



Republic of Rwanda  
Ministry of Education



**RTB** | RWANDA  
TVET BOARD

**ETERT501**

## **RADIO AND TELEVISION BROADCASTING SYSTEM INSTALLATION**

**Competence: Install radio and television broadcasting system**

**RQF Level: 5**

**Learning Hours**



**90hours**

**Credits: 9**

**Sector: Technical service**

**Trade: Electronics and Telecommunication**

**Module Type: Specific**

**Curriculum: TSVETE5001-TVET Certificate V in Electronics and Telecommuni-  
cation**

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Purpose statement	<p>This module describes the knowledge, skills and attitude required to install radio and television broadcasting system.</p> <p>It is intended to be pursued by learner at TVET certificate level V in Electronics and Telecommunication. At the end of this module, the learner will be able to Perform Pre-installation activities, install sound production room, Install TV production room, Operate radio and TV transmission system.</p>						
Learning assumed to be in place	<ul style="list-style-type: none"> <li>▪ N/A</li> </ul>						
Delivery modality	<b>Training delivery</b>		<b>100%</b>	<b>Assessment</b>		<b>Total 100%</b>	
	Theoretical content		30%	Formative assessment		30%	
	Practical work:		70%			50%	
	• Group work and presentation	30%					70%
	• Individual work	40%					
			Summative Assessment		50%		

## Elements of Competency and Performance Criteria

Elements of competency	Performance criteria
<b>1. Perform Pre-installation activities</b>	1.1 The site is correctly inspected according to audio and video studio installation standards
	1.2 Installation BOQ is appropriately developed based on Audio/Video production room tools ,materials and equipment quotation
	1.3 Tools, materials and equipment are properly selected according to their usage, specification and function
<b>2. Install sound production room</b>	2.1 The placements of studio audio equipment are accurately identified according to their positioning standard and expected outputs
	2.2 Studio audio equipment is properly interconnected based on the studio equipment interconnection process
	2.3 Studio audio equipment is appropriately configured according to the audio studio configuration standards and techniques
	2.4 Studio audio equipment functionality test is properly performed according to their operations and testing techniques
	2.5 The wiring diagram of the audio production room is appropriately drawn according to equipment interconnections and their symbols
	2.6 detailed system diagram of the audio production room is appropriately drawn based on equipment layout, signal flow, and connections
	2.7 Trainer guide is appropriately developed based on audio production room equipment operations
<b>3. Install TV production room</b>	3.1 The placements of TV production room equipment is accurately identified according to their positioning standard and expected output
	3.2 TV production room equipment is suitably interconnected based on their interconnection process
	3.3 TV production room equipment is appropriately configured according to their configuration standard and techniques
	3.4 The functionality of TV production room's equipment are properly tested according to their operations
	3.5 The wiring diagram of the video production room is appropriately drawn according to equipment interconnections and their symbols
	3.6 A detailed system diagram of the video production room is appropriately drawn based on equipment layout, signal flow, and connections

<b>4 Operate radio and TV transmission system</b>	4.1 Audio and video signal are properly processed based on signal processing equipment, standards and processing procedures
	4.2 The analogue and digital transmission system equipment are properly configured based on radio broadcasting station standard, equipment' standards and configuration techniques.
	4.3 The analogue and digital transmission system equipment are properly configured based on TV broadcasting station standard, equipment' standards and configuration techniques
	4.4 The analogue and digital transmission system functionality test is properly performed according to equipment operations and testing techniques.
	4.5 system adjustment is properly reported according to analogue and digital transmission system equipment operations and reporting templates

Knowledge	Skills	Attitude
<ul style="list-style-type: none"> <li>✓ Audio recording principles</li> <li>✓ Audio mixing techniques</li> <li>✓ Audio signal processing</li> <li>✓ Audio signal equalization</li> <li>✓ Knowledge of broadcasting specific equipment</li> <li>✓ Technical Symbols and diagrams</li> <li>✓ Interpret circuit diagrams</li> <li>✓ Industrial codes and standards</li> <li>✓ Basic of electronic fundamentals</li> <li>✓ Telecommunication equipment</li> <li>✓ Telecom transmission system equipment</li> <li>✓ Digital and analogue transmission system equipment</li> </ul>	<ul style="list-style-type: none"> <li>✓ Networking skills</li> <li>✓ Computer skills</li> <li>✓ Proper use of measurement tools</li> <li>✓ Computer-aided design</li> <li>✓ Creating circuit diagram</li> <li>✓ Analytical skills</li> <li>✓ Diagnostic skills</li> <li>✓ Communication skills</li> <li>✓ Collaborative skills</li> <li>✓ Task management skills</li> <li>✓ Installation skills</li> <li>✓ Spectrum monitoring</li> <li>✓ Collaborative skills</li> <li>✓ Proper use of measurement tools</li> <li>✓ Spectrum monitoring</li> </ul>	<ul style="list-style-type: none"> <li>✓ Innovative</li> <li>✓ Honest</li> <li>✓ Accountability</li> <li>✓ Self-motivated</li> <li>✓ Time management</li> <li>✓ Humble</li> <li>✓ Creative</li> <li>✓ Patient</li> <li>✓ Responsible</li> <li>✓ Flexible</li> <li>✓ integrity</li> <li>✓ Goal oriented</li> <li>✓ Self-confident</li> <li>✓ Motivated</li> <li>✓ Energetic</li> <li>✓ Able to work independently</li> <li>✓ Strong moral character</li> <li>✓ Personal hygiene/grooming</li> <li>✓ Time management</li> <li>✓ Open-minded</li> <li>✓ Organized</li> <li>✓ Maintain health</li> <li>✓ Positive work ethics</li> </ul>

<ul style="list-style-type: none"><li>✓ Technical drawing</li><li>✓ Radio frequencies principles</li><li>✓ Modulation techniques</li><li>✓ Radio frequency bands</li><li>✓ Radio Propagation characteristics</li></ul>		<ul style="list-style-type: none"><li>✓ Teamwork and Collaboration</li><li>✓ Professionalism</li><li>✓ Adaptability</li><li>✓ Safety Consciousness</li></ul>
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<p><b>Learning outcomes</b></p>	<p>At the end of the module the learner will be able to:</p> <ol style="list-style-type: none"> <li>1. Perform Pre-installation activities</li> <li>2. Install sound production room</li> <li>3. Install TV production room</li> <li>4. Operate radio and TV transmission system</li> </ol>
<p><b>Learning outcome 1: Perform Pre-installation activities</b></p>	<p><b>Learning hours: 15 hours</b></p>
<p><b>Indicative content</b></p>	
<ul style="list-style-type: none"> <li>• <b>Introduction to radio and television broadcasting system</b> <ul style="list-style-type: none"> <li>✓ Definition of key concepts in radio and television broadcasting system</li> </ul> </li> <li>• <b>Description of radio and television broadcasting system</b> <ul style="list-style-type: none"> <li>✓ Content creation (studios, production equipment)</li> <li>✓ Types of Broadcasting Systems</li> <li>✓ Distribution (broadcast tower, satellite and transmission medium)</li> <li>✓ Reception (receivers)</li> <li>✓ Technologies and standards</li> <li>✓ Regulatory bodies</li> </ul> </li> <li>• <b>Inspection of Broadcast Tower site</b> <ul style="list-style-type: none"> <li>✓ Pre-Inspection preparation                             <ul style="list-style-type: none"> <li>✚ Gather documentation</li> <li>✚ Safety Gear and Equipment</li> </ul> </li> <li>✓ Inspection steps                             <ul style="list-style-type: none"> <li>✚ Site access and security</li> <li>✚ Structural Integrity (Foundation, Tower structure)</li> <li>✚ Environmental conditions</li> </ul> </li> </ul> </li> </ul>	

- ✚ Electrical systems
- ✚ Existing Transmission Equipment
- ✚ Safety systems
- ✚ Documentation and Reporting
- **Inspection of Radio Studio and Television production room sites**
  - ✓ Pre-Inspection Preparation
    - ✚ Gather Documentation
    - ✚ Safety Gear and Equipment
  - ✓ Inspection Steps
    - ✚ Site access and security
    - ✚ Structural Integrity
    - ✚ Environmental conditions
    - ✚ Electrical systems
    - ✚ Network and Connectivity
    - ✚ Space and Layout
    - ✚ Soundproofing and Acoustics
    - ✚ Safety Systems
  - ✓ Documentation and Reporting before installation
  - ✓ Post-Inspection activities
    - ✚ Address Issues
    - ✚ Coordinate with Installation Team
    - ✚ Prepare for Installation
  - ✓ Safety Considerations (weather condition, emergency procedure, hazard awareness)
- **Development of Bills of Quantity (BOQ)**
  - ✓ Define Project Scope and Requirements
  - ✓ Breakdown the installation phases
    - ✚ Site preparation
    - ✚ Structural Installation
    - ✚ Studio Setup
    - ✚ Transmission Infrastructure
  - ✓ Create BOQ Components

- ✚ Materials
- ✚ Labor
- ✚ Equipment and Tools
- ✓ Cost Estimation and Pricing
- ✓ BOQ Documentation
- ✓ Review and Finalize
- **Selection of tools, materials and equipment**
  - ✓ Assess system requirement (broadcasting types, coverage area)
  - ✓ Material selection (material composition, types)
  - ✓ Tool selection (installation, measurement and safety)
  - ✓ Equipment selection (capacity and performance)
    - ✚ Studio equipment
    - ✚ Signal processing equipment
    - ✚ Transmission equipment
    - ✚ Receiver equipment
    - ✚ Power backup equipment
  - ✓ Vender selection and procurement (research vender, request quotes, verify compliance)

**Resources required for the learning outcome**

<b>Equipment</b>	Antennas, Transmitters, Microphones, Mixing Console, Headphone, Speakers/Monitors, Computers, Audio Processors, Modulators, UPS, Cameras, Video Monitors, LED Panels/Spotlights, Limiters, Video Switchers, Encoders, Decoders, RF Amplifier, RF Filter, Media Servers, Switches, Routers. Drilling Machine, Digital Multimeter, Air Blower, Soldering Station, Glue Gun, Personal Computer (Laptop), Personal Protective Equipment (PPE) Kit, Network Cable Tester, Monitor / Display, Poe Switch, Router / Access Point, Screwdriver Machine, Power Supply, Oscilloscope, Spectrum Analyzer, Filters For Antenna, Function Generator, Power Beam Antenna, GPS Meter, First Aid Box.
<b>Materials</b>	Cables, Connectors, Insulator Tap, Screws, Cable Ties , Wall Bolts, Drilling Bits, Racks

	Electronic Passive Components, Electronic Active Components, Glue Stick, CD/DVD, Flash Disk, Hard Disk Drive (HDD), Foam Cleaner, Thermal Paste, Soldering Paste, Di-Soldering Wire, Soldering Wire, RJ45 Connectors, BNC Connectors, USB Connectors, Ethernet Cable, Ethernet Cable Extender, Coaxial Cable, Coaxial Cable Extender, HDMI Cable, VGA Cable , VGA Adapter, HDMI Adapter, USB Adapter, Cable Converters / Adapters, Battery / Cells, Rack, Rope, Wave Guide, Cable Ladder/Tray/Trunk/Pipes, Isopropyl Alcohol, Antenna LNB (Feeder), Antenna Accessories, Jumper Wires, Charge Controller, USB Set, Power Cables
<b>Tools</b>	(Engineering, 'Studio Engineering for Sound Broadcasting', Chapter 9, 2024)
<b>Facilitation techniques</b>	<ul style="list-style-type: none"> <li>▪ Brainstorming</li> <li>▪ Research</li> <li>▪ presentation</li> <li>▪ Demonstration</li> <li>▪ Practical exercise</li> <li>▪ Trainer guided</li> <li>▪ Group discussion</li> </ul>
<b>Formative assessment methods /(CAT)</b>	<ul style="list-style-type: none"> <li>▪ Written assessment</li> <li>▪ Oral presentation</li> <li>▪ Performance assessment</li> </ul>

<b>Learning outcome 2: Install sound production room</b>	<b>Learning hours: 15 hours</b>
<b>Indicative content</b>	
<ul style="list-style-type: none"> <li>• Placements of studio audio equipment <ul style="list-style-type: none"> <li>✓ Studio layout <ul style="list-style-type: none"> <li>✚ Control room</li> <li>✚ Recording room</li> </ul> </li> <li>✓ Equipment inventory check</li> <li>✓ Equipment placement standard</li> </ul> </li> </ul>	

- ✓ Cable management
- ✓ Ventilation and noise control
- ✓ Ergonomics (comfortable working environment)
- **Interconnection of audio studio equipment**
  - ✓ Cables and connectors selection
  - ✓ Signal flow planning
  - ✓ Interconnection process
  - ✓ Labelling
- **Configuration of audio studio equipment**
  - ✓ Power ON sequence
  - ✓ Mixing console configuration
  - ✓ I/O routing
  - ✓ Audio processing equipment configuration
- **Test the functionality of Radio studio equipment**
  - ✓ Radio studio equipment list Check
  - ✓ Gather test materials
  - ✓ Power and connectivity check
  - ✓ Individual equipment testing
  - ✓ Signal flow and routing test
  - ✓ Communication and monitoring system test (talkback system)
  - ✓ Network and IT systems test (network connectivity, streaming, on line broadcasting)
  - ✓ Final adjustment
- **Draw a wiring diagram of the audio production room**
  - ✓ Gathering information (review installation plan, inspect installed equipment, verify the signal flow)
  - ✓ Identify component
  - ✓ Determine layout and placement
    - ✚ Physical layout
    - ✚ Equipment placement
  - ✓ Draw equipment symbols
  - ✓ Connect equipment symbols with lines

- ✓ Add notation
- ✓ Review and revise (double check connection, verify signal flow)
- ✓ Finalize the diagram
- **Draw a detailed system diagram of the audio production room**
  - ✓ Gathering detailed information
    - ✚ Equipment inventory
    - ✚ Connection types
  - ✓ Plan diagram layout (diagram scope, layout design)
  - ✓ Selection drawing software tool
  - ✓ Draw equipment symbols
  - ✓ Define signal path and connection
  - ✓ Connect equipment symbols with lines
  - ✓ Add annotation and details
  - ✓ Document connection and signal flow
  - ✓ document signal routing and processing (signal path and processing)
  - ✓ Document power distribution and grounding
  - ✓ Add notes and annotations (configuration details, legend and symbols)
  - ✓ Finalize the detailed system diagram
- **Develop trainer guide**
  - ✓ Gather information
    - ✚ Review system document
    - ✚ Understanding equipment and software
  - ✓ Define training objectives
  - ✓ Develop training content
    - ✚ Detailed equipment operation
    - ✚ Signal flow and routing
    - ✚ Recoding and broadcasting procedures
    - ✚ Troubleshooting and maintenance
    - ✚ Safety
  - ✓ Create training module/user guide
  - ✓ Develop assessment materials

✓ Review and finalization

### Resources required for the learning outcome

<b>Equipment</b>	microphones, mixing console, headphone, speakers/monitors, computers, audio processors, UPS, limiters, media servers, switches, routers. drilling machine, Digital multimeter, Air blower, Soldering station, Glue gun, Personal Computer (laptop), Personal protective equipment (PPE) kit, Network Cable tester, Monitor / display, PoE switch, Router / access point, Screwdriver machine, Power supply, First Aid box.
<b>Materials</b>	Cables, connectors, insulator tap, screws, cable ties , wall bolts, drilling bits, racks Glue stick, CD/DVD, Flash disk, Hard Disk Drive (HDD), Foam Cleaner, Thermal paste, Soldering paste, Di-soldering wire, Soldering wire, RJ45 connectors, USB connectors, Ethernet cable, Ethernet cable extender, Coaxial cable, Coaxial cable extender, HDMI cable, VGA cable , VGA adapter, HDMI adapter, USB adapter, Battery / cells, Access control bracket, Rack, Cable ladder/tray/trunk/pipes, isopropyl alcohol, Charge controller, USB set, Power cables
<b>Tools</b>	Screw driver set, spanners, pliers, Allen key set, tape measure, spirit level, multimeter, cable steppers and cutters, clipping tool, cable tester. Magnifying glass, Soldering iron, Di-soldering pump, Computer software, Electrician toolbox, Tweezer, Spanner set, Technician Knife, krone /punching tool, Ladder
<b>Facilitation techniques</b>	<ul style="list-style-type: none"> <li>▪ Brainstorming</li> <li>▪ Research</li> <li>▪ presentation</li> <li>▪ Demonstration</li> <li>▪ Practical exercise</li> <li>▪ Trainer guided</li> <li>▪ Group discussion</li> </ul>
<b>Formative assessment methods /(CAT)</b>	<ul style="list-style-type: none"> <li>▪ Written assessment</li> <li>▪ Oral presentation</li> <li>▪ Performance assessment</li> </ul>

**Learning outcome 3: Install TV production room**

**Learning hours: 25 hours**

**Indicative content**

- **Placements of TV production room equipment**
  - ✓ Access room layout and space
  - ✓ Identify equipment and function zone
  - ✓ Plan equipment placement
  - ✓ Consider ergonomics and accessibility
  - ✓ Cable management
  - ✓ Ventilation and noise control
  
- **Interconnection of TV production room equipment**
  - ✓ Equipment inventory (list of equipment, identify connection)
  - ✓ Plan interconnection layout
    - ✚ Equipment placement
    - ✚ Routing paths
    - ✚ Cable management
  - ✓ Cables and connectors selection
  - ✓ Cable routing and connection
    - ✚ Video connection
    - ✚ Audio connection
  - ✓ Data and control connection (networking, control surface, remote camera)
  - ✓ Power connection
  - ✓ Labelling
  
- **Configuration of TV production room equipment**
  - ✓ Power ON sequence
  - ✓ Audio and video configuration
    - ✚ Audio console settings

- ✚ Cameras configuration
  - ✚ Lighting settings
  - ✚ Video switcher settings
- ✓ System integration and networking
  - ✚ Network setup
  - ✚ System integration
- ✓ Software configuration
- ✓ Final checks
- **Test functionality of TV production room's equipment**
  - ✓ TV production room equipment list Check
  - ✓ Gather test materials
  - ✓ Power and connectivity check
  - ✓ Individual equipment testing
  - ✓ Signal flow and routing test
  - ✓ Communication and monitoring system test (intercom system)
  - ✓ Network and IT systems test (network connectivity, streaming, on line broadcasting)
  - ✓ Final adjustment
- **Draw wiring diagram of video production room**
  - ✓ Gathering information (review installation plan, inspect installed equipment, verify the signal flow)
  - ✓ Identify component
  - ✓ Determine layout and placement
    - ✚ Physical layout
    - ✚ Equipment placement
  - ✓ Draw equipment symbols
  - ✓ Connect equipment symbols with lines
  - ✓ Add notation
  - ✓ Review and revise (double check connection, verify signal flow)
  - ✓ Finalize the diagram
- **Draw a detailed system diagram of video production room**









- ✓ Gathering detailed information
  - ✚ Equipment inventory
  - ✚ Connection types
- ✓ Plan diagram layout (diagram scope, layout design)
- ✓ Selection drawing software tool
- ✓ Draw equipment symbols
- ✓ Define signal path and connection
- ✓ Connect equipment symbols with lines
- ✓ Add annotation and details
- ✓ Document connection and signal flow
- ✓ document signal routing and processing (signal path and processing)
- ✓ Document power distribution and grounding
- ✓ Add notes and annotations (configuration details, legend and symbols)
- ✓ Finalize the detailed system diagram

### Resources required for the learning outcome

<b>Equipment</b>	microphones, mixing console, headphone, speakers/monitors, computers, audio processors, UPS, cameras, video monitors, LED panels/spotlights, limiters, video switchers, media servers, switches, routers. drilling machine, Digital multimeter, Air blower, Soldering station, Glue gun, Personal Computer (laptop), Personal protective equipment (PPE) kit, Network Cable tester, Monitor / display, PoE switch, Router / access point, Screwdriver machine, Power supply, First Aid box.
<b>Materials</b>	Cables, connectors, insulator tap, screws, cable ties , wall bolts, drilling bits, racksGlue stick, CD/DVD, Flash disk, Hard Disk Drive (HDD), Foam Cleaner, Thermal paste, Soldering paste, Di-soldering wire, Soldering wire, RJ45 connectors, BNC connectors, USB connectors, Ethernet cable, Ethernet cable extender, Coaxial cable,Coaxial cable extender, HDMI cable, VGA cable , VGA adapter, HDMI adapter, USB adapter, Battery / cells, Access control bracket, Rack, Rope, Wave guide, Cable ladder/tray/trunk/pipes,Sensors / Sensors kit, isopropyl alcohol, Charge controller, USB set, Power cables
<b>Tools</b>	Screw driver set, spanners, pliers, Allen key set, tape measure, spirit level, multimme-

	ter, cable steppers and cutters, clipping tool, cable tester. Magnifying glass, Soldering iron, Di-soldering pump, Computer software, Electrician toolbox, Tweezer, Spanner set, Technician Knife, krone /punching tool, Ladder
<b>Facilitation techniques</b>	<ul style="list-style-type: none"> <li>▪ Brainstorming</li> <li>▪ Research</li> <li>▪ presentation</li> <li>▪ Demonstration</li> <li>▪ Practical exercise</li> <li>▪ Trainer guided</li> <li>▪ Group discussion</li> </ul>
<b>Formative assessment methods /(CAT)</b>	<ul style="list-style-type: none"> <li>▪ Written assessment</li> <li>▪ Oral presentation</li> <li>▪ Performance assessment</li> </ul>
<b>Learning outcome 4: Operate radio and TV transmission system</b>	<b>Learning hours: 35 hours</b>
<b>Indicative content</b>	
<ul style="list-style-type: none"> <li>• <b>Audio radio signal Processing</b> <ul style="list-style-type: none"> <li>✓ Audio source input</li> <li>✓ Pre-amplification</li> <li>✓ Audio processing techniques</li> <li>✓ Analog to digital conversion (ADC)</li> <li>✓ Stereo encoding</li> </ul> </li> <li>• <b>Video signal processing</b> <ul style="list-style-type: none"> <li>✓ Video source input</li> <li>✓ Video processing steps</li> <li>✓ Video signal compression</li> <li>✓ Video encoding</li> <li>✚ Packetizing</li> </ul> </li> </ul>	

## Multiplexing

- **Configuration of analog Radio transmission system equipment**
  - ✓ Source analog audio input
  - ✓ Audio signal pre-amplification
  - ✓ Modulation process
  - ✓ Transmission preparation (filtering, amplification)
  - ✓ Transmitter and antenna configuration
  - ✓ Transmitter and antenna interconnection
  - ✓ Signal monitoring (spectrum analyzers, audio monitors)
- **Configuration of Digital Radio transmission system equipment**
  - ✓ Audio source input
  - ✓ Video signal conversion
    -  Analog to digital conversion(ADC)
  - ✓ Digital audio signal processing (compression and noise reduction)
  - ✓ Digital audio encoding
  - ✓ Digital audio multiplexing
  - ✓ Digital modulation techniques
    -  Quadrature amplitude modulation (QUAM)
    -  Orthogonal frequency division multiplexing (QFDM)
  - ✓ Signal processing for transmission
    -  Forward error correction
    -  Data interleaving
    -  Data scrambling
  - ✓ Audio digital signal transmission preparation (filtering and Amplification)
  - ✓ Transmitter and antenna configuration
  - ✓ Transmitter and antenna interconnection techniques
  - ✓ Signal monitoring techniques (spectrum analyzers, audio and video monitors)
- **Configuration of analog TV transmission system equipment**
  - ✓ Source of analog video input
  - ✓ Video pre-amplification
  - ✓ Analog video processing
    -  Color correction
    -  Noise reduction

- ✓ Aspect ratio adjustment
  - ✓ Audio and video combination
  - ✓ Modulation process
  - ✓ Transmission preparation (filtering, amplification)
  - ✓ Transmitter and antenna configuration
  - ✓ Transmitter and antenna interconnection techniques
  - ✓ Signal monitoring techniques
- **Configuration of Digital TV transmission system equipment**
  - ✓ Source of digital video signal
  - ✓ Digital video pre-amplification
  - ✓ Digital video processing
    - ✓ Color space conversation
      - ✓ Video compression
      - ✓ Frame rate conversation
      - ✓ Resolution conversation
      - ✓ Video Rendering
  - ✓ Modulation techniques
  - ✓ Transmission preparation (filtering, amplification)
  - ✓ Transmitter and antenna configuration
  - ✓ Transmitter and antenna interconnection techniques
  - ✓ Digital Signal monitoring techniques
- **Functionality test of Analog Transmission System**
  - ✓ Visual Inspection (Cables, Connectors and Equipment)
  - ✓ Power-On Test (Power Supply, Indicator Lights)
  - ✓ Signal Input Test (Audio and video source)
  - ✓ Signal Processing Test
    - ✓ Audio Pre-amplification test
      - ✓ Audio Processing test
      - ✓ Video Pre-amplification test
      - ✓ Video Processing test
  - ✓ Modulation Test (Audio and video modulation)
  - ✓ Transmission Test (RF Amplification, Antenna System)

- ✓ End-to-End test (End-to-End Transmission test, Monitor output)
- **Functionality test of Digital Transmission System**
  - ✓ Visual Inspection (Cables, Connectors and Equipment)
  - ✓ Power-On Test (Power Supply, Indicator Lights)
  - ✓ Signal Input Test (Digital Audio and digital video source)
  - ✓ Signal Processing Test (Audio and video)
  - ✓ Compression and Encoding Test
    - ✚ Audio Codec
    - ✚ Video Codec
    - ✚ Multiplexing
  - ✓ Modulation Test (Digital Modulators, Spectrum analysis)
  - ✓ Bit Error Rate (BER) Test
  - ✓ Transmission Test (RF Amplification, Antenna System)
  - ✓ End-to-End test (End-to-End Transmission test, Monitor output)
- Analog and Digital transmission system equipment Reporting

### Resources required for the learning outcome

<b>Equipment</b>	Antennas, transmitters, headphone, speakers/monitors, computers, audio processors, modulators, UPS, video monitors, limiters, encoders, decoders, RF amplifier, RF filter, switches, routers. drilling machine, Digital multimeter, Air blower, Soldering station, Glue gun, Personal protective equipment (PPE) kit, Network Cable tester, Monitor / display, PoE switch, Router / access point, Screwdriver machine, Power supply, Oscilloscope, Spectrum Analyzer, Filters for antenna, Function Generator, Power beam Antenna, GPS meter, First Aid box.
<b>Materials</b>	Cables, connectors, insulator tap, screws, cable ties, wall bolts, drilling bits, racks Glue stick, Foam Cleaner, Thermal paste, soldering paste, Di-soldering wire, Soldering wire, RJ45 connectors, BNC connectors, USB connectors, Ethernet cable, Ethernet cable extender, Coaxial cable, Coaxial cable extender, HDMI cable, VGA cable, VGA adapter, HDMI adapter, USB adapter, Cable converters / adapters, Battery / cells, Access control bracket, Rack, Rope, Wave guide, Cable ladder/tray/trunk/pipes, isopropyl alcohol, Antenna LNB (feeder), Antenna accessories, Charge controller, USB set,

	Power cables
<b>Tools</b>	Screw driver set, spanners, pliers, Allen key set, tape measure, spirit level, multimeter, cable steppers and cutters, clipping tool, cable tester. Magnifying glass, Soldering iron, Di-soldering pump, Computer software, Electrician toolbox, Tweezer, Spanner set, Technician Knife, krone /punching tool, Ladder
<b>Facilitation techniques</b>	<ul style="list-style-type: none"> <li>▪ Brainstorming</li> <li>▪ Research</li> <li>▪ presentation</li> <li>▪ Demonstration</li> <li>▪ Practical exercise</li> <li>▪ Trainer guided</li> <li>▪ Group discussion</li> </ul>
<b>Formative assessment methods /(CAT)</b>	<ul style="list-style-type: none"> <li>▪ Written assessment</li> <li>▪ Oral presentation</li> <li>▪ Performance assessment</li> </ul>

### Integrated/Summative assessment

#### Integrated situation

TMAZX agency company Ltd, is a company located at NYARUGENGE district KIGALI city, you have been hired as a telecommunications technician for a leading broadcasting agency to do system installation of a new broadcasting station. This station will handle both analog and digital transmission systems for television and radio broadcasts. Your task involves planning, executing, and ensuring the correct installation of all broadcasting equipment, followed by rigorous testing to verify optimal performance and regulatory compliance.

Broadcasting agency to be audited:

- ✓ Audio and video Production rooms installation
- ✓ Radio studio installation
- ✓ transmission room installation

Resources	
<b>Tools</b>	Screw driver set, spanners, pliers, Allen key set, tape measure, spirit level, multimeter, cable steppers and cutters, clipping tool, cable tester. Magnifying glass, Soldering iron, Di-soldering pump, Computer software, Electrician toolbox, Tweezer, Spanner set, Technician Knife, krone /punching tool, Ladder.
<b>Equipment</b>	Antennas, transmitters, microphones, mixing console, headphone, speakers/monitors, computers, audio processors, modulators, UPS, cameras, video monitors, LED panels/spotlights, limiters, video switchers, encoders, decoders, RF amplifier, RF filter, media servers, switches, routers. drilling machine, Digital multimeter, Air blower, Soldering station, Glue gun, Personal Computer (laptop), Personal protective equipment (PPE) kit, Network Cable tester, Monitor / display, PoE switch, Router / access point, Screwdriver machine, Power supply, Oscilloscope, Spectrum Analyzer, Filters for antenna, Function Generator, Power beam Antenna, GPS meter, First Aid box.
<b>Materials/ Consumables</b>	Cables, connectors, insulator tap, screws, cable ties , wall bolts, drilling bits, racks, electronic passive components, Electronic active components, Glue stick, CD/DVD, Flash disk, Hard Disk Drive (HDD), Foam Cleaner, Thermal paste, soldering paste, Di-soldering wire, Soldering wire, RJ45 connectors, BNC connectors, USB connectors, Ethernet cable, Ethernet cable extender, Coaxial cable, Coaxial cable extender, HDMI cable, VGA cable , VGA adapter, HDMI adapter, USB adapter, Cable converters / adapters, Battery / cells, Rack, Rope, Wave guide, Cable ladder/tray/trunk/pipes, isopropyl alcohol, Antenna LNB (feeder), Antenna accessories, Jumper wires, Charge controller, USB set, Power cables

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
<b>1. Perform Pre-installation activities</b>	1.1 The site is correctly inspected according to audio and video studio installation standards	The site survey is well conducted			2
		The site survey's form is filled			2
	1.2 Installation BOQ is ap-	Tool used to develop BOQ is well selected			2

	appropriately developed based on Audio/Video production room tools ,materials and equipment quotation	BOQ is well developed			2
	1.3 Tools, materials and equipment are properly selected according to their usage, specification and function	Tools are well selected			2
		Material are well selected			2
		Equipment are well selected			2
<b>2. Install sound production room</b>	2.1. The placements of studio audio equipment are accurately identified according to their positioning standard and expected outputs	Audio studio is well selected			2
		Audio studio equipment are well placed			2
		Audio studio equipment are well positioned			2
	2.2 Studio audio equipment is properly interconnected based on the studio equipment interconnection process	Cables and connector are well selected			2
		Studio audio Equipment are well interconnect			3
	2.3. Studio audio equipment is appropriately configured according to the audio studio configuration standards and techniques	Studio audio equipment are well configured			3
		Configuration standard of studio audio equipment are well respected			3
	2.4. Studio audio equipment functionality test is properly performed according to their operations and testing techniques	The equipment are provide expected output			3
		Functionality test is well performed			3
	2.5. The wiring diagram of the audio production room is appropriately drawn according to equipment interconnections and their symbols	Drawing tool is well selected			2
		Wiring diagram is well drawn			2
	2.6. detailed system diagram of the audio production	Detailed system diagram is well drawn			2

	room is appropriately drawn based on equipment layout, signal flow, and connections	Signal flow are well drawn			3
		Legend are well shown			2
	2.7. Trainer guide is appropriately developed based on audio production room equipment operations	Trainer guide is well developed			2
<b>3. Install TV production room</b>	3.1. The placements of TV production room equipment are accurately identified according to their positioning standard and expected output	TV production room is well selected			2
		TV production room equipment are well selected			2
		TV production room equipment are correctly positioned			2
	3.2. TV production room equipment is suitably interconnected based on their interconnection process	TV production room equipment are connected			2
	3.3. TV production room equipment is appropriately configured according to their configuration standard and techniques	TV equipment are well configured			2
		Configuration standard is respected			2
	3.4. Studio audio equipment functionality test is properly performed according to their operations and testing techniques	Functionality of equipment is tested			2
	3.5. The wiring diagram of the video production room is appropriately drawn according to equipment interconnections and their symbols	Drawing tool is selected			2
		Drawing stand is respected			2
		Symbols of equipment are well respected			2
		Wiring diagram is well drawn			2
	3.6. A detailed system dia-	Drawing tool is selected			2

	gram of the video production room is appropriately drawn based on equipment layout, signal flow, and connections	Drawing stand is respected			2	
		Symbols of equipment are well respected			2	
		Legend are shown on diagram			2	
<b>4 Operate radio and TV transmission system</b>	4.1. Audio and video signal are properly processed based on signal processing equipment, standards and processing procedures	Audio and video signal are well prepared			2	
		Audio and video signal parameters are respected			2	
		Audio and video signal are properly processed			2	
	4.2. The analogue and digital transmission system equipment are properly configured based on radio broadcasting station standard, equipment' standards and configuration techniques.	Equipment of radio broadcasting are prepared			2	
		Transmitting radio equipment are configured			2	
		Configuration standard of radio transmission is respected			2	
	4.3. The analogue and digital transmission system equipment are properly configured based on TV broadcasting station standard, equipment' standards and configuration techniques	Equipment of TV broadcasting are prepared			2	
		Equipment of TV are configured			2	
		Configuration standard of TV broadcasting is respected			2	
	4.4. The analogue and digital transmission system functionality test is properly performed according to equipment operations and testing techniques.	Perform functionality test of the system			2	
	<b>Total marks</b>					<b>100</b>
	<b>Percentage Weightage</b>					<b>100%</b>
<b>Minimum Passing line % (Aggregate):</b>					<b>70%</b>	

## List of abbreviations

1. **ACS:** Access control system
2. **BNC:** Bayonet Neill Concelman
3. **CAT:** Common Admission Test
4. **CCTV:** Closed Circuit Television
5. **CD:** Compact Disc
6. **DVD:** Digital Video Disc
7. **DVR:** Digital Video Recorder
8. **DNS:** Domain Name System
9. **HDD:** Hard Disk Drive
10. **HDMI:** High-Definition Multimedia Interface
11. **IDS:** Intrusion of detection system
12. **IP:** Internet Protocol
13. **LCD:** Liquid Crystal Diode
14. **LED:** Light Emitting Diode
15. **NVR:** Network Video Recorder
16. **POE:** Power Over Ethernet
17. **PPE:** Personal Protective Equipment
18. **RJ:** Registered Jack
19. **UPS:** Uninterruptible Power Supply
20. **USB:** Universal serial bus
21. **VGA:** Video Graphic Array

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- [8] Education by Radio, monthly, National Committee on Education by Radio, 1 Madison Avenue, New York. Educational Radio and Recording, 20 North Wacker Drive, Chicago. Electronics, 330 West 42d Street, New York.
- [9] F.R.E.C. Service Bulletin, U. S. Office of Education, Federal Security Agency, Washington. Hein! Radio Business Letter, 2400 California Street, Washington, D.C. The Aistener, weekly,
- [10] British Broadcasting Corporation, Broadcasting House, London. W1 (combined with Radio Times owing to the war; see Radio Times).
- [11] London Calling, weekly, British Broadcasting -Corporation, London. Movie and Radio Guide, weekly, Chicago. N.A.B. News Review, National Assoc. of Broadcasters, 1626 K Street, N.W., Washington, D. C.



# Glossary

**Activity:** Activities include releases, events, and deployment plans that you develop, start, and complete with the product.

**Application environment:** A user-defined collection of resources that hosts an application. These application environments refer to environments that are created to be in the product.

**Application process:** A process that is associated with an application. Unlike a component or generic process, an application process is created from application-level steps.

**Application:** One or more computer programs or software components that provide a function in direct support of a specific business process or processes. See also application server.

**Architecture:** The internal structure of a computer system or a chip that determines its operational functionality and performance.

**Control processor:** The processor in a processor array machine that issues the instructions to be executed by all the processors in the processor array. Alternatively, the control processor may perform tasks in which the processors in the array are not

involved, e.g., I/O operations or serial operations.

**Deployment:** The activities used to deliver a software project to a deployment target. Typically, you run deployments for each stage of your release lifecycle, ending with the production stage when the software becomes generally available.

**Duration:** The time a task takes to run. Duration is measured from the time a task starts until it is resolved. When you create some task types, you can estimate their expected duration. Duration is reported in minutes.

**Environment:** A collection of resources that identify the components that can be deployed by the parent application and the agents that do the work.

**Events:** Release-related activities that are applied to releases and tracked with a calendar. You can use events to organize your releases and other time-dependent activities, such as holidays and blackouts.

**Initiative:** An action to take for the change occurred.

**Insights:** A set of related features such as metric data dashboards, reports, and the application portfolio.

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**Lifecycle:** The phases in a release. A lifecycle is a template for the stages of work in a release.

**Plugin:** A separately installable software module that adds functionality to an existing program, application, or interface.

**Resource:** A user-defined construct that is based on the architectural model of IBM Urban Code Velocity. A resource represents a deployment target.

**Role:** A job function that identifies the tasks that a user can perform and the resources to which a user has access. A user can be assigned one or more roles. Processors have direct access to all the memory in the system. Because of technological limitations on shared

bandwidth generally, not more than about 16 processors share a common memory.

**Task:** Represents a business-meaningful activity that has the starting and ending points and a measurable duration. Durations are used to estimate deployment times. You add tasks to deployment plans. When you run a deployment, you complete the tasks in the plan

**User:** A representation of an account on the server. Users can be members of teams and groups. Users can be created in IBM Urban Code Velocity server or import users from an external authentication realm, including an LDAP, Active Directory, or SSO provider