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MINISTRY OF SKILL DEVELOPMENT  
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# Facilitator Guide



Sector  
**Telecom**

Sub-Sector  
**Passive Infrastructure**

Occupation  
**Customer Service**

## Broadband Technician



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Reference ID: **TEL/Q0102**, Version **4.0**  
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**Shri Narendra Modi**  
Prime Minister of India

“ Skilling is building a better India.  
If we have to move India towards  
development then Skill Development  
should be our mission. ”



## Acknowledgements

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The preparation of this guide would not have been possible without the Telecom Industry's support. Industry feedback has been extremely beneficial since inception to conclusion and it is with their guidance that we have tried to bridge the existing skill gaps in the industry. This facilitator guide is dedicated to the aspiring youth, who desire to achieve special skills which will be a lifelong asset for their future endeavours.

## About this Guide

The facilitator guide (FG) for Broadband Technician is primarily designed to facilitate skill development and training of people, who want to become professional Broadband Technicians in the industry. The Facilitator Guide is aligned to the Qualification Pack (QP) and the National Occupational Standards (NOS) as drafted by the Telecom Sector Skill Council of India (TSSCI) and ratified by National Skill Development Corporation (NSDC).

It includes the following National Occupational Standards (NOSs):

1. TEL/N0111: Lay cable/system wiring and install equipment at customer premises
2. TEL/N0112: Configure customer premises equipment and establish Broadband connectivity
3. TEL/N0113: Troubleshoot and rectify faults
4. TEL/N9101: Organize work and resources as per health and safety standards
5. TEL/N9102: Interact effectively with team members and customers
6. DGT/VSQ/N0102: Employability Skills (60 Hours)

Post this training, the participants will be able to perform tasks as professional B. We hope Broadband Technician. We hope that this Facilitator Guide provides a sound learning support to our young friends to build a lucrative career in the telecom industry.

## Symbols Used



Ask



Demonstrate



Facilitation Notes



Learning Outcomes



Notes



Objectives



Practical



Team Activity



Do



Explain



Say



Resources



Activity



Summary



Role Play



Example




Time



Elaborate

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# 1. Introduction to the role of a Broadband Technician

Unit 1.1 – Broadband Technology

Unit 1.2 – Organizational policies and standards



## Key Learning Outcomes



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

1. Understand broadband technology
2. Know about duties and responsibilities of broadband technician
3. Understand organizational standard and policies
4. Appreciate size and scope of Telecom industry
5. Comprehend process workflow and role of Broadband technician in process

## UNIT 1.1: Broadband Technology

### Unit Objectives

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

1. Understand broadband technology
2. Understand the duties and responsibilities of a broadband technician

### Resources to be Used

Participant Handbook, pen, writing pad, whiteboard, flipchart, markers, laptop, overhead projector, laser pointer, equipment, and tools

### Say

Good morning and warm welcome to the training program on Broadband Technician. Let us start the unit by discussing the broadband technology and the duties and responsibilities of a broadband technician.

### Ask

Ask the participants whether they know about the broadband technology.

### Notes for Facilitation

- Explain to the participants that “broadband” is a radio term that refers to a wide band of frequencies used to transmit information. In general, broadband refers to high-speed connection to Internet that is faster than the traditional fixed telephone line.

- Tell them that the different platforms that provide broadband are:



Digital Subscriber Line  
(DSL)



Cable Modem



Fiber



Wireless



Dish



Broadband over  
Powerline (BPL)

Fig. 1.1.1: Different broadband platforms

- Explain the different broadband technologies one by one.
- Tell them that the Digital Subscriber Line (DSL) is one of the oldest Internet technologies and uses telephone lines for high-speed Internet connections. Tell them that the pros and cons associated with DSL are as follows:

#### Pros

- ☐ It is widely available
- ☐ Can use the phone and Internet at the same time
- ☐ Is faster than regular modem
- ☐ Does not need new wiring
- ☐ It is cheaper than satellite or broadband connections

#### Cons

- ☐ Connection quality depends on distance
- ☐ Is not available everywhere
- ☐ Connection for sending data is slower than for receiving data

Fig. 1.1.2: Pros and Cons of DSL

- Tell them that the cable modem is a hardware device designed to operate over cable TV lines. It enables a user to attach a PC to a local cable TV line and receive data.
- Tell them that with the help of a cable modem one can watch TV shows and browse the web at the same time.
- Tell the participants that the fibre optic cables are cables that contain pure glass strands of very thin size called optical fibres, in a protective, insulated jacket. The optical fibre cables can transmit large amount of data at a very high speed.
- Tell them that fibre optics provide a faster download and upload speed but is not as widely available as cable or DSL.
- Next, tell them that wireless is a broad term that refers to a technology that uses radio waves instead of wires to transmit and receive data.
- Tell them that some examples of wireless devices are TV remote controls, radios and GPS systems.
- Explain that people living in rural areas do not have access to cable services or Internet through wired connection. In such cases, satellite internet service is the only possible solution.
- Tell them that similar to satellite TV, satellite broadband is transmitted wirelessly through satellite dish. The difference being that with a satellite broadband connection one can not just receive information but also send out data to the satellite.
- Further, explain to them that Broadband over power line (BPL) is a technology that enables the data to be transmitted over ordinary residential electrical lines and power cables.
- Draw a comparison between DSL vs. cable vs. fibre vs. satellite with the help of the following table:

Broadband Type	Affordability	Speed	Reliability
DSL	Moderate	Moderate	Moderate
Cable	Moderate	High	High
Fiber	Moderate to high	Very High	High
Satellite	High	Low	Low

Table. 1.1.1: Comparison between DSL vs. cable vs. fibre vs. satellite

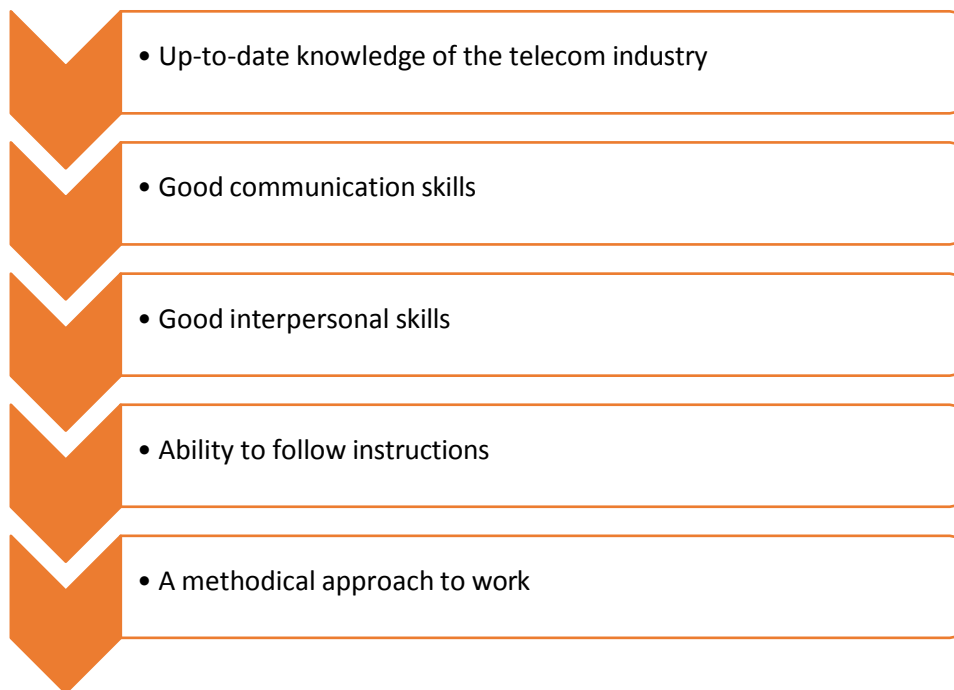
## Ask

Ask the participants whether they know about the duties and responsibilities of a broadband technician.

## Notes for Facilitation



- Start the session by telling the participants that a good broadband technician should possess the following attributes:
  - Patience
  - Integrity
  - Punctuality
  - Critical thinking
  - Amenable behaviour
  - Good interpersonal relationship building
- Explain to them about the responsibilities of a broadband technician.
- Tell the participants about the full scope of work of a broadband technician.
- Explain the importance of having thorough knowledge of the various components used in their job role.
- Explain the various technical skills they must possess to do their job efficiently and effectively.
- Explain that in addition to these technical skills, they must also have certain practical skills such as shown in the following figure:



*Fig. 1.1.3: Practical skills*

## Answers to exercises for PHB

Exercise Handling Strategy – **The solution for the exercise is given as:**

1. Ask the participants to write down the roles and responsibilities they have to perform as a Broadband Technician. Then, provide the solution as:
  - Installation of the customer premise equipment.
  - Review maps to route job orders in an efficient and timely manner.
  - Attend all required technical, safety and team meetings.
  - Thorough knowledge of cable and internet products.
  - Properly operate and maintain installation tools and equipment.
  - Provide customers with product and service information.
  - Perform other duties as needed to meet customer expectations.
2. Ask the participants to write down few points to explain the broadband technology in brief. Then, provide the solution as:
  - The technique which lets any user access the Internet services at higher speeds as compared to a dial—up connection is called Broadband. The speeds vary, subject to the technology set up and the distribution of the levels. Residential services have quicker download speed when compared to upload speeds
3. Ask the participants to give definitions of ADSL and SDSL to differentiate between them. Then provide the solution as:
  - Asymmetrical Digital Subscriber Line: Mainly used in homes. ADSL provides faster downstream rather than the upstream. This sanctions faster data transmission toward the end user, on the same line used for voice service
  - Symmetrical Digital Subscriber Line: Used mainly in commercial set ups, for services like video and voice conferencing. Here both the download and upload speeds remain identical. Faster forms of SDSL include High-data-rate DSL (HDSL) and Very High-data-rate DSL (VDSL)
- **The solution for the Multiple-Choice Questions is as below:**
  - Ask the participants what Wifi stands for. Then provide the solution as Wireless Fidelity.
  - Ask the participants what waves are used for transmitting signals in a wireless network. Then provide the solution as Radio waves.
  - Ask the participants which is the slowest Internet Connection. Then provide the solution as Dial-up service.
  - Ask the participants which equipment is needed to allow home computers to connect to the Internet. Then provide the solution as







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## 2. Cable Wiring and Equipment Installation at Customer Premises

Unit 2.1 – Cable and Connectors

Unit 2.2 – Cable Laying and Connectorization

Unit 2.3 – Customer Premise Equipment

Unit 2.4 – Equipment Installation Procedures

Unit 2.5 – UPS and its types

Unit 2.6 – Checking of Voltage, current and earthing

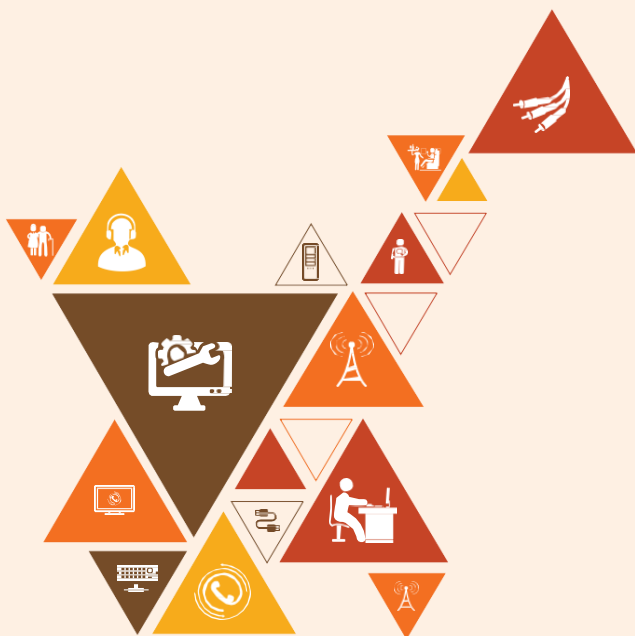
Unit 2.7 – Checking and testing battery

Unit 2.8 – Installation and repair of UPS

Unit 2.9 – Basic load calculation

Unit 2.10 – UPS and Battery compatibility

Unit 2.11 – Record keeping and Documentation



**TEL/N0111**

## Key Learning Outcomes

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

1. State the knowledge about cables and connectors
2. State the process of cable laying and its connection methods
3. Understand customer premise equipment like modem, router and switches
4. Execute and demonstrate the procedures for equipment installation
5. Execute and demonstrate the procedures for UPS installation
6. Explain how to check Voltage, current and earthing
7. Execute how to check and test battery
8. Execute installation and repair of UPS
9. Learn basic load calculation
10. Understand about UPS and Battery compatibility
11. Understand the importance of record keeping and documentation

## UNIT 2.1: Cable and Connectors

### Unit Objectives

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

1. Work with cables
2. Identify connectors

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- Coaxial cables, paired cables, twisted pair cables, fibre optic cables
- RJ-45, Straight tip(ST) connector, Lucent connector, Mutli-fiber Push On (MPO)

### Say

Good morning and warm welcome to this training program. Before we begin this session on cable and connectors, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us start this session on cable and connectors.

### Demonstrate

- Show the participants the different types of cables.

## Notes for Facilitation



- Explain that a cable can be defined as an assembly of electrical conductors/wires insulated from each other but laid up together (by being twisted around a central core).
- In addition, tell the participants that a cable is often misunderstood with a wire. Explain to them the difference between a wire and a cable with the help of the following table:

Parameter	Wire	Cable
<b>Definition</b>	Is a thin, flexible thread of metal	Is an assembly of electrical conductors/wires
<b>Uses</b>	Used to bear mechanical loads or electricity and telecommunication signals	Used for: <ul style="list-style-type: none"> <li>Power transmission</li> <li>Connecting two or more devices</li> <li>Carrying electric currents</li> </ul>
<b>Types</b>	Solid wire and stranded wire	Twisted pair cable, coaxial cable, multi conductor cable, fibre optic cable and so on

Table 2.1.1: Difference between a wire and a cable

- Tell them the basic classification of network cables with the help of the following figure:

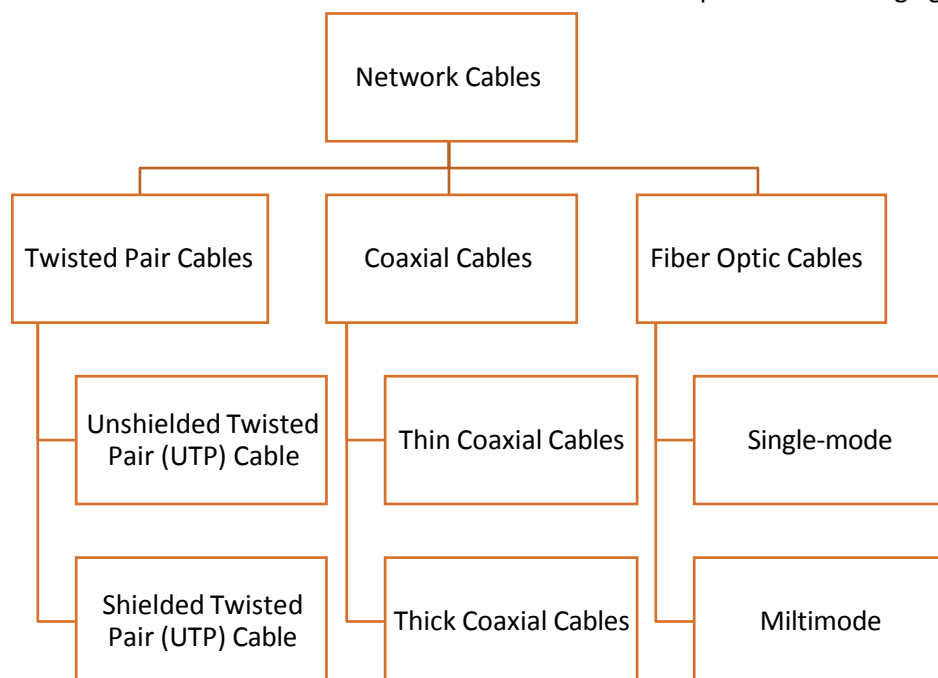


Fig. 2.1.1: Classification of Network Cables

- Briefly explain various cables used in broadband installation and show them the available ones.

## Demonstrate



- Show them different types of connectors.

## Notes for Facilitation



- Tell them that connectors provide interfaces for linking devices by using cables.
- Also, tell that connectors either have a male end with pins sticking out from it or a female part, also known as a socket, with holes for accommodating the pins.
- In addition, tell them that a pin layout describes which pin is to be coupled with which wire. Generally, each numbered pin corresponds to a wire within the cable.
- Tell them the different types of connectors with the help of the following figure:

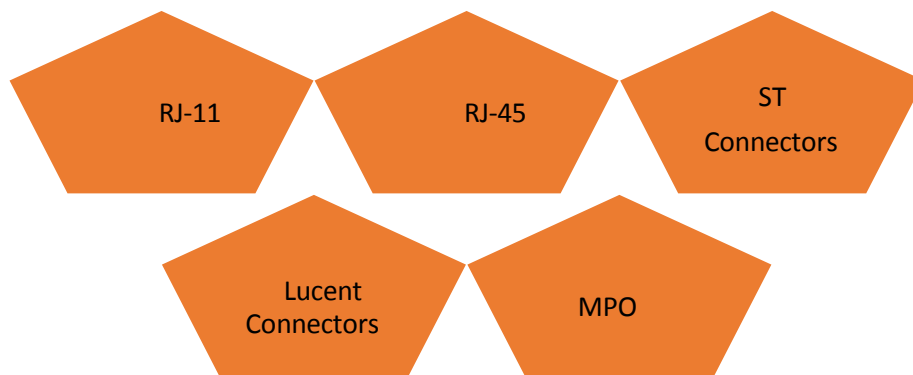


Fig. 2.1.2: Different Types of Connector

- Exercise Handling Strategy – **The solution for the exercise is given as:**
  - Ask the participants to list down different types of cables available in the lab with some practical application of each type of cable. Then provide the solution as:
    - Twisted Pair Cable
    - Coaxial Cable
    - Fibre Optic Cable
  - Ask the participants to list down different types of connectors and their applications with the types of cables they are used for. Then provide the solution as:
    - RJ-11
    - RJ-45
    - F- Type Connectors
    - Fibre Connectors
    - RS-232
  - Ask the participants to write down about fibre optic cable and mention some of the examples with its benefits. Then provide the solution as:
    - To prevent interference, any optical fibre has a glass core in center, surrounded by numerous coatings of material for protection which is further topped with an outer layer of PVC jacket or insulating Teflon.

This is for sure an expensive method when compared to others available in the market, but it has proven to be efficient in transmitting data in longer distances while ensuring good speed. This is further helpful in video conferencing and different interactive facilities.

- Ask the participants to answer the fill in the blanks.
  - Ask the participants what is used to connect the computer parts to the main supply. Then provide the answer as Power Unit Supply.
  - Ask the participants what is used to establish connectivity between computers. Then provide the answer as Router.
  - Ask the participants which cable is used to transmit. High-Definition signals. Then provide the answer as Standard HDMI Cable.

## UNIT 2.2: Cable Laying and Connectorization

### Unit Objectives

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

1. Perform the cable laying process
2. Perform the process of cable connection methods

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- Cables, connectors, crimping tools, cable tester

### Say

Good morning and warm welcome to this training program. Before we begin this session on cable laying and connectorization, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us begin this session on cable laying and connectorization.

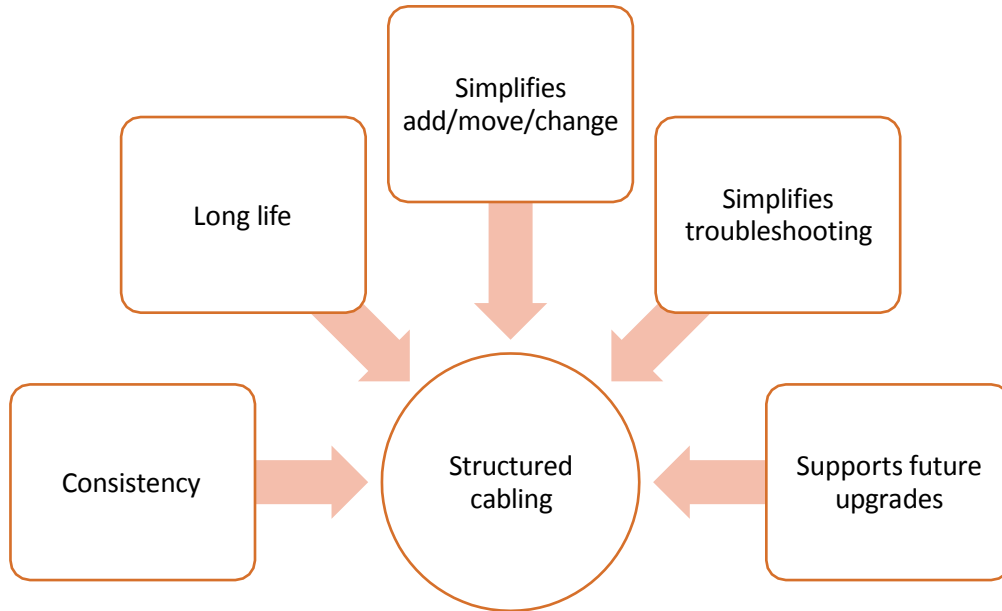
### Ask

Ask the participants whether they know about the cable laying process.

### Notes for Facilitation

- Explain to the participants that structured cabling refers to a complete system of cabling and associated hardware that integrates the voice, data and video to provide a comprehensive telecommunications infrastructure.

- Tell them that the whole system is made up of manageable blocks which can be easily moved, changed or added without disrupting the entire system.
- Explain the benefits of structured cabling with the help of the following figure:



*Fig. 2.2.1: Benefits of Structured Cabling*

- Next, tell them that the key components of structured cabling system are:
  - Horizontal Cabling
  - Backbone Cabling
  - Telecommunication Room
  - Work Area
  - Equipment Room
  - Entrance Facility
- Tell them that horizontal cabling uses Ethernet or fibre optic cables.



- Explain that the individual cable length should be 90 meters between the work area and the telecommunication room and the cables connecting computers to outlets should be limited to 3 meters in length, as shown in following figure:

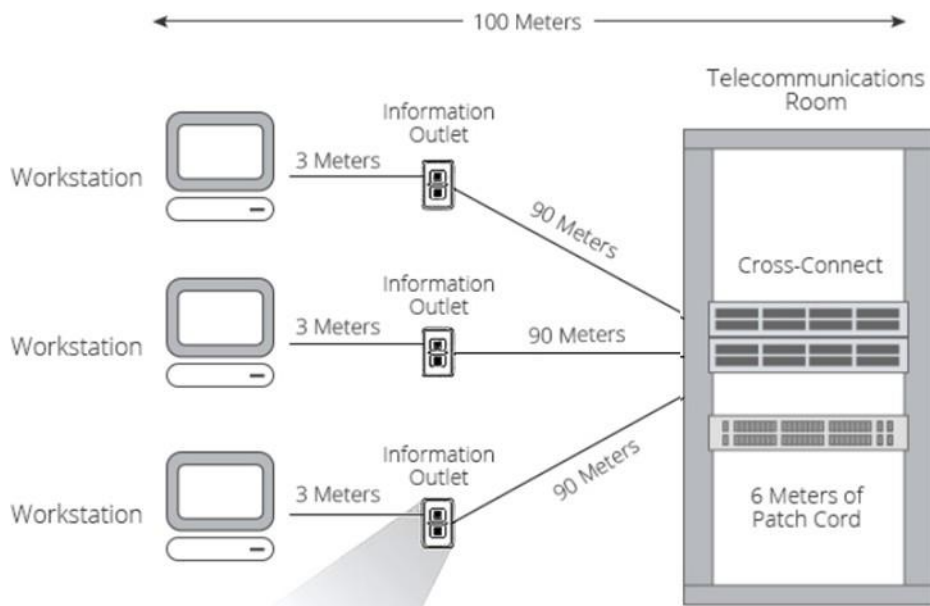


Fig. 2.2.2: Horizontal Cabling

- Explain that backbone cabling is done from floor to floor. The length of the cables connecting the equipment should not be more than 30 meters, as shown in following figure:

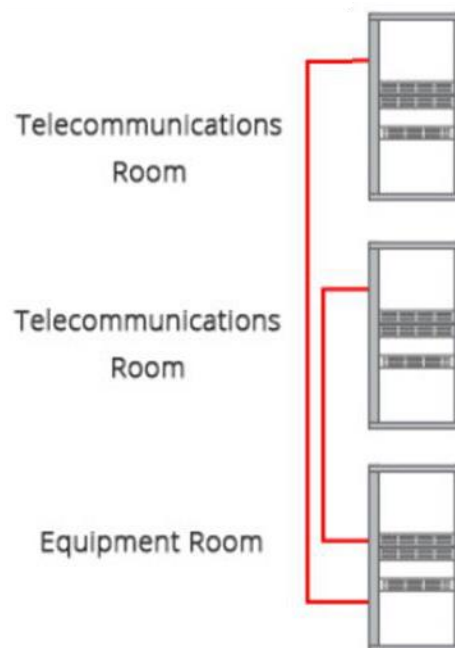


Fig. 2.2.3: Backbone Cabling

- Explain that the telecommunications room contains the termination points between horizontal cabling and backbone cabling.

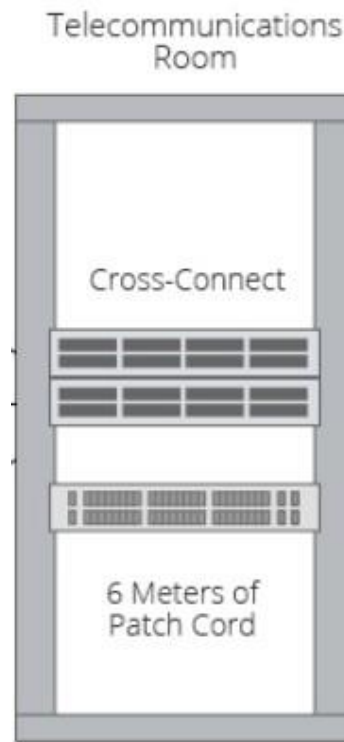


Fig. 2.2.4: Telecommunications Room

- Explain that the work area refers to the place where the equipment is connected to the termination point of the horizontal cabling. There should be a minimum of two outlets at each work area.
- Explain that the equipment room houses the equipment such as racks and routers and the wiring combination points in an environmentally protected zone.
- Explain that the entrance facility contains the cabling components that connect the indoor cabling to outside service facilities. This consists of service entrance pathways, cables, connecting hardware, circuit protection devices, and transition hardware.
- Explain the factors that help in choosing the correct cables for a network.

### Ask



Ask the participants whether they know about the connectorization process.

### Notes for Facilitation



- Explain to the participants that connectorization is the process of placing a connector on the end of a cable or wire.
- Tell them that a connector is a device such as a plug or jack that joins two wires or cables together.

- Explain the steps of the TIA/EIA 568A wiring sequence.
- Explain the steps of the TIA/EIA 568B wiring sequence.
- Explain to the participants that crimping refers to the joint between a cable and a connector. The joint is formed by deforming one of them and enabling one to hold the other. The resultant deformity is known as a crimp.
- Explain the steps of the cable crimping process.
- Exercise Handling Strategy – **The solution for the exercise is given as:**
  - Ask the participants the steps that need to be performed for performing a cable crimping. Then provide the solution as:
    - Cut the category 5 UTP is specified length
    - Strip of the outer covering
    - Insert these eight wires into the connector
    - Ensure every wire fits in their eight separate respective slots
    - Insert the cables with a firm and steady pressure
    - Complete assembly of connector should reach RJ-45 slot
  - Ask the participants to list the factors that need to be considered while choosing a cable for a network setup. Then provide the solution as:
    - Bandwidth
    - Signal attenuation
    - EMI (Electro-Magnetic Interference)
    - Cost of the cable
- Ask the participants to answer the fill in the blanks.
- Ask the participants what is the amount of data that needs to be transferred at a given time called. Then provide the answer as Bandwidth.
- Ask the participants Topology plays a critical role in determining what to set up networking infrastructure. Then provide the answer as hardware and cable types

## Demonstrate



- TIA/EIA 568A wiring sequence
- TIA/EIA 568B wiring sequence
- Cable crimping process

## UNIT 2.3: Customer Premises Equipment

### Unit Objectives

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

1. Identify customer premises equipment like modem, router and switches

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- Modem and broadband router, wireless router

### Say

Good Morning and warm welcome to this training program. Before we begin this session on customer premises equipment, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us begin this session on customer premises equipment.

### Ask

Ask participants, whether they know about the various customer premises equipment.

### Notes for Facilitation

- Explain to the participants that a modem stands for Modulator/Demodulator. It is a network device that enables a computer to transfer the data over a telephone line or a cable or a satellite connection.
- Tell them that modems are used in pairs, one at the transmitting end and the other at the receiving end.

- Explain that there are different types of modems based on the category of modem features such as:
  - Transmission mode: Synchronous and Asynchronous
  - Directional capacity: Half-duplex and full-duplex
- Explain that a synchronous modem uses a clock signal to transmit a continuous stream of data bits which are synchronized to the signal.
- Tell them that the asynchronous modems do not have a separate timing signal or clock between the modem and the DTE. They handle data bytes with start and stop bits.
- Tell them that the half-duplex modem allows transmission of data in a single direction only at a time.
- Tell them that the full-duplex modem permits transmission of data in both directions simultaneously as it has two carriers on the line, one outgoing and the other incoming.
- Explain that the modem uses the following continuous wave (CW) modulation techniques to convert digital data to analog signals:
  - Frequency shift keying (FSK)
  - Amplitude shift keying (ASK)
  - Phase shift keying (PSK)
  - Differential PSK (DPSK)
- Tell them about the parts of a modem.
- Explain to them that routers are at the gateways of networks.
- Tell them that a router is a device that routes the internet traffic between networks by joining the networks together. Data sent through the internet is in the form of data packets. A router receives the data packets, analyses its contents and then forwards the incoming packets to another network.
- Tell them that there are two types of routers:
  - Broadband routers
  - Wireless routers
- Tell them that the broadband routers also known as Cable or DSL router. They provide internet connection to the users through (RJ-45) WAN port.
- Tell them that the key features of a broadband router are as follows:
  - Provides broadband Internet access for users
  - Connects using wired or wireless LAN
  - Authenticates ISP subscribers
  - Enables multiple users to access the Internet simultaneously
- Tell them that instead of relying on cables for distributing data packets to computers, data packets are converted into radio signals by the wireless router which are broadcasted wirelessly using antennae.
- Explain the difference between a modem and a router.
- Tell them that a network switch is a small hardware device that connects two network devices (switches or routers) together. It acts as a bridge between multiple ports and helps to process and route packets at data link layer of the Open Systems Interconnection (OSI) reference model.

- Explain that the primary function of a switch is to receive information from any source connected to it and transmit that information to the suitable destination.
- Tell them that essentially, a switch serves as a controller that enables networked devices such as PCs, printers, access points, phones, lights, servers, and other hardware devices to talk to each other efficiently.
- Tell them that about Ethernet switch types:
  - Unmanaged switches
  - Managed switches
  - LAN switches
  - PoE switches
- Explain that an unmanaged switch does not require configuration. It can be simply plugged in and is therefore suitable only for basic connectivity.
- On the other hand, a managed switch can be custom-configured and thus provides more features and flexibility and improves the quality of service.
- Tell them about circuit-switching and packet-switching.
- Illustrate the differences between a router and a switch with the help of the following table:

	Router	Switch
Layer	Network layer	Data link layer
Function	Directs data in a network	Connects multiple devices
Used In	LAN, MAN, WAN	LAN
Transmission Mode	Full duplex	Half/Full duplex
Address used for data	Uses IP address	Uses MAC address
Examples	Linksys WRT54GL, Juniper MX, Cisco 3900	Alcatel's Omni Switch 9000; Cisco Catalyst switch 4500
Manufacturers	Linksys, Netgear, Cisco	Cisco, D-link and Juniper

Table 2.3.1 Difference between a router and a switch

- Exercise Handling Strategy – The solution for the exercise is given as:
  - Ask the participants which network device stores the IP addresses. Then provide the solution as: Router
  - Ask the participants which network device among the options connects two networks. Then provide the solution as: Gateway
  - Ask the participants which network device works in the network layer. Then provide the solution as: Router
  - Ask the participants which network device works on the data link layer of an OSI model. Then provide the solution as: Hub
  - Ask the participants which network device connects the devices in a twisted pair. Then provide the solution as: Bridge

## UNIT 2.4: Equipment Installation Procedures

### Unit Objectives

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

1. Execute and demonstrate the procedures for equipment installation

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- Modem, router, network switch, Power supply, Ethernet cable, tools

### Say

Good morning and warm welcome to this training program. Before we begin this session on customer premise equipment, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us begin this session on installation of equipment at customer premises.

### Ask

Ask participants, whether they know about installation of modem, router or network switch.

### Demonstrate

- Modem Installation process
- Router Installation process
- Networking Switch Installation process

## Notes for Facilitation



- Explain that this session will help them understand the correct way of installing network equipment such as modem, router and network switch at a customer's premises.
- Tell them that before beginning installation, they should prepare the site and ensure that they have the required and correct tools and equipment.
- Tell them that the following tools will be needed for installation:

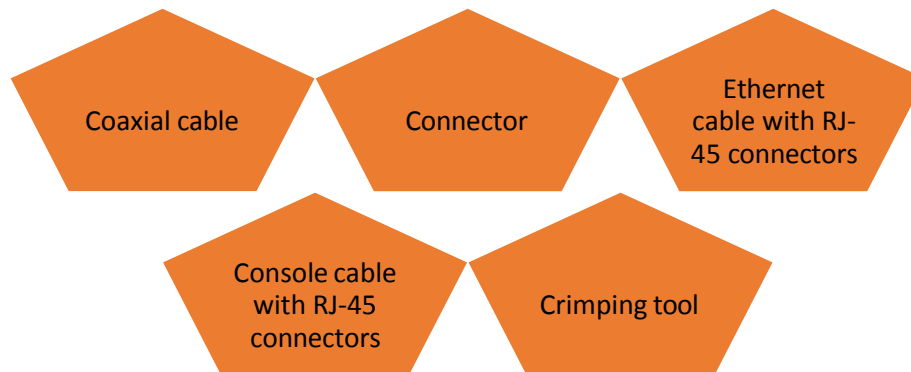


Fig. 2.4.1: Tools for Installation

- Explain that to ensure safety, they should work according to the following guidelines:

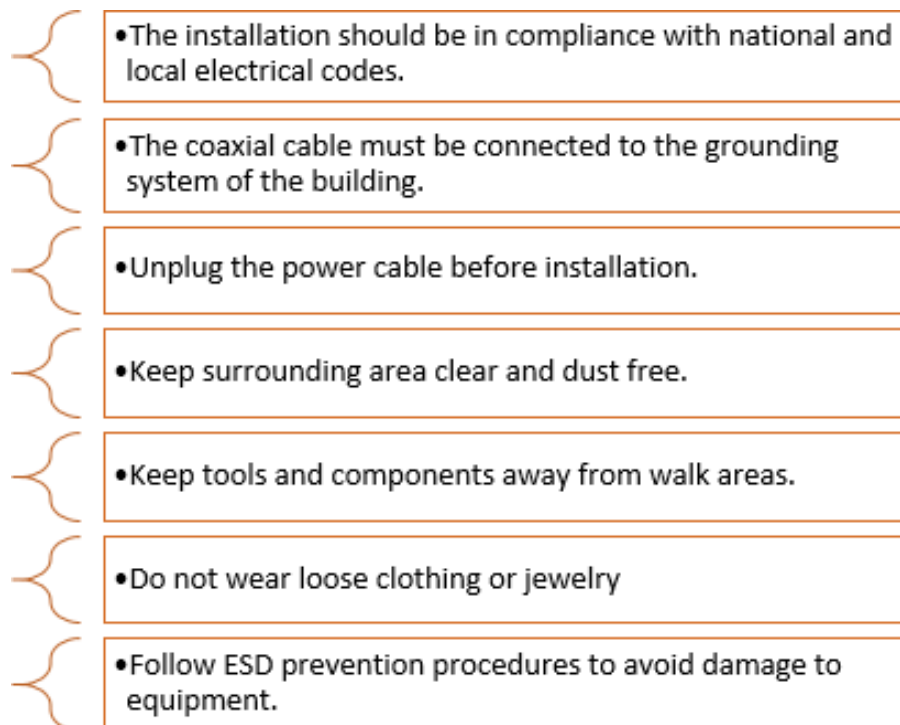


Fig. 2.4.2: Safety guidelines for Installation



- Explain the steps of installing a modem with the help of the following figure:

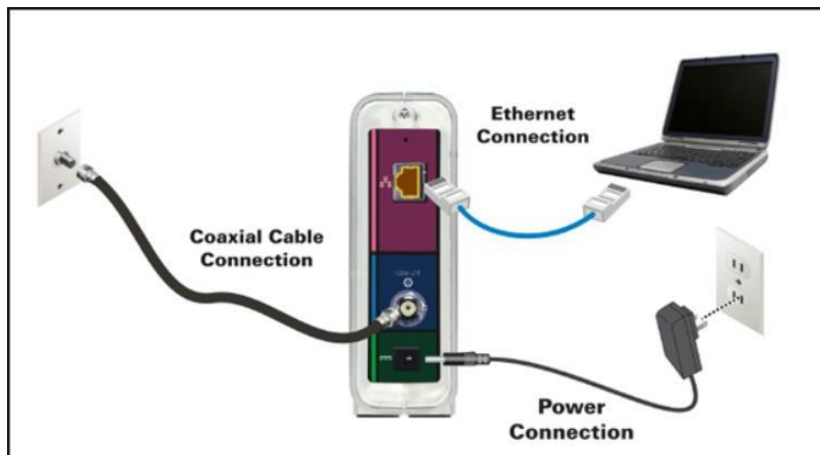


Fig. 2.4.3: Modem Installation

- Explain the steps of installing a router with the help of the following figure:

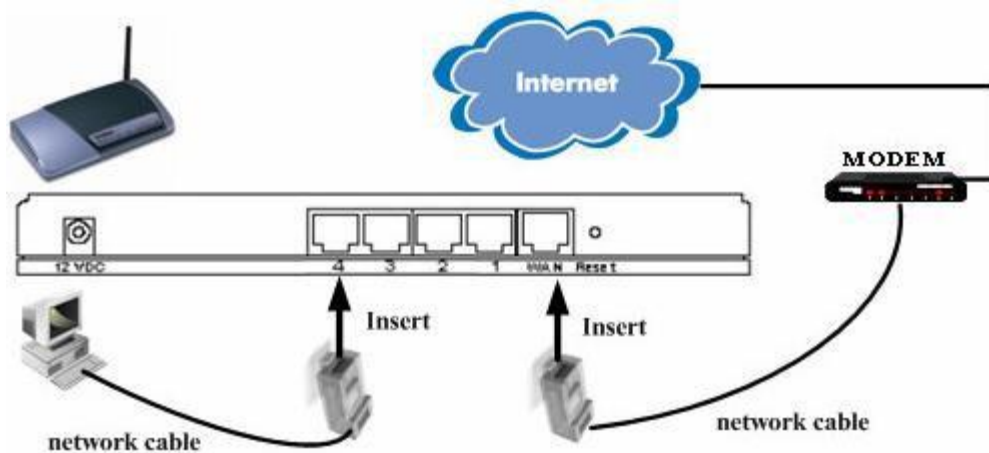


Fig. 2.4.4: Router Installation

- Explain the steps of installing a network switch with the help of the following figure:

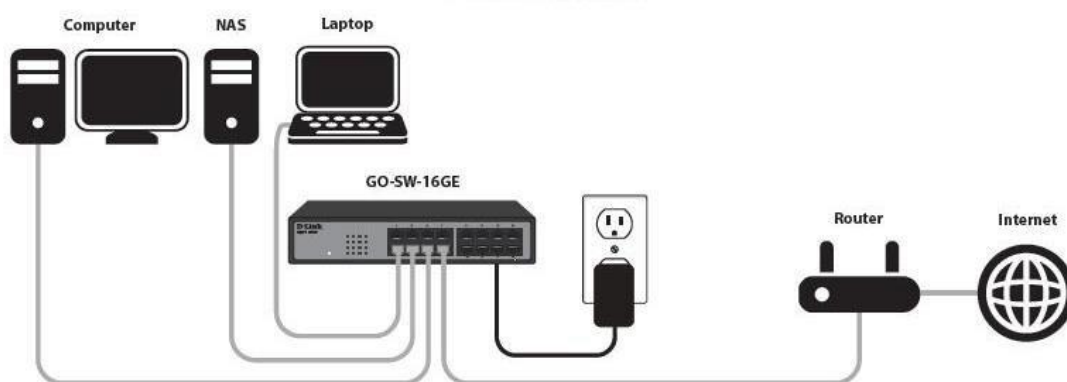


Fig. 2.4.5: Network Switch Installation

- Exercise Handling Strategy – **The solution for the exercise is given as:**
  - Ask the participants to install a modem in the lab and write down the step-by-step process of installation. Then provide the solution as:
    - Connect the coaxial cable to a splitter or a cable outlet.
    - Connect the other end of the cable to the modem through the cable connector on the modem.
    - To avoid damage, use hands to tighten.
    - Plug the end of the power cord to the modem's power port and other end into an electrical wall outlet.
    - Connect the end of the Ethernet cable to the Ethernet port and the other end to the modem
    - Do not plug power cord to power outlet while mounting the modem.
    - Ensure you have:
      - Wall-mounting template
      - Crosshead and flathead screwdriver
      - Two M3.5 (#6) screws with a flat underside. The maximum diameter of the screw head, required to mount the cable modem, is 9.0 mm
    - Mark the holes on the wall, by positioning and securing the wall mounting template.
    - Select the depth and diameter, to drill the holes. The depth of the holes should be at least 1½ inches (3.8 cm)
    - Reconnect the coaxial and Ethernet cable, after mounting the cable modem.
    - Connect the power cord into the power outlet on the wall and the +12VDC Power connector on the cable modem.
    - Arrange the cables properly to avoid any safety hazards.
    - Ensure that the cable modem is attached to the wall securely
  - Ask the participants to install a router in the lab and write down the step-by-step process of installation. Then provide the solution as:
    - Check the package of router for the items it is carrying in new pack
    - Arrange the following list before setting up a router
      - Internet service.
      - Information of Internet Service Provider (ISP) required for configuring the wireless router to access the Internet such as:
        - Internet Login Name and Password
        - Host and Domain Names
        - Fixed or Static IP Address Domain Name Server (DNS) Addresses
    - Use the indicator lights on the front of the wireless router to verify the status of various conditions

- Check the back of the wireless router
- Ask the participants to install network switches in the lab and write down the step by step process of installation. Then provide the solution as:
  - Plug in the power supply
  - Connect the incoming network cable to the switch, preferably in the first slot. The incoming cable from the modem will be considered in case of home and small office
  - Connect a Cat5 or Cat6 cable to another slot in the network switch. Attach the other end to a computer which needs to be connected to the network
  - Repeat this process until all the computers are connected or all slots are filled

## UNIT 2.5: UPS and its Types

### Unit Objectives

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

1. State the use and types of UPS

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- UPS

### Say

Good morning and warm welcome to this training program. Before we begin this session on UPS and its types, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us begin this session on UPS.

### Ask

Ask participants, whether they know what a UPS is.

### Demonstrate

- Show a UPS that could be in the classroom.

## Notes for Facilitation

- Explain to the participants that a UPS is a device that gets self-activated in events of power cuts.
- Tell them about the various types of UPS:
  - Standby UPS (Offline UPS)
  - Line Interactive UPS
  - Double Conversion On-Line
  - Delta Conversion On-Line
- Explain the participants about Offline and Online UPS on the basis of various parameters such as Operational Difference, Voltage distortion, Price, when to use, etc.
- Explain about UPS connectivity.
- Exercise Handling Strategy – **The solution for the exercise is given as:**
  - Ask the participants the purpose of UPS power supply. Then provide the solution as: An uninterruptible power supply (UPS) is a device that allows a computer to keep running for at least a short time when incoming power is interrupted. As long as utility power is flowing, it also replenishes and maintains the energy storage.
  - Ask the participants about the different types of UPS. Then provide the solution as: Standby UPS, Line Interactive UPS, Double Conversion On-Line, Delta Conversion On-Line

## UNIT 2.6: Checking of Voltage, Current and Earthing

### Unit Objectives

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

1. Check the voltage, current and earthing

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- Multimeter

### Say

Good morning and warm welcome to this training program. Before we begin this session on how to check voltage, current and earthing, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us begin this session on checking voltage, current and earthing.

### Ask

Ask participants, whether they know about voltage, current or earthing.

### Demonstrate

- Show the multimeter.

## Notes for Facilitation

- Explain what multimeter is used for.
- Tell them what all appliances can be verified using a multimeter.
- Tell them the two types of multimeter, Analog and Digital.
- Explain them about positive and negative connection.
- Explain to them what earthing is and why is it essential by telling them how it helps in avoiding hazards.
- Tell them about Grounding and how it protects the power system from malfunctioning.
- Elaborate on what can go wrong if grounding or earthing is avoided.
- Explain to them the Earthing checking procedure.

**Step 1:** Connect the probes and set the knob of the multimeter to 750V AC. Insert the red probe in phase hole and black probe in neutral hole

**Step 2:** Turn on the switch to measure the voltage.

**Step 3:** Insert the black test probe and red test probe, in earth and in phase respectively, and measure.

**Step 4:** Put the red probe and black probe in earth and neutral respectively, and measure.

**Step 5:** Calculate the voltage difference between Step 3 and Step 2.

**Step 6:** Calculate the difference in voltage received in Step 5 and Step 4

- Exercise Handling Strategy:
  - Ask the participants to explain how they will check current and voltage of power supply.  
Then provide the answer as:  
< Refer Unit 2.6 : Checking of Voltage, Current and Earthing  
Topic-2.6.1 Voltage and Current Checking >
  - Ask the participants to explain how they will check earthing.  
Then provide the answer as:  
< Refer Unit 2.6 : Checking of Voltage, Current and Earthing  
Topic-2.6.2 Earthing >

## UNIT 2.7: Checking and testing battery

### Unit Objectives

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

1. Check and test the battery

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- Battery

### Say

Good morning and warm welcome to this training program. Before we begin this session on how to check and test battery, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us begin this session on checking and testing battery.

### Ask

Ask participants, whether they know about how to test battery.

### Demonstrate

- Show the battery.



## Notes for Facilitation

- Briefly explain what battery is.
- Tell them why battery checking and testing is critical.
- Tell them how to assess the condition of battery.
- Explain them the various types of battery testing.
  - Impedance Testing
  - Electro-Chemical Testing
  - Load Bank Testing
  - Partial Discharge Testing
- Explain to them about UPS Battery Monitoring.
- Tell them about the maintenance check required for UPS.
- Exercise Handling Strategy: **(Fill in the blanks)**
  - Ask the participants the best way to assess the correct battery condition is through?  
Then provide the answer as: External Battery Testing
  - Ask the participants for large battery sets, what is more dependable.  
Then provide the answer as: block testing
  - Ask the participants in which testing batteries are discharged up to 80% of the capacity.  
Then provide the answer as: Partial Discharge Testing
  - Ask the participants what standard does UPS battery monitoring use.  
Then provide the answer as: IEEE 1491
  - Ask the participants under which testing method cell is evaluated to be charged.  
Then provide the answer as: Load Bank Testing(Discharge testing)
- Exercise Handling Strategy: **(Answer the questions)**
  - Ask the participants to list the different types of battery testing in detail.  
Then provide the answer as:  
< Refer Unit 2.7 : Checking and Testing Battery  
Topic-2.7.1 – Types of Battery Testing >
  - Ask the participants to list their observations while conducting a type of testing.  
Then discuss their observations.

## UNIT 2.8: Installation and repair of UPS

### Unit Objectives

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

1. Install a new UPS and repair a defective UPS

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- UPS

### Say

Good Morning and warm welcome to this training program. Before we begin this session on how to install and repair UPS, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us begin this session on installing and repairing UPS.

### Ask

Ask participants, whether they know about installing and repairing UPS.

### Demonstrate

- Show the UPS.

## Notes for Facilitation



- Briefly explain what is UPS used for.
- Tell them about the pre-installation checks.
  - Selecting the right company
  - Selecting the UPS
  - Location to install
- Explain them the UPS installation procedure.
- Explain them the procedure of installing and connecting batteries.
- Tell them about the common problems which a UPS normally faces.
- Tell them about the process to fix the UPS problems.
- Tell them about the preventive measures to undertake for a longer UPS life.
- Exercise Handling Strategy:
  - Ask the participants the pre-installation checks to be made for UPS installation.  
Then provide the answer as:  
    < Refer Unit 2.8 : Installation and Repair of UPS  
    Topic-2.8.1 UPS Installation -> Pre-Installation Checks >
  - Ask the participants the top three maintenance checks for a healthy UPS.  
Then provide the answer as:
    1. Cleaning of dust on or around UPS and batteries
    2. Rigidity of cable terminations inside the UPS systems, terminal blocks, and breakers
    3. Strength of DC capacitor banks

## UNIT 2.9: Basic Load Calculation

### Unit Objectives

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

1. Understand the basic load calculation for UPS power supply

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia

### Say

Good Morning and warm welcome to this training program. Before we begin this session on how to calculate the basic load, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us begin this session on basic load calculation.

### Ask

Ask participants, whether they know about load calculation.

## Notes for Facilitation



- Tell them about the different appliance consumption.

HIGH CONSUMPTION APPLIANCES					
Iron	1000 Watts	100W Light Bulb	100 Watts	Security Cameras	60 Watts
Electric Kettle	2000 Watts	60W Light Bulb	60 Watts	Alarm System	50 Watts
Hairdryer	1500 - 2000 Watts	Cell Phone Charger	10 Watts	PABX	150 Watts
Home Airconditioner	1500 - 2500 Watts	Alarm System	20 Watts	Point of Sale	220 Watts
Swimming pool pump	1500 Watts	Gate Motor	500 Watts	Photo Copier	250 Watts
Power Drill	600 - 1200 Watts	DVD Player	30 Watts	Fax Machine	120 Watts
Toaster	800 Watts	Fish Tank	700 Watts	Hi-Fi System	200-500 Watts
Microwave Oven	600 - 1200 Watts	Personal Computer	300 Watts	Playstation	200 Watts
Stove	1550 - 3000 Watts	Ink Jet Printer	100 Watts	Electric Fence	20- 500 Watts
Tumble Dryer	2500 Watts	Electric Fence	200 Watts	Electric Blanket	50-100 Watts
Clothes Iron	1000 Watts	DVD Player	30 Watts	Water Feature	50 Watts
Vacuum Cleaner	200 - 1200 Watts	Laptop Computer	150 Watts	Slow Cooker	200 Watts
Washing Machine	500 - 1500 Watts	ADSL Modem	20 Watts	Fridge/Freezer	500 Watts
Laser Printer	700 Watts	LCD TV	200 - 400 Watts	Ceiling Fan	70 Watts
Hot Plate	1200 Watts	DSTV	20 Watts	Garage Door	600 Watts
Geyser	2500 Watts	Plasma TV	200 - 400 Watts	X-Box	100 Watts
Coffee Maker	800 Watts				
TRY AVOID USAGE DURING LOAD SHEDDING					

- Tell them about the four steps to detect load by locating the Watts rating.
  - ❑ **Step 1:** Start by listing and placing all the equipment that are protected by inverter or a UPS in one column. For example, computers, alarm, TV, DSTV, lights and fridge.
  - ❑ **Step 2:** Put the volts and amps of each of these items in column 'b'. This information will be available on nameplates of each item. For example, 120V x 2.0A is written on the plate.
  - ❑ **Step 3:** Calculate the product of the volts and the amps of each equipment and note the total in a column labelled as "VA". If the rating of the equipment is given in watts, convert the rating to VA by multiplying the figure by 1.43 and note it into your VA column.
  - ❑ **Step 4:** Add an additional 25% to the total VA load to adapt any future growth. This also helps to avoid any potential overloading of the Inverter/UPS.
- Exercise Handling Strategy:
  - Ask the participants the meaning of load calculation. Then provide the answer as: The load is the combined amount of power that electrical devices will consume. To calculate the load, one should make an equipment list, which includes the total watts each piece of equipment requires to run properly.
  - Ask the participants steps to decide UPS Sizing.  
 <Refer Unit 2.9: Basic Load Calculation  
 Topic – 2.9.1 – Basic Load Calculation -> Sizing a UPS

## UNIT 2.10: UPS and Battery Compatibility

### Unit Objectives

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

1. Understand UPS and battery compatibility

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- UPS

### Say

Good Morning and warm welcome to this training program. Before we begin this session on UPS and battery compatibility, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us begin this session on UPS and Battery compatibility.

### Ask

Ask participants, whether they know about UPS and battery compatibility.

### Demonstrate

- Show the UPS.

## Notes for Facilitation

- Briefly explain them the importance of selecting the optimum UPS size and battery.
- Tell them about the factors on which the installation depends.
- Tell them about the various battery types used in a UPS.
- Explain them about battery sizing.
- Exercise Handling Strategy:
  - Ask the participants what system compatibility means.  
Then provide the answer as:  
Compatibility is the capacity for two systems to work together without having to be altered to do so. Compatible software applications use the same data formats. For example, if word processor applications are compatible, the user should be able to open their document files in either product.
  - Ask the participants how they will check UPS and battery compatibility.  
Then provide the answer as:  
<Refer Unit 2.10 : UPS and Battery Compatibility  
Topic- 2.10.1 – UPS and Battery Compatibility>

## UNIT 2.11: Record Keeping and Documentation

### Unit Objectives

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

1. Explain the importance of record keeping
2. Explain the importance of documentation

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- Two toy car mechanic set
- Sample repair form
- Sample installation report
- Sample feedback form

### Say

Good Morning and warm welcome to this training program. Before we begin this session on record keeping and documentation, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us begin this session on record keeping and documentation.

### Ask

Ask participants whether they know the importance of record keeping and documentation.



## Team Activity



- Divide the participants into two groups, Group A and Group B.
- Give one toy car mechanic set to each group.
- Ask them to make the model of a car using the set.
- Give an instruction manual to Group A.
- Do not give an instruction manual to Group B.

## Time



- Set 10 minutes as the time for completing the activity
- Ensure that the activity finishes in time.

## Explain



- Introduce the topic of record keeping and documentation.
- Explain that group A was able to perform better as they had been given clearly written step-by-step procedure.

## Notes for Facilitation



- After the end of team activity, ask both the groups to show their models.
- Ask them to observe that Group A's model is better than Group B.
- Explain to the participants the importance of maintaining proper documentation for all the activities undertaken.
- Tell them that maintaining proper documentation serves the following purpose:

Describes the  
installation, operation,  
maintenance of  
equipment

Assign responsibilities

Standardizes processes

Reduces/eliminates  
waste and inefficiency

Comply with  
regulations

Comply with customer  
requirements

Comply with  
contractual  
requirements

Fig. 2.5.1: Purpose of Documentation

- Tell them that the broadband technician should be able to understand and maintain the following:
  - Installation schedules
  - Operation manuals
  - Verbal instructions
  - Sequential start-up and operation tasks
  - Daily tasks

## Demonstrate



- Show a sample of repair form.
- Show a sample of installation report.
- Show a sample of feedback form.

## Notes for Facilitation



- Explain the importance of filling forms and submitting to the respective person for record keeping.
- Tell them that for documentation to be effective, it should possess the following characteristics:

It should be easily understood.

It should contain all the required information.

It should be easily accessible.

It should be easy to update.

*Fig. 2.5.2: Effective Documentation*

- Explain the information that a repair/replacement form contains.
- Explain the information that an installation report contains.

- Explain the information that a feedback form contains.
- Exercise Handling Strategy – The solution for the exercise is given as:
  - Ask the participants to prepare a Customer Complaint Report. Then provide the solution as:
    - Fill in the sample format of customer complaint form
  - Ask the participants to answer what they mean by record keeping. Then provide the solution as:
    - Documentation and record keeping guarantees accountability and coordination.
    - While giving best possible service to the customer, following-up is considered to be a major aspect and records in this step helps by providing previous history of the case and brief overview. Records become essential in cases which involves different steps of service to resolve an intricate problem





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## 3. Configure Equipment and Establish Broadband Connectivity

Unit 3.1 – Network Topologies

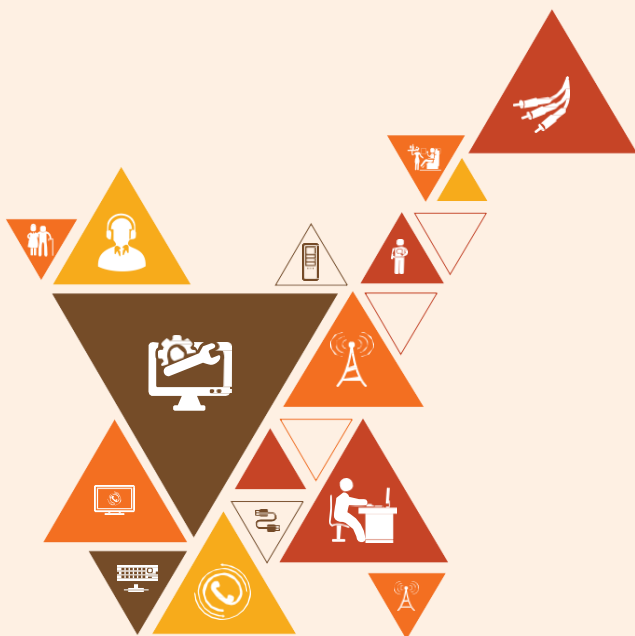
Unit 3.2 – Basic Command

Unit 3.3 – Connectivity of CPE and End User Devices

Unit 3.4 – Configuration Testing

Unit 3.5 – Comprehension and Interpretation of Technical Data

Unit 3.6 – Executing Speed Test and Analyze



**TEL/N0112**

## Key Learning Outcomes



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

1. Understand the network topologies.
2. Understand the basic command related to networking.
3. Understand the connectivity of CPE and End User devices.
4. Understand the Configuration of CPE and End User devices.
5. Understand the process of configuration testing.
6. Understand technical data.
7. Execute speed test and its analysis.

## UNIT 3.1: Network Topologies

### Unit Objectives

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

1. Understand the network topologies

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia

### Say

Good Morning and warm welcome to this training program. Before we begin this session on network topologies, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us start this session on network topologies.

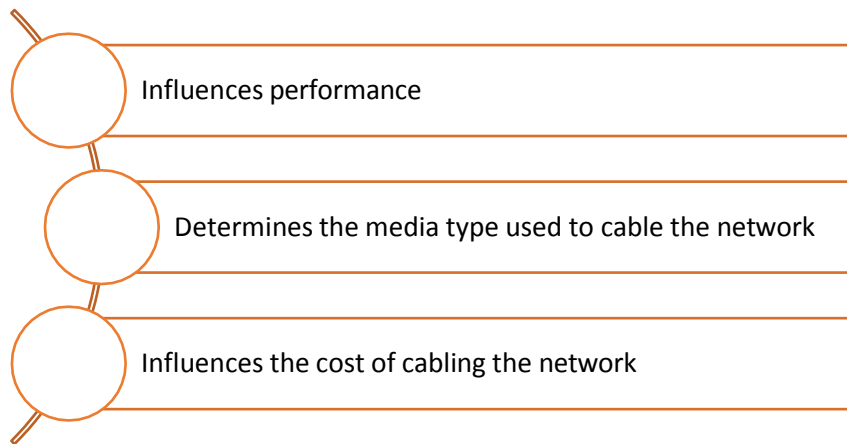
### Ask

Ask to the participants, whether they know about network topologies.

### Notes for Facilitation

- Explain to the participants that the term topology refers to the relationship between objects. Network topology refers to the layout of a network and the relationship between its various nodes.

- Explain the importance of network topology with the help of the following figure:



*Fig. 3.1.1: Importance of Network Topology*

- Tell them that network topologies are of two types:
  - Physical topology: the physical layout of the devices
  - Logical topology: the paths all the signals take between nodes
- Tell them that physical topologies are of following types:
  - Bus
  - Star
  - Token Ring
  - Ring
  - Mesh
  - Tree
- Explain each topology one by one with the help of diagram.
- Explain the advantages and the disadvantages of the bus topology as follows:

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Cost effective</li> <li>• Used in small networks</li> <li>• Easy to understand</li> <li>• Easy to expand</li> <li>• Requires least cable length</li> </ul>	<ul style="list-style-type: none"> <li>• Slower than ring topology</li> <li>• Cable has limited length</li> <li>• Cannot handle heavy traffic</li> <li>• Cable failure leads to network failure</li> </ul>

*Fig. 3.1.2: Advantages and Disadvantages of Bus Topology*



- Explain the advantages and the disadvantages of the ring topology as follows:

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Cheap to install</li> <li>• Easy to expand</li> <li>• Can handle heavy traffic</li> </ul>	<ul style="list-style-type: none"> <li>• Difficult to troubleshoot</li> <li>• Adding and deleting computers disturbs network activity</li> <li>• One computer failure leads to network failure</li> </ul>

*Fig. 3.1.3: Advantages and Disadvantages of Ring Topology*

- Explain the advantages and the disadvantages of the star topology as follows:

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Fast performance</li> <li>• Easy to upgrade</li> <li>• Easy to troubleshoot</li> <li>• Easy to setup</li> <li>• A node failure does not disrupt network activity</li> </ul>	<ul style="list-style-type: none"> <li>• High cost of installation</li> <li>• Expensive to use</li> <li>• Performance based on capacity of hub</li> <li>• Hub failure leads to network failure</li> </ul>

*Fig. 3.1.4: Advantages and Disadvantages of Star Topology*

- Explain the advantages and the disadvantages of the mesh topology as follows:

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Robust</li> <li>• Provides privacy and security</li> <li>• Easy to diagnose fault</li> <li>• Each connection carries its own data load</li> </ul>	<ul style="list-style-type: none"> <li>• Difficult to install and configure</li> <li>• High cost of cabling</li> <li>• Requires bulk wiring</li> </ul>

*Fig. 3.1.5: Advantages and Disadvantages of Mesh Topology*

- Explain the advantages and the disadvantages of the tree topology as follows:

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Easy to maintain</li> <li>• Easy to diagnose fault</li> <li>• Easy to expand</li> </ul>	<ul style="list-style-type: none"> <li>• High cost</li> <li>• Requires heavy cabling</li> <li>• Difficult to add nodes</li> <li>• Hub failure leads to network failure</li> </ul>

Fig. 3.1.6: Advantages and Disadvantages of Tree Topology

### Ask



Ask to the participants, whether they know about broadband network elements.

### Demonstrate



- How to find the IP address of a network card
- How to find the IP address of a smart phone
- How to find the MAC address of a network card

### Notes for Facilitation



- Introduce the topic of broadband network elements.
- Tell them that network elements are as follows:
  - Network Gateway
  - IP address
  - Subnet Mask
  - Ethernet Address
  - MAC Address
- Explain each element one by one.
- Explain that network gateway that is a hardware device such as a router, firewall, or a server which acts as a gate between two networks.
- Explain the features of a gateway as follows:
  - Enables flow of traffic
  - Protects the nodes
  - Translates data received from other networks

- Explain that IP address is a unique identity for every computing device such as personal computers, tablets, and smartphones using the internet. The device uses this address to identify itself and set up communication with the other devices in the IP network.
- Illustrate by giving the following example:
  - Suppose you want to send a letter to your friend. You have to write the destination address on the envelope to enable the letter to reach your friend.
- Tell them that in the same way, an IP address basically has two primary functions:
  - As an interface identification for a network of host machines
  - To provide a location of that machine
- Tell them that there are specific types of IP address, which are as follows:
  - Private IP address: The address reserved for internal use behind a router.
  - Public IP address: The address provided by Internet Service Provider (ISP) for a user.
  - Static IP address: A permanent internet address that never changes. It has to be manually configured for a device.
  - Dynamic IP address: A temporary internet address that is assigned every time a computer or device accesses the Internet. It is automatically assigned to each connection.
- Tell them about the two standards of IP addresses, IPv4 and IPv6.
- Tell them that an IP address has two parts, the network address and the host address. A subnet mask separates the IP address into the network and the host addresses.
- Tell them that subnet mask is short for sub network mask. The subnet mask is basically used by the TCP/IP protocol to check whether a host is on local subnet or on remote network.
- Tell them that the benefits of sub netting are as follows:
  - Enhances network performance and speed
  - Improves network security
  - Reduces network congestion
  - Eases administration
  - Controls network growth
- Tell them that the Ethernet address is the physical address that uniquely identifies an individual Ethernet controller board.
- Tell them that the Ethernet address is also referred to as media access control address (MAC address). It is a unique 48-bit hardware number that is "burnt into" the device by the manufacturer of the Ethernet or network card.
- Tell them that the MAC address is also referred to as hardware or physical address of a device.

- Tell them the difference between the IP address and the MAC address with the help of the following figure:

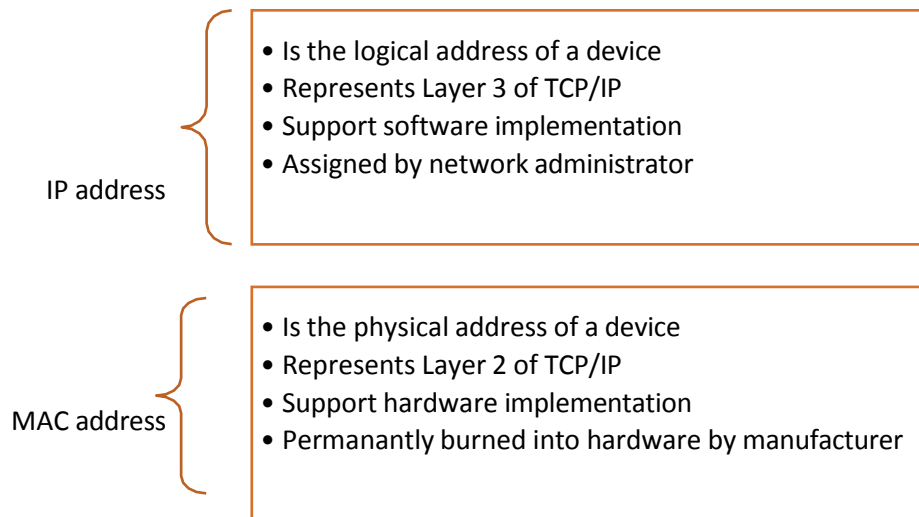


Fig. 3.1.7: IP address vs. MAC address

- Exercise Handling Strategy – The solution for the exercise is given as:
  - Ask the participants to describe the term topology. Then provide the solution as:
    - Schematic description of the planning of a network is referred to as topology, when discussing communication networks.
  - Ask the participants to describe the mesh network. Then provide the solution as:
    - A mesh network is a group of connectivity devices, such as Wi-Fi routers that act as a single network, so there are multiple sources of connectivity around your house instead of just a single router. The mesh network topology consists of two types: full mesh and partial mesh. When each system is interconnected directly it's called as full mesh topology. In case where some systems are connected to each other while the others are only connected to those, which exchange data in abundance, is referred to as partial mesh topology.
  - Ask the participants what they understood by the term MAC Address. Then provide the solution as:
    - The hardware address of a network interface card (NIC) is called its MAC address. MAC stands for Media Access Control.
- Ask the participants to answer the Multiple Choice Questions.
  - Ask the participants which term refers to the way in which the nodes of a network are linked together. Then provide the solution as: Topology
  - Ask the participants what a network comprising multiple topologies is known as. Then provide the solution as: Hybrid
  - Ask the participants the maximum number of IP addresses that can be assigned to hosts on a local subnet that uses the 255.255.255.224 subnet mask. Then provide the solution as: 30
  - Ask the participants if a host on a network has the address 172.16.45.14/30, what is the subnetwork this host belongs to. Then provide the solution as: 172.16.45.12

## UNIT 3.2: Basic Commands

### Unit Objectives

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

1. Understand the basic commands related to networking

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- Computer with internet connection

### Say

Good Morning and warm welcome to this training program. Before we begin this session on basic commands related to networking, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us start this session on basic commands related to networking.

### Ask

Ask to the participants, whether they know about the basic commands related to networking.

### Notes for Facilitation

- Tell the participants that ipconfig is the short form of internet protocol configuration. It is a Windows console application designed to run from the Windows command prompt. It displays the IP address, subnet mask, and default gateway for all physical and virtual network adapters.

## Demonstrate



- How to use the ipconfig command
- How to use the ping command

## Notes for Facilitation



- Tell them that ipconfig supports various command line options. The command ipconfig /? displays the set of available options, such as:
  - ipconfig /all
  - ipconfig /release
  - ipconfig /renew
  - ipconfig /displaydns
  - ipconfig /flushdns
  - ipconfig /registerdns
- Tell them that the ping command is a basically Command Prompt command which is used to test the whether the source computer can reach another computer at a specified destination.
- Explain that the ping command works by sending Internet Control Message Protocol (ICMP) Echo Request messages to the destination computer and then waits for the response.
- Tell them that the purpose of using ping command is:
  - To test connectivity
  - To determine the response time
- Tell them that they can use the ping command in following ways:
  - Ping xxx.xxx.xxx.xxx
  - Ping site.com (web address)
  - Continuous Ping (Ping xxx.xxx.xx.xx -t)
  - Number of Pings (Ping xxx.xxx.xx.xx -n 10)
  - Size of Packet (Ping xxx.xxx.xx.xx -l 1500)
  - Time Out (Ping xxx.xxx.xx.xx -w 5000)
  - Resolving Host name Address (Ping -a xxx.xxx.xx.xx)
- Tell them that in all of these examples "xxx.xxx.xxx.xxx" is an example of a Domain Name or an IP Address.
- Exercise Handling Strategy – **The solution for the exercise is given as:**

1. Internet Protocol Configuration	6. ping
2. TCP/IP network configuration values ; DHCP and DNS	7. "n"
3. ipconfig /flushdns	8. ping
4. ipconfig /registerdns	9. ping<<site>>.com
5. ipconfig /displaydns	10. Continuous Ping

## UNIT 3.3: Connectivity of CPE and End User Devices

### Unit Objectives

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

1. Understand the connectivity of CPE and End User Devices
2. Understand the configuration of CPE and End-User Devices

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia

### Say

Good Morning and warm welcome to this training program. Before we begin this session on connectivity of CPE and end user devices, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Now let us start this session on connectivity of CPE and end user devices.

### Notes for Facilitation

- Tell the participants that, in telecommunication terminology, any equipment that is installed at a customer location is referred to as customer premises equipment (CPE).
- Tell them that CPE is generally owned by the telecommunication provider and includes hardware such as telephone handsets, cable TV set-top boxes, and Digital Subscriber Line routers.

- Explain the connectivity of CPE and end user devices from the main infrastructure with the help of the following figure:

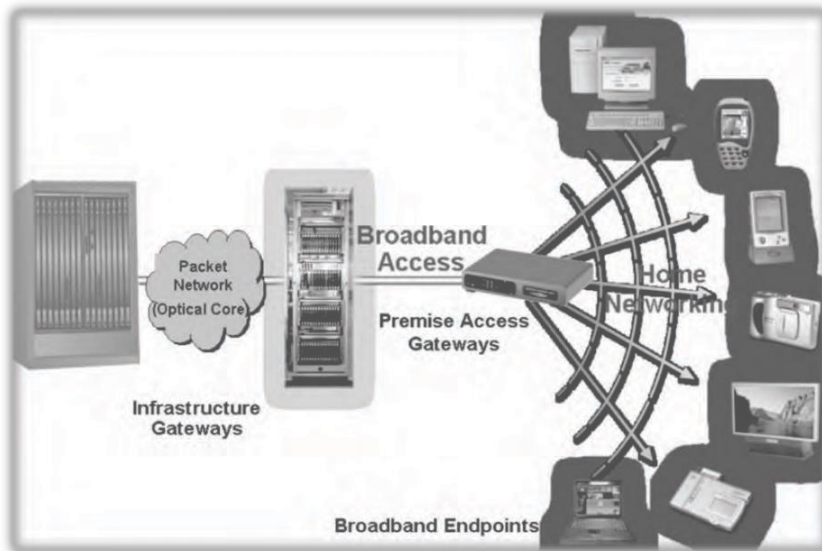


Fig. 3.3.1: Broadband Connectivity

- Explain them how to check if the Internet is connected.
- Explain to them the steps of configuring TCP/IP for Windows 11.
  - Step 1: Click Start -> Control Panel
  - Step 2: Click Network and Internet
  - Step 3: For Wi-Fi, select Wi-Fi-> Manage known networks and choose network for which the settings needs to be altered
  - Step 4: For Ethernet, select Ethernet, then select network to connect
  - Step 5: Next to IP assignment, select Edit
  - Step 6: Select Automatic (DHCP) or Manual under Edit network IP settings or Edit IP settings
  - Step 7: To specify IPv4 / IPv6 settings manually. Under Edit network IP settings or Edit IP settings, choose Manual, then turn on IPv4/IPv6
  - Step 8: To specify an IP address, in the IP address, Subnet mask, and Gateway boxes, type
  - Step 9: To specify a DNS server address, in the Preferred DNS and Alternate DNS boxes, type the addresses of the primary and secondary DNS servers
  - Step 10: To specify if you want to use an encrypted (DNS over HTTPS) or unencrypted connection to the DNS server you specify, for Preferred DNS encryption and Alternate DNS encryption, choose the setting you want
  - Step 11: Select Save.
- Exercise Handling Strategy – **The solution for the exercise is given as:**
  - Ask the participants to demonstrate configuration of TCP/IP in Windows 11 and write the steps. Then provide the solution as:  
 <Refer Unit 3.3: Connectivity of CPE and End use devices Topic – 3.3.3 Configuring TCP/IP for Windows 11>



- Ask the participants, demonstrate configuration of TCP/IP in MAC and write the steps. Then provide the solution as:
  - Click the Apple menu then select System Preferences.
  - When the System Preferences screen appears, look for Internet & Wireless section and click Network.
  - Under the Network screen, select Airport, and then click Advanced
  - Click TCP/IP->In the Configure IPV4 box, please select "Manually"->and then fill in the IP address, Subnet Mask and the Router (the default gateway)-> click OK
- Ask the participants to explain CPE. Then provide the solution as:

A telecommunications hardware that is positioned at customer's home or at the business of a customer is referred to as CPE device. Some examples of such equipment are set-top boxes which are used for cable, digital subscriber line or broadband routers, VoIP base stations, telephone handsets, etc.

## UNIT 3.4: Configuration Testing

### Unit Objectives

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

1. Understand configuration testing

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids

### Say

Good Morning and warm welcome to this training program. Before we begin this session on configuration testing, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Now let us start this session on configuration testing.

### Notes for Facilitation

- Start by explaining the meaning of configuration testing.
- Tell them that configuration testing is a process of testing the system along with the supported software and hardware configurations.
- Tell them that the purpose of configuration testing is to find out the ideal configuration that the system can work with, without any flaws or bugs.
- Explain that there are certain pre-requisites for configuration testing. These are as follows:
  - Creating various combinations of configuring software and hardware
  - Prioritizing the configurations
  - Testing every configuration based on prioritization

- Tell them that the objectives of configuration testing is to:
  - Validate the system to ensure that it fulfils the configurability requirements
  - Manually causing failures to help identify any inherent defects
  - Determine an ideal configuration of the application
  - Analyse the performance of the system by adding or modifying the hardware resources
  - Analyse the efficiency of the system

## Demonstrate

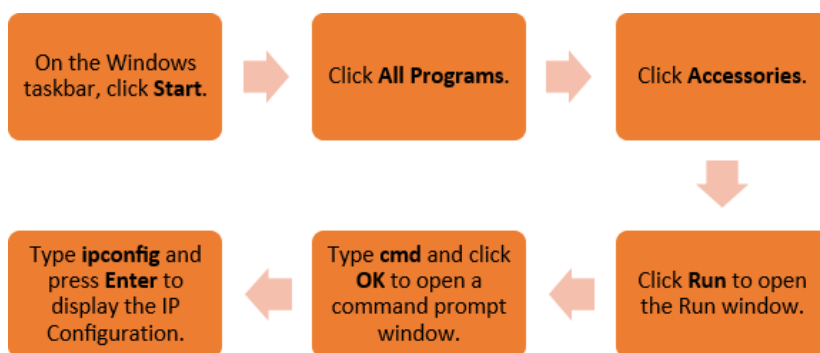


- How to verify IP address in Windows 11 for Wifi.
- How to verify IP address in Windows 11 for Ethernet.

## Notes for Facilitation



- Explain that once the TCP/IP configuration is done in Windows 11, the next step is to verify the IP address.
- Explain the steps of to verify the IP address in windows 11.
- Exercise Handling Strategy – **The solution for the exercise is given as:**
  - Ask the participants to explain the term configuration testing with an example. Then provide the solution as:
    - Configuration testing is defined as a software testing. It checks a system with multiple combinations of software and hardware to find out the optimal configurations that the system can work without any flaws or bugs.
  - Ask the participants the steps of configuration testing. Then provide the solution as:



- Ask the participants, explain the importance of configuration testing while discussing an example. Then provide the solution as:
  - Without configuration testing being performed it is difficult to analyze the optimal system performance and also software might encounter compatibility issues that it is supposed to run on.

## UNIT 3.5: Comprehension and Interpretation of Technical Data

### Unit Objectives

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

1. Comprehend and interpret technical data

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids

### Say

Good Morning and warm welcome to this training program. Before we begin this session on comprehension and interpretation of technical data, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Now let us start this session on comprehension and interpretation of technical data.

### Demonstrate

- Run ipconfig/all command at the command prompt and display the output.

### Notes for Facilitation

- Explain to the participants that it is very important for a broadband technician to be able to comprehend and interpret technical data such as IP configuration and network problems.
- Tell them that they need to understand the output displayed when they type " ipconfig /all" at the command prompt.

- Tell them that the meaning of output is as follows:
  - **Host Name:** Displays the name of the computer, as seen by Internet Protocol
  - **Node Type:** Tells how one computer identifies the address of another computer on the LAN
  - **DHCP Enabled:** If set to yes, implies dynamic IP address and if set to no, implies static IP address
  - **Description:** Provides short description of the network connection
  - **IPv6 address:** Displays IP address in new IPv6 protocol.
  - **IPv4 address:** Displays IP address of your computer in the local network.
  - **Default gateway:** Displays IP address of router used to connect to Internet
  - **DHCP server:** Displays address of server which assigns dynamic addresses to the computers on the network
  - **Subnet mask:** Defines the range of addresses that can be assigned to computers by the router
  - **Physical address:** Displays the MAC address of the computer.
- Exercise Handling Strategy – **The solution for the exercise is given as:**
  - Ask the participants to explain about the term technical data and give some examples. Then provide the solution as:
    - It is very important for a broadband technician to know how to interpret the technical data. He should be aware of technical data and its interpretation.
    - "ipconfig /all >c:\ipconfig.txt" (less the "")
    - "notepad c:\ipconfig.txt" (less the ""), for immediate examination.
    - Or, copy file to another computer by typing "c: \ipconfig.txt", for comparative examination.
  - Ask the participants, what is method to interpret the technical data? Explain in brief. Then provide the solution as:
    - Data interpretation refers to the implementation of processes through which data is reviewed for the purpose of arriving at an informed conclusion.
    - Regression analysis
    - Cohort analysis
    - Predictive and prescriptive analysis
  - Ask the participants to explain what a DNS number indicates. Then provide the solution as:
    - **Domain Name System** is the Internet's system for converting alphabetic names into numeric IP addresses. For example, when a Web address (URL) is typed into a browser, DNS servers return the IP address of the Web server associated with that name.

## UNIT 3.6: Executing speed test and analyze

### Unit Objectives

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

1. Explain how to run, read and communicate speed tests

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids

### Say

Good Morning and warm welcome to this training program. Before we begin this session on speed tests, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Now let us start this session on executing and analyzing speed tests.

## Notes for Facilitation



- Explain to them why speed tests are required.
  - Talk about certain terminologies such as Download speed, Upload speed, Mbps, Latency and Ping.
  - Demonstrate to them how they can run a speed test.
  - Explain how they can interpret the results of the speed test.
  - Discuss ways to troubleshoot a faulty speed test.
  - Explain how important it is to communicate the speed result analysis with the client.
  - Discuss with them situations that could make the client angry and how they have to stay composed.
  
  - Exercise Handling Strategy – **The solution for the exercise is given as:**
    - Ask the participants to explain about the process of running a speed test. Then provide the solution as: < Refer Unit 3.6 : Executing speed test and analyze Topic 3.6.1 – Speed Test measures -> How to run a speed test >
    - Ask the participants what they mean by latency. Then provide the solution as: the time data took to travel to its destination and returned back to user
- Solution of fill in the blanks:**
1. Ping
  2. speed of uploading and downloading information bits per second(bps)
  3. 1,000,000 bps ; 1,000,000,000 bps
  4. coaxial
  5. maintain the connection







## Key Learning Outcomes

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

1. State the importance and function of escalation matrix.
2. Understand the process of problem-solving.
3. Understand how to identify cables and connectors correctly.
4. Understand the importance of EMI and EMC.
5. Understand the process of crimping and soldering.
6. Demonstrate troubleshooting of cable and connector.
7. Demonstrate troubleshooting of CPE (Modem, Router, and Switch).
8. Demonstrate the troubleshooting of configuration and connectivity.

## UNIT 4.1: Escalation Matrix

### Unit Objectives

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

1. State the importance and function of escalation matrix

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- Escalation matrix form

### Say

Good Morning and warm welcome to this training program. Before we begin this session on escalation matrix, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us start this session on escalation matrix.

### Ask

Ask the participants whether they know about escalation matrix.

### Demonstrate

- Escalation Matrix Guideline of the company “Vistara”

## Notes for Facilitation



- Explain to the participants that the term escalation means when something or some problem increases or intensifies in magnitude.
- Give an example:
  - If a customer has registered a complaint and it is not solved by the field technicians, then he might raise the issue to the technician's supervisor or manager. This is called escalation.
- Escalation matrix refers to the hierarchy in an organization that deals with issues or problems as they escalate.
- To continue with the same problem:
  - If the manager is not able to resolve customer complaint, it then goes to senior manager and then to operations head and so on higher up till it reaches the top level.
- Tell them that this chain of people or hierarchy is referred to as escalation matrix.
- Explain the key features of escalation matrix.
- Explain the escalation matrix form to the participants.
- Explain the importance of having a clear-cut escalation matrix in place.
- Tell them that it helps both the technician as well as the customer.
- Explain that there will be situations in which the technicians might not be able to resolve an issue even after making reasonable effort. In such cases, he/she can seek help so that the next higher person (with more authority/decision-making powers) can step in and try to resolve the issue in the best possible manner and as per the policies laid down.
- Similarly, from a customer's point of view, an escalation matrix assures that the issue will eventually get resolved as per his/her satisfaction and within a specified time period.
- Tell them that escalation matrix consists of levels L1, L2 , and L3 where:
  - L1 is the first line of end user support
  - L2 is the next level, if L1 is not able to resolve the issue within a specified number of days
  - L3 highest level, if L2 is not able to resolve the issue within a specified number of days
- The following figure depicts the levels of escalation matrix:

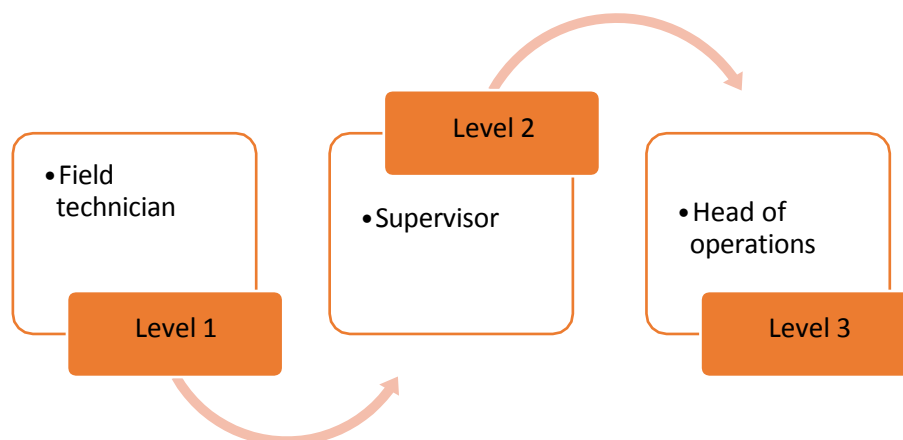


Fig. 4.1.1: Levels of Escalation Matrix

- Tell them that if there is an escalation plan in place, the technicians would know whom to contact next and how to contact them when required.
- Explain to them that an escalation plan refers to a set of protocols and procedures to be followed to deal with potential problems.
- Exercise Handling Strategy – **The solution for the exercise is given as:**
  - Ask the participants to what they mean by escalation. Explain by giving an example. Then provide the solution as:
    - Escalation matrix is a process of set protocols and procedures which defines the steps while handling any potential dispute and/or problem.
  - Ask the participants to discuss some of the cases in which escalation matrix needs to be prepared. Then provide the solution as:
    - Operational (scheduling, service cancellations, etc.)
    - Logistical (delivery, in transit missing products, etc.)
    - Technical (error messages, etc.)
  - Ask the participants what kind of information can they get from an escalation matrix form. Then provide the solution as:
    - Scheduling
    - Obtaining Instructions
    - Customer Satisfaction
    - Service Information
    - Obtaining materials
    - Performance issues
    - Service cancellations

## UNIT 4.2: Problem Solving

### Unit Objectives

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

1. Understand the process of problem solving

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia

### Say

Good Morning and warm welcome to this training program. Before we begin this session on problem solving, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us start this session on problem solving.

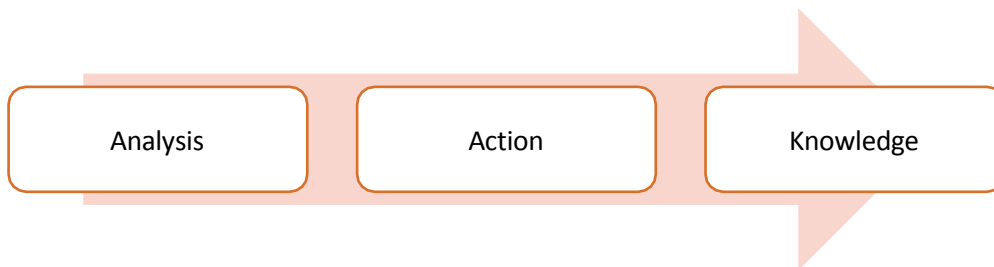
### Ask

Ask the participants whether they know about problem solving.

### Notes for Facilitation

- Tell the participants about the problem solving process and its steps. Use the following pointers to explain the steps:
  - The first step in a problem solving process is to identify the problem.
  - Then, gather details about the problem and its possible solution. The more data you have the better decision-making you can do.

- Third step is to analyse the problem. You may need to use mathematical or statistical tools to arrive at a point, which will help you to take a decision.
- Develop alternatives, which will help to have a plan B in case plan A does not work.
- Finally, choose the best option.
- Then, tell the participants about some benefits of problem solving, such as:
  - It is based upon previous knowledge and they will learn from it.
  - It will help them to understand the process and suggest improvements by eliminating the waste.
  - It requires them to be thorough with the process and also be updated with the new developments.
  - Critical and reflective thinking will help to identify the process disruptions and the reasons for it.
  - Analyse the reasons for the delay and how the improvements can be done.
  - The problem solving process can be defined as given in the following figure:



*Fig. 4.2.1: Problem solving*

- Explain the importance of solving a customer's problem/issue as soon as possible.
- Explain the correct way of behaving when a customer reports a problem.

## Role Play



- Ask two participants to enact a role play.
- One of them should act as a broadband technician and the second one should act as his/her customer.
- The situation is that the customer has complained that he is not able to connect to internet.
- Ask them to enact the interaction between the two of them.

## Time



- Set five minutes as the time limit of the role play.
- Ensure that the role play finishes within the time limit.

## Notes for Facilitation

- Explain the importance of solving the customer's problem in the right manner.
- At the end of the role play activity, illustrate the significance of every point, one by one.
- Ask two other volunteers to play the roles of a broadband technician and a customer.
- Tell the person acting as the broadband technician to enact an incorrect way of doing something, for example putting the blame on the customer.
- Ask the person playing the role of a customer how he/she felt when the broadband technician was standing too close to him/her.
- Explain to the rest of the participants the correct distance to be maintained while interacting with a customer.
- In this way, ask different people to do small role plays to explain the dos and don'ts to the participants.
- Explain the guidelines they should follow to solve customer's problem.
- Explain that even after they have solved the customer problem, they should make it a point to follow-up with the customer. This will ensure customer satisfaction and also give them a visibility in case there are some additional issues.
- Discuss the problem solving checklist with them, briefly explaining each point.
- Exercise Handling Strategy – **The solution for the exercise is given as:**
  - Ask the participants what they mean by problem solving. Then provide the solution as:
    - Typically, customers want that their problems should be easy to report, quickly acknowledged and timely acted upon with compassion and fairness. Addressing these issues is problem solving.
  - Ask the participants to list the problems they can encounter in their work life.
    - Check the steps by which they can solve their problems.
  - Ask the participants, to prepare a checklist for solving a problem. Then provide the solution as:
    - Exhibit your understanding towards the problem and respect urgency.
    - Explain briefly in a layman's term the cause and action plan for the customer's problem.
    - Share the time frame with the customer and take his/her verbal agreement on the same.
    - Inform about the cost involved in fixing the customer's issue in case he/she is not covered under warranty. It is advised to always give a quote in writing to avoid conflicts at the time of payment.
    - Be patient and informative while explaining the cause of the problem to the customer and never argue if he retaliates.



## UNIT 4.3: Identifying and repairing faulty Cables and Connectors

### Unit Objectives

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

1. Understand how to identify faulty cables and connectors correctly
2. Test the cables using signal level meters/OTDR
3. Repair and replace faulty connectors or damaged cables

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- Connectors such as RJ-11, RJ-45
- Cat 3 cable or Cat 5 cable, Rollover cable
- Wire stripping and crimping tools

### Say

Good Morning and warm welcome to this training program. Before we begin this session on cables and connectors, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us start this session on cables and connectors.

### Notes for Facilitation

- Do a quick recap of cables and connectors.
- Tell them that cables are hardware devices used to connect one network device such as computers to other network devices such as printers, scanners.
- Tell them that the most common cables used in networking are the twisted pair cable, coaxial cable, and optical fibre cable.

- Tell them that the most common type of network cable is unshielded twisted pair (UTP) which contains eight wires split into four pairs. Each wire is covered in a coloured plastic coating. The colours are:
  - Green
  - Orange
  - Blue
  - Brown

## Demonstrate



- Strip a UTP cable to show individually coloured wires.
- Identifying an RJ-45 straight-through cable
- Identifying an RJ-45 crossover cable
- Identifying an RJ-45 rollover cable

## Notes for Facilitation



- Tell them how cables and connectors go through a lot of wear and tear and explain them the possible issues.
  - Loose cable connections at Switches and Outlets
  - Wire Connections Made with Electrical Tape
  - Two or More Wires Under One Screw Terminal
  - Loose Connections on Circuit Breaker Terminals
  - Faulty Neutral Wire Connections at Circuit Breaker Panels
- Also explain to them the possible solutions to these issues.
- Explain them what OTDR is.
- Demonstrate them how to test a fiber optic cable.
- Explain them how Signal level meters are used for installation as wells as for finding faulta and for timely maintenance.
- Explain them the various types of Signal Level Meters, namely CCTV, Satellite & CATV Signal Level Meters.
- Tell them that, depending on the wiring of the cables and their intended use, the network cables can be categorised as:
  - Straight-through Wired Cables
  - Crossover Wired Cables
  - Rollover Wired Cables
- Tell them that the straight-through cables have the same pin assignment on each end, that is, Pin 1 connector A goes to Pin 1 on connector B, Pin 2 to Pin 2 and so on. These cables are used to connect the client to a host. Example of straight-through cables is Cat 5e patch cables.

- Tell them that the cable used to connect a computer with a router is known as rollover cable. It is not meant to carry data rather it creates an interface with the device.
- Tell them that it is called rollover because it has opposite pin assignments on each side of the cable. The wire that connects to pin 1 at one end goes to pin 8 at the other end, the wire that goes to pin 2 and the first end goes to pin 7 and so on.
- Tell them that a connector is an electro-mechanical device used to connect or disconnect a circuit. Connectors are of different sizes, shapes and quality levels.
- Tell them that connectors can be categorised on the basis of their physical appearance and mating properties as:
  - Male connectors such as jacks and plugs
  - Female connectors such as sockets and ports
- Tell them that some common connector types used in broadband are as follows:
  - RJ-11: Used for analog telephone lines
  - RJ-45: Used for Ethernet
  - RJ-49: Use for ISDN
- Tell them that RJ stands for Registered Jack.
- Tell them that an RJ-45 connector is used for connecting ends of Ethernet cables. It consists of eight connectors for eight pins.
- Explain the way to identify an RJ-45 straight-through cable.
- Explain the way to identify an RJ-45 crossover cable.
- Explain the way to identify an RJ-45 rollover cable.

## Demonstrate



- Connecting a cable to an RJ-45 connector.

## Notes for Facilitation



- Explain to the participants the process of connecting a Cat 3 or a Cat 5 cable to an RJ-45 connector.
- Tell them that the basic step is to ensure that they have the required cables, connectors and tools.
- Tell them to work carefully to make sure that there is no damage to the wires or the connector.
- Tell them to use only specific tools for crimping.
- Tell them to make sure that the cable sheathing is completely inside the connector where it can be locked into place.
- Tell them to make sure that the wires go all the way to the end part of the connector.
- Tell them that after they have connected the cable to an RJ-45 connector, they should use a cable tester to ensure that the cable is working properly.
- Exercise Handling Strategy – **The solution for the exercise is given as:**
  - Ask the participants how to identify that cables and connectors are correctly placed. Then provide the solution as:
    - A crossover cable can be identified by comparing the two modular ends of it. The leftmost coloured wire (pin 1) at one end of the cable goes to the pin 3 at the other end of the cable. The coloured wire of pin 2 at one end of the cable, goes to pin 6 at the other end of the cable.
    - A rollover cable is identified by holding each of its end and ensuring that the colour of the wires on the outside of the left-hand plug and on the right side are same.
  - Ask the participants, list the steps to connect cables correctly. Then provide the solution as:
    - Cut the outer jacket of the wire by about 1 -1.5 inches by using a wire stripper.
    - Before installing the wire, arrange them in the order in which they are supposed to go in the RJ45 connector.
    - After the wires are arranged in the specified order, cut them at least ½ inch from the point which will be used for installation.
    - Push the cables into the connector, for ensuring that the wires are below the gold crimping pins, towards the end of the cable and. One should confirm that each wire has gone into the right place.
    - Specific tool should be used for crimping the cable. To check the connection, tug the cable slightly. Accordingly crimp again, if required.
  - Ask the participants, list the steps to connect the connectors correctly. Then provide the solution as:
    - Cut the outer jacket of the wire
    - Cut the wire into 1 and 1/2 inch in length
    - RJ45 connector
    - Cable installed in RJ45 connector

- Before installing the wire, arrange them in the order in which they are supposed to go in the RJ45 connector.
- After the wires are arranged in the specified order, cut them at least ½ inch from the point which will be used for installation.
- Push the cables into the connector, for ensuring that the wires are below the gold crimping pins, towards the end of the cable and. One should confirm that
- each wire has gone into the right place.
- Specific tool should be used for crimping the cable. To check the connection, tug the cable slightly. Accordingly crimp again, if required.
- Ask the participants, list the steps to connect the connectors correctly. Then provide the solution as:
  - Cut the outer jacket of the wire
  - Cut the wire into 1 and 1/2 inch in length
  - RJ45 connector
  - Cable installed in RJ45 connector
- Ask the participants, what is an optoelectronic instrument for understanding the character of an optical fiber. Then provide the solution as Optical Time-Domain Reflectometer (OTDR).
- Ask the participants to name the two types of Signal Level Meters. Then provide the solution as: CCTV Signal Level Meters and Satellite & CATV Signal Level Meters.

## UNIT 4.4: Electro Magnetic Interference (EMI) and Compatibility (EMC)

### Unit Objectives

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

1. Understand the importance of EMI and EMC

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- Speaker
- Cell phone

### Say

Good Morning and warm welcome to this training program. Before we begin this session on importance of EMI and EMC, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us start this session on importance of EMI and EMC.

### Demonstrate

- The principle of EMI by placing a cell phone next to the speaker and observing the static produced by the speaker during an incoming call.

## Notes for Facilitation



- Explain to the participants that EMI stands for Electromagnetic Interference.
- Tell them that it is a phenomenon which occurs when electromagnetic fields caused by an electronic device interferes with the operation of another electronic device in its vicinity.
- Some common examples of EMI in everyday life are as follows:
  - Disturbance in audio signals on a radio when an airplane flies at a low altitude
  - Travellers requested to switch-off cell phones during take-off and landing of an airplane
- Tell them that the effects of EMI can be minimised by:
  - Moving away from the source of EMI
  - Moving the equipment away from the range of EMI
  - Installing a good electrical ground system and by shielding the equipment
  - Using EMI cancellation mechanisms such as shielding
- Tell them that if an equipment is not properly shielded from EMI, it will not function properly.
- EMI shielding ensures that the electronic device/system remains fully operational and runs without interference.
- Explain to the participants that EMC stands for Electromagnetic Compatibility.
- Tell them that electromagnetic compatibility aims to control EMI in order to lessen the risk of equipment damage.
- Tell them that EMC means that a device is compatible with its electromagnetic environment. The levels of EMI emitted by the device does not cause interference in the working of other devices near it.
- Give an example that:
  - A speaker and a cell phone are not electromagnetically compatible. So, when there is an incoming call or message, the speaker produces a static sound as the EMI waves emitted by the phone interfere with the speaker's coils.
- Explain that the difference between EMI and EMC is that EMI stands for radiation emitted by a device and EMC is the ability of a device to work in presence of a radiation.
- Exercise Handling Strategy – **The solution for the exercise is given as:**
  - Ask the participants what they understand by the term EMI. Explain with example. Then provide the solution as:
    - EM waves are radiated from mostly every device which can affect the working of the nearby wireless or RF systems. This phenomenon is referred to as EMI.
  - Ask the participants what they understand by the term EMC. Explain with example. Then provide the solution as:
    - EMC is the electric noises produced by every device passes through cables, which can affect the working of adjoining devices connected to the same electric system.

- Ask the participants if they know the difference between EMI and EMC. Then provide the solution as:
  - EMI stands for radiation emitted by a device and EMC is the ability of a device to work in presence of a radiation.



## UNIT 4.5: Crimping and Soldering

### Unit Objectives

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

1. Understand the process of crimping and soldering

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- Cables and connectors
- Soldering tools and equipment
- Crimping tools and equipment

### Say

Good Morning and warm welcome to this training program. Before we begin this session on crimping and soldering, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us start this session on crimping and soldering.

### Ask

- Ask the participants if they have seen soldering iron.
- Ask them if they know what a solder and flux is.

## Demonstrate



- The soldering process

## Notes for Facilitation



- Inform the participants that soldering is a process of joining two or more objects, which are usually made of metal, by melting and putting solder which acts as a filler, into the joint.
- Inform them that soldering iron is used to heat up the joint to such an extent that the solder is melted, and then the melted solder flows around the joint making it secured and protected.
- Explain that the four key elements in soldering are:
  - Iron
  - Solder
  - Flux
  - Component
- Define solder to them as a metal alloy that is used to form a permanent bond between the metal pieces, which are to be joined using soldering.
- Further tell them that the function of flux is to facilitate the process of soldering.
- Explain that the flux performs very critical function in soldering such as:
  - Removing metal oxide
  - Preventing re-oxidation
  - Reducing surface tension
  - Ensuring a smooth solder finish
- Explain to them the various steps involved in soldering as follows:
 

**Step 1:** Heat up the soldering iron sufficiently.

**Step 2:** Clean the soldering iron with a damp sponge, if it is dirty. If using a soldering station, adjust its temperature.

**Step 3:** Apply suitable flux to remove any type of oxide when soldering.

**Step 4:** Coat the soldering iron's tip with a thin layer of solder. This process of tinning helps in transferring of heat between the tip and the component to be soldered.

**Step 5:** Use pliers for bending the lead of the component is to be soldered so that it can easily be embedded on the board.

**Step 6:** Hold the soldering iron and place the iron tip in a way so that it touches both the surface and the lead of the component.

**Step 7:** Touch the solder to the iron tip and move that around the joint by keeping the iron tip fixed. Let the solder melt and flow till the joint is covered.

**Step 8:** Remove the iron after removing the solder and make sure the joint is kept stationary till it cools down.
- Explain the precautions that need to be followed while soldering.

- Explain that to ensure good soldering, they must keep the following points in mind:
  - Heat the solder iron at required temperature. Poor heating or overheating will lead to defects in soldering.
  - Apply correct amount of solder.
  - Do not move the wire until the solder has solidified.
  - Be careful when releasing the solder iron.
  - Visually check to confirm the quality of solder.
- Explain the disadvantages of the soldering process.

## Demonstrate



- The crimping process

## Notes for Facilitation



- Inform the participants that crimping is a process of joining two pieces of metal, generally a wire and a connector, together by deforming one of them and enabling one to hold the other. The resultant deformity is known as a crimp.
- Explain the steps of crimping process as shown in the following image:

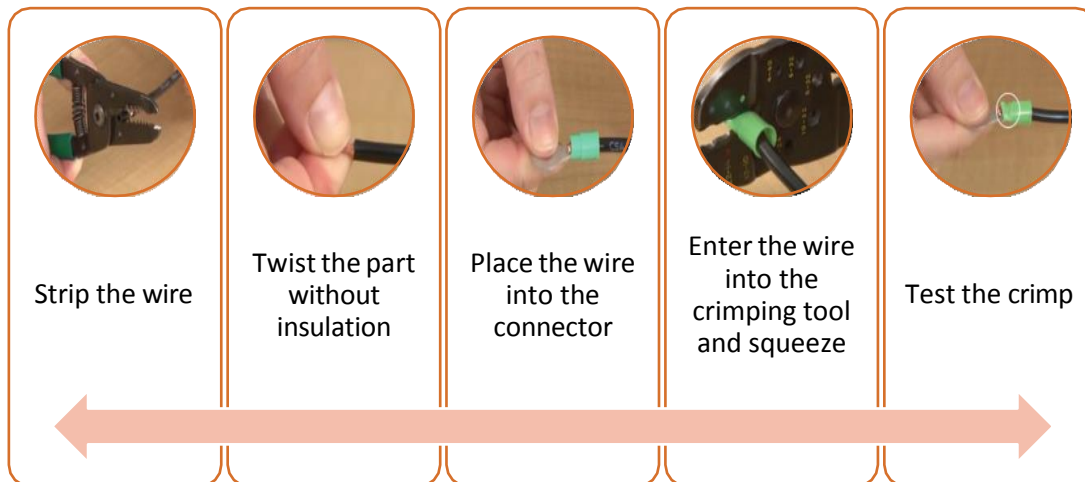


Fig. 4.5.1: Steps of Crimping

- Explain the various reasons why crimping is the preferred method to terminate connectors on coax cable.
- Explain the disadvantages of the crimping method.
- Exercise Handling Strategy – **The solution for the exercise is given as:**
  - Ask the participants what they mean by crimping. Explain with example. Then provide the solution as:
    - Crimping is a process of joining two pieces of metal, generally a wire and a connector, together by deforming one of them and enabling one to hold the other.

- Ask the participants what they mean by soldering. Explain with example. Then provide the solution as:
  - Soldering is a process of joining two or more objects, which are usually made of metal, by melting and putting solder which acts as a filler, into the joint.
- Ask the participants how they will ensure that crimping and soldering have been done properly. Explain with example. Then provide the solution as:
  - By checking the deformity in the connection and testing the connection by passing power supply.
- Ask the participants to name the tools used in Soldering. Then provide the solution as: soldering station, soldering gun
- Ask the participants, what connections are the methods Crimping and Soldering used to establish. Then provide the solution as: Reliable cable

## UNIT 4.6: Troubleshooting of Cable and Connector

### Unit Objectives

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

1. Demonstrate troubleshooting of cable and connector

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- Router connected to a device/devices and to power supply.

### Say

Good Morning and warm welcome to this training program. Before we begin this session on troubleshooting of cable and connector, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us start this session on troubleshooting of cable and connector.

### Notes for Facilitation

- Start the session by asking the participants if they know the meaning of troubleshooting.
- Tell them that troubleshooting refers to the process of systematically searching for the source of a problem with the purpose of solving it to make a product or a process operational again.
- Tell them that every troubleshooting process consists of the following six steps:
  - Define the problem
  - Collect information
  - Identify cause of failure

- Design and implement problem solving plan
- Analyse implementation results
- Document the changes
- Go over these points one by one with the participants.
- Explain each step with the help of related examples.

### Ask



- Ask the participants if they can list some problems that can come up during first start-up.

### Demonstrate



- Troubleshooting the problems that can come up during first start-up.

### Notes for Facilitation



- Write down all the problems shared by the participants on the whiteboard.
- Go over the problems one by one.
- Invite the participants to share the solution, if they know.
- Go over the step-by-step solution for each problem.
- Exercise Handling Strategy – **The solution for the exercise is given as:**
  - Ask the participants to list various kinds of problems associated with cable and connectors. Explain with example. Then provide the solution as:
    - The cable is not connected in proper manner.
    - The cable is damaged.
  - Ask the participants how to troubleshoot problems associated with cables and connectors. Explain with example. Then provide the solution as:
    - Ensure the device is connected in accurate manner.
    - Check plugs and connectors
    - Ensure there is no physical damage to the cable.
    - Ensure device is connected accurately.

## UNIT 4.7: Troubleshooting of CPE (Modem, Router, Switch)

### Unit Objectives

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

1. Demonstrate troubleshooting of CPE (modem, router and switch)

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- Cable modem
- Router
- Switch

### Say

Good Morning and warm welcome to this training program. Before we begin this session on troubleshooting of CPE, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us start this session on troubleshooting of CPE.

### Ask

- Ask the participants if they can tell what the status lights on the front panel of a modem depict.
- Ask the participants if they can tell about the connections in the rear panel of a modem.

## Demonstrate



- The connections on the front and rear panel of the modem
- Troubleshooting broadband connection

## Notes for Facilitation



- Show a cable modem to the participants.
- Explain the front and back panel of the modem.
- Explain the meaning of various status lights and what do they mean when they blink, when they are steady, and when they are off.
- Explain the steps of troubleshooting connectivity problems.

## Notes for Facilitation



- Show a router to the participants. The following image depicts the status lights on top of the panel:



*Fig. 4.7.1: Front panel of router*



- Explain the meaning of status lights on the front side panel with the help of the following figure:

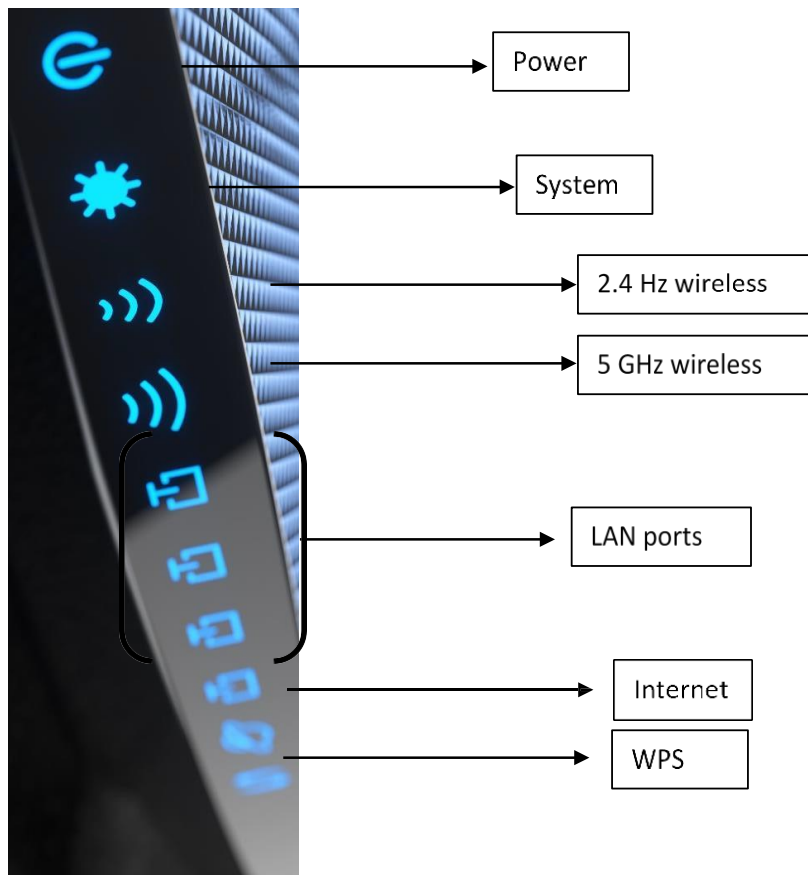


Fig. 4.7.2: Status lights on front panel of router

- Explain the meaning of various status lights and what do they mean when they blink, when they are steady, and when they are off with the help of the following table:

Name	Off	Flashing	Steady
Power	Power is off		Power is connected
System	Router has system error	Router is working properly	Router is initializing
2.4 GHz	Wireless function disabled	Wireless function enabled	
5 GHz	Wireless function disabled	Wireless function enabled	
LAN ports	No device linked	Data being sent	Device linked
Internet	No Ethernet cable is connected	Data being sent or received	Ready to transmit data
WPS	No WPS connection	WPS currently in use	Wireless security enabled

Table 4.7.1: Meaning of various status lights

- Show the back panel of the router to the participants.
- Explain the meaning of connections on the back panel with the help of the following figure:



Number	Stands for
1	Internet port
2	4 LAN ports
3	USB port
4	Wi-Fi On/Off button
5	AC power adapter outlet
6	Power On/Off switch

*Fig. 4.7.3: Back panel of router*

- Explain the steps of troubleshooting connectivity problems.

### Ask

- Ask the participants if they can tell about the ports present on a network switch.

### Demonstrate

- The ports on the rear panel of the network switch
- Troubleshooting broadband connection

## Notes for Facilitation



- Show a network switch to the participants. The following image depicts the ports on the rear panel of the network switch:

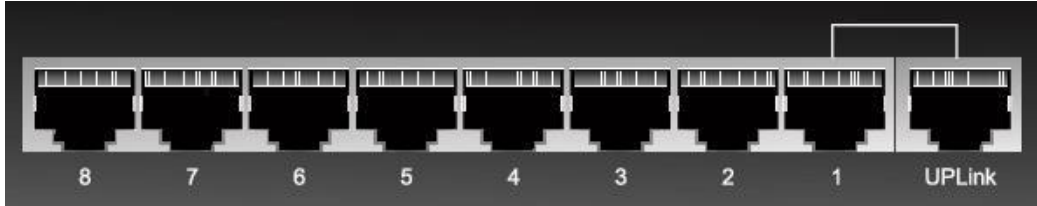


Fig. 4.7.4: Back panel of network switch

- Explain to the participants that a network switch contains 8, 10, 24, 48 number of Ethernet ports.
- Tell that that in addition to these ports there is one or many uplink ports also.
- Explain that an uplink port is a special port that can reverse the transmission and receive the circuit of any twisted pair cable attached to it.
- Explain that some of the common router and switch problems and their solutions are as follows:

Problem	Cause	Solution
The switch port indicates that the device is connected	Connection is not patched through	Check that switch port is activated Check that connection is patched
Unable to get an IP address	No address received from DHCP server	Check the NIC settings
Incorrect VLAN assignment	Switches are not properly configured	Check the switch configurations
Duplex mismatch	In the connection one side is operating in full duplex and other device in half duplex	Set all connections on the network to auto-negotiate
Slow application performance	Check for packet loss on the network	Check for Ethernet errors
Bad or improper cable type	Cable lower than Cat 5 used	Replace the cable

Table 4.7.2: Common router and switch problems

- Exercise Handling Strategy – **The solution for the exercise is given as:**
  - Ask the participants to list the process to diagnose a cable modem. Then provide the solution as:
    - Check Power
    - Check Send/Receive

- Check Online
- Check PC/ Activity
- Check Standby.

- Ask the participants, to list the steps to be followed to troubleshoot cable modem indicator. Explain with example. Then provide the solution as:

Modem Light	Status	Problem	Solution
Power	OFF	Show no power.	Confirm the supply of power.
	Flashing	Normal operation has been interrupted due to error.	Reset the modem after checking the coax cable.
Receive	Flashing	Searching for cable connection.	Check the cable connection and try resetting the modem.

- Ask the participants, to list the steps to be followed to troubleshoot cable broadband connection. Then provide the solution as:
  - Once the modem is connected to the network, this will be indicated by four green lights (not blinking but solid) on the cable modem, network devices such as routers/switches can be restarted. Finally, restart the computer system.
  - Restarting or resetting the cable modem might take up to 5-30 mins.
  - Network Status
  - Unplanned network outages can interrupt the cable broadband service.
  - In the section below, you will find the solution for most common problems while the modem is not connected to the cable modem network.

## UNIT 4.8: Troubleshooting Configuration and Connectivity

### Unit Objectives

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

1. Troubleshoot configuration and connectivity

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia

### Say

Good Morning and warm welcome to this training program. Before we begin this session on troubleshooting configuration and connectivity, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us start this session on troubleshooting configuration and connectivity.

### Demonstrate

- Troubleshooting configuration and connectivity process
- Run the network configuration and troubleshooting commands

### Notes for Facilitation

- Explain the steps of troubleshooting wireless network connection problems.
- Tell them that they should take the following steps:
  - Check LAN and WAN connections
  - Ensure that the Wi-Fi adapter is enabled
  - Verify AP and router settings

- Check the TCP/IP settings
- Check network connection with Ping
- Check wireless-specific issues
- Check for any security mismatch
- Check intermittent network connectivity issues such as poor signal strength, RF interference and so on
- Go over each step one by one and discuss the steps.
- Ask the participants to take part in the discussion and offer solutions.
- Write every point on the whiteboard and add whatever points are missing.
- Explain that any network configuration problem can be resolved by using the following commands:
  - Ping
  - nslookup
  - traceroute
  - host
  - netstat
  - ARP
  - Ipconfig
- Tell them that the ping command helps in ensuring that the network connection is established between a host and destined computer and in determining the speed of the connection.
- Tell them that the nslookup command helps in fetching the IP address or the domain name from DNS records
- Tell them that the traceroute command helps in getting the route of a packet.
- Tell them that the host command helps in finding the domain name associated with the IP address or find IP address associated with domain name.
- Tell them that the netstat command helps in displaying the routing table, connection information, status of ports, and so on.
- Tell them that the ARP command helps in determining the MAC address associated with an IP address.
- Tell them that the ipconfig command helps in displaying the IP address and netmask of a network interface.
- Run each command one by one and show the results to the participants.
- Exercise Handling Strategy – **The solution for the exercise is given as:**
  - Ask the participants, to list the problems commonly associated with connectivity and configuration. Then provide the solution as:
    - No data transfer.
    - Can't connect to some servers
    - No coaxial cable connection
    - Scanning for the upstream frequency.
    - Scanning for the network connection.

- Transmitting or receiving data
- Modem is in standby mode (the other indicators are OFF)
- Ask the participants how they will troubleshoot connectivity and configuration problems. Then provide the solution as:
  - It is possible that servers on the internet are down temporarily. Try to open a connection to the server after some time.
  - You can also check connection with a server; it will give you: IP address, a trace route from your system.
  - Check all connections of the cable and reset the modem.
  - Push the standby-button at the top.
  - Computer to the server you can't connect to and the time the trace route has been done.
  - Unplug Ethernet or USB cable from computer and reconnect cable. Make sure the PC/ Activity indicator is blinking.

## UNIT 4.9: Troubleshooting and Repairing of client's Broadband Connection Service

### Unit Objectives

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

1. Understand the common causes of broken Internet connection
2. Learn how to diagnose internet connection

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia

### Say

Good Morning and warm welcome to this training program. Before we begin this session on troubleshooting the connection, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session. Ask the following questions:
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us start this session on troubleshooting the connection.

### Notes for Facilitation

- Explain to the participants some common causes of Broken Internet Connection such as Slow Connection, No Connection at all, Service Fluctuations, Equipment Failure and Operator error.



## UNIT 4.10: Diagnosing Internet Connection

### Unit Objectives

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

1. Explain how to diagnose Internet connection

### Resources to be Used

- Available objects such as a duster, pen, notebook, projector and other teaching aids
- Presentation slides
- Multimedia
- Multimeter
- Electrical switch

### Say

Good Morning and warm welcome to this training program. Before we begin this session on diagnosing Internet connection, let us revise the previous session.

### Do

- Begin with revising the things explained in previous session.
- Encourage the participants to give answers, if they have any doubt clarify it and tell them about what they are going to study in this session.

### Say

Let us start this session on diagnosing Internet connection.

### Notes for Facilitation

- Explain to the participants how to diagnose Internet connection. Follow the below steps:
  - Check equipment like the modem, the router, the line, and your device or computer
  - Check for functioning of website
  - Use Ping command
  - Check for DNS server problems
  - Check Internet package

- Exercise Handling Strategy– The solution for the exercise is given as:
  - Ask the participants, to list a few common causes of broken Internet Connection. Then provide the solution as:
    - Slow Connection
    - No Connection at all
    - Service Fluctuations
    - Equipment Failure
    - Operator error
  - Ask the participants to name a few things to check while diagnosing Internet connection. Then provide the solution as:
    - Check equipment like the modem, the router, the line, and your device or computer
    - Check for functioning of website
    - Use Ping command
    - Check for DNS server problems
    - Check Internet package



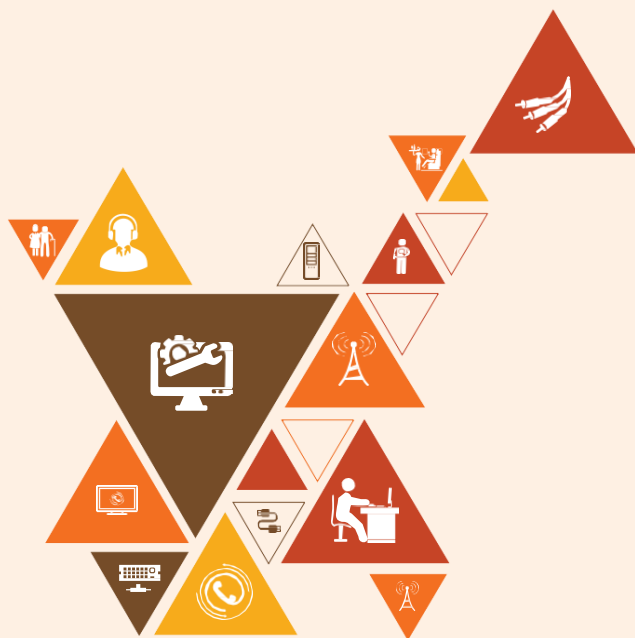


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# 5. Plan work effectively Organize Resources and Implement safety Practices

- Unit 5.1 – Work Place Health and Safety
- Unit 5.2 – Different types of Health Hazards
- Unit 5.3 - Importance of safe working Places
- Unit 5.4 - Reporting Safety Hazards
- Unit 5.5 - Waste Management
- Unit 5.6 - Organization's focus on Greening of Jobs



**TEL/N9101**

## Key Learning Outcomes

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

1. Explain about workplace health and safety
2. understand different types of health hazards
3. Demonstrate various first-aid techniques
4. Understand the importance of safety at workplace
5. understand basic hygiene practices and hand washing techniques
6. Explain the need for Social Distancing
7. Understand the hazard reporting methods at workplace
8. Explain e-waste and process of disposing them
9. Explain the greening of jobs

## UNIT 5.1: Workplace Health and Safety

### Unit Objectives

At the end of this unit, the participants 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

### Resources to be Used

- Participant handbook, white board marker pen, notebook, whiteboard, flipchart, laptop, overhead projector, laser pointer, etc.

### Notes

- In this unit, we will discuss about workplace health & safety.

### Say

Good morning and welcome back to this training program on Telecom E-Waste Handler.  
In this session, we will discuss about workplace health & safety practices.

### Ask

Ask the trainees the following questions:

- What do you understand by workplace safety?

Write down the trainees' answers on the whiteboard/flipchart.

Draw appropriate cues from the answers and start teaching the lesson.

### Say

In this session, we will discuss the following points:

- Safety: Tips to design a safe workplace
- Non-Negotiable employee safety habits

Let us participate in an extempore activity to understand this unit better.

## Activity



- This activity will be based on individual performance.
- Provide each trainee with a printout/Xerox copy of the safety hazard report
- Now ask each of them to fill up the report individually
- After completing, collect all the forms and evaluate them
- End the session by providing constructive feedback

Activity	Duration (in mins)	Resources Used
Role-play – Safety Hazard Report	40 minutes	Participant handbook, whiteboard, notebook, laptop, pen, pencil, marker, printout/Xerox copy of safety hazard report, etc.

## Do



- Ensure that the report contains all possible hazards in the workplace, safety measures, and ways to counter the hazards if they occur
- Guide the trainees throughout the activity
- Ask the trainees if they have any questions
- Encourage other trainees in the class to answer it and encourage peer learning in the class
- Explain the consequences of not following the safety guidelines at the workplace

## UNIT 5.2: Different types of Health Hazards

### Unit Objectives

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

1. Understand the health hazards
2. Demonstrate First Aid Techniques

### Resources to be Used

- Participant handbook, pen, notebook, whiteboard, markers, flipchart, laptop, overhead projector, laser pointer, equipment and tools, safety signs and symbols, safety equipment

### Notes

- In this unit, we will discuss about different types of health hazards and first aid techniques

### Say

- Good morning and welcome back to this training program on Telecom E-Waste Handler. In this session, we will discuss about different types of health hazards.

### Ask

Ask the trainees the following questions:

- What is a health hazard?
- Can you name any health hazards that may occur at the workplace?

Write down the trainees' answers on the whiteboard/flipchart.

Draw appropriate cues from the answers and start teaching the lesson.

### Notes for Facilitation

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



Explain the first aid techniques for injuries due to various causes. For burns, electric shock, fracture due to accidental fall etc.

Explain the concept of CRP and give a demonstration using a video how to administer CRP for a patient suffering a heart attack.

Through a demonstration explain the use of various safety gadgets used in the workplace.

## Say



In this session, we will discuss the following points:

- First aid
  - First aid techniques
    - For burns
    - For broken bones and fractures
    - For heart attack/stroke
    - For head injury
  - Using breathing apparatus
  - Briefing and guidance for firefighters
  - Evacuation process
  - Special evacuation requirements for specially-abled persons
  - Importance of fire safety drills
- Let us participate in an activity to understand this unit better.

## Activity



- This session will be in the form of a "Show and Explain " activity.
- In this activity, bring a few PPE (relevant to the job role) to the class and demonstrates each of them - safety helmet, safety goggles, gloves, ear muff, respirator, harness, safety boots, etc.
- Now ask the trainees to identify the PPE and state their usage
- After the session, you will select a few volunteers and make them wear PPEs.
- The focus of this activity is to select and use appropriate personal protective equipment compatible with the work and compliant with relevant occupational health and safety guidelines.

Activity	Duration (in mins)	Resources Used
Practical activity - PPE	40 minutes	Participant handbook, laptop, overhead projector, internet connection, various protective equipment like safety helmet, safety goggles, gloves, ear muff, respirator, harness, safety boots, etc.

**Do**

- Ensure that all trainees participate in the activity
- Share your inputs and insight to encourage the trainees and add to what they talk about

**Summarize**

- Ask the participants what they have learnt so far.
- Ask if they have any questions related to what they have talked about so far.
- Close the discussion by summarizing the different health hazards and video demo of how to wear the PPE kits and first aid techniques.

## UNIT 5.3: Importance of safe working practices

### Unit Objectives

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

1. Explain Basic Hygiene Practices
2. Understand the importance of Social Distancing
3. Demonstrate the safe working practices

### Resources to be Used

- Participant handbook, pen, notebook, whiteboard, flipchart, markers, laptop, overhead projector, laser pointer, etc.

### Notes

- In this unit, we will discuss about the importance of safe working practices.

### Say

Good morning and welcome back to this training program on Telecom E-Waste Handler. In this session, we will discuss about the importance of safe working practices

### Ask

Ask the trainees the following questions:

- List a few personal hygiene tips that you regularly follow.
- How social distancing helps to reduce the spread of Covid 19?
- What are the various covid protocols people followed during the pandemic?

Write down the trainees' answers on the whiteboard/flipchart.

Draw appropriate cues from the answers and start teaching the lesson.

## Elaborate



In this session, we will discuss the following points:

- Basic hygiene practices
  - Personal hygiene
  - Personal hygiene practices at home
- Importance of social distancing
  - Social distancing and isolation
  - Self-quarantine
  - Disposing off the PPE kits
- Safe workplace practices
  - Supplies and Accessories in the first aid box
  - CPR

## Say



- Let us participate in a practical activity to understand this unit better.

## Notes for Facilitation



- Familiarize the trainees with the first aid box and the supplies inside it.
- Explain the importance of first aid and why is it good to know how to administer CRP for a patient who has suffered a heart attack.
- Answer all the questions/doubts raised by the trainees in the class
- Encourage other trainees to answer queries/questions and boost peer learning in the class

## Practical

- Gather all the trainees in the laboratory and divide them into groups of two
- Ask each group to demonstrate the correct process for performing CRP
- Ensure the students follow all the steps of CPR in the correct sequence
- This activity can also be performed on a dummy, if available

Activity	Duration (in mins)	Resources Used
Practical activity – CPR	60 minutes	Participant handbook, whiteboard, notebook, laptop, pen, marker, dummy (if available), etc.

## Do

- Prepare in advance and use appropriate energisers
- Encourage the students to explore how the training session can help them improve their work
- Keep the ambience constructive and positive
- Ensure each contribution is given fair consideration

## Exercise

1. Burnt area should be kept under **cold water** for a minimum of 10 minutes
2. **Emergency exits** should be easily accessible in case of fire
3. **Antiseptic cream or Solution** must be applied to the wound to reduce the skin infection
4. The RICE which is Rest, Ice, Compression and Elevation therapy must be applied to control and reduce swelling.
5. CPR is **Cardio Pulmonary Resuscitation**

## UNIT 5.4: Reporting Safety Hazards

### Unit Objectives

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

1. Discuss the process of reporting in case of emergency (safety hazards)
2. Understand methods of reporting hazards

### Resources to be Used

Participant handbook, pen, notebook, whiteboard, flipchart, markers, laptop, overhead projector, laser pointer, etc.

### Say

Good morning and welcome to this training program on Customer Care Executive (Repair Centre)  
In this session, we will discuss about reporting safety hazards.

### Ask

Ask the trainees the following questions:

- What is a safety hazard?

Write down the trainees' answers on the whiteboard/flipchart.

Draw appropriate cues from the answers and start teaching the lesson.

### Elaborate

In this session, we will discuss the following points:

- Methods of reporting safety hazards
- Describing hazard matrix
- Hazard report form

### Say

Let us participate in an activity to understand this unit better.

## Notes for Facilitation

- Explain the trainees about reporting the safety hazards to the people concerned.
- Explain the 6C's of communication protocols followed in the organizations.
  - Communicate First
  - Communicate Rightly
  - Communicate Credibly
  - Communicate Empathetically
  - Communicate to instigate appropriate action
  - Communicate to promote respect
- Explain about the Hazard report form
- Ask the trainees if they have any questions
- Encourage other trainees to take part in the activity and encourage peer learning in the class
- Discuss the exercises at the end of the chapter in the Participant Handbook and encourage them to answers.

## Activity

- Divide the class into small groups
- Conduct a quiz and ask questions related to the unit
- Display all questions on the projector screen
- Display the correct answer after all groups have got their chances of answering a given question

Activity	Duration (in mins)	Resources Used
Quiz – Interpreting Signs	40 minutes	Laptop, internet connection, overhead projector, white screen, whiteboard, markers, laser pointer

## Do

- Ask a student to maintain the scores on the whiteboard
- Jot down the crucial points on the whiteboard as the students speak
- Share your inputs and insight to encourage the students and add to what they talk about
- Ensure that all students participate in the class
- Ask a student to summarise what was discussed in the session
- Demonstrate enthusiasm for the subject matter, course and participant's work

## UNIT 5.5: Waste Management

### Unit Objectives

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

1. explain what is e-waste?
2. Understand the concept of waste management
3. Explain the process of recycling e-waste

### Resources to be Used

- Participant handbook, pen, notebook, whiteboard, flipchart, markers, laptop, overhead projector, laser pointer, etc.

### Say

Good morning and welcome back to this training program on Telecom Customer Care Executive (Repair Centre).

In this session, we will discuss about waste management.

### Ask

Ask the trainees the following questions:

- What do you understand by waste management?
- What are the sources of medical waste?

Write down the trainees' answers on the whiteboard/flipchart.

Draw appropriate cues from the answers and start teaching the lesson.

### Elaborate

In this session, we will discuss the following points:

- Introduction to e-waste
  - What is e-waste?
- Electronic goods/gadgets are classified under three major heads
- E-waste management process
- Recyclable and non-recyclable waste
- Colour codes of waste collecting bins
- Waste disposal methods
- Sources of waste
- Source of Pollution
- Types of Pollution – Air, Water, Soil, Noise, Light



## Say

Let us participate in an extempore activity to understand this unit better.

## Activity

- This activity will be based on individual performance.
- In this activity, you will give two topics to the trainees
- The first topic in this session will be air pollution.
- The second topic on which the trainees will prepare their extempore will be on waste disposal method.
- You will randomly pick up trainees and separate them into two groups.
- Ensure that the trainees are equal in number.
- Allot the trainees 2 minutes to prepare the topic you will give them.
- After the time is up, you will call out any trainee and ask them to speak on the topic for 5 minutes.
- The trainee, with a simple explanation but rich content, will be appreciated with accolades.

Activity	Duration (in mins)	Resources Used
Extempore	40 minutes	Participant Handbook, Whiteboard, Notebook, Pen, Pencil, Marker, etc.

## Do

- Do a de-briefing of the activity
- Conduct a doubt clarification session if needed.
- Encourage the quiet and shy trainees to open up and speak

## Notes for Facilitation

- Encourage other participants to answer it and encourage peer learning in the class
- Answer all the doubts in case any of the participants

## UNIT 5.6: Organization's focus on Greening of Jobs

### Unit Objectives

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

1. Understand the concept of ESG
2. Explain the different factors of ESG

### Resources to be Used

- Participant handbook, pen, notebook, whiteboard, flipchart, markers, laptop, overhead projector, laser pointer, etc.

### Say

Good morning and welcome back to this training program on Telecom Customer Care Executive (Repair Centre).

In this session, we will discuss about greening of Jobs

### Ask

Ask the trainees the following questions:

- What is ESG?

Write down the trainees' answers on the whiteboard/flipchart.

Draw appropriate cues from the answers and start teaching the lesson.

### Elaborate

In this session, we will discuss the following points:

- What is ESG?
  - ESG stands for Environmental, Social, and Governance.
  - Environmental, social, and governance (ESG) investing refers to a set of standards for a company's behaviour used by socially conscious investors to screen potential investments.
  - Investors are increasingly applying these non-financial factors as part of their analysis process to identify material risks and growth opportunities.
- Factors of ESG
  - Environmental
  - Social
  - Governance

## Say

Let us participate in a group discussion to explore the unit a little more.

## Activity

- Conduct a group discussion in the class on the factors of ESG
- Ask the participants what they have learnt from this exercise
- Ask if they have any questions related to what they have talked about so far
- Close the discussion by summarising the importance of the ESG in recent times

Activity	Duration (in mins)	Resources Used
Group Discussion	45 minutes	Participant Handbook, Whiteboard, Notebook, laptop, Pen, Pencil, Marker, microphone and speakers etc.

## Do

- Do a de-briefing of the activity
- Conduct a doubt clarification session if needed.
- Encourage the quiet and shy trainees to open up and speak
- Ensure a friendly and cordial atmosphere during the group discussion
- Give chance to each and everybody to give their opinion
- Guide the students in identifying key points

## Notes for Facilitation

- Encourage other participants to answer it and encourage peer learning in the class
- Answer all the doubts in case any of the participants
- Discuss the proper combination technique in group discussion
- Make sure everybody understood the concept of greening of Jobs

## Ask



- If they can, why can't you?
- Discuss concepts related to 'Creativity and Innovation' with the participants as given in the Participant Handbook.

## Say



- Recall the stories on motivation.
- What is the inner drive that motivates people to succeed?
- Let's learn more about such creative and innovative entrepreneurs with the help of an activity.

## Team Activity



- This is a group activity.
- Think of any one famous entrepreneur and write a few lines about him or her.

**Activity De-brief**

- Why did you choose this particular entrepreneur?
- What is his/her brand name?
- What creativity does he/she possess?
- What was innovative about their ideas?

## Do



- Conduct a doubt clarification session if needed.
- Encourage the non-participating trainees to open up and speak

## Summarize

- Summarize the unit by asking participants if they know of some people who are highly creative and innovative in their approach.
- Ask them to share some experiences about these people with the class.

## Notes for Facilitation

- Source for stories on innovations:  
<http://www.rediff.com/getahead/report/achievers-top-31-amazing-innovations-from-young-Indians/20151208.htm>

## Exercise

1. ESG stands for Environmental, Social Governance
2. Governance factors include Tax strategy, structure of the company , relationship with the stakeholders
3. The three causes of air pollution are emission from the car, dust particles and factories emitting chemical dust
4. Mining waste includes chemical gases emitted from mine blasting
5. Landfill is a waste that can't be recycled or reused
6. Blue, Black and Green coloured bins are used in disposing the waste
7. Plastic cans are trashed in blue bin
8. computer parts, mobile devices and electronic appliances 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 lead, mercury, toxic material and gas



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& ENTREPRENEURSHIP



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National  
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Corporation

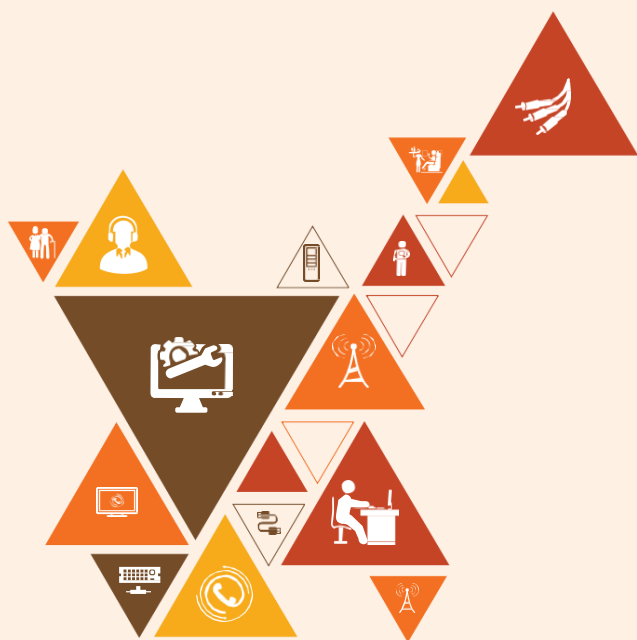
Transforming the skill landscape



# 5. Communication & Interpersonal Skills

Unit 5.1 - Interaction with supervisors, peers and Customers

Unit 5.2 - Explain the importance of developing sensitivity towards differently abled people



TEL/N9102

## Key Learning Outcomes

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

1. Understand what communication is and the importance of communication in the workplace
2. Understand effective communication and how to communicate effectively for success
3. Discuss types of communication - verbal and non-verbal
4. Communicate at workplace
5. Communicate effectively with superiors
6. Communicate effectively with colleagues and customers using different modes viz face-to-face, telephonic and email communication
7. Understand the hurdles to effective communication
8. Conduct professionally at the workplace
9. Respect differences in gender and ability
10. Communicate effectively with a person with disabilities
11. Show respect for disabled people

## UNIT 6.1: Interaction with supervisor, peers and customers

### Unit Objectives

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

4. Understand the importance of communication
5. Understand types of communication

### Resources to be Used

- Participant handbook, pen, notebook, whiteboard, flipchart, markers, laptop, overhead projector, laser pointer, equipment and tools

### Notes

- In this unit, we will discuss how to communicate effectively with supervisor, peers and customers

### Say

Good morning and welcome to this training program on Customer Care Executive (Repair Centre)  
In this session, we will discuss about effective communication with supervisor, peers and customers

### Ask

Ask the trainees the following questions:

- What is communication?
- What is non-verbal communication?
- What are the barriers to effective communication?

Write down the trainees' answers on the whiteboard/flipchart.

Draw appropriate cues from the answers and start teaching the lesson



## Elaborate



In this session, we will discuss the following points:

- What is communication?
- Why is communication important?
- Effective communication
  - Effective communication for success
  - Significance of clear and effective communication
- Types of communication
  - Verbal communication
  - Non-Verbal communication
    - Signs and symbols
    - Gestures and expressions
- Communication at workplace
  - Communication with supervisors
  - Communication with colleagues & customers
  - Face-to-face communication
  - Telephonic communication
  - Email communication
- Importance of timely completion of tasks
- Standard operating procedure
- Escalation matrix
  - Escalation mechanism
  - Escalation through CRM
- Escalation Issues at work
  - What does it mean to escalate an issue at work?
  - When should you escalate an issue at work?
- Hurdles for effective communication
- Professional conduct
- Respect gender differences
- Communication with a disabled person
  - Communicating with people with a hearing impairment
  - Respect People with disability
  - Safety at the workplace for people with disability
    - Responsibilities of an employer towards disabled people
- Workplace adaptations for people with disability
  - Workplace adaptations

## Say



In this session, we will discuss the following points:

Let us participate in the activity to understand all about effective communication

## Activity



### Scenario 1:

- This is an activity involving two. One volunteer as boss and the other as team member
- Provide the trainees with a scenario mentioned below
- You are the boss for a team of 15 members. You want to convey your displeasure regarding the performance of one of your team member. How would you convey this to him/her
- State what measures you will take to convey this matter to them.

### Scenario 2:

- This is an activity involving two. One volunteer as boss and the other as team member
- Provide the trainees with a scenario mentioned below
- You are the boss for a team of 15 members. You want to appreciate one of your team mate's performance. He closed a big business deal of Rs.1 cr. How would you do?
- State what measures you will take to appreciate to them.

Activity	Duration (in mins)	Resources Used
Mock activity	60 minutes	Participant handbook, whiteboard, laptop, notebook, pen, pencil, marker, etc.

## Do



- Ensure that all trainees participate in the class.
- Encourage the non-participating trainees to open up and speak.
- Do a de-briefing for this activity. You tell them, scolding is always done in private, one to one, whereas appreciation is always done in open in front of others, for them to feel happy about it and at the same time others get motivated to give their best performance.

## Notes for Facilitation



- Ask them to answer the questions given in the participant manual.
- Ensure that all the participants answer every question.
- Answer all the doubts raised by the trainees in the class
- Discuss the proper communication technique in all the class activity

## UNIT 6.2: Explain the importance of developing sensitivity towards differently abled people

### Unit Objectives

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

3. Communicate Effectively with person with disabilities
4. Respect people with disability, at workplace

### Resources to be Used

- Participant handbook, pen, notebook, whiteboard, markers, flipchart, laptop, overhead projector, laser pointer, equipment and tools

### Notes

- In this unit, we will discuss about how to communicate effectively with people who has disabilities

### Say

- Good morning and welcome back to this training program on Telecom Customer Care Executive (Repair Centre).
- In this session, we will discuss about how to communicate with people who are differently abled

### Ask

Ask the trainees the following questions:

- What is an effective communication?
- Have they ever got an opportunity to help/assist a disabled person?

Write down the trainees' answers on the whiteboard/flipchart.

Draw appropriate cues from the answers and start teaching the lesson

## Notes for Facilitation

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

As a co-worker, one should be empathetic with them and talk to them politely and with respect. Every work place has guidelines for handling these kinds of people. And all employees need to adhere to those guidelines.

## Say

In this session, we will discuss the following points:

- What is a disability
- General tips for communication with disabled people
- Respect people with disability
- Work place safety for people with disability
- Work place adaptation by people with disability

## Do

- Ensure that all trainees have understood the purpose of this module
- Encourage them to participate in the discussion

## Summarize

- Ask the participants what they have learnt so far.
- Ask if they have any questions related to what they have talked about so far.
- Explain them how to interact with differently abled people, respect them and assist and support them to complete their work if need be.
- Learnt about effectively communicating with people who are differently abled.

## Ask



- If they can, why can't you?
- Discuss concepts related to 'Creativity and Innovation' with the participants as given in the Participant Handbook.

## Say



- Recall the stories on motivation.
- What is the inner drive that motivates people to succeed?
- Let's learn more about such creative and innovative entrepreneurs with the help of an activity.

## Team Activity



- This is a group activity.
- Think of any one famous entrepreneur and write a few lines about him or her.

**Activity De-brief**

- Why did you choose this particular entrepreneur?
- What is his/her brand name?
- What creativity does he/she possess?
- What was innovative about their ideas?

## Do



- Conduct a doubt clarification session if needed.
- Encourage the non-participating trainees to open up and speak

## Summarize



- Summarize the unit by asking participants if they know of some people who are highly creative and innovative in their approach.
- Ask them to share some experiences about these people with the class.

## Notes for Facilitation



- Source for stories on innovations:  
<http://www.rediff.com/getahead/report/achievers-top-31-amazing-innovations-from-young-Indians/20151208.htm>

## Do



Exercise Handling Strategy – The solution for the exercise is given as:

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

### **Fill in the blanks**

1. Before sending the mail it's important to check the **grammar and spelling** of the content.
2. When you interact through phone, provide your identity details like **Name, company** and **department**
3. Add your **signature** at the bottom of your mail.
4. The Customer Care Executive is mainly responsible for handling **customer Queries**





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MINISTRY OF SKILL DEVELOPMENT  
& ENTREPRENEURSHIP



N.S.D.C.  
National  
Skill Development  
Corporation

Transforming the skill landscape

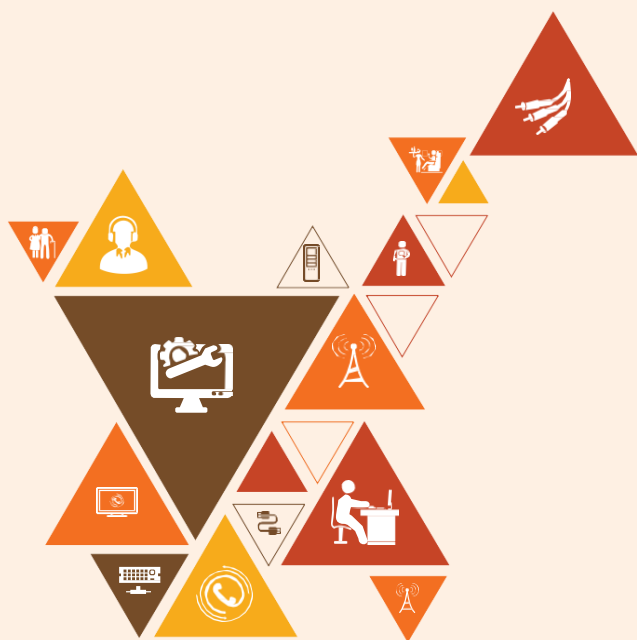


# Annexures

Annexure I: Training Delivery Plan

Annexure II: Assessment Criteria

Annexure III: List of QR Codes used in PHB





## Annexure I - Training Delivery Plan

Training Delivery Plan			
<b>Program Name:</b>	Broadband Technician		
<b>Qualification Pack Name &amp; Ref. ID</b>	Broadband Technician (TEL/Q0102) Version 4.0		
<b>Version No.</b>	V4.0	<b>Version Update Date</b>	30/12/2021
<b>Pre-requisites to Training</b>	Ability to troubleshoot and solve problems, colour vision, manual dexterity, strong customer service skills and bookkeeping skills, familiarity with workforce management software, ping tools.		
<b>Training Outcomes</b>	<p>By the end of this program, the participants will be able to:</p> <ul style="list-style-type: none"> <li>• <b>Aggregate awareness of mining and equipment installation and configuring CPE:</b> arrange and check access to site, tools, and cables according to guidelines</li> <li>• <b>Comprehend and initiate the importance of reporting and recording:</b> ensure all reports, CPE configurations, settings, and faults are documented for future reference.</li> <li>• <b>Establish connection amongst service provider gateway, CPE and user device:</b> ensure connectivity, settings and tests are properly executed.</li> <li>• <b>Identify , locate and execute CPE faults, cable and connector faults:</b> understand different types of cables, correct pairs, software required for installation and various tests for troubleshooting</li> </ul>		

Sl. No.	Module Name	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools/Aids	Duration (hours)
1	Introduction to the role of a Broadband Technician	Introduction to the Telecom Sector and the Role of Broadband Technician	<ul style="list-style-type: none"> <li>Describe the size and scope of the Telecom industry and its various sub-sectors.</li> <li>Explain the role and responsibilities of broadband technician.</li> <li>Discuss the organisational policies on workplace ethics, managing sites, quality standards, personnel management and public relations (PR).</li> <li>Describe the process workflow in the organization and the role of broadband technician in the process.</li> <li>List the various daily, weekly, monthly operations/activities that take place at the site under a broadband technician.</li> </ul>	Bridge module	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Laptop with software like MS Office and internet, Whiteboard, Marker, Projector	30 Theory(20:00) Practical(10:00)
2	Install Cable/System Wiring and Equipment at Customer Premises	Understand the work requirements	<ul style="list-style-type: none"> <li>Explain the need to collect work requirements, tools, equipment and materials required for installation</li> </ul>	TEL/N011 1 PC1	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Types of cables (OFC, UTP, STP, Twisted Pair etc.) and connectors (RJ-45, RJ-11 etc.), crimping tools, soldering tools and splicing tools, signal level meters /OTDR, voltmeter, digital multimeter, digital clamp meter, signal tester, electrical drill, ladder, spanner, screwdriver set, nut driver set, bolt remover, cutter, angle finder, Wiring layout, Instruction manual, Service Manual/ User Manuals, Customer Registration, Program Authentication Form, CustomerFeedback form	11 Theory(4:00) Practical(7:00)
		Analysis of installation environment	<ul style="list-style-type: none"> <li>Discuss the significance of visiting site/customer premises for installation</li> <li>Explain how to analyse installation environment and customer requirements to select the correct type of cables and connectors</li> </ul>	TEL/N011 1 PC2,PC3			11 Theory(4:00) Practical(7:00)
		Verify the cabling requirement	<ul style="list-style-type: none"> <li>Explain how to inspect indoor and outdoor cable route to ensure that the route is free of electrical hazards</li> <li>Discuss the ways to verify that the cable running length is within the permissible limit to ensure continuity and designed throughput</li> <li>Discuss the ways to verify that the equipment installation location is near power point and has proper signal coverage</li> </ul>	TEL/N011 1 PC4,PC5, PC6			11 Theory(4:00) Practical(7:00)

		Explain ways to undertake wiring and install system hardware	<ul style="list-style-type: none"><li>• Explain how to install structured wiring (interior and exterior) from PoP to customer premises</li><li>•Elaborate perform cable splicing and crimping wherever required</li><li>•Explain how to perform neat wiring and clipping within customer premises</li><li>• Demonstrate the use of appropriate connectors and ensure that the cables are terminated properly</li><li>• Elucidate how to perform fault clearance</li><li>•Discuss how to test the cable and joints for transmission loss and strength, re-terminate if loss exceeds prescribed limits</li><li>•Elaborate how to install equipment such as modem, router and/or switch</li><li>• Demonstrate and explain the use of equipment to customers</li></ul>	TEL/N011 1 PC7,PC8, PC9,PC10,PC11,P C12,PC13,PC14			14 Theory(6:00) Practical(8:00)
		Ensure the checks for voltage, current, earthing and battery	<ul style="list-style-type: none"><li>•Discuss how to perform checks for voltage, current and earthing</li><li>•Explain ways to perform checks for battery in case of a defective UPS</li></ul>	TEL/N011 1 PC15, PC16			11 Theory(4:00) Practical(7:00)
		Ensure the ways to install/ replace UPS	<ul style="list-style-type: none"><li>• Demonstrate way to install/replace UPS as per manufacturer's instructions</li><li>• Use appropriate measures to route the power supply through the UPS</li><li>• Discuss way to calculate equipment load and compare it with UPS rating</li></ul>	TEL/N011 1 PC17,PC18,PC19			11 Theory(4:00) Practical(7:00)
		Cleaning up of work site and completion of documentation	<ul style="list-style-type: none"><li>• Explain the significance of dispose of the installation waste properly and restoration of work site</li><li>• Show how to record the details of installation, test results and update plans</li><li>• Exemplify way to complete all installation documents and get customer signof</li></ul>	TEL/N011 1 PC20,PC21,PC22			11 Theory(4:00) Practical(7:00)
3	Configure Equipment and Establish Broadband Connectivity	Discuss ways to configure CPE	<ul style="list-style-type: none"><li>•Demonstrate ways to connect up laptop/PC, smart/ip TV and other customer device to the CPE and establish connectivity</li><li>•Explain Customer Premise Equipment (CPE) settings using default login credentials</li><li>•Elaborate the configuration of CPE as per the base setting (ip, gateway, mask etc.)</li></ul>	TEL/N011 2 PC1,PC2, PC3	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Types of cables (OFC, UTP, STP, Twisted Pair etc.) and connectors (RJ-45, RJ-11 etc.), crimping tools, soldering tools and splicing tools, signal level meters /OTDR, voltmeter, digital multimeter, digital clamp meter,	20 Theory(10:00) Practical(10:00)

		Broadband connectivity of CPE with service provider gateway and end user device	<ul style="list-style-type: none"> <li>• Ensure to verify that all cables and connectors are plugged in properly</li> <li>• State how to ping the service provider gateway</li> <li>• Explain to analyse test results for connectivity and throughput parameters</li> <li>• Demonstrate ways to configure end user device to establish LAN /WiFi connectivity with CPE</li> <li>• Discuss to ping CPE from end user device and analyse response</li> </ul>	TEL/N011 2 PC4,PC5, PC6,PC7, PC8		signal tester, electrical drill, ladder, spanner, screwdriver set, nut driver set, bolt remover, cutter, angle finder, Wiring layout, Instruction manual, Service Manual/ User Manuals, Customer Registration, Program Authentication Form, Customer Feedback form	20 Theory(10:00) Practical(10:00)
		Record configuration setting	<ul style="list-style-type: none"> <li>• State ways to record CPE configuration settings</li> <li>• Discuss recording of end user device configuration settings</li> <li>• Explain record pinging procedure and expected result parameters</li> </ul>	TEL/N011 2 PC9,PC10			20 Theory(10:00) Practical(10:00)
		Steps taken for testing by customer	<ul style="list-style-type: none"> <li>• Demonstrate process of performing speed test and record the data throughputs and show customer that they are as per committed plan</li> <li>• Brief customer on basic trouble-shooting steps/self help</li> </ul>	TEL/N011 2 PC11,PC12,PC13			20 Theory(10:00) Practical(10:00)
4	Troubleshoot and Rectify Faults	Cable and Connector faults	<ul style="list-style-type: none"> <li>• Explain to identify cause of fault, No Service or service degradation</li> <li>• State how to test cabling using signal level meters /OTDR</li> <li>• Discuss repair and replace faulty connectors / damaged cable</li> <li>• Show process to perform re-connectorization/crimping (of cable pairs with connector) or replace cable, if required</li> </ul>	TEL/N011 3 PC1,PC2,PC3,PC4	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Types of cables (OFC, UTP, STP, Twisted Pair etc.) and connectors (RJ-45, RJ-11 etc.), crimping tools, soldering tools and splicing tools, signal level meters /OTDR, voltmeter, digital multimeter, digital clamp meter, signal tester, electrical drill, ladder, spanner, screwdriver set, nut driver set, bolt remover, cutter, angle finder, Wiring layout, Instruction manual, Service Manual/ User Manuals, Customer Registration, Program Authentication Form, Customer Feedback form	20 Theory(10:00) Practical(10:00)
		CPE Faults	<ul style="list-style-type: none"> <li>• Show the procedure to connect CPE to laptop/CPU/portable device</li> <li>• State how to access CPE through browser/software application and run diagnostic application</li> <li>• Demonstrate the installation of CPE access software, if required</li> <li>• Illustrate re-configuring/resetting the CPE to correct settings</li> </ul>	TEL/N011 3 PC5,PC6,PC7,PC8			20 Theory(10:00) Practical(10:00)

		Broadband Service	<ul style="list-style-type: none"> <li>• Demonstrate how to troubleshoot/repair problems between customer equipment and the optical node</li> <li>• Show the procedure to adhere for handling problems for signal loss and interference</li> <li>• Exemplify way to take readings at all splitter points and terminated ends to determine the signal loss and continuity</li> <li>• State network troubleshooting including ping test, trace routes and speed test</li> <li>• Show ways to monitor, repair and record system, drop, and in-house signal leakage</li> </ul>	TEL/N0113 PC9,PC10,PC11,P C12,PC13			20 Theory(10:00) Practical(10:00)
		Documentation	<ul style="list-style-type: none"> <li>• Show the process to record steps undertaken for fault localization/isolation</li> <li>• Demonstrate ways to record repairs/replacements undertaken during fault rectification</li> <li>• State the significance of restoring any changes made to the worksite during fault repair to the client's satisfaction</li> </ul>	TEL/N0113 PC14,PC15,PC16			20 Theory(10:00) Practical(10:00)

6		Resolve Customer Complaints	<ul style="list-style-type: none"> <li>• Explain what is warranty and how to check the same</li> <li>• Discuss the term Dead on Arrival, and under what condition the handset is considered as DOA</li> <li>• Explain the TAT i.e turn around time and how does it impact customer satisfaction</li> <li>• Discuss the tips to handle different types of customers, especially angry customers</li> </ul>	N2201/PC9,PC10,PC14, KU10, KU11-KU13,KU16			34 T(16:00) P(18:00)
7	Organise resources and work effectively and safely	Perform work as per quality standards	<ul style="list-style-type: none"> <li>•Employ appropriate ways to keep the workspace clean and tidy</li> <li>•Discuss how to perform individual roles and responsibilities as per the job role while taking accountability for the work</li> <li>•Show how to record/document tasks completed as per the requirements within specific timelines</li> <li>•Perform the steps to implement schedules to ensure the timely completion of tasks</li> <li>•Identify the cause of a problem related to your own work and validate it</li> <li>•Apply appropriate techniques to analyse problems accurately and communicate different possible solutions to the problem</li> <li>•Discuss how to comply with the organisation's</li> </ul>	TEL/N9101 PC1, PC2, PC3, PC4, PC5, PC6	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Whiteboard/blackboard marker /chalk, Duster, Computer or Laptop attached to LCD projector, Personal Protection Equipment: Safety glasses, Head protection, Rubber gloves, Safety footwear, Warning signs and tapes, Fire extinguisher and First aid kit	6  T(2:00) P(4:00)
8		Maintain a safe, healthy and secure working environment	<ul style="list-style-type: none"> <li>current health, safety, security policies and procedures</li> <li>•Demonstrate the steps to check for</li> </ul>	TEL/N9101 PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10, PC11, PC12, PC13, PC14			6  T(2:00) P(4:00)

(Part - 1)

			<p>water spills in and around the workspace and escalate these to the appropriate authority</p> <ul style="list-style-type: none"> <li>•Practice reporting any identified breaches in health, safety, and security policies and procedures to the designated person</li> <li>•Use safety materials such as goggles, gloves, earplugs, caps, ESD pins, covers, shoes, etc.</li> <li>•Apply required precautions to avoid damage of components due to negligence in ESD procedures or any other loss due to safety negligence</li> <li>•Identify hazards such as illness, accidents, fires or any other natural calamity safely, as per the organisation's emergency procedures, within the limits of the individual's authority</li> <li>•Explain the importance of regularly participating in fire drills or other safety-related workshops organised by the company</li> <li>•Discuss the significance of reporting any hazard outside the individual's authority to the relevant person in line with organisational procedures and warn others who may be affected</li> </ul>				
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9		Maintain a safe, healthy and secure working environment (Part - 2)	<ul style="list-style-type: none"> <li>• Explain how to maintain appropriate posture while sitting/standing for long hours</li> <li>• Employ appropriate techniques to handle heavy and hazardous materials with care while maintaining an appropriate posture</li> <li>• Discuss the importance of sanitising workstations and equipment regularly</li> <li>• Discuss how to avoid contact with anyone suffering from communicable diseases and take necessary precautions</li> <li>• Show how to clean hands with soap and alcohol-based sanitiser regularly</li> <li>• List the safety precautions to be taken while travelling, e.g., maintain a 1m distance from others, sanitise hands regularly, wear masks, etc.</li> <li>• Role-play a situation to report hygiene and sanitation issues to the appropriate authority</li> <li>• Discuss how to follow recommended personal hygiene and sanitation practices, for example, washing/sanitising hands, covering the face with a bent elbow while coughing/sneezing, using PPE, etc.</li> </ul>	TEL/N9101 PC15, PC16, PC17, PC18, PC19, PC20, PC21, PC22			6 T(2:00) P(4:00)
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10		Conserve material / energy / electricity	<ul style="list-style-type: none"> <li>•Apply appropriate ways to optimise the usage of material, including water, in various tasks/activities/processes</li> <li>•Use resources such as water, electricity and others responsibly</li> <li>•Demonstrate the steps to carry out routine cleaning of tools, machines and equipment</li> <li>• Apply appropriate ways to optimise the use of electricity/energy in various tasks/activities/processes</li> <li>•Perform periodic checks of the functioning of the equipment/machine and rectify wherever required</li> <li>•Explain the significance of reporting malfunctioning and lapses in the maintenance of equipment</li> <li>•Use electrical equipment and appliances properly</li> </ul>	TEL/N9101 PC23, PC24, PC25, PC26, PC27, PC28, PC29			6 T(2:00) P(4:00)
11		Use effective waste management / recycling practices	<ul style="list-style-type: none"> <li>•Identify recyclable, non-recyclable and hazardous waste</li> <li>•Apply appropriate ways to deposit recyclable and reusable material at the identified location</li> <li>•Explain the process to dispose of non-recyclable and hazardous waste as per recommended processes</li> </ul>	TEL/N9101 PC30, PC31, PC32			6 T(2:00) P(4:00)

12	Communication and interpersonal skills	Interact effectively with superiors	<ul style="list-style-type: none"> <li>• Explain how to receive work requirements from superiors and customers and interpret them correctly</li> <li>• Role-play a situation to inform the supervisor and/or concerned person about any unforeseen disruptions or delays</li> <li>• Practice participating in decision-making by providing facts and figures, giving/accepting constructive suggestions</li> <li>• Practice rectifying errors as per feedback and ensure the errors are not repeated</li> </ul>	TEL/N9102 PC1, PC2, PC3, PC4	Classroom lecture / PowerPoint Presentation / Question & Answer / Group Discussion	Whiteboard and Markers, Chart paper and sketch pens, LCD Projector and Laptop for presentations, Sample of escalation matrix, organisation structure	6 T(2:00) P(4:00)
13		Interact effectively with colleagues and customers (Part - 1)	<ul style="list-style-type: none"> <li>• Discuss how to comply with the organisation's policies and procedures for working with team members</li> <li>• Apply appropriate modes of communication, such as face-to-face, telephonic and written, to communicate professionally</li> <li>• Show how to respond to queries and seek/provide clarifications if required</li> </ul>	TEL/N9102 PC5, PC6, PC7			6 T(2:00) P(4:00)
14		Interact effectively with colleagues and customers (Part - 2)	<ul style="list-style-type: none"> <li>• Illustrate the process to co-ordinate with the team to integrate work as per requirements</li> <li>• Discuss how to resolve conflicts within the team/with customers to achieve a smooth workflow</li> <li>• Discuss how to recognise emotions accurately in self</li> </ul>	TEL/N9102 PC8, PC9, PC10, PC11			6 T(2:00) P(4:00)

			and others to build good relationships •State how to prioritise team and organisation goals above personal goals				
15		Gender sensitisation	<ul style="list-style-type: none"> <li>•Explain how to maintain a conducive environment for all genders in the workplace</li> <li>•Discuss ways to encourage appropriate behaviour and conduct with people across gender</li> <li>•Explain how to ensure equal participation of people across genders in discussions</li> </ul>	TEL/N9102 PC12, PC13, PC16			6 T(2:00) P(4:00)
16		PwD sensitisation	<ul style="list-style-type: none"> <li>•Identify ways to assist team members with a disability in overcoming any challenges faced at work</li> <li>•Practice appropriate verbal and non-verbal communication while interacting with People with Disability (PwD)</li> </ul>	TEL/N9102 PC14, PC15			6 T(2:00) P(4:00)
17	Employability Skills	DGT/VSQ/N0102 Employability Skills		DGT/VSQ/N0101			60 hrs

<b>Total Duration</b>		<b>Theory Duration</b>
		210
<b>On the Job Training (Training provided by the relevant industry)</b>		<b>Practical Duration</b>
		180
<b>Employability Skills (DGT/VSQ/N0102) (<a href="https://eskillindia.org/NewEmployability">https://eskillindia.org/NewEmployability</a>)</b>		120
<b>Total Duration (Theory+Practical+OJT+ES)</b>		60
		510

## Annexure II – Assessment Criteria

### CRITERIA FOR ASSESSMENT OF TRAINEES

Assessment Criteria for “Broadband Technician”	
Job Role	Broadband Technician
Qualification Pack	TEL/Q0102
Sector Skill Council	Telecom Sector Skill Council
<b>Guidelines for Assessment</b> <ol style="list-style-type: none"> <li>1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.</li> <li>2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.</li> <li>3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.</li> <li>4. 4a. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center. (as per assessment criteria below). 4b. Individual assessment agencies will create unique evaluations for skill practical part for every student at each examination/training center based on this criterion.</li> <li>5. To pass the Qualification Pack, every trainee should score a minimum of 70% of aggregate marks to successfully clear the assessment.</li> <li>6. In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.</li> </ol>	

Assessment Outcome	Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<b>TEL/N0111: Lay cable/system wiring and install equipment at customer premises</b>	<i>Prepare for wiring and equipment installation</i>	12	14	-	2
	PC1. collect work requirements, tools, equipment and materials required for installation	2	-	-	-
	PC2. visit site/customer premises for installation	1	-	-	-
	PC3. analyse installation environment and customer requirements to select the correct type of cables and connectors	3	4	-	1
	PC4. inspect indoor and outdoor cable route to ensure that the route is free of electrical hazards	2	3	-	1
	PC5. verify that the cable running length is within the permissible limit to ensure continuity and designed throughput	2	3	-	-
	PC6. verify that the equipment installation location is near power point and has proper signal coverage	2	4	-	-
	<i>Undertake wiring and install system hardware</i>	13	21	-	5
	PC7. install structured wiring (interior and exterior) from PoP to customer premises	2	3	-	1
	PC8. perform cable splicing and crimping wherever required	1	1	-	-
	PC9. perform neat wiring and clipping within customer premises	1	2	-	1
	PC10. use appropriate connectors and ensure that the cables are terminated properly	2	3	-	1
	PC11. perform fault clearance	2	3	-	-
	PC12. test the cable and joints for transmission loss and strength, re-terminate if loss exceeds prescribed limits.	2	4	-	1
	PC13. install equipment such as modem, router and/or switch	2	4	-	1

	PC14. demonstrate and explain the use of equipment to customers	1	1	-	-
	<i>Install/replace UPS and check domestic power supply</i>	9	9	-	3
	PC15. perform checks for voltage, current and earthing	1	1	-	-
	PC16. perform checks for battery in case of a defective UPS	2	2	-	1
	PC17. install/replace UPS as per manufacturer's instructions	2	2	-	1
	PC18. route the power supply through the UPS	2	2	-	1
	PC19. calculate equipment load and compare it with UPS rating	2	2	-	-
	<i>Clean-up work site and complete documentation</i>	6	6	-	-
	PC20. dispose of the installation waste properly and restore work site	2	2	-	-
	PC21. record the details of installation, test results and update plans	2	2	-	-
	PC22. complete all installation documents and get customer sign-off	2	2	-	-
	<b>NOS Total</b>	<b>40</b>	<b>50</b>	<b>-</b>	<b>10</b>
<b>TEL/N0112: Configure customer premises equipment and establish Broadband connectivity</b>	<i>Configure CPE</i>	11	12	-	3
	PC1. connect up laptop/PC, smart/IP TV and other customer device to the CPE and establish connectivity	3	4	-	1
	PC2. access Customer Premise Equipment (CPE) settings using default login credentials	4	4	-	1
	PC3. configure CPE as per the base setting (IP, gateway, mask etc.)	4	4	-	1
	<i>Establish broadband connectivity of CPE with service provider gateway and end user device</i>	16	20	-	5
	PC4. verify that all cables and connectors are plugged in properly	3	4	-	1
	PC5. ping the service provider gateway	2	4	-	1
	PC6. analyse test results for connectivity and throughput parameters	4	4	-	1
	PC7. configure end user device to establish LAN/Wi-Fi connectivity with CPE	4	4	-	1
	PC8. ping CPE from end user device and analyse response	3	4	-	1
	<i>Record configuration setting and testing steps for customer</i>	13	18	-	2

	PC9. record CPE configuration settings	4	4	-	-
	PC10. record end user device configuration settings	3	4	-	1
	PC11. record pinging procedure and expected result parameters	2	4	-	-
	PC12. perform speed test and record the data throughputs and show customer that they areas per committed plan	2	3	-	1
	PC13. brief customer on basic trouble-shooting steps/self help	2	3	-	-
	<b>NOS Total</b>	<b>40</b>	<b>50</b>	<b>-</b>	<b>10</b>
<b>TEL/N0113: Troubleshoot and Rectify Faults</b>	<i>Troubleshoot and rectify cable, connectors and CPE faults</i>	21	18	-	6
	PC1. identify cause of fault, No Service or service degradation	2	2	-	1
	PC2. test cabling using signal level meters /OTDR	2	2	-	1
	PC3. repair and replace faulty connectors /damaged cable	2	4	-	-
	PC4. perform re connectorization/crimping (cable pairs with connector) or replace cable, if required	4	2	-	1
	PC5. connect CPE to laptop/CPU/portable device	2	2	-	1
	PC6. access CPE through browser/software application and run diagnostic application	2	2	-	1
	PC7. install CPE access software, if required	4	2	-	-
	PC8. re-configure/reset the CPE to correct settings	3	2	-	1
	<i>Troubleshoot and repair clients' broadband service</i>	16	22	-	4
	PC9. troubleshoot/repair problems between customer equipment and the optical node	4	4	-	1
	PC10. troubleshoot problems for signal loss and interference	4	4	-	1
	PC11. take readings at all splitter points and terminated ends to determine the signal loss and continuity	2	4	-	-

	PC12. perform network troubleshooting including ping test, trace routes and speed test	4	6	-	1
	PC13. monitor, repair and record system, drop, and in-house signal leakage	2	4	-	1
	<i>Complete documentation and cleanup work site</i>	3	10	-	-
	PC14. record steps undertaken for fault localization/isolation	1	6	-	-
	PC15. record repairs/replacements undertaken during fault rectification	1	2	-	-
	PC16. restore any changes made to the worksite during fault repair to the client's satisfaction	1	2	-	-
	<b>NOS Total</b>	<b>40</b>	<b>50</b>	<b>-</b>	<b>10</b>
<b>TEL/N9101: Organise Work and Resources as per Health and Safety Standards</b>	<i>Perform work as per quality standards</i>	4	9	-	2
	PC1. keep workspace clean and tidy	-	1	-	-
	PC2. perform individual role and responsibilities as per the job role while taking accountability for the work	1	1	-	1
	PC3. record/document tasks completed as per the requirements within specific timelines	-	1	-	1
	PC4. implement schedules to ensure timely completion of tasks	-	2	-	-
	PC5. identify the cause of a problem related to own work and validate it	2	2	-	-
	PC6. analyse problems accurately and communicate different possible solutions to the problem	1	2	-	-
	<i>Maintain safe, healthy and secure working environment</i>	16	27	-	4
	PC7. comply with organisation's current health, safety, security policies and procedures	1	1	-	-
	PC8. check for water spills in and around the workspace and escalate these to the appropriate authority	1	2	-	1
	PC9. report any identified breaches in health, safety, and security policies and procedures to the designated person	1	2	-	1



PC10. use safety materials such as goggles, gloves, ear plugs, caps, ESD pins, covers, shoes, etc.	1	2	-	1
PC11. avoid damage of components due to negligence in ESD procedures or any other loss due to safety negligence	2	3	-	1
PC12. identify hazards such as illness, accidents, fires or any other natural calamity safely, as per organisation's emergency procedures, within the limits of individual's authority	2	1	-	-
PC13. participate regularly in fire drills or other safety related workshops organised by the company	1	3	-	-
PC14. report any hazard outside the individual's authority to the relevant person in line with organisational procedures and warn others who may be affected	1	3	-	-
PC15. maintain appropriate posture while sitting/standing for long hours	1	1	-	-
PC16. handle heavy and hazardous materials with care, while maintaining appropriate posture	1	1	-	-
PC17. sanitize workstation and equipment regularly	1	2	-	-
PC18. clean hands with soap, alcohol-based sanitizer regularly	-	1	-	-
PC19. avoid contact with anyone suffering from communicable diseases and take necessary precautions	-	1	-	-
PC20. take safety precautions while travelling e.g., maintain 1m distance from others, sanitize hands regularly, wear masks, etc.	1	2	-	-
PC21. report hygiene and sanitation issues to appropriate authority	1	1	-	-
PC22. follow recommended personal hygiene and sanitation practices, for example, washing/sanitizing hands, covering face with a bent elbow while coughing/ sneezing, using PPE, etc.	1	1	-	-

	<i>Conserve material/energy/electricity</i>	7	16	-	3
	PC23. optimize usage of material including water in various tasks/activities/processes	1	2	-	-
	PC24. use resources such as water, electricity and others responsibly	1	2	-	1
	PC25. carry out routine cleaning of tools, machine and equipment	1	2	-	-
	PC26. optimize use of electricity/energy in various tasks/activities/processes	1	3	-	1
	PC27. perform periodic checks of the functioning of the equipment/machine and rectify wherever required	1	3	-	1
	PC28. report malfunctioning and lapses in maintenance of equipment	1	2	-	-
	PC29. use electrical equipment and appliances properly	1	2	-	-
	<i>Use effective waste management/recycling practices</i>	3	8	-	1
	PC30. identify recyclable, non-recyclable and hazardous waste	1	2	-	1
	PC31. deposit recyclable and reusable material at identified location	1	3	-	-
	PC32. dispose non-recyclable and hazardous waste as per recommended processes	1	3	-	-
	<b>NOS Total</b>	<b>30</b>	<b>60</b>	<b>-</b>	<b>10</b>
<b>TEL/N9102: Interact Effectively with Team Members and Customers</b>	<i>Interact effectively with superiors</i>	7	15	-	2
	PC1. receive work requirements from superiors and customers and interpret them correctly	1	2	-	-
	PC2. inform the supervisor and/or concerned person about any unforeseen disruptions or delays	2	4	-	1
	PC3. participate in decision making by providing facts and figures, giving/accepting constructive suggestions	2	5	-	1

PC4. rectify errors as per feedback and ensure the errors are not repeated	2	4	-	-
<i>Interact effectively with colleagues and customers</i>	7	26	-	4
PC5. comply with organisation's policies and procedures for working with team members	1	2	-	-
PC6. communicate professionally using appropriate mode of communication such as face-to-face, telephonic and written	2	4	-	1
PC7. respond to queries and seek/provide clarifications if required	2	4	-	1
PC8. co-ordinate with team to integrate work as per requirements	-	3	-	-
PC9. resolve conflicts within the team/ with customers to achieve smooth workflow	1	5	-	1
PC10. recognize emotions accurately in self and others to build good relationships	1	4	-	-
PC11. prioritize team and organization goals above personal goals	-	4	-	1
<i>Respect differences of gender and ability</i>	11	24	-	4
PC12. maintain a conducive environment for all the genders at the workplace	2	5	-	1
PC13. encourage appropriate behavior and conduct with people across gender	2	5	-	1
PC14. assist team members with disability in overcoming any challenges faced in work	3	4	-	1
PC15. practice appropriate verbal and non-verbal communication while with People with Disability (PwD) interacting	2	4	-	1
PC16. ensure equal participation of the people across genders in discussions	2	6	-	-
<b>NOS Total</b>	<b>25</b>	<b>65</b>	<b>-</b>	<b>10</b>










<b>DGT/VSQ/N 0102: Employability Skills (60 Hours)</b>	<i>Introduction to Employability Skills</i>	1	1	-	-
	PC1. identify employability skills required for jobs in various industries	-	-	-	-
	PC2. identify and explore learning and employability portals	-	-	-	-
	<i>Constitutional values – Citizenship</i>	1	1	-	-
	PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.	-	-	-	-
	PC4. follow environmentally sustainable practices	-	-	-	-
	<i>Becoming a Professional in the 21st Century</i>	2	4	-	-
	PC5. recognize the significance of 21st Century Skills for employment	-	-	-	-
	PC6. practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life	-	-	-	-
	<i>Basic English Skills</i>	2	3	-	-
	PC7. use basic English for everyday conversation in different contexts, in person and over the telephone	-	-	-	-
	PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English	-	-	-	-
	PC9. write short messages, notes, letters, e-mails etc. in English	-	-	-	-
	<i>Career Development &amp; Goal Setting</i>	1	2	-	-
	PC10. understand the difference between job and career	-	-	-	-
	PC11. prepare a career development plan with short- and long-term goals, based on aptitude	-	-	-	-




<i>Communication Skills</i>	2	2	-	-
PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings	-	-	-	-
PC13. work collaboratively with others in a team	-	-	-	-
<i>Diversity &amp; Inclusion</i>	1	2	-	-
PC14. communicate and behave appropriately with all genders and PwD	-	-	-	-
PC15. escalate any issues related to sexual harassment at workplace according to POSH Act	-	-	-	-
<i>Financial and Legal Literacy</i>	2	3	-	-
PC16. select financial institutions, products and services as per requirement	-	-	-	-
PC17. carry out offline and online financial transactions, safely and securely	-	-	-	-
PC18. identify common components of salary and compute income, expenses, taxes, investments etc	-	-	-	-
PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation	-	-	-	-
<i>Essential Digital Skills</i>	3	4	-	-
PC20. operate digital devices and carry out basic internet operations securely and safely	-	-	-	-
PC21. use e- mail and social media platforms and virtual collaboration tools to work effectively	-	-	-	-
PC22. use basic features of word processor, spreadsheets, and presentations	-	-	-	-
<i>Entrepreneurship</i>	2	3	-	-
PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research	-	-	-	-

PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion	-	-	-	-
PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity	-	-	-	-
<i>Customer Service</i>	1	2	-	-
PC26. identify different types of customers	-	-	-	-
PC27. identify and respond to customer requests and needs in a professional manner.	-	-	-	-
PC28. follow appropriate hygiene and grooming standards	-	-	-	-
<i>Getting ready for apprenticeship &amp; Jobs</i>	2	3	-	-
PC29. create a professional Curriculum vitae (Résumé)	-	-	-	-
PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively	-	-	-	-
PC31. apply to identified job openings using offline /online methods as per requirement	-	-	-	-
PC32. answer questions politely, with clarity and confidence, during recruitment and selection	-	-	-	-
PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements	-	-	-	-
<b>NOS Total</b>	<b>20</b>	<b>30</b>	<b>-</b>	<b>-</b>

### Annexure III

#### List of QRs used in PHB

Chapter No.	Unit No.	Topic Name	Page No. in PHB	QR Code
2	2.3	Difference between hub, router, and switch	27	 <p>Click/Scan the QR code to access the related video</p>
2	2.3	How to install a router	24	 <p>Click/Scan the QR code to access the related video</p>
2	2.6	Use of Multimeter and revise electricity basics	43	 <p>Click/Scan the QR code to access the related video</p>
3	3.6	How to perform speed test	84	 <p>Click/Scan the QR code to access the related video</p>
5	5.2	First Aid Techniques	127	 <p>Click/Scan the QR code to access the related video</p>
5	5.3	Handwashing Techniques	136	 <p>Click/Scan the QR code to access the related video</p>
5	5.3	CPR	143	 <p>Click/Scan the QR code to access the related video</p>
5	5.5	E-waste Management Process	149	 <p>Click/Scan the QR code to access the related video</p>
6	6.1	Types of Communication	160	 <p>Click/Scan the QR code to access the related video</p>

Chapter No.	Unit No.	Topic Name	Page No. in PH	QR Code
6	6.1	Communication with Colleagues and Customers	163	 <p>Click/Scan the QR code to access the related video</p>
6	6.1	Telephone Communication	165	 <p>Click/Scan the QR code to access the related video</p>
Employability Skills				 <p>Click/Scan the QR code to access the related video</p>







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