

# **TELECOMMUNICATIONS EQUIPMENT INSTALLATION AND MAINTENANCE**

## ***LEVEL 2:***

## **NATIONAL SKILLS QUALIFICATIONS (NSQ)**

**Qualification:** Telecommunication Equipment Installation and Maintenance

**Qualification Ref. No:**

**Level:** 2

**Credit Value:** 24

**Guided Learning Hours:** 230

**Level Purpose:**

The purpose of the Qualification is to train a learner to be competent in installing and maintaining Telecommunication Links, UPS and radio equipment. At the end of the Units, the learner will be able to:

1. Know the basic health and safety requirements in workplace environment.
2. Understand the importance of communication skills
3. Understand the importance of Team work in workplace environment.
4. Understand the Principles of Basic Electronics
5. Know how to identify various Telecommunication Components and Accessories
6. Understand how to carry out maintenance in fibre optics cable.
7. Know routine maintenance of a radio equipment
8. Understand Cable Wiring System and Equipment
9. Understand how to carry out installation and maintenance of solar power and UPS systems.
10. Basic Computer Appreciation

**Level assessment requirements/evidence requirements:**

There are eight compulsory units (Units 1, 2, 3, 4, 5, 6, 7 and 8) and 2 other optional units (Units 9 and 10) to enable the learner qualify for Level 2 in **TELECOMMUNICATION SYSTEM INSTALLATION AND MAINTENANCE.**

Assessment must be carried out in real workplace environment in which learning and

human development is carried out. ***Simulation is not allowed*** as all evidences are to be obtained directly in the field.

***Assessment methods to be used for this level include:***

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Work product (WP)
5. Personal Statement (PS)
6. Assignment

**QCF LEVEL 2:****TELECOMMUNICATION EQUIPMENT INSTALLATION AND MAINTENANCE****Mandatory Units**

S/No /Unit No	Reference Number	NOS Title	Credit Value	Guided Learning Hours	Remark
1	ICT/TIM/001/L2	Health, Safety and Environment	3	30	Level 2
2	ICT/TIM/002/L2	Communication Skills in Workplace	2	20	Level 2
3	ICT/TIM/003/L2	Teamwork in work environment	2	20	Level 2
3a	ICT/TIM/003a/L2	Introduction to Codes and Standards	2	20	Level 2
4	ICT/TIM/004/L2	Electronics 1	3	30	Level 2
5	ICT/TIM/005/L2	Telecom Components and Accessories	3	30	Level 2
6.	ICT/TIM/006/L2	Introduction to Fibre Optic Cables	3	30	Level 2
7.	ICT/TIM/007/L2	Understanding the steps in Radio Equipment Maintenance	3	30	Level 2
8.	ICT/TIM/008/L2	Understanding Telecommunications Cabling	2	20	Level 2
9	ICT/TIM/010/L2	Basic Computer Appreciation	3	20	Level 2
	<b>TOTAL</b>		<b>24</b>	<b>230</b>	

**Optional Units**

S/No /Unit No	Reference Number	NOS Title	Credit Value	Guided Learning Hours	Remark
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10	ICT/TIM/010/L2	Solar power and UPS Installation and Maintenance	2	20	Level 2
11	ICT/TIM/011/L2	Basic Telecommunications Network maintenance	2	20	Level 2
	<b>TOTAL</b>		<b>4</b>	<b>40</b>	

### **Unit 1: Health, Safety and Environment**

**Unit Reference Number:** ICT/TIM/001/L2

**Level:** 2

**Credit Value:** 3

**Guided Learning Hours:** 30

**Unit Purpose:** This qualification is about health and safety in the work environment. At the end of the Unit learners will be able to maintain good personal hygiene and carry out work activity in a safe manner to prevent hazards.

#### **Unit assessment requirements/evidence requirements:**

Assessment must be carried out in real workplace environment in which learning and human development is carried out. **Simulation is allowed** in this unit and level.

The evidences required for this Unit include:

#### **Assessment methods to be used include:**

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)



UNIT 01

Unit Title: Health, Safety and Environment

Level: 2

Credit Unit: 3

Guided Learning Hours: 30

LEARNING OBJECTIVE (LO)	PERFORMANCE CRITERIA			Evidence Type	Evidence Ref. Page No.			
The learner will:	The learner can:							
<b>LO 1:</b> Demonstrate Occupational and Environmental Health and Safety in Telecommunication system installation and maintenance	1.1	Explain occupational health and safety						
	1.2	Identify health and safety risks in Telecom system						
	1.3	Identify environmental hazards in Telecom system						
	1.4	Explain the effects of environmental hazards						
	1.5	Apply environmental protection methods						
<b>LO 2:</b> Demonstrate Personal Safety Measures in Telecommunication system installation and maintenance	2.1	Wear clean and appropriate Personal Protective Equipment						
	2.2	Work safely at all times, complying with health and safety and other relevant regulations and guidelines						
	2.3	Get any cuts, graze and wounds treated by the appropriate person						
	2.4	Report illness and infection promptly to the appropriate persons						
	2.5	State own responsibility under the (Nigeria factory Health and Safety Act, 2015) as it relates to own occupation						
	2.6	State general rules on hygiene that must be followed						
	2.7	State correct Personal Protection Equipment such as Head Protection, Foot Protection, Face and eye protection, Hand and Body protection and regulatory protection						
	2.8	State the importance of maintaining good personal hygiene						
	2.9	Describe how to deal with cuts, grazes and wounds and why it is important to do so.						
<b>LO 3:</b>	3.1	Demonstrate first aid procedures for						

LEARNING OBJECTIVE (LO)		PERFORMANCE CRITERIA	Evidence Type	Evidence Ref. Page No.
The learner will:		The learner can:		
First Aid Procedures and Security of Work Environment		defined situations		
	3.2	Identify first aid materials		
	3.3	Select first aid materials		
	3.4	Apply first aid methods		
	3.5	State the importance of working in a healthy, safe and secure workplace		
	3.6	Report any accidents or near accidents quickly and accurately to the appropriate personnel		
	3.7	Follow health and safety procedures during work		
	3.8	Follow emergency procedures during work		
	3.9	Follow organizational security procedures		
	3.10	Ensure the disposal of waste and Pollution control with organic, inorganic and electronic waste(e-waste) disposal methods etc.		
	3.11	Follow sound and noise control and protection methods and guidelines		
LO 4: Emergency Procedures	4.1	Describe the types of emergencies that may happen in the workplace and how to deal with them		
	4.2	Identify where to find the first-aid equipment and who the registered first-aider is, in the work place		
	4.3	Demonstrate safe lifting and handling techniques that should be followed		
	4.4	State other ways of working safely that are relevant to own position and why they are important		
	4.5	Describe organizational emergencies procedures, in particular fire, and how these should be followed		
	4.6	State the possible causes of fire in the workplace		
	4.7	Describe how to minimize the possibility of fire in the workplace		
	4.8	State where to find the alarms and how to set them off		
	4.9	State why a fire should never be approached unless it is safe to		



LEARNING OBJECTIVE (LO) The learner will:	PERFORMANCE CRITERIA The learner can:		Evidence Type				Evidence Ref. Page No.				
	4.10	State the importance of following the fire safety rules									
	4.11	State the importance of reporting all usual or non- routine incidents to the appropriate personnel									
	4.12	Emergency Contacts									
		Reading and Understanding Safety Symbols									

**Unit 2:** Communication Skills in Work Environment

**Unit Reference Number:** ICT/TIM/002/L2

**Level:** 2

**Credit Value:** 2

**Guided Learning Hours:** 20

**Unit Purpose:** This qualification is about communication skill in the working environment. At the end of the Unit learners will be competent in maintaining good communication skill among workers/clients in the work environment.

**Unit assessment requirements/evidence requirements:**

Assessment must be carried out in real workplace environment in which learning and human development is carried out. ***Simulation is not allowed*** in this unit and level.

The evidences required for this Unit include:

***Assessment methods to be used include:***

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)

UNIT 02

Unit Title: Communication Skills in work environment

Level: 2

Credit Unit: 2

Guided Learning Hours: 20

LEARNING OBJECTIVE (LO)  The learner will:		PERFORMANCE CRITERIA  The learner can:	Evidence Type	Evidence Ref. Page No.
LO 1: Use of a non-complex Communication in Work Environment	1.1	Use a simple verbal means to pass on necessary information		
	1.2	Use non-verbal means to pass necessary information, e.g. body language		
	1.3	Interpret symbols and signs appropriately		
LO 2: Identify the source of information in a work environment	2.1	Locate the source of information in an organization and work environment		
	2.2	Relate appropriately with source of information		
	2.3	Use the general information flow systems in a work environment		
	2.4	Use information to avoid challenges in a work situation		
	2.5	Report findings in accordance to procedure in a work environment		
LO 3: Use of a various Communication means in a work environment	3.1	Locate the various communication equipment in the work environment		
	3.2	Use effectively the general communication equipment in a work environment		
	3.3	Pass information effectively to the right personnel		
	3.4	Pass information effectively using symbols, signs and codes		

	3.5	Comply with general instructions in line with ethics of the work environment								
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**Unit 3: Teamwork in Work Environment**

**Unit Reference Number:** ICT/SIM/003/L1

**Level:** 2

**Credit Value:** 2

**Guided Learning Hours:** 20

**Unit Purpose:** At the end of this Unit the learners will be able to apply team spirit and develop positive working relationship with colleagues.

**Unit assessment requirements/evidence requirements:**

Assessment must be carried out in real workplace environment in which learning and human development is carried out. **Simulation is not allowed** in this unit and level.

The evidences required for this Unit include:

**Assessment methods to be used include:**

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)

UNIT 03

Unit Title: Team work in work environment

Level: 2

Credit Unit: 2

Guided Learning Hours: 20

LEARNING OBJECTIVE (LO)		PERFORMANCE CRITERIA	Evidence Type				Evidence Ref. Page No.					
The learner will:		The learner can:										
<b>LO 1: Establish Positive working relationship with colleagues</b>	1.1	Identify the need for developing positive working relationship with colleagues										
	1.2	Recognise the importance of relating with other people that make them feel valued and respected.										
	1.3	Assist team members when required										
	1.4	Report to the personnel when request for assistance fall outside area of responsibility										
	1.5	Communicate information to colleagues about own that might affect others										
<b>LO 2: Take responsibilities within the team</b>	2.1	Recognize own role and responsibilities within the team										
	2.2	Perform individual tasks in line with the team rules and regulations										
	2.3	Participate effectively in team work										
<b>LO 3: Work in compliance with policy of organisation</b>	3.1	Work in line with organizational standard										
	3.2	Use Organisation Code of Practice										
	3.3	Explain Organizational Code of Conduct										

## **UNIT 4: Electronics 1.**

**Unit Reference Number:** ICT/TIM/004/L2

**Level:** 2

**Credit Value:** 2

**Guided Learning Hours:** 20

**Unit Purpose:** At the end of this Unit the learners will be introduced to the basic electronic and telecommunication equipment

**Unit assessment requirements/evidence requirements:**

Assessment must be carried out in real workplace environment in which learning and human development is carried out. ***Simulation is not allowed*** in this unit and level.

The evidences required for this Unit include:

***Assessment methods to be used include:***

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Personal Statement (PS)
4. Witness Testimony (WT)

UNIT 04

Unit Title: Electronics. 1

Level: 2

Credit Unit: 2

Guided Learning Hours: 20

LEARNING OBJECTIVE (LO)  The learner will:		PERFORMANCE CRITERIA  The learner can:	Evidence Type	Evidence Ref. Page No.
<b>LO1:</b> Introduction to Basic Electronics Components and Symbols	1.1	Identify various electronics components used in electronics circuits, e.g. - resistors, - capacitors, - inductors, - diodes - transistors, - thyristors, - ICs, etc.		
	1.2	Identify various signs and symbols used in electronics circuits.		
	1.3	Determine the value of resistors and capacitors using colour codes		
	1.4	Identify different types of electronic circuits using passive and active components.		
	1.5	Distinguish between AC and DC quantities.		
	1.6	Sketch simple electronic circuits indicating passive and active components		
	1.7	Construct simple electronic circuits using passive and active components.		
	1.8	Determine the value of power in a circuit using Ohm's Law		
<b>LO 2:</b> Electronics Test Equipment and Tools	2.1	Identify various types of test equipment and their uses, e.g. - Multimeter - IC Tester		

		- Oscilloscope, etc.											
	2.2	Carry out tests in electronics circuits using test equipment in (2.1) above.											
	2.3	Identify different types tools and their uses, e.g. <ul style="list-style-type: none"> <li>- Pairs of pliers</li> <li>- Soldering iron</li> <li>- Side cutters</li> <li>- Strippers</li> <li>- Crimping tool, etc.</li> </ul>											
	2.4	Demonstrate the use of electronics tools in constructing electronic circuits.											
<b>LO 3:</b> Identification of basic electronics circuitry	3.1	Describe basic RLC Circuits											
	3.2	Identify simple rectifier circuits: <ul style="list-style-type: none"> <li>a. Half wave rectifier</li> <li>b. Full wave rectifier</li> <li>c. Bridge rectifier</li> </ul>											
	3.3	Identify simple electronic circuit using transistors: <ul style="list-style-type: none"> <li>1. Simple detector circuit</li> <li>2. Simple amplifier circuit</li> </ul>											



## **UNIT 5: Telecommunications Components and Accessories.**

**Unit Reference Number:** ICT/TIM/005/L2

**Level:** 2

**Credit Value:** 2

**Guided Learning Hours:** 20

**Unit Purpose:** At the end of this Unit the learners will be able to identify and use various components and accessories in Telecommunication Systems.

**Unit assessment requirements/evidence requirements:**

Assessment must be carried out in real workplace environment in which learning and human development is carried out. ***Simulation is not allowed*** in this unit and level.

The evidences required for this Unit include:

***Assessment methods to be used include:***

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment

UNIT 05

Unit Title: Telecommunications Components and Accessories

Level: 2

Credit Unit: 2

Guided Learning Hours: 20

<b>LEARNING OBJECTIVE (LO)</b> <b>The learner will:</b>		<b>PERFORMANCE CRITERIA</b> <b>The learner can:</b>	<b>Evidence Type</b>	<b>Evidence Ref. Page No.</b>
<b>LO1:</b> Demonstrate understanding of Telecommunications Network Components	1.1	Explain the divisions of the Telecommunication industry		
	1.2	Distinguish between a Transmitter and a Receiver in Telecommunications system		
	1.3	Describe the use of Hubs and Switches in Telecommunication systems		
	1.4	Carry out the installation of Routers		
	1.5	Identification of spare parts in Telecommunication Systems		
	1.6	Identify telecommunication antennas, e.g. V-Sat, Microwave, RF, TV, and Satellite antennas.		
	1.7	Identify mobile telecommunication components and accessories		
<b>LO 2:</b> Demonstrate the use of Networks in Telecommunications Sector	2.1	Compare various Network Elements used in Telecommunication Systems		
	2.2	Describe the functions of network elements		
	2.3	Identify the different types of cables used in Telecommunication Systems		
<b>LO 3:</b> Apply the use of Telecommunications Media and Accessories in the Telecommunications sector	3.1	Demonstrate how to interface computer system to its accessories		
	3.2	Explain the operations of a MODEM		
	3.3	Demonstrate the applications of a MODEM in Telecommunication systems.		
	3.4	Distinguish between different types of Networking Cables, e.g. CAT5, CAT6, CAT7		
	3.5	Mount telecommunication the		

		following equipment on the wall: PABX, TV Display, Cable Trays, Trunking, Rack and Battery Stand.											
	3.6	Carry out connectivity tests from point to point and point to multipoint on Patch Panel using punch tools and LAN Tester											
	3.7	Identify Telecommunications power components e.g. batteries, mini-circuit breakers, power generator etc											
<b>L04:</b> Explain the Protocol Layers in a Telecom Systems	4.1	Define Protocol in a Telecommunication System											
	4.2	Identify the protocol layers in a Telecommunications System											
	4.3	Compare the OSI and SS7											

**UNIT 6: Introduction to Fibre Optic Cables.**

**Unit Reference Number:** ICT/TIM/006/L2

**Level:** 2

**Credit Value:** 3

**Guided Learning Hours:** 30

**Unit Purpose:** At the end of this Unit the learners will be competent in carrying out basic maintenance in Fibre Optics Cable links in Telecommunication Systems.

**Unit assessment requirements/evidence requirements:**

Assessment must be carried out in real workplace environment in which learning and human development is carried out. ***Simulation is not allowed*** in this unit and level.

The evidences required for this Unit include:

***Assessment methods to be used include:***

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Personal Statement (PS)

UNIT 06

Unit Title: Introduction to Fibre Optic Cables.

Level: 2

Credit Unit: 3

Guided Learning Hours: 30

<b>LEARNING OBJECTIVE (LO)</b> <b>The learner will:</b>		<b>PERFORMANCE CRITERIA</b> <b>The learner can:</b>	<b>Evidence Type</b>				<b>Evidence Ref. Page No.</b>			
<b>LO1:</b> Demonstrate the Knowledge of Various Types of Fibre Optic Cables, Standards and Accessories	1.1	Identify the different types of Fibre Optic Cables; <ul style="list-style-type: none"> <li>- Multimode</li> <li>- Single mode</li> </ul>								
	1.2	Determine the use of each type of fibre cable mentioned above 1.1								
	1.3	Demonstrate understanding of fibre cable installation design and layout diagram								
	1.4	Identify different elements in a network based on fibre optic cable system and their functions								
	1.5	Demonstrate the least types of fibre cable connectors and their applications								
	1.6	Describe a Standard Cable cover colour and Standard Fibre cable colour codes.								
<b>LO 2:</b> Demonstrate the Understand of Cabling Techniques and Tools	2.1	Identify the different tools and equipment used in fibre cable repairs and maintenance, e.g. <ul style="list-style-type: none"> <li>- Cleaver,</li> <li>- Stripper</li> <li>- Splicing Machine</li> <li>- VFL</li> <li>- OTDR</li> </ul>								
	2.2	Identify the different consumables used in fibre cable repairs and								

		maintenance, e.g. - Isopropyl (sprit) - Wipes								
	2.3	Explain fibre optic cable network installation and the maximum distance allowed by standards in fibre								
	2.4	Explain the use of cable trays, wall plates, tensile strength and maximum bend radius, splice tray, cassette, termination panels, patch cables in fibre, cable strippers, Cable Duct, etc								
	2.5	Introduction to fibre optic cable splicing and termination.								
<b>LO 3:</b> Demonstrate how to carry out Troubleshooting, Fault Isolation and Repairs in Telecommunication Installation.	3.1	Determine how a fibre optic cable is prepared for installation, protecting the eye, skin, and inhalation.								
	3.2	State the common problems encountered in fibre optic cable installation or repair.								
	3.3	Identify bad connector installation and poor splicing, equipment failure, cable cut, etc.								
	3.4	Describe step by step methods of tracing faults in a fibre network,								
	3.5	Explain the measures taken towards resolution of a minor fault in fibre optics.								

## **UNIT 7: Understanding the Steps in Radio Equipment Maintenance.**

**Unit Reference Number:** ICT/TIM/007/L2

**Level:** 2

**Credit Value:** 3

**Guided Learning Hours:** 30

**Unit Purpose:** At the end of this Unit the learners will be able to carry out basic routine maintenance in radio equipment in Telecommunications.

### **Unit assessment requirements/evidence requirements:**

Assessment must be carried out in real workplace environment in which learning and human development is carried out. ***Simulation is not allowed*** in this unit and level.

The evidences required for this Unit include:

### ***Assessment methods to be used include:***

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Personal Statement (PS)

**UNIT 07**

**Unit Title: Routine Maintenance of Radio Equipment.**

**Level: 2**

**Credit Unit: 3**

**Guided Learning Hours: 30**

<b>LEARNING OBJECTIVE (LO)</b> <b>The learner will:</b>		<b>PERFORMANCE CRITERIA</b> <b>The learner can:</b>	<b>Evidence Type</b>				<b>Evidence Ref. No.</b>	<b>Page</b>					
<b>L01:</b> Demonstrate the Knowledge of Functional Elements of a Radio Base Transceiver Station (BTS).	1.1	Identify the functional elements of a BTS; - the feeder cable - the jumper cable - tower mast amplifier(TMA) - connectors - parabolic dish antenna - sectorized antennas - combiner - duplexer											
	1.2	Demonstrate how to use the various tools used in maintenance of radio equipment											
	1.3	Demonstrate how to use the various test sets in maintenance of BTS											
	1.4	Explain the basic function of a Tower Mast Amplifier (improving signal strength)											
	1.5	Explain Alarm Systems of the BTS (for minor Fault Clearing)											
	1.6	Describe the Routine Maintenance procedures to be carried out in BTS site environment.											
	1.7	Discuss the use of fault dockets in reporting faults.											
	1.8	Explain how the ambient temperature of the equipment shelter affects the system unit											
<b>L02:</b> Demonstrate the	2.1	Determine the procedures of weather-proofing the feeder cables for											



knowledge of installation of Feeder Cable and Antenna Alignment		protection purposes against ingress of moisture																		
	2.2	Describe the procedures for the crimping of feeder and jumper cables to the connectors to achieve interconnectivity.																		
	2.3	Demonstrate the use of basic tools in antenna alignment: <ul style="list-style-type: none"> <li>- compass</li> <li>- inclinometer</li> <li>- binoculars</li> <li>- spanners</li> </ul>																		
<b>LO 3:</b> Describe various Types of power supply in the BTS site.	3.1	Identify the major and backup power supply procedures of the following; <ul style="list-style-type: none"> <li>- Mains power supply</li> <li>Generator backup power supply</li> <li>- Solar power backup power supply</li> </ul>																		
	3.2	Demonstrate the use of test tools, e.g. Megger-tester in carrying out earth loop impedance test.																		
	3.3	Demonstrate the knowledge of various voltage levels used in the equipment and perform the necessary checks.																		
<b>LO 4:</b> Demonstrate the knowledge of functionality of Very Small Aperture Terminal (VSAT) & Microwave Radios	4.1	Explain the working of very small aperture terminal (VSAT) with respect to space segment.																		
	4.2	Identify the components of the VSAT network: <ul style="list-style-type: none"> <li>- Block Up Converter (BUC)</li> <li>- Low Noise Block Amplifier (LNB)</li> <li>- Orthomode Transducer (OMT)</li> <li>- Feedhorn</li> <li>- Antenna dish</li> <li>- Inter-Facility Link (IFL – Coaxial Cable)</li> <li>- MODEM (Indoor Unit)</li> </ul>																		
	4.3	Discuss the procedures for setting of a remote VSAT station.																		
	4.4	List the basic tools used in the alignment of antenna dish.																		
	4.5	Explain the procedures for commissioning a VSAT remote station.																		

## **UNIT 8: Understanding Telecommunications Cabling.**

**Unit Reference Number:** ICT/TIM/008/L2

**Level:** 2

**Credit Value:** 2

**Guided Learning Hours:** 20

**Unit Purpose:** At the end of this Unit the learners will be competent in the wiring of different cables and equipment in the Telecommunication Systems.

**Unit assessment requirements/evidence requirements:**

Assessment must be carried out in real workplace environment in which learning and human development is carried out. ***Simulation is not allowed*** in this unit and level.

The evidences required for this Unit include:

***Assessment methods to be used include:***

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Personal Statement (PS)

UNIT 08

Unit Title: Cable system wiring and equipment.

Level: 2

Credit Unit: 2

Guided Learning Hours: 20

LEARNING OBJECTIVE (LO)		PERFORMANCE CRITERIA	Evidence Type	Evidence Ref. Page No.
The learner will:		The learner can:		
<b>LO1:</b> Demonstrate the knowledge of Cables and Accessories in Wiring	1.1	Identify the types of cables; <ul style="list-style-type: none"> <li>- coaxial cable (RG 58, RG9)</li> <li>- straight through cable (STC),</li> <li>- cross-over cable</li> <li>- twisted wire cable(shielded and unshielded)</li> <li>- fibre optic cable</li> <li>- waveguide cable</li> </ul>		
	1.2	Identify the types of cable connectors; <ul style="list-style-type: none"> <li>- Block Network Connector (BNC),</li> <li>- N-type connector,</li> <li>- phono connectors,</li> <li>- banana connectors</li> <li>- RJ 11</li> <li>- RJ 45</li> </ul>		
	1.3	Identify the types Cable Wiring system: <ul style="list-style-type: none"> <li>- Termination of cables in a patch panel</li> <li>- Telephone Lines (indoor)</li> <li>- Faulty Electrical wires (indoor)</li> </ul>		
	1.4	Describe the application of at least one (1) Cable Wiring in (1.3) above.		
	1.5	Identification of the Spare Parts in Cable Wiring system: <ul style="list-style-type: none"> <li>-Numbering Tags</li> <li>-Generic and Standard Names</li> <li>- Symbols and Colour Codes</li> </ul> (e.g. NIG IEC 61935.2:2006*		

		NIG ISO/IEC 14763.3:2007*)								
<b>LO 2:</b> Demonstrate the use of Cable Wiring Tools on Specific Network Equipment	2.1	Identify the Cable Wiring System Tools: <ul style="list-style-type: none"> <li>- anti-static testers</li> <li>- cable strippers</li> <li>- cable testers</li> <li>- cable tie tensioners</li> <li>- crimpers, etc.</li> <li>- punch down tools</li> </ul>								
	2.2	Describe how to carry out the following tests using the tools mentioned in (2.1) above; <ul style="list-style-type: none"> <li>- bit error rate (BER)</li> <li>- continuity</li> <li>- end to end</li> <li>- frequency response</li> <li>- functionality test</li> <li>- gain and attenuation</li> <li>- loop back</li> <li>- signal to noise ratio</li> <li>- speed, etc.</li> </ul>								
	2.3	Demonstrate the use of the following equipment in carrying out tests in (2.2) above: <ul style="list-style-type: none"> <li>- analog transmission measuring sets</li> <li>- digital transmission measuring sets</li> <li>- multimeters</li> </ul>								
	2.4	Carry out Cable Wiring installation on the following Network Equipment: <ul style="list-style-type: none"> <li>- cable/Pay TV</li> <li>- closed circuit TV (CCTV)</li> <li>- free to air TV</li> <li>- intercom</li> <li>- office equipment</li> </ul>								
<b>LO3:</b> Demonstrate the knowledge of site selection for installation of Telecommunication Systems.	3.1	Identify site to determine the suitability for installation of Telecommunications Systems, e.g. <ul style="list-style-type: none"> <li>- building debris</li> <li>- glass fibre</li> <li>- live power lines</li> <li>- manual handling</li> <li>- mud and water</li> <li>- needle stick injury</li> </ul>								

		<ul style="list-style-type: none"> <li>- optical cable</li> <li>- remote power feeding services</li> <li>- external line plant cable layout</li> </ul>							
	3.2	<p>Demonstrate the use of the following Telecommunications kits and accessories on site:</p> <ul style="list-style-type: none"> <li>- personal protective clothing:</li> <li>- earmuffs</li> <li>- gloves:</li> <li>- plastic</li> <li>- rubber</li> <li>- leather</li> <li>- head protection</li> <li>- kneepads</li> <li>- masks</li> <li>- protective suits</li> <li>- safety boots</li> <li>- safety glasses</li> </ul>							
	3.3	<p>Demonstrate the use of the Telecommunications Kits and Accessories above for commissioning and decommissioning of isolated worksite and lines prior to commencement</p>							
	3.4	<p>Identify the closest telecommunications equipment on site:</p> <ul style="list-style-type: none"> <li>- flashing lights</li> <li>- safety barriers</li> <li>- trench guards</li> <li>- warning signs and tapes</li> </ul>							
	3.5	<p>Handle the following items in the work site:</p> <ul style="list-style-type: none"> <li>- asbestos</li> <li>- chemicals</li> <li>- materials</li> <li>- tools and equipment</li> <li>- work platforms</li> <li>- special access requirements</li> <li>- suitable light and ventilation</li> <li>- lightening protection</li> </ul>							
		Carry out Environmental Impact							

	3.6	Assessment (EIA) in preparation of Cable Wiring Installation: <ul style="list-style-type: none"> <li>- clean-up protection</li> <li>- storm-water protection</li> <li>- waste management(organic, inorganic, electronic waste)</li> </ul>										
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**UNIT 9: Solar Power and UPS Installation and Maintenance.**

**Unit Reference Number:** ICT/TIM/009/L2

**Level:** 2

**Credit Value:** 2

**Guided Learning Hours:** 20

**Unit Purpose:** At the end of this Unit the learners will be competent in carrying out the installation and maintenance of Solar Power Supply and UPS for the Telecommunication Systems.

**Unit assessment requirements/evidence requirements:**

Assessment must be carried out in real workplace environment in which learning and human development is carried out. **Simulation is not allowed** in this unit and level.

The evidences required for this Unit include:

**Assessment methods to be used include:**

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Personal Statement (PS)

**UNIT 09**

**Unit Title: Solar Power and UPS Installation and Maintenance**

**Level: 2**

**Credit Unit: 2**

**Guided Learning Hours: 20**

LEARNING OBJECTIVE (LO)		PERFORMANCE CRITERIA	Evidence Type				Evidence Ref. No.	Page No.				
The learner will:		The learner can:										
<b>LO1:</b> Identification of Components of Solar Power Supply Installation	1.1	Identify the component of a Solar Power System: <ul style="list-style-type: none"> <li>- Solar Panels</li> <li>- Charge Controller</li> <li>- Inverter</li> <li>- Storage devices (battery)</li> </ul>										
	1.2	Acquire the ability to install the Solar Power Supply for power delivery to the telecommunication equipment.										
	1.3	Prepare the location of the Solar Power Supply; <ul style="list-style-type: none"> <li>- Battery rack</li> <li>- Inverter rack</li> <li>- Solar panel mounting</li> </ul>										
<b>LO 2:</b> Demonstrate how to carry out maintenance of Solar Power Supply in a telecommunications environment	2.1	Demonstrate the knowledge of <ul style="list-style-type: none"> <li>a. Preventive Maintenance</li> <li>b. Corrective Maintenance</li> </ul>										
	2.2	Identify <ul style="list-style-type: none"> <li>(a) working Solar Power Supply and</li> <li>(b) a failed Solar Power Supply.</li> </ul>										
	2.3	Determine proper working condition of the; <ul style="list-style-type: none"> <li>- charge controller</li> <li>- inverter</li> <li>- battery bank</li> </ul>										
	2.4	Conduct maintenance on the Solar Power Supply										

	2.5	Describe the malfunction associated with convectors and cable accessories.																
<b>LO 3:</b> Describe the integration of Solar Power Supply to the UPS Device in a Telecommunication System.	3.1	Explain the interconnection between the UPS device and the Solar Power Supply in a Telecommunications System.																
	3.2	Install Hybrid Power Supply to handle seamless power delivery to a Telecommunications System																
	3.3	Demonstrate the use of basic tools: compass, inclinometer, binoculars and spanners in carrying out antenna alignment;																
<b>LO 4:</b> Demonstrate the Knowledge of UPS of proper operation condition of a UPS System	4.1	Identify the components of UPS - Battery - Fuses - Regulators - Connectors, etc.																
	4.2	Identify proper working condition of a UPS system.																
	4.3	Describe the overall status and performance condition of the UPS in the event of power failure from the grid.																
	4.4	Demonstrate the ability to replace faulty elements in a UPS; - Battery - Fuses - Regulators - Connectors, etc.																
	4.5	Implement connection between the UPS, Solar Power Supply and Alternate Power Supply.																
	4.6	Carry out General maintenance; Maintenance of a UPS System in a Telecommunications Environment.																



## **UNIT 10: Basic Computer Appreciation**

**Unit Reference Number:** ICT/TIM/010/L2

**Level:** 2

**Credit Value:** 2

**Guided Learning Hours:** 20

**Unit Purpose:** At the end of this Unit the learners will be introduced to basic computer operation in the Telecommunication Systems.

**Unit assessment requirements/evidence requirements:**

Assessment must be carried out in real workplace environment in which learning and human development is carried out. ***Simulation is not allowed*** in this unit and level.

The evidences required for this Unit include:

***Assessment methods to be used include:***

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)

UNIT 10

Unit Title: Basic Computer Appreciation

Level: 2

Credit Unit: 2

Guided Learning Hours: 20

<b>LEARNING OBJECTIVE (LO)</b> <b>The learner will:</b>		<b>PERFORMANCE CRITERIA</b> <b>The learner can:</b>	<b>Evidence Type</b>																		
<b>LO1:</b> Explain Computer System Operation	1.1	Describe a Computer system																			
	1.2	Differentiate between computer soft and hardware.																			
	1.3	Identify basic input/output devices eg:- Keyboard, mouse, VDU displays, and printers																			
	1.4																				
<b>LO 2:</b> Demonstrate knowledge of the use a Computer System	2.1	Start and short down a computer system																			
	2.2	Demonstrate how to use computer keyboard and mouse																			
	2.3	Identify the use of various icons on the menu bar and tool bar for specific appropriate functions																			
	2.4	Perform typing exercise and make data input																			
<b>LO 3:</b> Explain the Impact of Computer in Modern Society	3.1	Identify the benefits of computer to society																			
	3.2	Outline the role of computer in telecommunication system.																			
	3.3	Describe the use of computer in data transmission																			
	3.4	Enumerate services available on internet e. g., Email, Browsing, Using search engine etc.																			
	3.5	Enumerate some challenges of the computer system in telecommunication industry.																			

<b>LO 4:</b> <b>Explain the</b> <b>Various Types of</b> <b>Computers and</b> <b>Accessories and</b> <b>where they are</b> <b>used</b>	4.1	Describe the classes of computers according to sizes and usage.											
	4.2	Enumerate various types of microprocessors											
	4.3	Identify the main components of the computer system eg:- Mother-board including the Processor, RAM, ROM, HDD capacity, the input/output systems, CD/DVD etc.											
	4.4	Describe the software component including Systems Software and Applications software.											
	4.5	Explain the relationship between the functions of 4.3 and 4.4.											

## **UNIT 11: Basic Telecommunications Network Site Maintenance.**

**Unit Reference Number:** ICT/TIM/011/L2

**Level:** 2

**Credit Value:** 2

**Guided Learning Hours:** 20

**Unit Purpose:** At the end of this Unit the learners will be competent in performing basic telecommunication site maintenance.

**Unit assessment requirements/evidence requirements:**

Assessment must be carried out in real workplace environment in which learning and human development is carried out. ***Simulation is not allowed*** in this unit and level.

The evidences required for this Unit include:

***Assessment methods to be used include:***

5. Direct Observation/oral questions (DO)
6. Question and Answer (QA)
7. Witness Testimony (WT)
8. Assignment

UNIT 11

Unit Title: Basic Telecommunications Network Site Maintenance.

Level: 2

Credit Unit: 2

Guided Learning Hours: 20

LEARNING OBJECTIVE (LO)		PERFORMANCE CRITERIA	Evidence Type				Evidence Ref. Page No.			
The learner will:		The learner can:								
<b>LO1:</b> Demonstrate knowledge of Network media and topology	1.1	Identify the types of Network; - Network Topology e.g. - Star - Tree - Ring - Mesh - Bus - Hybrid								
	1.2	Identify connectivity media; - Wire-Line - Wireless - Hybrid - Types of Wire-line - Types of Wireless - Types of Hybrid								
	1.3	Identify the types Cable Wiring Maintenance - Continuity test - Poor Contact - Connector Installations - Wall plate installation - Label Conformance - Tags Maintenance								
<b>LO 2:</b> Demonstrate	2.1	Identify Types of Network - LAN								

Understanding of Types of Network		<ul style="list-style-type: none"> <li>- MAN</li> <li>- WAN</li> </ul>							
	2.2	Identify Various test equipment required for maintenance in 2.1 <ul style="list-style-type: none"> <li>- Signal strength tester</li> <li>- Digital Multimeter</li> <li>- LAN Tester</li> </ul>							
	2.3	Demonstrate the use of the following equipment in carrying out tests in (2.2) <ul style="list-style-type: none"> <li>- Spectrum Analyzer</li> <li>- Oscilloscope</li> <li>- OTDR</li> <li>- Noise Generator</li> <li>- SWR Bridge</li> <li>- Power meter</li> <li>- Megger Tester</li> <li>- Punch – Down Tools</li> </ul>							
LO3: Demonstrate the knowledge of cabling and wireless network maintenance at telecommunication site	3.1	Carry-Out maintenance on <ul style="list-style-type: none"> <li>- Patch Panels</li> <li>- Krone Blocks</li> <li>- Distribution Box</li> <li>- Junction Box</li> <li>- Lightning Arrestors</li> <li>- Earthing Systems</li> </ul>							
	3.2	Carry-out routine maintenance on Network Devices: <ul style="list-style-type: none"> <li>- Access Points</li> <li>- Hub</li> <li>- Switches</li> <li>- Basic Maintenance on Routers</li> </ul>							
	3.3	Documentation and Records <ul style="list-style-type: none"> <li>- Site Log-book</li> <li>- Maintenance Schedule</li> <li>- Periodic Reports (Weekly etc)</li> <li>- Site Equipment Record</li> <li>- Site Inventory</li> <li>- Stock Management</li> <li>- Equipment Specification</li> </ul>							

<b>L04: Demonstrate knowledge of Telecommunications maintenance Types</b>	4.1	<b>Preventive Maintenance</b> - Identify and carry out periodic maintenance schedules								
	4.2	- Document of site log-book <b>Corrective Maintenance</b> - Identify, Isolate and rectify faults								
	4.3	<b>Predictive Maintenance</b> - Pre-empting Failures -								

## **LIST OF RESOURCES REQUIRED FOR TELECOMMUNICATION SYSTEM INSTALLATION AND MAINTENANCE: LEVEL II**

1. Digital Multi-meter
2. Oscilloscope
3. Digital Inclinator
4. Digital Compass
5. Vision Binocular
6. Spectrum Analyzer
7. Tool Box Containing various hand tools
8. Desktop computer
9. Laptop with installed software tools
10. Continuity tester
11. Screw drivers (assorted)
12. Spanners (assorted)
13. Insulation tapes
14. Acid tester (hydrometer)
15. Soldering iron
16. Lead (solder)
17. Brush
18. Pliers
19. Wire Cutter
20. Electrician knife
21. Optical Time Domain Reflectometer (OTDR)
22. Cleaver
23. Splicing Machine
24. Visual Fault Locator (VFL)
25. Light Source and Power Meter
26. Impact Connector
27. Compass



## 28. Log Book

### Spare Parts/Consumables

1. Batteries
2. Charge Controllers
3. Inverters
4. Fuses (assorted)
5. Resistors (assorted)
6. Diodes (assorted)
7. Inductors
8. Capacitors
9. Transistors
10. ICs
11. Copper Cladded Board (CuCB)

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