remains.

UNIT 3.3: Basic Troubleshooting

Unit Objectives

At the end of this unit, you will be able to:

1. Recall and demonstrate steps to troubleshoot common software related issues in mobile phones
2. Recall and demonstrate steps to update the software of popular tablets and create a back-up of data from tablet to a computer

3.3.1 Common Software Problems and Solutions

Screen issues

- A common reason for slow responding touchscreens is a lack of RAM. Freeing up RAM may improve the responsiveness of your tablet. The best way to do this is to shut down any apps you have running in the background or remove apps / files no longer in use.
- Sometimes a simple shutdown and re-starting the device makes the screen work properly again.
- Try and localising the area of the screen that seems to be unresponsive, you may use either a calculator or map app. This will make it easier for you to tap different parts of the screen and note down which areas are unresponsive. This can make a much quicker diagnosis.

Power & battery problems

- If a tablet's battery appears to be draining unusually fast it may be because of an app(s) that is not optimised for the latest version of the tablet operating system. Delete the app, you may have to delete them one by one or perform a factory reset.
- If the tablet is not charging at all, try a different charger. This could be because of a faulty charger.

Computer not recognising tablet

- On the tablet, go to its settings and then storage. There you should be able to see 'U“B computer connection (or something similar).' Check that the media device option is ticked and try plugging the tablet into the computer again.
- If it does not work, try using a different USB cable as it could be the cable that is the problem rather than the tablet or PC.

3.3.2 Steps: Update a Tablet

It is a good practice to back up your data such as contacts and photos before a tablet upgrade.

Android

Step 1– Navigate to the Setting menu of your tablet.

Step 2– Scroll down the Settings menu and click on 'About Device'. If you have a tabbed settings menu then this will appear in the 'general' section.

Step 3– Click the 'Software Update' or a similar option.

Step 4– Your tablet will now search for an available update. If you are taken to another menu, select the 'Software update check' button or something similar. If an update is available for your device then you will be asked whether you wish to install it. If you select yes then the system will download and install the new software and reboot the tablet.

iPad

From the tab directly

Step 1– Plug your iPad in to power and connect to the Internet with Wi-Fi.

Step 2– Tap Settings > General > Software Update.

Step 3– Tap Download and Install.

Step 4– To update now, tap Install.

Step 5– If prompted, enter your passcode.

Through iTunes

Step 1– Install the latest version of iTunes on your computer.

Step 2– Connect the iPad to your computer.

Step 3– Open iTunes and select your iPad.

Step 4– Click “ummary, then click 'Check for Update'.

Step 5– Click Download and Update.

3.3.3 Steps: Tablet Data Transfer

Using USB Cable

Step 1– Connect the tablet to your computer using the USB cable that comes with the tablet.

Step 2– Find the icon of a removable drive (your tablet) on your computer under My Computer or Finder if a pop-up window does not open.

Step 3– Drag and drop files that you want to copy from your tablet to the computer (or vice-versa).

Step 4– When you are finished, close the window and disconnect the USB cable.

Using Bluetooth

Step 1– Make sure Bluetooth is turned on in both the tablet and computer. You can activate it in your tablet by looking under Settings or Controls. If you have a Mac, you can make sure your Bluetooth is on by clicking on the Bluetooth symbol on the right side of the upper toolbar. The symbol should be to the left of the Date and Time and should look like a white B with a blue background. On Windows it should be under the Control Panel.

Step 2– Make sure that the tablet is not too far away from the computer.

Step 3– Find and select the file (tablet) that you want to transfer.

Step 4– Select Copy or Send in the menu.

Step 5– Choose the Bluetooth option.

Step 6– Select the "Look for Devices" or a similar option in the Bluetooth menu that pops up.

Step 7– Select your device (computer).

Step 8– Request would be sent to the device to accept the file.

Step 9– Accept request and data will be sent from tablet to computer and vice-versa.

3.3.3 Steps: Tablet Data Transfer (Contd)

Using iTunes

Step 1– Connect iPad to computer using a USB cable. If iTunes doesn't open automatically, open it from the Start Menu or your Applications folder.

Step 2– Select your iPad from the list under Devices button (upper right corner of iTunes window).

Step 3– Choose the media (Apps, Music, Movies, etc.) that you want to sync. Click on each tab that you want to add to your device and check the ""ync" checkbox. You can choose to sync all media of that type, or just specific files.

Fig. 3.3.3: Data transfer from a tablet using iTunes

UNIT 3.4: Safety Guidelines

Unit Objectives

At the end of this module, you will be able to:

1. Understand and follow common safety precautions while repairing a tablet

3.4.1 Safety Tips and Precautions

- Software troubleshooting of any tablet must always be done on an ESD-Safe Mat.
- The person doing the repairing job should also be wearing ESD-Safe Clothing like ESD-Safe Apron, ESD-Safe Slippers, ESD-Safe Hand Gloves and Anti-static wrist strap. This prevents the gadget from any potential damage to sensitive electronic components mainly SMD due to static electricity.
- The workstations should be well equipped so that all your tools of regular use are within your arms reach and at appropriate place.
- Make sure the LCD does not get any scratches. Handle connectors and connecting cables carefully as they are very delicate.
- In case you have to reinstall the operating system in a tablet, make sure to backup all data first.

Fig. 4.4.1: ESD-Safe Clothing

Exercises

1. Which of the following is a common reason for slow touchscreens:

a. RAM

b. Camera

c. Microphone

d. Vibrartor

2. Sometimes deleting apps fix problem related to:

a. Battery

b. Audio

c. Camera

d. Internet

3. You can connect a tablet to computer using:

a. USB cable

b. Bluetooth

c. iTunes

d. All of the above

4. You need to backup data in case of:

a. Factory reset

b. OS reinstall

c. Both a & b

d. No audio

5. To remove a battery, we have to first remove the:

a. Motherboard

b. Camera

c. Display cable

d. LCD

Exercises (Cont.)

6. A tablet cannot do the following:

a. Browse the web

b. Send email

c. Read eBooks

d. Play DVDs

7. Which of the following OS is used in tablets:

a. iOS

b. Window

c. Android

d. All of the above

8. In what all ways can you update an iPad:

a. From the device directly

b. iTunes

c. Both a & b

d. None of the above

9. In case you have to reinstall the OS in a table, remember to:

a. Clean the PCB

b. Backup all data

c. Delete apps first

d. Turn bluetooth on

10. Which of the following is antistatic clothing :

a. ESD-Safe Apron

b. ESD-Safe Slippers

c. ESD-Safe Hand Gloves

d. All of the above

Exercises (Cont.)

11. **Briefly explain a tablet.**

12. **How can you fix up a slow responding touchscreen?**

13. **List steps to transfer data using iTunes.**

14. **List some ESD-safe clothing.**

Exercises (Cont.)

15. Name some popular tablet platforms.

16. Which common tools are used in tablet repair?

17. How will you fix the battery drain issue in a tablet?

18. What will you do if the computer does not recognise a tablet?

Tips

- Do not touch the inside of the glass, you will not be able to get rid of the fingerprints after assembly
- Count the screws while opening a tablet, if you have any leftover then backtrack.

Notes

Skill India

GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP

N·S·D·C National Skill Development Corporation
Transforming the skill landscape

Telecom Sector Skill Council

4. Carry out chip-level repair of mobile phone

Unit 4.1 – Analyse the status of mobile phone and estimate the repair cost

Unit 4.2 – Perform chip-level repairs

Unit 4.3 – Prepare necessary documentation

ELE/N4631

UNIT 4.1 Analyse the status of mobile phone and estimate the repair cost

Unit Objectives

At the end of this unit you will be able

1. Analyse the cost of repair based on the status of the mobile
2. Understand the company's warranty policy for different
3. Understand the company's line of business and product
4. Explain the company's policy on repair and Turn-around Time (TAT),

4.1.1 Company's warranty policy for different products

A manufacturer's warranty is a pledge from the manufacturer that, if there are any manufacturing flaws within a certain time frame, they will fix or replace your phone. In order to cover your phone for a longer period of time, many manufacturers also provide a "extended mobile warranty."

However, a mobile insurance provides your phone with an additional layer of security because it is an All Risk Cover and covers damages resulting from any accident, Act of God Perils, theft, or burglary. Additionally, the Cover can be expanded to cover liquid damage and damage brought on by mechanical and electrical failure.

In essence, a mobile phone warranty only protects the equipment against flaws, whereas mobile phone insurance covers any harm brought on by mishaps or unplanned events.

Typically, when you buy a phone, the manufacturer's warranty is included. Some mobile insurances can be purchased right away, but if not, you can purchase them online or from your insurance company.

4.1.2 Company's line of business and product portfolio

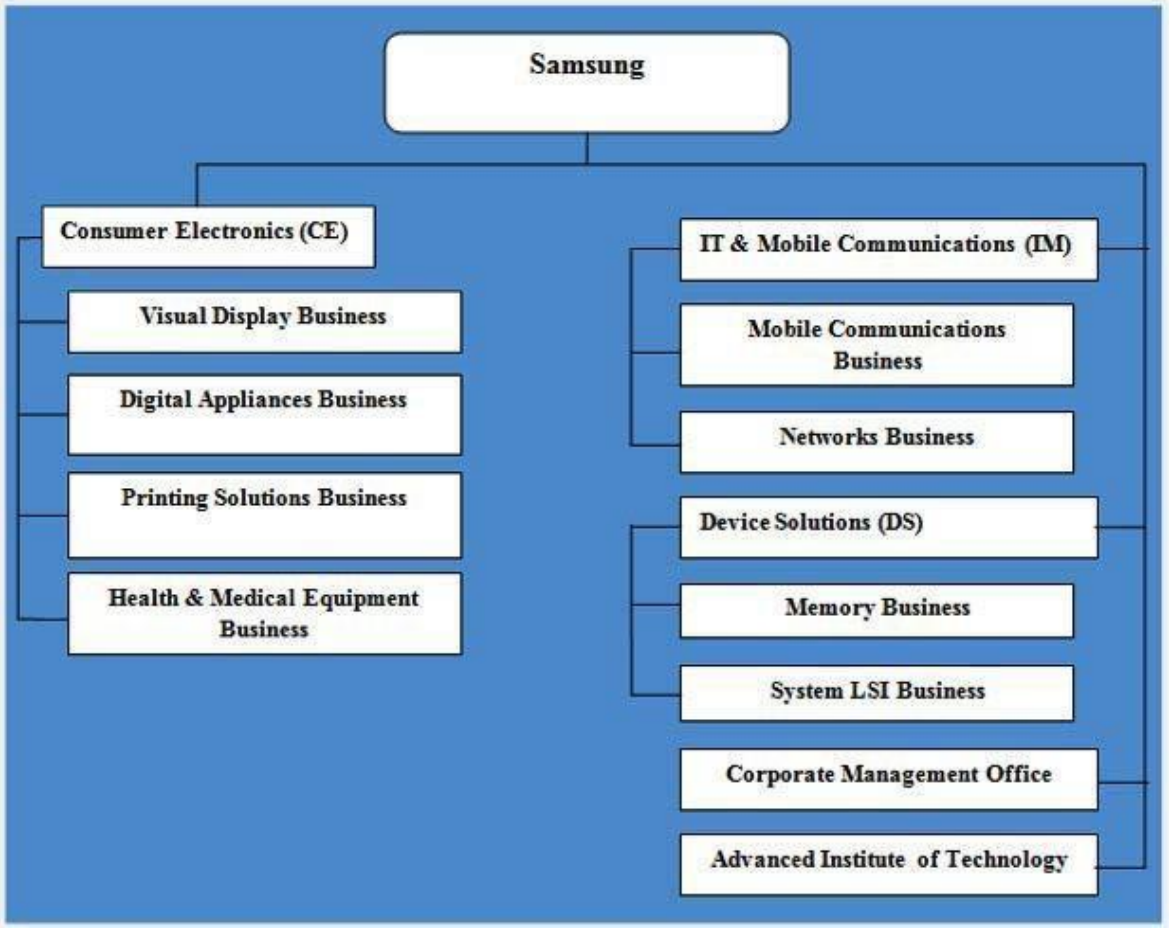
A business or manufacturer's connected goods or services are referred to as its "line of business" (LOB) in general. For instance, a corporation that produces solid-state disc drives would assert that its LOB is data storage.

A line of business is a group of related goods that are managed together for production efficiencies, economies of scale, or a market niche.

A company's whole line of goods or services are compiled into a product portfolio. The portfolio could be simple and only include one product, or it could include several varied product lines.

The company's accomplishments, goods, and services are compiled in the portfolio. The purpose of a corporate portfolio is to establish the company's market presence, draw in additional clients, and demonstrate how the company differentiates from its top rivals.

Samsung Electronics manufactures LCD and LED displays, cell phones, solid-state drives, memory chips, NAND flash, televisions, digital theatre screens, and laptops. Previously, the company made printers and hard discs.



4.1.3 Company's policy on repair and Turn-around Time (TAT)

Turn Around Time (TAT):
TAT stands for the entire amount of time elapsed between the time a process is submitted and the time it is finished.

The Turn Around Time of the process is defined as the interval between the time of completion and the time of arrival.

- **CT (Completion Time)** – It is the exact time when a process completes the execution part.
- **AT (Arrival Time)** – It is the time of arrival of a process in its ready state (before its execution).

Thus, **CT – AT = TAT**

Waiting Time (WT):
WT stands for the total amount of time a process takes to wait in a ready queue before being sent to the CPU.
The waiting time of a process is defined as the interval between the turn-around and burst times.
BT (Burst Time) – It is the total time that a process requires for its overall execution.

Thus, **TAT – BT = WT**

Now, we can also easily calculate the Turn Around Time using the Burst Time and the Waiting Time.

Here, **BT + WT = TAT**

Organization and its processes:

- Company's policies on: incentives, delivery standards, and personnel management
- Company's sales and after sales support policy
- Importance of the individual's role in the workflow
- Reporting structure
- Company's policy on product's warranty and other terms and conditions
- Company's line of business and product portfolio
- Company's service level agreement (SLA) with the brand

UNIT 4.2 Perform chip-level repairs

Unit Objectives

At the end of this unit you will be able to:

1. Explain the use and functions of the solid type and Surface Mounted Device resistors and SMD testers, electromagnetic coils, solid and SMD type diodes, PNP and NPN transistors
2. Test a capacitator using a multimeter and SMD tester
3. Explain different types of Metal Oxide Semiconductor Field-effect transistors
4. Understand the concept of Quartz, clock and pulse and measuring unit
5. Explain the process of conducting a Quartz crystal test
6. Describe the process of conducting diagnostic or power on tests for different types of Original Equipment Manufacturer (OEM) components
7. Explain the features and operations of different models of chip-based mobile phones
8. Explain different types of mobile operating system (OS) and applications
9. Explain the importance of using licensed/ approved OS and applications on mobile phones

4.2.1 Use of denoting letters, colour coding, symbol and functions of the solid type and Surface Mounted Device (SMD)

SMD Resistor – Surface Mount Chip Resistor:
A SMD resistor has some blue colour on it and is mostly black from the top. White is the colour at the bottom. Study up on SMD resistors.

Surface-mount resistor or chip An electrical component known as a resistor combines the characteristics of resistance and blockage. Resistance is the name of this component's characteristic.

Fig 4.2.1 Surface Mount Chip Resistor

Resistance: The obstruction or resistance created by any matter in the flow of current is called resistance.

Resistor:

- A resistor is denoted by the character R.
- The Function of a resistor is to decrease current.
- The unit of resistance is: Ohm
- The power rating of resistor is Watt

An SMD resistor has some blue colour on it and is mostly black from the top. White is the colour at the bottom.

Facts about SMD Resistor:

- A resistor never gets short.
- Resistor can be open.
- Value of resistor can be high.
- Resistor is available with or without code. Mostly resistors without code are used in mobile phones.
- R and E alphabets in the resistor denote Ohms

Different Types of SMD Resistors:

- Network Resistor: A network resistor is a combination of many resistor groups. They come in a solitary package.
- Chip Jumper (Zero Ohm) Type Resistor: Mobile phones employ this kind of chip resistor as a jumper.
- Thermistor-Type Resistor: This type of resistor's rating is temperature- dependent. It is completely black on all sides. These resistors come in two varieties: NTC (Negative Temperature Co-efficient type Thermistor) and PTC (Positive Temperature Co-efficient type Thermistor) (Co- efficient type Thermistor).
- The LDR (Light Dependent Resistor) is a resistance that changes in response to light. A LDR's resistance can reach several mega Ohms in complete

4.2.2 Symbol, types, identification and functions of SMD tester

The SMD tester is simple to use and can be connected directly to the power source. The tester can be used with a variety of power sources.

This clever SMD tester is really just a pair of tweezers for a multimeter. This spares you from fumbling with bulky probes or long cords while troubleshooting circuits with small SMD parts. One-handedly test diodes, capacitors, and resistors!

Fig 4.2.2 SMD Tester

SMD components are far more challenging to test and identify than conventional components since surface mount devices are typically small and without wire leads. The MS8910 provides customers with a simple method for measuring on-board, troubleshooting, and sorting stray components. Even the smallest SMD components can be picked up and reliably touched by precise tips made of non-magnetic steel, and they can also be used to measure an object that has already been put on a board.

Conventional components with wire lead that are too short to fit into the test terminals can also be tested using the probe. The Tester is a handheld and battery operated very convenient small Tool that is specially used to measuring SMD (Surface Mounting Device), there are chip type resistor, chip type capacitor and diode, for example. Moreover, the tester has the continuity checking function.
The tester is automatically identified the passive component as has been indicated above. Therefore, the measurement is allowed by fully automatic detection. The tester is designed to meet IEC1010-1 standard and stipulation of 2-poulation grade. The tester conforms to the European Union's following requirement. CE regulation 89 or 336 (EMC Electromagnetic Compatibility). The entire outer surface of the tester case has been with thermo plastic elastomer and the two testing pins has been gold-plated, so that it is reduce pin contact resistance and prevent to get rusty. Please read the relevant material carefully and strictly follow all warming and note instructions as this operating manual includes information on safety and caution.

4.2.3 How to test a capacitor using a multimeter and SMD tester

One type of electrical component used to store energy in the form of an electric charge is a capacitor. These serve a variety of purposes in various electrical and electronic circuits. By placing a capacitor in an active circuit, a capacitor can be charged. Once it is connected, the capacitor will begin to receive electrical charge. The secondary plate of the capacitor serves as a conduit for the discharge of electrical charge when the capacitor's primary plate is unable to maintain its charge. So the charging and discharging of the capacitor refers to this operation.

The market is filled with a variety of electrical and electronic components. Some of them are very sensitive to voltage spikes. Similarly, a capacitor is also sensitive to voltage swings so there is a chance of damage permanently. So to overcome this, a capacitor test plays an essential role to check the functionality of a capacitor.

Some factors involved in the capacitance include the following.

- Capacitors have a short lifespan and frequently break down.
- Short circuits have the potential to harm capacitors.
- When a capacitor shorts out, a fuse or other circuitry elements may sustain damage.
- When a capacitor opens, the circuit's parts are unable to function properly.
- Deterioration can also cause the capacitance value to vary.

Test a Capacitor using Analog Multimeter

To test a capacitor through AVO like ampere, voltage, ohmmeter, then follow the steps.

- Check the capacitor that is fully charged or discharged.
- Use ampere, voltage, ohm meter.
- Choose analog meter on Ohm and always choose a high range of ohms.
- Connect the two meter leads to the terminals of the capacitor
- The reading & evaluate through the following outcomes.
- The short capacitor will show extremely less resistance
- The open capacitor will not demonstrate any deflection over the Ohm meter display
- The good capacitor will illustrate low resistance after that slowly increases in the direction of the infinite. So, the capacitor is in an excellent state.

Test a Capacitor using Digital Multimeter

To test a capacitor through digital multimeter, then follow these steps.

- Check the capacitor is charge/discharge.
- Locate the digital multimeter on 1k.
- Connect the leads of this meter to the terminals of a capacitor.
- This meter will display some numbers, please note down.
- After that, it will come back to the Open Line. Every time it will show the same result so we can conclude that capacitor is in good condition.

Fig 4.2.3 Resistance Capacitance Meter Tester

Smart SMD RC Resistance Capacitance Meter Tester

- Small size and light weight, handheld and portable test tool.
- Used to measure SMD, such as Chip resistor, Chip capacitor and Chip diode devices.
- Auto scanning, it identifies resistor, capacitor and diode automatically Continuity testing.
- When the resistance is less than 30Ω, it will sound.
- It also can be operated manually.
- You can press the button “FUNC” to select one certain measuring mode.
- Has the function of data hold.
- Long press the “FUNC” key to turn on/ off this tester.

4.2.4 Coils used in electronic components

It is possible to create contactless location or proximity sensing using an electromagnetic coil. As in a power transformer, the field created by the current in one coil induces a matching current in an adjacent coil.

An electrical conductor, such as a wire in the form of a coil, spiral, or helix, is what makes up an electromagnetic coil. In electrical engineering, magnetic coils are used in components including electric motors, generators, inductors, electromagnets, transformers, and sensor coils where electric currents and magnetic fields interact. Either a magnetic field is created by passing an electric current through the coil's wire, or an external, time-varying magnetic field passing through the coil's interior creates an EMF (voltage) in the conductor.

Due to Ampere's law, any conductor that receives current generates a circular magnetic field around it. Utilizing the coil form has the benefit of enhancing the magnetic field's strength produced by a given current. The magnetic fields produced by the various wire turns all pass through the coil's core and combine (superpose) to create a potent field there. The field produced is stronger the more wire twists there are. In contrast, due to Faraday's law of induction, a fluctuating external magnetic flux generates a voltage in a conductor like a wire. Since the field lines cross the circuit several times, the induced voltage can be raised by wrapping the wire into a coil.

The right hand grip rule can be used to determine the direction of a coil's magnetic field. The thumb of the right hand will point in the direction that the magnetic field lines move through the coil if the fingers are wrapped around the coil's magnetic core in the wire's normal current-flow direction. The North pole is said to be the point at which the field lines leave a magnetic core.

There are many different types of coils used in electric and electronic equipment.

4.2.5 Denoting letter, symbol and functions of solid and SMD type diodes

Diodes are two-terminal electronic devices or parts that act as a one-way switch, permitting only one direction of current passage. Semiconductor materials like silicon, germanium, and gallium arsenide are used to make these diodes.

The two terminals of the diode are known as Anode and Cathode. Based on the potential difference between these two terminals, the operation of diode can be classified in two ways:

- If anode has higher potential than cathode, then the diode is said to be in Forward Bias and it allows current to flow.
- If cathode has higher potential than anode, then the diode is said to be in Reverse Bias and it doesn’t allow current to flow.

Different diode types require different voltage levels. The forward voltage is 0.7V for silicon diodes and 0.3V for germanium diodes. The black band on one end of a silicon diode typically designates the cathode terminal, while the other terminal represents the anode.

Rectification, or turning AC into DC, is one of the principal uses of diodes. Diodes are utilised in reverse polarity protector and transient protector applications because they only let current to flow in one direction while blocking current flow in the other direction.

A typical solid-state diode has a very low forward resistance (causing a 0.5 to 1.5V drop) and a very small reverse current (blocking several hundred amps) when compared to other types. In layman's terms, a diode is a semiconductor with two electrodes that only allows electric current to flow in one way.

Light-emitting diodes that are positioned and soldered flat against a circuit board are known as surface-mounted diodes. It differs significantly from normal LEDs in this regard, which are held in place by wire leads.

SMD Signal Diodes: If an SMD signal diode is not enclosed in a glass housing, it can be difficult to distinguish it from other SMD diodes. Reading the written code on their package is the simplest way to recognise them.

It is practically impossible to identify smaller SMD diodes since many of them lack the two indented letters that make up a code.

SMD Zener Diodes: There are several different packages for SMD zener diodes, but one of the most common ones has three pins.

The precise placement of the diode is guaranteed by the usage of three pin packages (a three pin SOT-23 part can only be inserted one way).

Zener diodes can also be found with a glass enclosure and plastic pins. The plastic models feature a thick line next to the cathode, while the glass models have a thick blue band to identify the cathode.

SMD Rectifier: SMD Rectifiers are easy to spot. They are square in shape and have markings next to each pin that indicates their function (positive +, negative -, and AC input ~).

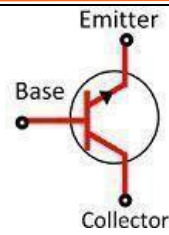
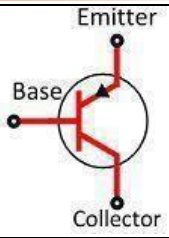
These parts, like other SMD parts, are not worth salvaging, as they are difficult to use in projects, require SMD soldering, and have limited applications.

Instead of using used components, SMD rectifiers are less expensive and simpler to obtain as new parts.

4.2.6 Difference between and functions of Positive-Negative-Positive (PNP) and Negative-Positive-Negative (NPN) transistors

To understand in detail, let's distinguish between NPN and PNP transistor in tabular form:

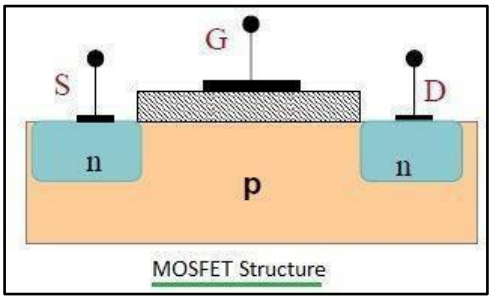
Basis For Comparison	NPN Transistor	PNP Transistor
Definition	Transistor in which two n-type layer are separated by one P-type layer	Two blocks of p- types semiconductors are separated by one thin block of n-type semiconductor.

Symbol		
Full Form	Negative Positive and Negative	Positive Negative and Positive
Direction of Current	Collector to Emitter	Emitter to Collector
Turn-on	When electrons enters into the base.	When holes enter into the base.
Inside Current	Develop because of varying position of electrons.	Originate because of varying position of holes.
Outside Current	Current develop because of the flow of holes.	Current develop because of the flow of electrons.
Majority Charge Carrier	Electron	Hole
Switching Time	Faster	Slower
Minority Charge Carrier	Hole	Electron
Positive Voltage	Collector Terminal	Emitter Terminal
Forward Biased	Emitter Base Junction	Emitter Base Junction
Reverse Biased	Collector Base Junction	Collector Base Junction
Small current	Flows from emitter-to-base	Base to emitter
Ground Signal	Low	High

4.2.7 Different types of Metal Oxide Semiconductor Field-effect transistors (MOSFET) such as 3 leg MOSFET and 8 Leg MOSFET and the identification of N-Channels

An electronic signal controller is a type of transistor called a metal-oxide-semiconductor field-effect transistor (MOSFET). The conduction of a MOSFET is determined by channel width, which may be changed using gates. The fundamental working of a MOSFET is that the electrons (change carriers) move along channels (electrodes).

The most typical application of a metal-oxide-semiconductor field-effect transistor is to switch or amplify electrical signals by altering current across them. They are utilised in computer integrated circuits and high-speed switching gear for networks. The transistor conducts better the wider the channel. The channel is where the charged electron enters from the source point and exits through the drain. By altering the voltage applied to and passed through a gate electrode, the channel width can be controlled. A very thin layer of metal oxide insulates the gate from the channel and is positioned between the source and drain. Current cannot pass between the gate and channel because of the insulation.



The various types of MOSFET are given below:

- **Depletion Type:** The transistor requires the Gate-Source voltage (VGS) to switch the device "OFF". The depletion-mode MOSFET is equivalent to a "Normally Closed" switch.
- **Enhancement Type:** The transistor requires a Gate-Source voltage (VGS) to switch the device "ON". The enhancement-mode MOSFET is equivalent to a "Normally Open" switch.

4.2.8 Concept of Quartz, clock and pulse and measuring unit

Electronics make extensive use of quartz, and quartz resonators are employed as high-performance resonators in oscillators and filters. Quartz is able to provide resonant electrical components with unusually high levels of Q for usage in filters and oscillators in electronic circuit designs.

A quartz watch operates as follows: A battery generates current in the watch circuit, which includes the quartz crystal. The quartz vibrates precisely 32768 times per second as a result of this current. The circuit counts the oscillations and generates an electric pulse for each of the 32768 vibrations.

Devices like cell phones, television receivers, and, of course, watches and clocks frequently use quartz crystals as a component. One of the main reason quartz is used in so many electronic devices is because it is piezoelectric, meaning it generates an electric charge when pressure is exerted upon it.

List of different Sensors are available inside a Smartphone:

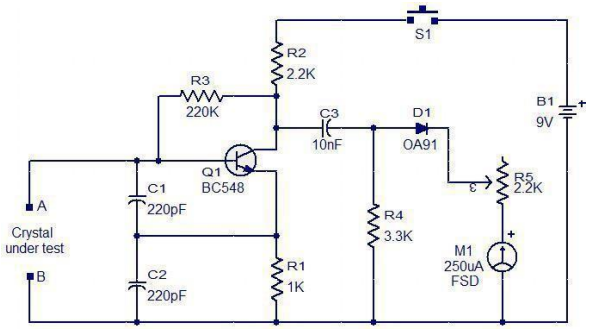
1. Microphone (Decibel, Frequency, Noise cancellation)
2. Camera/Image sensor (Scanner, Barcode, Colour temperature-Kelvin)
3. Proximity sensor (Obstacle detection/Like Leaser Mouse Operation-Infrared)
4. Ambient light sensor (Light Intensity-Luminance/lux)
5. Motion sensor (Can be used by Accelerometer)
6. Gyroscope (orientation, Constellation degree-Google sky map)
7. Accelerometer sensor (Acceleration, Gravity, Speed)
8. Digital compass / Magnetometer

9. Magnetic field sensor (xyz wise-micro tesla)
10. Hall sensor
11. Temperature
12. Humidity
13. Barometer (Air pressure, Altimeter)
14. Battery temperature
15. Fingerprint scanner (Ultrasonic or Optical Scanner)
16. Iris Scanner (Retina scanner-can be used by front camera)
17. Pedometer or Step counter (mostly used by Accelerometer)
18. Heart rate Monitor (Samsung Galaxy S5, Lenovo ZUK Z2 Pro)
19. Pulse oxymeter (Samsung Galaxy S5, Lenovo ZUK Z2 Pro)
20. Geiger Counter (Harmful Radiation level detector-Sharp Pantone 5 injapan)
21. NFC (Type of radio frequency tag scanner, Connectivity)
22. Infrared Blaster (For using TV remote data connection etc)
23. Laser (Auto focus, Distance Measurement, Also one type of laser bar-code scanner available- Panasonic Toughpad FZ-F1 Mobile)
24. Touch screen (Conductivity or by pressure)
25. Air Gesture (by using front camera)
26. 3D Air gesture & 3D scanning (use multiple camera 2 to 5- Takee 3D mobile)
27. GNSS (Global Navigation Satellite System- GPS, GLONASS, BeiDuo-BDS, IRNSS-Indian Navigation Satellite system- Global position, Elevation or altitude, Speed, Time measurement, Distence measurement, Satellite scanning)
28. Other signal receiver spectrum and band width (1G, 2G, 3G, 4G, 5G, WiFi, Bluetooth, FM radio, Television)
29. LiFi (Data connectivity by Visible spectrum light)
30. Clock (Normal and Atomic clock-Distance measurement and Satellite positioning)
31. Molecular/ Material sensing (SCio sensor based on Near Infrared or FTIR type Raman Spectroscopy detector to identify material like Mango Fruit, Gold, Body fat or anything- Changhong H2 Mobile)

4.2.9 Process of conducting a Quartz crystal test

This circuit can be used to test quartz crystals because it is relatively straightforward and affordable. The transistor T1 is used to connect a Colpitts oscillator in this circuit. The crystal will oscillate at a high frequency when the circuit is linked between terminals A and B. The oscillations can only be produced if the crystal is of high quality. These oscillations will be rectified by the diode OA91, which is shown on the metre. The relationship between the meter's deflection and the crystal's activity is linear.

Circuit diagram with Parts list:



Notes:

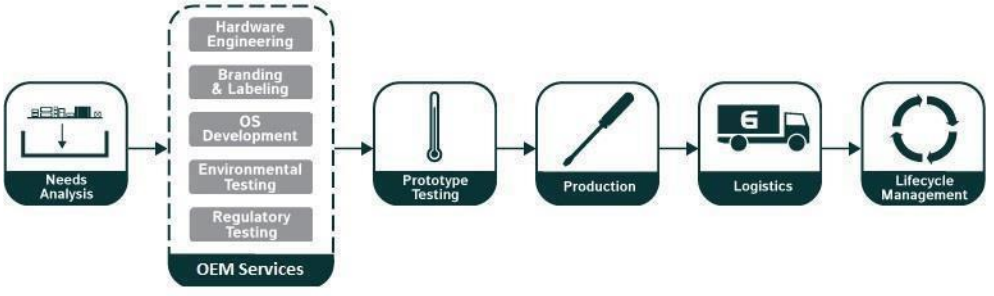
- Assemble the circuit on a general purpose PCB
- The circuit can be powered from a 9V PP3 battery.
- The push button switch S1 can be used as an ON/OFF switch.
- The meter M1 can be a 250uA FSD ammeter.
- POT R5 can be used to adjust the deflection of the meter.
- The crystal to be tested can be connected between terminal marked A and B.

4.2.10 Process of conducting diagnostic or power on tests for different types of Original Equipment Manufacturer (OEM) components

Original Equipment Manufacturer (OEM) Support:

OEM network support is made to keep equipment operational for a predetermined amount of time.

"Original equipment manufacturer" (OEM) refers to a manufacturer who supplies materials or labour to sell a product. OEMs frequently create items that are utilised as parts of other products, and these items are frequently connected to a category of services known as OEM services.



4.2.11 Features and operations of different models of chip-based mobile phones

The capabilities, services, and applications that mobile phones offer to their users make up its feature set. Mobile phones provide rudimentary telecommunications and are frequently referred to as feature phones. Native code is used by handsets with more powerful computer capabilities to differentiate their own goods by adding new features that will appeal to customers. Over the past 20 years, this has spurred significant progress in the development of mobile phones.

The common components found on all phones are:

- A number of metal–oxide–semiconductor (MOS) integrated circuit (IC) chips.
- A battery (typically a lithium-ion battery), providing the power source for the phone functions.
- An input mechanism to allow the user to interact with the phone. The most common input mechanism is a keypad, but touch screens are also found in smartphones.
- Basic mobile phone services to allow users to make calls and send text messages.
- All GSM phones use a SIM card to allow an account to be swapped among devices. Some CDMA devices also have a similar card called a R-UIM.
- Individual GSM, WCDMA, IDEN and some satellite phone devices are uniquely identified by an International Mobile Equipment Identity (IMEI) number.

Every mobile phone has a common set of services that enable communication between devices of various types and from various countries, and they are all built to operate on cellular networks. However, they can also accommodate additional features that have been added by different manufacturers over time:

- Roaming which permits the same phone to be used in multiple countries, providing that the operators of both countries have a roaming agreement.
- Send and receive data and faxes (if a computer is attached), access WAP services, and provide full Internet access using technologies such as GPRS.
- Applications like a clock, alarm, calendar, contacts, and calculator and a few games.
- Sending and receiving pictures and videos (by without internet) through MMS, and for short distances with e.g. Bluetooth.
- In Multimedia phones Bluetooth is commonly but important Feature.
- GPS receivers integrated or connected (i.e. using Bluetooth) to cell phones, primarily to aid in dispatching emergency responders and road tow truck services. This feature is generally referred to as E911.
- Push to talk, available on some mobile phones, is a feature that allows the user to be heard only while the talk button is held, similar to a walkie-talkie.
- A hardware notification LED on some phones.

4.2.12 Different types of mobile operating system (OS) and applications and the issues experienced with them

The different types of mobile operating system are as follows:

Android OS (Open source)

- Android Operating System is one of the widespread software developed by Android Inc Company. It's an excellent rise because it was created just in 2008.
- The question is – Where can we download Android Apps?
- If you've got the Android-based phone you'll realize Google Play, the Android market, where you'll find tons of applications for this OS. It's about 700 000 apps there.
- Features of Android OS: The features of Android OS are as follows –
    - The interface of Android was developed in order to fulfil all user requirements.
    - You can embellish your screen pages by widgets or you can place icons for your favorite applications whenever you would like them on. It's available on a larger number of smartphones and there are several versions of its OS.

Apple iOS (Closed Source)

- Everyone knows it. If you've got an iPhone, iPod or an IPad you recognize what I'm talking about.
- Every smartphone from Apple uses such sort of software. It's the second top-selling OS for smartphones within the world.
- The question is – How is Android different from iOS? Android and Apple are two strong competitors. For many, it's always hard to make a decision, which OS among Android and iOS is the best.
- The key difference between these two mobile phone OS is that the iOS is made to run only on Apple's smartphone line.
- The interface of this OS was unchanged since the primary iPhone was developed in 2007.
- Find Apps for iOS: The apps for this OS are often purchased within the official Apple app store, which has about 700 000 apps and games. This OS was made for people that want a straightforward interface and a gorgeous design.

Windows mobile (Closed source)

Windows mobile may be a mobile OS for smartphones and mobile devices from Microsoft Corp.

Design Specification for Windows OS

- Instead of standard icons, the screen of the Windows smartphone is covered with different coloured squares. The design also provides tons of huge text and an easy interface.
- The interesting feature of Windows OS is that there is also a really interesting feature of this OS – Kids corner.
- Kids corner: It generates a separate corner for teenagers in order that they can't reach your personal data. This OS is ideal for people that just like the PC OS and fogeys, who want to ban their personal information from children.

Blackberry (Closed Source)

- Blackberry mobile operating system is established specially for the blackberry device.
- This OS runs only on blackberry phones like Curve, Perl, Blackberry bold and Storm series. This OS is analogous to Apple iOS because it can't run on different brands of phones.
- Now the question is – Which Platform is used for developing Blackberry Apps?
- Mainly all the Blackberry applications were written on the Java platform. But in 2010 it introduced the new platform, which makes use of the widget SDK.

Prevention of Malware and Virus:

On a mobile OS device, malware and viruses can be avoided in three different ways:

- Download and update security patches whenever they come because companies release them to make your device more secure from new kinds of malwares and viruses.
- Don't install apps from unofficial websites because they might be integrated with a virus or a malware.
- Don't click on ads that show on websites they are also integrated with various viruses or they can take you to a malicious website.

4.2.13 Importance of using licensed/ approved OS and applications on mobile phones

If you are the owner of a mobile software programme, you should employ at least one mobile app licence agreement to prevent theft or unauthorised use of your intellectual property rights. This is valid regardless of whether your mobile app runs on Android OS tablets and smartphones, iPhones, or iPads.

In most cases, software licences grant end users the freedom to make one or more copies of the software without infringing on copyrights. The licence may place limitations on how the software may be used and establishes the obligations of the parties to the licence agreement.

You can order and activate a particular licence type and level via right-to-use (RTU) licencing, after which you can control how the licence is used on your switch. The types of licenses available to order are: Permanent licenses—Purchased with a specific feature set with no expiration date.

4.2.13 Process of repairing a variety of chip-based mobile phone modules

Chipsets (The Lowest Level):
The chipset, shown below, is the term for the most basic radio system. The chipset is seen in the image below as the large, black square in the centre of the board. They are, however, really tiny in actuality.

The chipset performs a number of crucial tasks. With the cellular network, it will negotiate the most basic levels of connection and identification. It will regulate the frequency. It will manage all the incredibly technical RF equipment needed to connect and transmit data, SMS, and voice over the cellular network.

4.2.13 Qualcomm Chipset

It's incredibly difficult to operate with chips. To operate all the cellular components, you often require a specially developed board and other devices that are challenging to communicate with directly.

A person who wants to become a skilled primary engineer who can handle issues with the chips of computers, laptops, mobile devices, or other electronics devices should take a training course in chip level fixing.

4.2.14 Frequently encountered software and hardware problems in a chip-based phone and how to fix them

Requirements for fixing phones hardware problems: Take the following steps just before you start

1. **Do Software Checkup –** Use a certain **flashing device** for that particular handset product to be able to read logs, logs is a reading of mobile phones firmware programmed and installed unto it.
2. You can do flash, reformat at first hand if found something wrong with the mobile phones firmware. If all methods of software already done and nothing happens, proceed to **hardware troubleshooting**.
3. No matter the condition, **do not use raw force to remove any component of your phone.** However, if you have seen a video of who use pure force to remove that particular model, then go ahead. Surprisingly, I am yet to come across such. I only know of a situation where you have failed to remove a hidden screw(s) which is standing in your way. Please check properly. Look under the stickers, security seals and the likes.
4. Similar to the above, if you are not a professional don't attempt to disassemble any phone without seeing a video on how to do so. Alternatively, you can ask a repairer to help you undo the screws while you do the fixing yourself.

Major Software issues and the solution:

- **Freezing of Phone:** Have not all people gone through that at least once? It is the most typical issue we have with our phones. The problem may occasionally be a small one brought on by careless phone use or even a third-party software, but other times it may be a problem with your phone's firmware or an overloaded RAM. If so, all you need to do is update your firmware; always use the most recent version, and if the problem is with the storage, attempt a factory reset.
- **Battery being bad:** Your phone's battery may not be functioning properly, and there could be a number of causes for this. Dimming the phone's brightness, keeping it in battery-saving mode, turning off the data while not using it, and turning off your GPS, Bluetooth, and Wi-Fi are simple ways to solve this problem. To find out which app is using the most data on your phone, check the battery settings. If necessary, close the app in the background or just remove it.
- **Heating as hell:** The fact that the phone becomes extremely hot while being used is yet another common but serious issue. Bad batteries can also be the source of this issue. Apply the suggested fix for the faulty battery. Keep your phone out of the sun's heat, avoid charging it for too long, and if nothing else, schedule your phone's servicing straight immediately in case it is a hardware problem.
- **Connectivity Complexities:** It's possible for some mobile phones to experience connectivity issues with Bluetooth, WiFi, or network connections. In that situation, we advise you to take a moment to breathe deeply before restarting your phone. You may occasionally need a professional to reinstall the firmware or update the software on your phone.

UNIT 4.3 Prepare necessary documentation

Unit Objectives

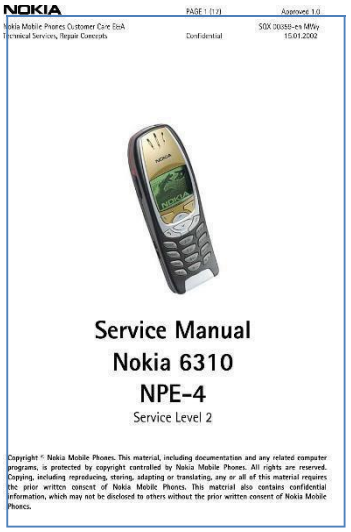
At the end of this unit, you will be able to:

1. Interpret and follow the service and repair manual for chip-based mobile phones
2. Understand the importance of documenting all the necessary details

4.3.1 How to interpret and follow the service and repair manual for a variety of chip-based mobile

A manual's function is to offer detailed written instructions for a place of business, organisation, task, or object. Examine examples from the real world as you learn about typical manual kinds like operations manuals and owner's manuals.

Benefits of a Repair Manual: It gives mechanics information on how to identify faults and remedy them.



The most recent generation of mobile devices are now as feature-rich and powerful as some desktops. The democratisation of smartphones—true handheld computers that put calls second in importance—accelerated this evolution.

Identification: You must first determine the make and model of your mobile phone in order to perform the repair yourself in the best possible circumstances. You can quickly find them on your smartphone.

On the front face of the mobile device, the manufacturer's logo is typically visible. It might show up on the back of some newer cell phones. You must locate the correct model, which is typically found on the back case, on the battery, or in the "information" option on your mobile device.

Kindly read service manual for service/repair of chip-based mobile phones.

4.3.2 Importance of documenting all the necessary details

Monitoring all of your processes, how they function, and each step you take toward your goals requires **documentation**. The fact that documentation lays the groundwork for efficient management demonstrates the significance of documentation. It is simpler to manage and guide the people you deal with regularly when there is proper documentation. Although creating the appropriate papers can seem like a daunting process, it is necessary to maintain efficient operations.

A greater understanding of an organization's capabilities can be attained through documentation. They use this knowledge to plan how they will carry out their duties and meet expectations. Any organization that fails to implement proper documentation may have to contend with various repercussions that include compromising general safety, inaccurate billing, losing revenue, and minimal employee growth.

Understand the Complaint:

- Interact with customers to understand the customer's purpose of visit such as repair of phone, purchase of accessories, software upload, collection of repaired phones
- Listen to customers and understand the customer level complaint such as display not working, not switching on
- Interrogate the customers to assess the cause of problem such as physical damage, uploading of any unauthorized software or application
- Decide on the action to be performed, i.e., front end repair or hardware level repair is required
- Inform customers about the time taken
- In case the handset is beyond warranty, inform the customer the delivery time & the estimated cost of repairs
- Provide document to customers for collecting the device after repair

Document on Computer:

- Use the system to identify the warranty coverage of the mobile phone and other terms and conditions
- Understand the customer relationship management policy of the mobile brand and inform customers about them
- Log into customer portal and enter the details of the customer and other details such as phone model, complaints, warranty coverage
- Understand and use the interactive ERP system of the company and enter appropriate details
- Use the system to prepare invoice, stock management, order placement, accessories availability, etc.

Interact with Superior & Meet Targets:

- Understand the work requirement from superior, periodically
- Report to superior on the work completed
- Seek technical assistance from superior whenever required
- Document the work completed

UNIT 4.4 Achieve the quality and productivity standards

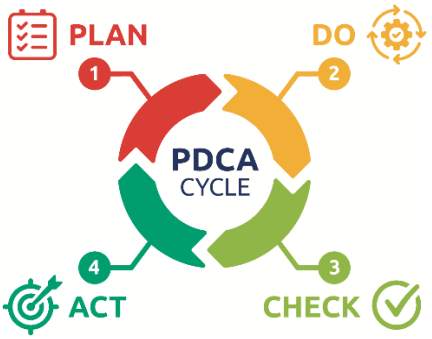
Unit Objectives

At the end of this unit you will be able to:

1. Describe certain problem-solving techniques
2. Understand the importance of honouring the TAT given to the customer

4.4.1 Problem-solving techniques such as Plan-Do-Check-Act (PDCA) cycle, Root Cause Analysis (RCA), etc.

The **Deming cycle or PDCA** is a management approach that seeks to continuously enhance procedures. Plan, do, check, and act are the four stages on which this cycle is founded. Having a method is necessary to adjust to market changes, increase efficiency, promote productivity, and satisfy consumer needs.



The Plan-do-check-act Procedure

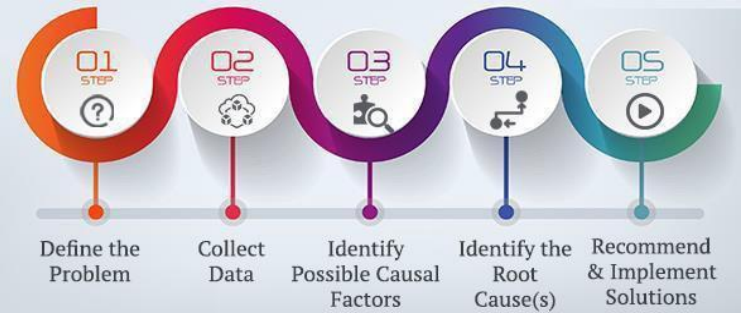
- Plan: Recognize an opportunity and plan a change.
- Do: Test the change. Carry out a small-scale study.
- Check: Review the test, analyze the results, and identify what you've learned.
- Act: Take action based on what you learned in the study step.

Root Cause Analysis

The methodical analysis of issues to identify the fundamental causes that, when fixed, can avoid or considerably reduce the risk of a recurrence is known as root cause analysis (RCA), sometimes known as root cause failure analysis (RCFA). "Root causes" refer to these fundamental causes. It is crucial to understand that most issues have multiple contributing causes, and that if one of these reasons were removed, the issue would no longer exist.

Equipment breakdowns that are unanticipated are abnormal and shouldn't be permitted. We need to understand why the failure occurred and correct the cause, not just the failed equipment, because it is common for equipment faults to be inadequately stated and only partially resolved, allowing the equipment to resume operation.

To ensure that we identify the underlying root cause(s) of an issue rather than its more evident symptoms, a systematic RCA approach is required. If we only deal with the symptoms of the issue, it is apparent that the issue will come back at some time in the future or that the established remedy would lead to new issues.



Every setback gives us the chance to grow. We will pass up the possibility to lengthen equipment life, reduce the frequency of repairs, and boost profitability if we neglect these opportunities. There four fundamental steps to RCA:

- Quantify the magnitude of the problem and decide on the resources required to resolve it
- Perform the analysis by selecting the appropriate technique
- Develop a list of options for solving the problem and implement the most cost-effective solution
- Document the results of the analysis in the appropriate format

4.4.2 Importance of honouring the TAT given to the

Why TAT is important?

- Setting customer expectations and providing them with an acceptable response time from the organization's perspective are the top two reasons for having TAT.
- Imagine yourself speaking with a buddy. How do you feel when you ask a question and don't hear back? It's awkward, right? The same is true in client-vendor relationships. A response is anticipated from the other end within a predetermined time frame if one is asking a question or sharing a point.
- It is a known truth that responding to a customer in the shortest amount of time possible promotes customer satisfaction and occasionally becomes the cause of joy.
- Responding slowly all the time causes you to lose clients and ultimately money.

- On the other hand, if you want to establish a name for yourself and amass a following of loyal clients, you must implement a system within your business that ensures that superior goods and services are supported by quick and effective customer service.
- Consistent customer communication results in a seamless problem-solving process. If your company's staff are in continual communication with your clients, who might be there for various purposes, they are always aware of what each client wants specifically and when they are aware of their requests, they can answer appropriately and promptly after working together.
- The problem has been resolved even more precisely and smoothly through online modes. This is a useful way of keeping a record of service requests, helping both parties to keep track of demands and responses. Live online-medium becomes a bridge for instant solutions and responses. But as per experiences, customers get satisfaction when they get to talk to representatives of the company.

Exercise

1. Write down the steps to prevent malware virus
2. Explain the concept of Turn Around Time

Fill in the blanks

1. Resistor's function is to _____current.
2. WT stands for _____
3. Full form of AVO is _____, _____ and _____
4. IOS Operating System runs only on _____ phones
5. PDCA problem solving technique has _____, _____,_____ and _____

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Corporation
Transforming the skill landscape

5.Organise work and resource as per health and safety standards

Telecom
Sector
Skill
Council

Unit 5.1 -Workplace health and Safety
Unit 5.2 - Different types of health hazards
Unit 5.3- Importance of Safe working practices
Unit 5.4- Reporting safety hazards
Unit 5.5 -Waste Management
Unit 5.6 - Organizations' Focus on Greening of Jobs

TEL/N9101

Key Learning Outcomes

At the end of this module, you would be able to

- Understandwhat is communication andthe importance of communication in the workplace
- Understand effective communication and communicate effectively for success
- Discuss types of communication -verbal and non-verbal
- Communicate at workplace
- Communicate effectively with superiors
- Communicate effectively withcolleagues and customersusing different modes viz face-to face, telephonic and email communication
- Understand the hurdles for effective communication
- Conduct professionally at work place
- Respect differences in gender and ability
- Communicate effectively with person with disabilities
- Respect for disable people

UNIT 5.1: Workplace health & safety

Unit Objectives

At the end of this unit, you will be able to:

1. Understand about workplace health and safety
2. Explain tips to design a safe workplace
3. Explain precautions to be taken at a workplace

5.1.1 Safety: Tips to Design a Safe Workplace

Workplace health and safety policy defines the best possible work conditions and safety for the employees. Employees have a right to feel safe in their workplace. Hence the organizations create and follow legal standards and ensure a hazard-free workplace.

Every organization is obligated to ensure that theworkplace follows the highest possible safety protocol. When setting up a business some tips to remember:

- Use ergonomically designed furniture and equipment to avoid stooping and twisting
- Provide mechanical aids to avoid lifting or carrying heavy objects
- Have protective equipment on hand for hazardous jobs
- Ensure presence of emergency exits and they are easily accessible
- Set down health codes and ensure they are implemented
- Follow the practice of regular safety inspections in and around the workplace
- Get expert advice on workplace safety and follow it
- Get regular inspection of electrical wiring and also the electrical switches and gadgets
- Install fire extinguishers and fire alarms.

5.1.2 Precautions to be taken while at work

Every employee is obligated to follow all safety protocols put in place by the organization. All employees must make it a habit to:

- Immediately report unsafe conditions to the supervisor
- Recognize and report safety hazards that could lead to slips, trips and falls
- Report all injuries and accidents to the supervisor
- Wear the correct protective equipment when required
- Learn how to correctly use equipment provided for safety purposes
- Be aware of and avoid actions that could endanger other people
- Always be alert
- Educate the employees about the first/emergency exits on the floor, and also where the fire extinguishers are kept.
- Keep the list of emergency numbers
- Practice evacuation drills regularly to avoid chaotic evacuations

UNIT 5.2: Different types of Health hazards

5.2.1 First Aid

Illness, injuries, and pain are part of human life. This can happen anyway. Every individual is prone to illness and injuries at anytime and anywhere.
In case of any of these, some kind of immediate medical attention or treatment is needed to reduce the discomfort, pain, and deterioration of the condition. The medical attention that is given at the first instance before seeking professional medical help is called “First Aid”. First aid is the immediate and temporary treatment given to the victim of an accident or sudden illness while awaiting the arrival of “Medical Aid”. First Aid means providing the initial treatment and life support for people with an injury or illness. However, First Aid has its limitations and does not take the place of professional medical treatment. Proper early assistance given by First Aider helps in saving the life of a patient.
Illness and injuries can happen anywhere, be at home, the workplace, or in the market place. Whatever safety measures we adopt, we are all prone to illness sometime or the other.
Some common injuries and their rescue techniques:

5.2.2 First Aid Techniques

- Direct pressure must be applied to the cut or wound with a clean cloth, tissue, or piece of gauze, until bleeding stops.
- If blood soaks through the material, it is highly recommended not to remove it.
- More cloth or gauze must be put on top of it, and pressure must be Continued.
- If the wound is on the arm or leg, the limbmust be raised above the heart to help slow the bleeding.
- Hands must be washed again after giving first aid and before cleaning and dressing the wound.
- A tourniquet must not be applied unless the bleeding is severe and not stopped with direct pressure.

click/scan to view the video on First Aid at workplace

Fig. 5.2.2(i): Clean cut or wound

Clean cut or wound

- The wound must be cleaned with soap and lukewarm water.
- To prevent irritation and burning sensation, the soap solution must be rinsed out of the wound.
- Hydrogen peroxide or iodine must not be used to clean or treat the wound since they are corrosive and can damage live tissues.

Fig. 5.2.2(ii): apply hydrogen peroxide or iodine

Protect the wound

- Antiseptic cream or solution must be applied to the wound to reduce the risk of infection.
- Then the wound must be gently covered with a sterile bandage.
- Till the wound heals, the bandage must be changed (dressed) daily to keep the wound clean and dry.

Fig. 5.2.2(iii): Protect the wound

Call the Emergency Helpline if:

- The bleeding is severe and deep
- You suspect Internal Bleeding
- Abdominal or Chest wound exists
- Bleeding continues even after 10 minutes of firm and steady pressure

For Burns:

- Immediately put the burnt area under cold water for a minimum of 10 minutes
- If the burned area is covered, take clean scissors, cut and remove the fabric covering the area
- In case clothing is stuck to the burned area, leave it as it is
- Before sterile dressing application, remove jewellery (if any)
- It is better to leave the burned area open
- Do not apply any medication or ointment
- Breaking a blister – it is an absolute no-no!

Fig. 5.2.2(iv): Put Burnt Area under Water

For Broken Bones and Fractures

1. Protruding bones must be left alone
   i. If a bone has broken the skin, it must not be pushed back into place.
   ii. The area must be covered with a clean bandage and immediate medical attention must be sought
2. Bleeding must be stopped
   i. steady and direct pressure must be applied with a clean piece of cloth for 15 minutes and the wound must be elevated
   ii. if a blood soaks through one must apply another cloth over the first and seek immediate medical attention
3. Swelling must be controlled
   i. The RICE (Rest,Ice, Compression and Elevation) Therapy must be applied to control and reduce swelling
   ii. Rest the injured part by having the person stay off it
   iii. Ice must be applied on the area with the help of an ice pack or by wrapping the ice in a clean cloth. Ice must not be directly placed against the skin.

For Heart Attack/Stroke

Think FAST:

1. Face: is there weakness on one side of the face,
2. Arms: can they raise both arms?
3. Speech: is there speech easily understood?
4. Time:to call emergency help line

Immediately call medical/ambulance helpline or get someone else to do it.

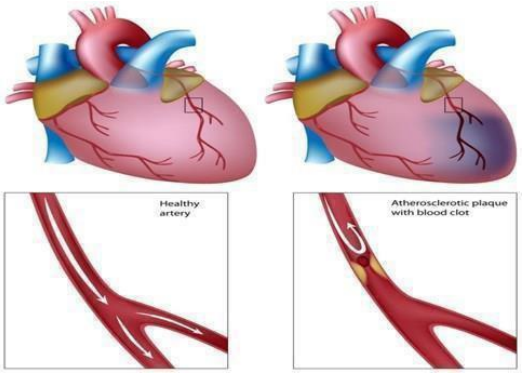

Fig 5.2.2(v): Anatomy of Heart Attack

For Head Injury

1. Ask the victim to rest and apply a cold compress to the injury (e.g ice bag)
2. if the victim becomes drowsy or vomits, call Medical helpline or get some one else to do it

Fig 5.2.2(vi)Steps of using breathing apparatus:

Check theparts of the breathing apparatus thoroughly.

Check the bypass knob (red). Close it if you seeit open. After this, press the reset button (area above bypass nob – black)

Inspect the facemask to See that it is

Lift thecylinder ensuringthat on the top the cylinder valve should be present. The back plate of the cylinder should face the wearer. Wear the breathing apparatus on the shoulder like a bag pack and by the neck strap, hang the face mask.

Afterwearing the breathingapparatustighten shoulder straps and fasten the waist belt.

The cylinder valve should be opened slowly to inspect the pressure gauge.

Makesure that 80% of the cylinder is full.

Wear the mask slowly by resting your chin in the resting cusp andpull the head strapslowly over your head.

Pull the head straps for a snug but comfortable fit.

Breath in and normally to see if you can breathe normally or not.

Nowinsert afingersidewise of the face mask for easy outward airflow.

Slowly close the cylinder valvewithout leaving the knob.

Be steady for 10 minutes and hold your breath or extremely slow to listen to any wheezing sound.
Also, check the pressure gaugefor any dip in the pressure.

Normally Breathe to vent system
Listenfor a whistle alarm while observing thepressure gauge
at 55 bar (+/-5 bar)

Briefing and Guidance for Fire Fighters

There are basically three methods with the help of which people can be rescued from a building engulfed in a blazing fire. To ensure on-site reception, here are two of the important steps that we will discuss now. These come under the best safe lifting and carrying practices.

Conventional Technique: This is a good method if there is an open area close by. The first rescuers will make the victim sit reach under their armpits and finally, grab their wrist. The other rescuer will cross the ankle (victim), pull up that person's legs on his shoulder. Finally, on the count of 3, both will lift the person up and move out.

Fig. 5.2.2(vii)f: Fast Strap

Fast Strap: In case the victim is completely incapable of moving out of the fire zone. The rescuers should follow this method. One of the rescuers will place their knee between victim's shoulder and head. Pin the loop of webbing to the ground with the help of the knee. This acts as an anchor. With the non- dominant hand hold the other end of the webbing and make a loop. With steady hands, pull the victim's hand in from the loop, tie it securely and finally clip the webbing loops.

Fig. 5.2.2(vi): Fast Strap

Essentials for Smooth Evacuation: The following are essentials to have a smooth evacuation during an outbreak:

1. clear passage ways to all escape routes
2. signage indicating escape routes should be clearly marked
3. enough exits and routes should be present to allow large number of people to be evacuated quickly
4. emergency doors that open easily
5. emergency lights where needed
6. training for all employees to know and use the escape routes
7. A safe meeting point or assembly area for staff
8. instructions on not using the elevator during a fire

Special Evacuation Requirements For Specially Abled Persons

1. Visually Impaired

- Announce the type of emergency
- offer your arm for help

2. With Impaired Hearing

- Turn lights on/off to gain the person's attention, or indicate directions with gestures, or write a note with evacuation details

3. People with Prosthetic Limbs, Crutches, Canes, Walkers

- Evacuate these individuals as injured persons
- assist and accompany to evacuation site if possible
- use sturdy chair or a wheeled one to move the person to an enclosed stairwell
- notify emergency crew of their location

UNIT 5.3: Importance of Safe Working Practices

Unit Objectives

At the end of this unit, you will be able to:

1. Explain Basic Hygiene Practices
2. Understand the importance of Social Distancing
3. Demonstrate the safe working practices

5.3.1 Basic Hygiene Practices

We are living in an environment with millions of germs and viruses. And our body can be a breeding space for these microbial organisms. They grow and multiply and cause many diseases which sometimes can prove to be fatal for the human beings. These disease-causing microbial organisms kill over 17 million people every year. Some simple hacks and little changes of basic personal hygiene habits can bring amazing changes to all of us. We can prevent contracting these diseases if we follow these hygiene practices every day.

Personal Hygiene

Personal hygiene is all about managing your body hygiene, essentially caring for your well-being incorporating some physical hygiene habits. Also, there are mental health benefits as well, as they affect each other immensely.

What are good personal hygiene habits?

Good personal hygiene includes but not limited to -

- Take regular shower
- Maintain oral hygiene
- Wash your hands frequently
- Wash your genitals
- Keep your clothes and surrounding dry and clean

These habits should be practiced on a regular basis, at home, at work, basically where you are!

That's the whole idea of preventing your body system collapse over a tiny microbe

Personal Hygiene Practices at Home

Take Regular shower

- Do not wait up to feel the dried sweat in your body to feel the urge to take shower, make it a routine, you have the choice to either take them before you head to work or after the long day or even before you head to sleep, whichever one suits your routine. Make sure to rinse your body thoroughly, especially the genitals and underarms as they produce more sweat and are more prone to fungal activities.

Wash your hands frequently

- We use our hands to do our most physical acts, from picking up the keys, browsing through our phones, cooking or eating to attending our pets. While we agree and accept the importance of washing hands before eating and after visiting the toilet, it is also important to wash our hands with soap or sanitizer every now and then. The pandemic covid-19 which crippled the life all over the world has taught us an important lesson that sanitizing our hands regularly is the only way we can avoid transmission of the disease. Use alcohol-based sanitizer to wash hands well to prevent the spread of communicable diseases

Maintain oral hygiene practices

- It is very important to take care of the teeth and gum, to prevent tooth decay and bad odour.
- Just brushing them twice a day is not enough, but using fluoride toothpaste and
- brushing properly is very essential.
- And wash it well with water to remove any food particles that is stuck in the gap in between the teeth.
- It is advised to wash the teeth everyday twice to maintain healthy teeth and gum.

Nails and hairs hygiene

- The cleanliness of nails and hair is also very important. They store dirt and grease. And even the microbes could be in there stuck and spreading. If the nail is not clean they can cause severe food poisoning, as we use our hands to eat food. Trim the nails once in a fortnight and wash hair at least twice a week with a shampoo to keep them healthy .

Nose and ears hygiene

- Wherever we are most likely to breathe in some pollutants, and most of the particles are bound to be stuck in the nasal hair. So, rinse the nose and ear with warm water once you return from outside

Wear fresh and clean clothes

- Changing into neat and clean clothes will prevent many infectious diseases. It will also give the mental effect immediately and it will boost the mind. Wash clothes with a good detergent every day and dry it in the sun.
- This will ward off any microbes attached to the clothes. If possible, Dettol can be used while rinsing which is an anti-disinfectant.

Food hygiene

- You can get severely sick from food-borne diseases, as most of your foods are raw, purchased from outside, they risk being cross-contaminated with harmful microbes.
- Food hygiene is basically the idea of better storage, handling, and preparation of food to prevent contamination and to prevent food poisoning.

5.3.1 - 7 steps for Handwashing

Click/scan to view the video on hand washing techniques

5.3.2 Importance of Social Distancing

Preventing communicable diseases:

All these above practices will help us to prevent communicable diseases. These diseases are highly infectious and contagious and spread through air, urine, feaces, saliva, skin (through touch) and using same towels and utensils.

Social Distancing and isolation, Self-Quarantine:

Ever since the spread of the pandemic covid-19, several health organisations have been insisting on following social distancing and isolation. Communicable diseases mainly spread through coming close to the infected individual and through physical touch. If a person is infected with diseases like normal flu or cold and spread it to others, the symptoms and may remain with the infected person for a day or two. The virus may be destroyed by taking an antibiotic. But in severe cases like corona virus the infection is severe and can prove fatal to the affected people. To prevent the spread of the virus, the entire world adopted lockdown, ***social distancing*** and compulsory face mask. And the infected person has to be in ***self isolation*** and ***quarantine*** till the time the symptoms are over. This was the advisory from the World Health Organisation, and the entire world followed it to prevent the rapid spread of the virus. The same can be applicable to all types of communicable diseases that are spread mainly through air and touch.

As communities reopen and people are more often in public after the pandemic, the term "physical distancing" (instead of social distancing) is being used to reinforce the need to stay at least 6 feet from others, as well as wearing face masks.
Historically, social distancing was also used interchangeably to indicate physical distancing which is defined below.
However, social distancing is a strategy distinct from the physical distancing behavior.

What is self-quarantine?
Self quarantine was imposed on people who have been exposed to the new covid-19 and who are at risk for getting infected with the virus were recommended to practice ***self-quarantine***. Health experts advised the self- quarantine for 14 days or two weeks. Two weeks provides enough time for them to know whether or not they will become ill and be contagious to other people.

self-quarantine was also recommended for people who have recently returned from traveling to a part of the country or the world where COVID-19 was spreading rapidly, or if a person has knowingly been exposed to an infected person.

Self-quarantine involves:

- Using standard hygiene and washing hands frequently
- Not sharing things like towels and utensils
- Staying at home
- Not having visitors
- Staying at least 6 feet away from other people in your household

Once your quarantine period has ended, if the symptoms are not there, then the person may return to normal routine as per doctor's advice.

What is isolation?
Anybody who is infected with a contagious disease needs to practice isolation in order to prevent the spread of the germs to their near and dear ones. This became very popular and was strictly adhered to during the covid-19 pandemic. People who were confirmed to have COVID-19, **isolation** was mandatory. Isolation is a health care term that means keeping people who are infected with a contagious illness away from those who are not infected. Isolation can take place at home or at a hospital or care facility. Special personal protective equipment will be used to care for these patients in health care settings. They are attended by well trained nurses and specialised doctors. And these people have to be in the PPE kits all through their presence in the hospital.

5.3.2Complete PPE Kit

Disposing off the PPE Kits

The PPE kits are worn by health workers and doctors who are attending to patients with highly infectious diseases and who are kept is isolation in order to arrest the spread. They have to wear it every time they go near the patient and have to remove it once their duty is over. Most of the PPE components are used for single use, however the face mask and goggles can be reused provided they are sanitised properly. The PPE kits have to be disposed off safely as they might have contaminants stuck to them and they may infect the healthy person if they are not discarded properly. The health workers may be all the more vulnerable to contact the disease.

5.3.3 Safe Workplace Practices

Every company has the provision of first aid box. As you have already read about the types of injuries that technicians can receive in their field of work, it is imperative for the companies to have appropriate first aid accessories.

The basic first aid supplies and accessories that a first aid box should have are:

Fig 5.3.3 Supplies and Accessories in the First Aid Box

Splint

Elastic wraps

Latex gloves

Adhesive tape

Tweezers

Blanket

Scissors

Wound Cleaning Agent

Triangle Bandage

Gauze roller bandage

Adhesive bandages

Gauze pads

Antiseptic cleansing wipes

Burn cream or gel

Eyewash liquid

Gauze roller bandage

Adhesive bandages

Gauze pads

Antiseptic cleansing wipes

Burn cream or gel

Eyewash liquid

CPR Kit

Chemical hazards are caused by toxic materials, which are poisonous. And being poisonous in nature, they can either be fatal or cause serious damages in case the preventive actions are not taken on time. Now, the exposure to chemicals can be in 3 forms.

They can be:

1. Inhaled (**entering the** body through nose)
2. Directly in contact with skin
3. Ingested (consumed)

The symptoms, in this case, will be:

- Seizures
- Partial or complete loss of responsiveness
- Burning sensation
- Stomach Cramping with bouts of excruciating pain
- Nausea
- Vomiting (and in times with blood-stains)

Fig 5.3.3(ii) Right way of coughing

Now, where there are problem, their solutions come side by side. In such situations, the person giving first aid requires to be calm and take certain preventative actions.

Some of the essential actions are:

1. Using insulated equipment
2. Wearing protective clothing, goggles, masks, shoes and gloves
3. Ensuring the place has enough ample ventilation

Remedial action

1. The foremost thing that one should do is to provide immediate first aid. However, it is to be remembered that the victim should not be given any kind of fluid (water, milk) until doctors from Poison control unit gives a green signal.
2. Aside from this, there are a few things a person can perform to the victim of toxic material exposure.
3. Remove the victim from the toxic zone or vicinity
4. Call for an ambulance
5. Remove contaminated clothing
6. Splash water in the eyes
7. If ingested, do not try to make the victim puke (vomit)
8. Wash their mouth with water

Fig. 5.3.3(iii): CPR

Click/Scan this QR code to view the video on CPR techniques

- In case the victim's breathing has stopped, give CPR (Cardiopulmonary resuscitation)
- In case of burning due to toxic material, apply burn gel or water gel on that area.
- Avoid any cream based or oil-based lotion or ointment
- Even though giving first aid is the right thing to do in the first place, it is also important to report the incident to their supervisor.

Exercise

1. Burnt area should be kept under _____ for a minimum of 10 minutes
2. _____ exits should be easily accessible in case of fire
3. _____ or _____ must be applied to the wound to reduce the risk of infection
4. The RICE which is _____, _____, _____ and _____ therapy must be applied to control and reduce swelling
5. CPR is _____

UNIT 5.4: Reporting Safety Hazards

Unit Objectives

At the end of this unit, you will be able to:

- Discuss the process of reporting in case of emergency (safety hazards)
- Understand methods of reporting hazards

5.4.1 Methods of Reporting Safety Hazards

Every organization, from every industry, has a standard reporting protocol, comprising the details of people in the reporting hierarchy as well as the guidelines to be followed to report emergencies. However, the structure of this reporting hierarchy varies between organizations, but the basic purpose behind the reporting procedure remains same.

The general highlights of the Organizational Reporting Protocol, commonly known as

The 6Cs, are:

- Communicate First
  - The first source of information during emergency is the preferred source.
  - Crises situations are time-bound and hence it is important to communicate promptly.
- Communicate Rightly
  - Distortion of information due to panic must be avoided.
  - Proper, accurate information must be provided to concerned authorities and this can save lives.
- Communicate credible
  - Integrity and truthfulness must never be forgotten during emergencies.
- Communicate empathetically
  - One must wear the shoes of the victims while communicating emergencies.
- Communicate to instigate appropriate action
  - Communicating to the right authorities help in taking the necessary action.
- Communicate to promote respect
  - Communicating with the victims with respect help in earning their trust and thus eases the disaster management process.

Hazards and potential risks / threats can be identified and then reported to supervisors or other authorized persons in the following ways:
While identifying and reporting a hazard / potential threat / potential risk, one must describe the following:

Part A: to be completed by the worker details required

- Name of worker
- Date of filling up the form
- Time of incident/accident
- Supervisor/Manager Name
- Work Location/Address
- Description of the Hazard/what happened(includes area, task, equipment, tools and people involved

Possible solutions to prevent recurrence(suggestions)

Part B: to be completed by the supervisor/Manager Details Required:

- Results of Investigation (Comment on if the hazard is severe enough to cause an injury and mention the causes of the incident / accident)

Part C: to be completed by the supervisor/Manager-Details Required

- Actions taken/Measures adopted (identify and devise actions to prevent further injury, illness and causalty

Action	Responsibility	Completion Date

Any job role and any occupation in this world have some hazards, in varying severity, associated with it. These are called Occupational Hazards. Occupational Hazard can be defined as “a risk accepted as a consequence of a particular occupation”. According to the Collins English Dictionary, it is defined as “something unpleasant that one may suffer or experience as a result of doing his or her job”. Occupational Hazards are caused by the following:

Hazard Report Form	
Name:	
Location:	Date:
Tools/ Equipment:	
Description of hazards:	
Suggested Corrective Action	
Signature:	
Supervisor's remarks:	
Corrective action taken:	
Signature of Supervisor:	Date:

UNIT 5.5: Waste Management

Unit Objectives

At the end of this unit, you will be able to:

1. Understand what e-Waste
2. Understand the concept of Waste-Management
3. Explain the process of recycling of e-waste

5.5.1 Introduction to E-Waste

Electrical and electronic products are all around us. We can't imagine a world without these gadgets. Our life is indispensable without electricity and electronic devices. Growth in the IT and communication sectors has increased the usage of electronic equipment immensely. Frequent change on the technological features of electronic products is forcing consumers to discard their old electronic products very quickly, which, in turn, adds to e-waste to the solid waste pool. What this translates to is mountainous masses of electrical and electronic waste which has a high potential to pollute the environment. This growing menace of e- waste calls for a greater focus on recycling e-waste and better e-waste management.

E-waste means electrical and electronic equipment, whole or in part discarded as waste by the consumer or bulk consumer as well as rejects from manufacturing, refurbishment, and repair processes. E-waste usually is made up of usable and non-usable material. Some of the waste if left unattended will be destructive to the environment. E-waste is made up of hazardous substances like lead, mercury, toxic material, and gases.

There are many companies these days who are engaged in the collection, handling, and disposal of this e-waste in a safer and more secure place to protect the environment.

5.5.2 What is E-Waste?

The amount of e-wastes comprising computers and computer parts, electronic devices, mobile phones, entertainment electronics, refrigerators, microwaves, TV, fridges, and industrial electronics that are obsolete or that have become unserviceable is growing. All these electronic devices contain plastics, ceramics, glass, and metals such as copper, lead, beryllium, cadmium, and mercury and all these metals are harmful to humans, animals, and the earth. Improper disposal only leads to poisoning the Earth and water and therefore all life forms. Our effort is meant to preserve the environment and prevent pollution by proper handling of e-waste. While it will take a lot of effort to educate people to dispose of such wastes in the right way, we are doing our part by providing a channel to collect e-wastes and dispose off them in a sustainably safe manner. We convert waste to usable resources.

The electronic industry is not only the world's largest industry but also a fast-growing manufacturing industry. It has been instrumental in the socio-economic and technological growth of the developing society of India.

At the same time, it poses a major threat in the form of e-waste or electronics waste which is causing harmful effects on the whole nation

e-waste is creating a new challenge to the already suffering Solid waste management, which is already a critical task in India.

5.5.3 Electronic goods/gadgets are classified under three major heads:

White goods: Household appliances
Brown goods: TVs, Camcorders, Cameras etc.,
Grey goods: Computers, printers, fax machines, scanners etc

The complete process is carried out as per the government guidelines.

5.5.4 E-Waste Management Process

- Collection of e-Waste from all the electronic stores, manufacturing companies etc.
- Transport to e-waste to the disposal unit
- Segregation of e-waste at the disposal unit
- Manual dismantling of e-waste to segregate components into various types such as metal, plastics and ceramics
- convert into raw material(recylce and reuse)
- Supply recovered raw material to processors and electrical/electronic industries
- Dispatch hazardous e-waste for safe disposal

5.5.4 E-Waste Management Process (contd.)

Waste management is carried out to ensure that all types of waste and garbage are collected, transported, and disposed of properly. It also includes recycling waste so that it can be used again

Fig 5.5.4 waste Management Hierarchy

5.5.5 Recyclable and Non-Recyclable waste

Recyclable waste is **renewable or can be reused**. This means that the waste product is converted into new products or raw material, like paper, corrugated cardboard (OCC), glass, plastics containers and bags, hard plastic, metal, wood products, e-waste, textile, etc

Recycling not only conserves important areas in our landfills but also assists decrease greenhouse gas emissions.

Contrary to this, Non-recyclable waste cannot be recycled and cause a major threat to the environment.

The following items cannot be recycled:

Shredded paper, aerosol cans, paper coffee cups, milk and juice cans, used baby diapers, and bottle caps.

Recycling is one of the best ways to have a favorable influence on the world where we live.

Recycling will greatly help us to save both the environment and us from pollution. If we take immediate action, we can control this, as the quantity of waste we are accumulating is increasing all the time.

Click/Scan this QR code to view the video on Waste Management

5.5.6 Colour codes of waste collecting bins

Waste collecting bins colour code

India's urban population of 429 million citizens produce a whopping 62 million tonnes of garbage every year. Out of this, 5.6 million tonnes is the plastic waste, 0.17 million tonnes is the biomedical waste, 7.90 million tonnes is hazardous waste and 15 lakh tonnes is e-waste.

According to an estimate, 40% of municipal waste in the city is 'wet' waste, which can easily be composted and used as manure. Nearly 30% of the municipal waste comprises of plastic and metal, which can be sent to an authorized dealer for recycling, and about 20% of it is e-waste, from which precious metals can be taken apart and recycled. However, out of the total municipal waste collected, 94% is dumped on land and only 5% is composted. To gather the garbage two color bin system was suggested. Green bin for wet waste and blue for dry waste. However, there is a drawback in that system. People do through the sanitary napkins and children's diaper along with wet waste causing the contamination of things. Hence the government has come up with three colored garbage collection bins

5.5.6 Tricolored Bins

1. **Green Bin**

The green coloured bin is used to dump biodegradable waste. This bin could be used to dispose off wet/organic material including cooked food/leftover food, vegetable/fruit peels, egg shell, rotten eggs, chicken/fish bones, tea bags/coffee grinds, coconut shells and garden waste including fallen leaves/twigs or the puja flowers/garlands will all go into the green bin.

2. **Blue bin**

The blue coloured bin is used for segregating dry or recyclable left over. This category includes waste like plastic covers, bottles, boxes, cups, toffee wrappers, soap or chocolate wrapper and paper waste including magazines, newspapers, tetra packs, cardboard cartons, pizza boxes or paper cups/plates will have to be thrown into the white bin. Metallic items like tins/cans foil paper and containers and even the dry waste including cosmetics, hair, rubber/thermocol (polystyrene), old mops/dusters/sponges.

3. **Black bin**

Black bin, make up for the third category, which is used for domestic hazardous waste like sanitary napkins, diapers, blades, bandages, CFL, tube light, printer cartridges, broken thermometer, batteries, button cells, expired medicine etc.

5.5.7 Waste disposal methods:

- Incineration: Combusting waste in a controlled manner to minimize incombustible matter like waste gas and ash.
- Waste Compaction: Waste materials are compacted in blocks and are further sent away for recycling.
- Landfill: Waste that can't be recycled or reused can be thinly spread out in the low-lying areas of the city.
- Composting: Decay of organic material over time by microorganisms.
- Biogas Generation: With the help of fungi, bacteria, and microbes, biodegradable waste is converted to biogas in bio-degradation plants.
- Vermicomposting: Transforming the organic waste into nutrient-rich manure by degradation through worms.

5.5.8 Sources of Waste

Construction waste – waste coming from construction or demolition of buildings.

Commercial waste from commercial enterprises

Household waste- garbage from households is either organic or inorganic

Medical or clinical waste -wastes from the medical facilities- like used needles and syringes, surgical wastes, blood, wound dressing

Agricultural waste- Waste generated by agricultural activities that include empty pesticide containers, old silage packages, obsolete medicines, used tires, extra milk, cocoa pods, wheat husks, chemical fertilizers, etc.

Industrial waste-The waste from manufacturing and processing industries like cement plants, chemical plants, textile, and power plants

Electronic waste-The defective, non-working electronic appliances are referred to as electronic waste. These are also called e-waste. Some e-waste (such as televisions) contains lead, mercury, and cadmium, which are harmful to humans and the environment

Mining waste- chemical gases emitted in mine blasting pollutes the environment. And the mining activity greatly alters the environment and nature.

Chemical waste-waste from the chemical substance is called chemical waste.

Radioactive waste: radioactive waste includes nuclear reactors, extraction of radioactive materials, and atomic explosions.

5.5.9 Sources of Pollution

All these above-mentioned waste also adds to environmental pollution. The contaminants that cause detrimental change to the environment are called pollution. It is one of the most serious problems faced by humanity and other life forms on our planet. The earth's physical and biological components have been affected to
such an extent that normal environmental processes could not be carried out properly

5.5.10 Types of Pollution

Types of Pollution	Detail/Pollutants involved
Air pollution	1. Solid particles and gases mixed in the air cause air pollution 2. Pollutants: emissions from the car, factories emitting chemical dust, and pollen
Water pollution	1. Water gets polluted when toxic substances enter water bodies such as lakes, rivers, oceans, and so on. They get dissolved in it and cause it unfit for consumption. 2. Pollutants that contaminate the water are discharges of untreated sewage, and chemical contaminants, release of waste and contaminants into surface
Soil pollution	1, It is the presence of toxic chemicals (pollutants or contaminants) in soil, in high enough concentrations to pose a risk to human health and/or the ecosystem 2 Sources of soil pollution include metals, inorganic ions, and salts (e.g. phosphates, carbonates, sulfates, nitrates),
Noise pollution	1. Noise pollution happens when the sound coming from planes, industry or other sources reaches harmful levels 2. Underwater noise pollution coming from ships has been shown to upset whales' navigation systems and kill other species that depend on the natural underwater world
Light pollution	1. Light pollution is the excess amount of light in the night sky. 2. Light pollution, also called photo pollution, is almost always found in urban areas. 3. Light pollution can disrupt ecosystems by confusing the distinction between night and day.

UNIT 5.6: Organizations' focus on the Greening of jobs

Unit Objectives

At the end of this unit, you will be able to:

1. Understand the concept of ESG
2. Explain the different factors of ESG

5.6.1 What is ESG?

The ESG is the short form of environmental, social, and governance. ESG guidelines are used to evaluate businesses on how well they control emissions, governance, human rights, and other factors of their business.

Several companies audit these companies for ESG compliance. They will let the companies know how well the ESG policies are implemented in their company hat let companies know how well their ESG policy is working.

Every business enterprise is deeply intertwined with Environmental, Social, and Governance (ESG) issues. ESG has been looked at seriously by the corporate, government establishments and stakeholders.

ESG is important as it creates high value, drives long-term returns, and global stakeholders are paying attention to the topic.

ESG is said to have created high value, and focuses on long-term returns, and stakeholders are focusing more on this concept.

5.6.2 Factors of ESG

Several factors are used to determine how well a business is doing in maintaining its ESG policies. For creating the ESG Policy, thorough knowledge of these factors are critical.

The factors are divided into three categories; environmental, social, and governance. Knowing about these factors come a long way in designing the effective ESG policy.

Environmental

Environmental factors relate to a business's impact on the environment. Examples include:

- Usage of renewable energy
- Effective waste management
- Policies for protecting and preserving the environment

Social

Social factors relate to the people of the organization. How they are treated in the organization is what it focuses on. The major entities are the stakeholders, employees, and customers. Examples include:

- diversity and inclusion
- proper work conditions and labor standards
- relationships with the community

Governance

Governance factors relate to the company policies for effectively running it. They include:

- tax strategies
- structure of the company
- relationship with stakeholders
- payments to the employees and CEO

Every factor is important and matters a lot to the overall rating of the company in ESG compliance. Ignoring one aspect in favor of another can affect the rating and in turn the reputation of the company.

The companies make a clear communication about these policies to all the employees, and to the public, they should mention what their various activities are that will protect the environment, people, and the governing factors.

Exercise

1. ESG stand for _____, _____, _____.
2. Governance factors include _____, _____, _____,
3. The three causes of air pollution _____, _____and
4. Mining waste includes_____.
5. Landfill is a _____.
6. _____ and _____coloured bins are used for disposing the waste
7. The plastics cans are trashed in _____coloured bin.
8. _____and _____are considered as e-Waste
9. _____part of e-waste is recycled and used again
10. E-waste is made up of hazardous substances like _____,_____ and _____

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6. Communication and Interpersonal Skills

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Skill
Council

Unit 6.1 - Interaction with supervisor, peers, customers and differently-abled persons

Unit 6.2 - Explain the importance of developing sensitivity towards disabled persons

TEL/N9102

Key Learning Outcomes

At the end of this module, you would be able to

- Understandwhat is communication andthe importance of communication in the workplace
- Understand effective communication and communicate effectively for success
- Discusstypes of communication -verbal and non-verbal
- Communicate at workplace
- Communicate effectively with superiors
- Communicate effectively withcolleagues and customersusing different modes viz face-to face, telephonic and email communication
- Understand the hurdles for effective communication
- Conduct professionally at work place
- Respect differences in gender and ability
- Communicate effectively with person with disabilities
- Respect for disable people

UNIT 6.1: Interaction with supervisor, peers ,customers and differently abled persons

Unit Objectives

At the end of this unit, you will be able to:

1. Understand the importance of communication
2. Understand types of communication

6.1.1 Why is communication important?

- Communication Skills are more important than ever, for all fields of endeavor.
- Whatever the role a person is holding in the organization, having a firm grasp of effective communication will undoubtedly be a key role in the individual's as well as the organization's success
- Oftentimes, people with excellent technical skills don't get promoted to higher roles because of their inability to communicate effectively
- Hence one fundamental skill everybody should be proficient along with the technical skill is Communication Skills
- Effective communication help us to build rapport with the customer both internal and external and help us resolve issues and conflicts easily and quickly.

6.1.2 What is Communication?

- Communication is the process of sending and receiving information among people. It is imparting or exchanging of information by speaking, writing, or using some other medium
- The purpose of communication is to convey your thoughts and opinions to others. Communication is said to be successful only when both the sender and the receiver perceive it in the same way.
- In your personal and professional life, you would be communicating with the following people-

– Colleagues
– Customers
– Friends
– Parents
– Relatives

6.1.3 Effective Communication

Effective communication is the process of delivering messages to a target audience in a way that guarantees satisfactory reception and understanding. If the communication is effective, both the sender and the receiver will share the same information at the end of the process. Effective communication is about more than just exchanging information. It's about understanding the emotion and intentions behind the information

Click/Scan the QR code to view the video on
Types of Communication

6.1.4 Effective Communication for Success

Effective Communication is critical to a business's success. From top to bottom, among colleagues, from subordinates to superiors, and from the organization to the outside, several messages are delivered daily. All the people must communicate these messages properly. Content, language, remarks, tone of voice, and non-verbal communication are elements that affect the effectiveness of messages

Clear and effective communication will

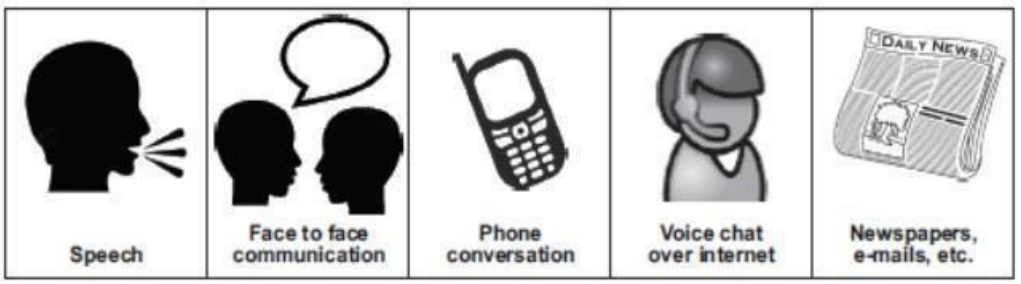
1. Increase customer satisfaction
2. Bring more business to the company
3. Increase productivity among team members

6.1.5 Types of Communication

Communicationhas been divided into two types:-

- Verbal Communication
- Non-Verbal Communication

Verbal communication takes place when people exchange words with eachother, either spoken or written. It includes the **choice and use of words and language to convey a message**. Examples of verbal communication are face-to-face conversation, telephonic conversation, and a speech or presentation.



6.1.5(i) Ways of Verbal Communication

Speech has certain characteristics which will affect the message that is being spoken:

- Volume – loud speech may sound bossy, very quiet speech cannot be heard.
- Tone – use warm tones without sounding over-friendly. Cool tones are very unwelcoming.
- Pace – fast speech is not easy to follow. Speak at a reasonable pace so that the other person has a chance to understand.

Correct body language also plays an important role in effective communication. Forexample, a warm smile accompanying 'Have a nice day' or looking directly at the person who is being spoken to give a positive image of the organisation.

Non –Verbal Communication

Non-verbal communication includes the overall body language of a person. There are two kinds of non-verbal communication:

Signs and symbols: for example, pictures, or notices, or signboards, or even photographs, sketches and paintings. Here are some examples of different signs and symbols:

Fig 6.1.5(ii) Non-Verbal Communication

Gestures and expressions: hand signs, facial expressions, body postures or body language that can help to convey a message. You can learn to communicate better with others if you learn to recognise some of these.

Facial expressions - A smile or a frown

Gestures - movements of hands and body to help explain or emphasize the verbal message

Body posture - how we stand or sit. Maintain a good posture. When you are talking to a colleague or guest, remember to stand up straight, look professional and be positive. Do not slouch, lean against something or fidget with equipment or your hands.

Orientation - whether we face the other person or turn away

Eye contact - whether we look at the other person and for how long

Proximity - the distance we are from a person

Head nods - for encouragement, indication of agreement or disagreement

Appearance - dress and grooming

Non-verbal aspects of speech - tone and pitch of voice

Fig 6.1.5(iii) Gestures and Expressions

These non-verbal clues are important as they can be used to improve the quality of communication. They can be used to reinforce any verbal communication; for example, leaning forward and looking at the person you are speaking to and smiling naturally. Your expressions, posture and appearance must be appropriate and should tell the guest that you are professional, competent and willing to help.

Communication takes place in mainly three different ways:

1. **Talking and listening** face-to-face and on the telephone
2. **Writing and reading** messages, forms, report etc.
3. **Through body language** including facial expression, gestures, eye contact or looking away/looking at the floor and how close you are to a person.

6.1.6 Communication at workplace

In every situation, while interacting with people, we make use of both verbal and Non-Verbal Communication. It is the key to the success of any organization. Be it communication with customers, supervisors, or peers. In today's scenario having technical skills alone is not enough to get the work done, but communication skill is also equally important. Completing the task must require the support of the whole team, and without proper communication, it cannot happen. Effective Communication helps managers to perform their jobs and responsibilities and it serves as a foundation for planning.

6.1.7 Communication with supervisors

Effective and open communication within a team will build a common purpose among team members that will allow them to reach their goals. Team leaders know that group communicationenhances organizational efficiency. The team members should always follow the communication guidelines. Some of the points to remember while interacting with supervisors:

1. Beware of the communication guidelines of the organization
2. understand and interpret clearly, the work requirements from the supervisor
3. Keep the supervisor informed about the progress of the task assigned.
4. Participate in all the discussions which call for decision-making, and provide fact and figures
5. Give/accept suggestions during the discussions
6. Accept the feedback positively and work towards rectifying errors if any. Make sure the same mistakes are not repeated.
7. Give/accept suggestions during the discussions.

Click/Scan this QR code to view the video on communication with customers and Colleagues

6.1.8 Communication with colleagues & customers

- Themain responsibility of a Customer Care Executive is to handle customers' concerns.
- Interaction with colleagues/peers is also equally essential and it enhances productivity in the workplace.
- Be polite in speaking to your peers at the office.
- Value other people's time as much as you value your own.
- Before you begin discussing something, ask your coworker if it is the right time to talk, and give a true picture of how much time you expect to take. Always start the conversation
- Communication with colleagues/customers can be through face-to-face, telephonic, or email.
- Keeping a few points in mind while communicating will make the interaction pleasant and fruitful.

6.1.9 Face-to-face Communication

This is an important medium of oral communication, wherein two or more persons talk to each other and see each other physically. This form of communication is direct or straight.

Things to remember while you are communicating face to face

1. Adjust the tone of voice, don't be too loud
2. Make eye contact
3. Use appropriate language
4. Maintain adequate distance
5. Acknowledge, nod during interaction
6. Use appropriate non-verbal gestures to communicate with persons with disabilities

Benefits of face-to-facecommunication

1. Instant feedback
2. Information conveyed clearly
3. Build rapport

6.1.10 Telephonic Communication

Another widely adopted mode of communication is through the telephone. This is the person-to-person conversation where nobody sees others but hears each other and interacts instantly. Nowadays mobile phones are becoming more popular along with landlines as a mechanical media of oral communication.

The following suggestions are recommended to follow while making telephone calls-

1. Make the call at the appropriate time
2. Provide details about your identity like name, company, department, etc.
3. Discuss the purpose of the call
4. Think about the tone of your voice
5. Listen carefully
6. Speak clearly
7. If you don't understand something, ask
8. Use please, thank you, sorry wherever necessary
9. Follow the organization's policies and procedures while interacting on the telephone

Click/Scan this QR code to view the video on Effective Telephonic Communication

6.1.11 Email Communication

Email or Electronic mail is a method of exchanging messages using electronic media. The official or business communication between colleagues or inter-department communication usually happens through email. The advantage of email is you can send communication to many people at the same time.

Points to remember in email communication

1. Be clear and concise
2. Keep the content short and to the point
3. Avoid using jargon and short forms
4. Re-readthe message, before sending it for grammar and spelling mistakes
5. The subject line should describe the mainmail content
6. Use readable font size (don't keep it too small)
7. Add signature at the bottom of themail body
8. Check the attachments for viruses before sending

6.1.12 Importance of timely completion of tasks

Time is a major factor that evaluates **the success or failure of a project**. Even when the whole team has done a wonderful job and produced high-quality results, with half the cost allotted to the project, everything will be a waste if it was not delivered on time. Any deviation from the timeline will call for a penalty and sometimes may result in losing the project and eventually the customer. so adhering to the timeline is important when it comes to any organization who are into products and services.

Benefits of adhering to timelines:

1. Increased and improved customer satisfaction
2. Increased productivity and efficiency of the individual
3. Team feels motivated
4. Sense of adhering to the SLA's and Standard Operating Procedures
5. Shows the commitment toward the work and the organization
6. Good word of mouth from the customers

6.1.13 Standard Operating Procedure

A ***Standard Operating Procedure (SOP)*** is a standardized process that outlines a set of detailed instructions to help workers perform complex tasks properly and safely. The main objective of standard operating procedures is to develop an effective quality system and comply with industry- specific regulations and standards. Failure to follow SOPs can cause significant errors in operations and services.

For amobile repairing center, the SOP defines the different process ofoperations, namely handling customer, repairs, sales and interaction among the staff within the repair center.

SOP also clearly defines the responsibility of each and every designated person in the organisation and what is expected from them. It further defines what the various levels of engineers will handle with respect to the handsets coming for repair.

The escalation matrix specifies how the different levels escalate the issue to the next level and adhere to the timelines for repair and communication to the customer.

SOP is created keeping in mind the customer satisfaction as a main motive.

Each and every person in the organisation is expected to read the SOP thoroughly and work accordingly. Because every customer when they go for purchasing a product, one of the main things they see is the post-sales Support. If they find the brands deliver good service support then they don't mind even spending few extra moneys.

6.1.14 Escalation Matrix

Escalation matrix is made up of several levels of contact based on the specific problem at hand. This is being followed by all who are working on that product and have to adhere to the service guidelines. And the problem has to be closed at aminimum turnaround time, and for any reason the repair is taking time proper reason has to be mentioned and notified to all the people concerned including the customer.

6.1.15 Escalation Mechanism

Customer service is a very important aspect of a typical service industry. Giving committed service to customers every time and on time is very crucial for the success of the brand. In recent times, customers do research on how the after-sales support of a product is, and based on that rating they will decide which brand to buy. If the customer service is not good, they will not go for that product even though the product is very good. Hence customer service is a second important aspect of a product and services organization.

The resolution time matters a lot, all these technology has become indispensable for business and people. Their business cannot function without that. Hence too much downtime is also not good. Once the complaint is raised the service center allocates it to the technicians who are trained to handle any kind of technical issues. The L1 support level looks into the problem and try to resolve it. If it's beyond their area of resolution the same is escalated to the next level. Every organization has ***Standard Operating Procedures*** clearly state the workflow for the customer service and Technical support for their business. Every individual working there must be aware of the same and adhere to the deadline for faster service and enriched customer satisfaction.

6.1.16 Escalation through CRM

Customer Relationship Management is a software, through which most of these companies who are into customer service, manage their customers. The customer details are entered in the system and also the services which are logged against a particular customer. This is the automated system, which takes a particular action after a period of time. For example, if a service request is assigned to an engineer for rectifying a problem of a client, and if the engineer does not update the status of the service in the system within a specified period of time, the problem is automatically escalated to the next level for resolution. Then the new engineer who is responsible for resolving pick it and try to find a solution. This system helps to maintain a track of a particular problem and the current status which will help the organization in effectively managing the customer queries. The complete escalation route is mentioned in the SOP and the same is implemented through the CRM software. This eases the manual escalation procedure which is time consuming and slow.

6.1.17 Escalation issues at work

Whether an issue arises among team members or with customers, sometimes the severity of the circumstance requires an escalation to management. Understanding how to approach an escalation can help you better find a solution when conflicts arise. We explore what it means to escalate an issue in the workplace and provide tips for how to do so successfully.

What does it mean to escalate an issue at work?

Escalating an issue in the workplace is the process of bypassing those involved by contacting upper/senior management. It involves raising awareness of the context to the right people in order to resolve a challenging situation. Typically, escalation occurs when there is an issue that the current staff working on the problem can't resolve and requires assistance from those with more authority and resources

When should you escalate an issue at work?

Deciding when to escalate an issue depends on the amount of risk it can bring to the company. Because escalating an issue can lead to difficult meetings and cause disruptions in work, you should reserve them for issues that truly require escalation. You can often avoid escalating an issue by solving the problem with the individual first.

However, some issues require support from those with higher authority. Consider escalating an issue at work when:

You have already tried other strategies but that did not work.

Resolving may incur additional cost to the company or the customer, while rectifying the problem.

Because of the non-availability of certain parts, the repair work is taking longer than usual.

The engineer broke another part while repairing a part. So escalation is required to get the approval to replace the broken part by the company.

6.1.18 Hurdles for Effective Communication

Following are factors contribute to communication not being effective.

Stress and out-of-control emotion. When you are stressed or emotionally disturbed, you're more likely to misread other people and send confusing non-verbal signals. Calm down before continuing the conversation.

Lack of focus. You can't communicate effectively when you're multitasking. If you're checking your phone, planning what you're going to say next, or day dreaming, you're almost certain to miss non-verbal cues in the conversation. To communicate effectively, you need to avoid distractions and stay focused.

Inconsistent body language. Non-verbal communication should support what is being said, not contradict it. If you say one thing, but your body language says something else, your listener will likely feel that you're being dishonest. For example, you can't say "yes" while shaking your head no.

Negative body language. If you disagree with or dislike what's being said, you might use negative body language to ignore the other person's message, such as crossing your arms, avoiding eye contact, or tapping your feet. You don't have to agree with, or even like what's being said, but to communicate effectively and not put the other person on the defensive, it's important to avoid sending negative signals.

6.1.19 Professional Conduct

There are six basic rules to be followed for professional conduct:

- **Be on time:** Being late impedes a company's operations and demonstrates a lack of consideration of the time concerns of others. If you are constantly late for work, meetings, or are always late with your reports and other tasks; it demonstrates to others that you are probably not executive material because you disregard the value of time.
- **Be discreet:** Keep company secrets such as new product designs, sales figures or any other confidences to yourself.
- **Be courteous, pleasant, and positive:** No matter how demanding your clients, customers, co-workers or employees might be; always remain upbeat and positive. Projecting a positive company image has the same effect.
- **Be concerned with others, not just yourself:** Finding out a customer or client's point of view naturally helps you get ahead in any industry. Concern for others should include your superiors, co-workers and subordinates as well.
- **Dress appropriately:** Dress to be comfortable in your environment. Dressing poorly or too casually does not convey a good image, neither does overdressing, which breeds suspicion and mistrust, and will be seen as inappropriate.
- **Use proper written and spoken language:** People who can express themselves clearly are at an advantage. This goes beyond using good grammar, proper spelling, and appropriate diction in all your communications; you should also speak and write to the point.

6.1.20 Respect Gender Differences

In any business, be it a small company to a big corporate, the workforce is a mix of both genders. The ratio of men vs. women varies from 70:30 or 60:40. Studies show that business teams with an equal gender mix perform significantly better than male-dominated teams when it comes to both sales and profits. No two women or men are alike and yet at the same time there are some work related traits that are gender specific. Both men and women approach their work in a different way and deal with many hurdles that come their way. Since they all share the same workspace every organization has devised a policy as to how they treat the opposite gender at the workplace and what are the implications of any abuses

Some of the points to remember while interacting with female colleagues

1. Treat them with respect
2. Support them in case they approach you
3. Value their opinion and suggestions
4. Involve and include the opposite gender in all the discussions

Unit 6.2: Explain the importance of developing sensitivity towards disabled persons

Unit Objectives

At the end of the unit, you will be able to

1. Respect differences in gender and ability
2. communicate effectively with person with disabilities
3. Respect people with disability at work

6.2.1 Communication with disabled person

A **disability** is any condition that makes it more difficult for a person to do certain tasks or interact with the people around them (socially or materially). These conditions, or defects, may be cognitive, developmental, intellectual, mental, physical, sensory, or a combination of multiple conditions. Defects may be present from birth or can be acquired during a person's lifetime. Often, disabled people are excluded from full participation in any activity." But things are changing, every organization has allotted some percentage of employees from this section of the society. They are also allowed to exhibit their skills in a few jobs which they can perform without putting their life at risk

General tips for communication with disabled people

Keep these points in mind while interacting with people with a hearing problem

1. Speak to them as you would speak to anyone else in a soft and low tone.
2. Respect the person first, not their disability. For example, use the term ‘a person with disability’ rather than ‘a disabled person’.
3. Do not use phrases such as ‘suffers from’ and ‘crippled’ rather the phrase should be ‘people who use a wheelchair’ rather than ‘wheelchair bound.
4. Don’t drag or push a person’s wheelchair, and don’t move their crutches or walking stick without their permission. It has to be in their personal space.
5. When talking to a person who is in a wheelchair, try to sit in such a way you could reach their eye level. This would not strain them much, to lift their head and talk.

6.2.2. Communicating with people with a hearing impairment

Keep these points in mind while interacting with people with a hearing problem

- Draw the person's attention before you speak. Give a gentle tap on their shoulder, a wave of some other visual signal to the person's attention
- Stand in front of the personand maintain eye contact
- Don't cover the mouth while talking. They can figure out what is being said by just looking at the lip movement
- Speak at a normal pace don't speak fast or slow
- Choose the words wisely
- Use short sentence

6.2.3 Respect people with disability

Learn the proper way to act and speak around someone with a disability.

- Do not use offensive or derogatory words like 'handicapped', 'crippled', and retarded etc.
- Don'tcriticize or blame them. Don't shout at them or use abusive language
- Talk slowly with a low tone. Pause while talking
- Avoid excessive whispering, joking and laughing unnecessarily
- Assuming things about them or their situation.
- Don't make jokes about their condition or be sarcastic
- Don't look down upon them because of their disability
- Appreciate them for their efforts and work, and motivate them to perform better

6.2.4 Safety at workplace for people with disability

Disabilities of all types affect employees and can pose various mental or physical challenges. In many situations, a disability may impact the amount of time it takes for an employee to complete a task or get from one part of a facility to another. Some disabilities may be known while others remain unknown to an employer.

Health and safety legislation should not prevent disabled people from finding or staying in employment so it should not be used as an excuse to justify discrimination against them. Disabled people and those with health conditions, including mental health conditions, should be given the opportunity to both get into and stay in work.

Responsibilities of an employer towards disabled people

The employer is responsible for the health, safety and welfare of all of their employees, whether they have a disability or not. Disability is not always obvious so one might not realise a worker is disabled or they might choose not to tell you, particularly if their disability has no impact on their ability to do their job. Workers do not have to tell anybody unless they have a disability that could foreseeably affect the safety of themselves or anyone else connected to their work. If they do not reveal and there are no obvious indicators of any disability, then the organization are not under any obligation to make workplace adjustments. Periodically, consult with the employees (whether directly or through their representatives) on issues relating to health and safety. These discussions reflect good safety practice because employees have day-to-day understanding of the job, so they are likely to have good ideas on keeping themselves and others safe.

6.2.5 Workplace adaptation for people with disability

Few changes in the workplace to make it a safe place for the disable people will go a long way in the employee satisfaction for an organisation.

Workplace Adaptations

Workplace should be easily accessible for these people with special needs. One major compliance concern deals with accessibility. For example, if workplaces have been adjusted or created more accessible entrances and exits to their facilities, allowing more independence for persons in wheelchairs, would be a great idea. Other subtle changes may include the width of bathroom stalls, hand rails inside the stalls and long ramps instead of stairs. The path of travel that employees take should never be obstructed; there should be no barriers to prevent someone from getting to safety in an emergency.

Workstations easily can be adapted to follow this universal design. Many companies now use slide out keyboard trays and monitors on swinging arms to allow employees to adjust to their needs. Desks can accommodate wheelchairs in place of regular chairs, and general work spaces can be lowered to allow easier access. The main goal is to remove all barriers and allow everyone to concentrate more on completing their tasks.

The biggest challenge with universal design is accommodating the multitude of challenges that different disabilities present. Not all disabilities are the same, and not all will present the same challenges for employees. Some employees may have issues with their right hand while others have issues with their left. For some, it may involve not being able to stand or sit. Some may need low lighting, while others need bright lighting. Designing a facility to accommodate all is always going to be a challenge.

Complying with government guidelines can be more difficult in regards to employees with disabilities. This difficulty lies with ensuring that employees are aware of all hazards in the workplace. Multiple disabilities will create multiple reasons that may keep employees from recognizing hazards. Employees with impaired vision, for example, must have other means of identifying hazards. This may be remedied with audible alarms or touch-activated devices that warn employees not to go in an area. Other employees may have difficulties reading and may benefit from shapes or colors to further identify hazardous areas.

For workers who lack hearing ability, employers can utilize signs to demonstrate hazards or use flashing strobes to identify when employees need to evacuate an area and head to safety. Every organization has to make few adaptations in order to make it a better place to work even for people with dis-ability. It should provide an environment where they feel they are safe and can carry out their work rather than worrying about their safety.

Exercise

1. What are the three points you will focus on when you talk to people face to face?

_____

_____

_____

Fill in the blanks

1. Before sending the mail it's important to check the _____ and _____ of the content
2. when you interact through phone, provide your identity details like_____ and _____
3. Add your _____ at the bottom of your mail.
4. The Customer Care Executives are responsible for handling _____

Notes

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