Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

CONSUMER ELECTRONIC EQUIPMENT REPAIR

ETECE302 REPAIR CONSUMER ELECTRONIC EQUIPMENT

Competence

RQF Level: 3

Learning Hours 110

Credits: 11

Sector: Technical Services

Trade: Electronics and Telecommunication

Module Type: Specific

Curriculum: TSVETE3001-TVET Level 3 in Electronics and Telecommunication

Issue Date: April 2022

<table>
<tr><td>Purpose statement</td><td>Consumer electronics are home electronic (analog and digital) equipment intended for everyday use. They include devices and equipment used for entertainment, communications, and recreation.

At the end of this module the trainees will be equipped with necessary knowledge, skills, and attitudes to repair and conduct servicing of consumer electronic equipment namely radio receiver, TV receiver, audio power amplifier, audio mixer and synthesizer.</td></tr>
<tr><td>Learning to be assumed in place</td><td>Basics of telecommunication, Basics of electricity, SHE</td></tr>
<tr><td>Delivery modality</td><td>
<table>
<tr><th>Training delivery</th><th colspan="2">100%</th><th colspan="2">Assessment</th><th>Total 100%</th></tr>
<tr><td colspan="2">Theoretical content</td><td>30%</td><td rowspan="4">Formative assessment</td><td>30%</td><td rowspan="4">50%</td></tr>
<tr><td colspan="2">Practical work:</td><td rowspan="3">70%</td><td rowspan="3">70%</td></tr>
<tr><td>● Group project and presentation</td><td>20%</td></tr>
<tr><td>● Individual project /Work</td><td>50%</td></tr>
<tr><td colspan="3"></td><td colspan="2">Summative Assessment</td><td>50%</td></tr>
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Elements of Competency and Performance Criteria

Elements of competency	Performance criteria
1. Conduct pre-repair activities	1.1. The working place is properly prepared according to the work to be done
	1.2. The type of tools, equipment and materials are identified according to the work to be done
	1.3. Assembling and disassembling techniques are systematically applied
2. Repair radio receiver	2.1. Radio receivers are clearly identified according to their types and applications
	2.2. The radio receiver is correctly disassembled according to user manual
	2.3. The defected parts of radio receiver are correctly tested according to testing techniques
	2.4. The defected parts of radio receiver are adequately replaced or repaired according the identified faults
	2.5. After repair test is systematically conducted according to user manuals
	2.6. The radio receiver is reassembled according the user manual

3. Repair TV receiver	3.1. TV receivers are clearly identified according to their types and applications
	3.2. The TV receiver is correctly disassembled according to user manual
	3.3. The defected parts of TV receiver are correctly tested according to testing techniques
	3.4. The defected parts of TV receiver are adequately replaced or repaired according the identified faults
	3.5. After repair test is systematically conducted according to user manuals
	3.6. The TV receiver is appropriately reassembled according the user manual
4. Repair power audio amplifier	4.1. Power audio amplifier are clearly identified according to their types and applications
	4.2. The Power audio amplifier is correctly disassembled according to user manual
	4.3. The defected parts of power audio amplifier are correctly tested according to testing techniques
	4.4. The defected parts of power audio amplifier are adequately replaced or repaired according the identified faults
	4.5. After repair test is systematically conducted according to user manuals
	4.6. The power audio amplifier is reassembled according the user manual
5. Repair audio mixer	5.1. Audio mixer is clearly identified according to their types and applications
	5.2. The audio mixer is correctly disassembled according to user manual
	5.3. The defected parts of audio mixer are correctly tested according to testing techniques
	5.4. The defected parts of audio mixer are adequately replaced or repaired according the identified faults
	5.5. After repair test is systematically conducted according to user manuals
6. Repair synthesizer	6.1. The synthesizer is clearly identified according to their types and applications
	6.2. The synthesizer is correctly disassembled according to user manual
	6.3. The defected parts of synthesizer are correctly tested according to testing techniques

	6.4. The defected parts of synthesizer are adequately replaced or repaired according the identified faults
	6.5. After repair test is systematically conducted according to user manuals
7. Prepare technical report and invoice	7.1. Elements of the report are respectively identified considering the repair work done
	7.2. Used tools, materials and consumables are accurately Identified
	7.3. Detailed repair report contents are correctly developed in respect to reporting procedures
	7.4. The invoice is timely completed and submitted

Course content

Learning outcomes	At the end of the module the learner will be able to: 1. Conduct pre-repair activities 2. Repair radio receiver 3. Repair TV receiver 4. Repair power audio amplifier 5. Repair audio mixer 6. Repair synthesizer **7.** Prepare technical report and invoice
Learning outcome 1: Conduct pre-repair activities	**Learning hours: 10**

Indicative content

- **Preparation of the workplace**
  - ✓ Workplace cleaning techniques;
- **Identification of tools, equipment and materials**
- **Application of assembling and disassembling techniques**
  - ✓ Health and safety precautions associated with electronic equipment
  - ✓ Reading equipment's user manual
  - ✓ Use of power tools
  - ✓ Cable disconnection and terminals, connectors labelling/ Marking
  - ✓ Board orientation and fixation

Resources required for the learning outcome

Equipment	PPE, Soldering station gun, Oscilloscope, DC power supply, Multimeter, Hot air blower, Glue gun machine
Materials	Brush, Glue gun stick, Soldering tin, Solder paste, Paste flux, Liquid flux, Cleaning sponge, PCB cleaner / WD40, Jumper wire
Tools	Antistatic mat, Microscope magnifier, Magnifying lamp, Precision screwdrivers kit, Tweezers, Soldering iron, Pliers and cutters, Blade cutter, Allen keys, Screw drivers, User manuals
Facilitation techniques & learning activities	• Demonstration • Practical exercise • Trainer guided • Group discussion
Formative assessment methods	• Written assessment • Oral presentation • Performance assessment

Learning outcome 2: Repair radio receiver	Learning hours: 15

Indicative content

- **Description of radio receivers**
  - ✓ Introduction on radio receivers (types and applications)
  - ✓ Working principle of a radio receiver
  - ✓ Main parts / blocks of radio receiver
- **Disassembling a radio receiver**
- **Testing different parts of a radio receiver**
  - ✓ Testing the power supply
  - ✓ Testing the amplifier
  - ✓ Testing tuning control systems
  - ✓ Testing louder speaker
  - ✓ Testing selectors, controls, and inlet / outlet systems
- **Replacing and repairing defected parts of radio receiver**
- **Frequent / common faults of radio receiver and their diagnostic techniques**
- **Conducting after repair test**
- **Reassembling a radio receiver**

Resources required for the indicative content

Equipment	PPE, Soldering station gun, Oscilloscope, DC power supply, Multimeter, Hot air blower, Glue gun machine, Radio receivers
Materials	Brush, Glue gun stick, Soldering tin, Solder paste, Paste flux, Liquid flux, Cleaning sponge, PCB cleaner / WD40, Jumper wire, Electronic components
Tools	Antistatic mat, Microscope magnifier, Magnifying lamp, Precision screwdrivers kit, Tweezers, Soldering iron, Pliers and cutters, Blade cutter, Allen keys, Screwdrivers, User manuals
Facilitation techniques & learning activities	• Demonstration • Practical exercise • Trainer guided • Brainstorming • Online video aid
Formative assessment methods	• Written assessment • Oral presentation • Performance assessment • Product based assessment

Learning outcome 3: Repair TV receiver	Learning hours: 35

Indicative content

- **Description of TV receivers**
  - ✓ Introduction on TV receivers (types and applications)
  - ✓ Working principle of a TV receiver
  - ✓ Main parts / blocks of TV receiver
- **Disassembling a TV receiver**
- **Testing different parts of a CRT TV receiver**
  - ✓ Testing the switching mode power supply
  - ✓ Testing the power audio amplifier section
  - ✓ Testing high voltage section
  - ✓ Testing vertical and horizontal section
  - ✓ Testing the synchronizing, memory and processing sections
  - ✓ Testing deflection yoke system
  - ✓ Testing tuning and Inlet/Outlet section
  - ✓ Testing the CRT screen
- **Testing different parts of flat screen TV receiver**
  - ✓ Testing the switching mode power supply
  - ✓ Testing the inverter stage
  - ✓ Testing the main board
  - ✓ Testing the LVDS cable
  - ✓ Testing T-CON board
  - ✓ Testing the back light stage
- **Replacing and repairing defected parts of CRT TV receiver**
  - ✓ Respecting safety information on devices
  - ✓ Devices symbol rules
  - ✓ Respecting devices rating and specifications
  - ✓ Discharging methods
  - ✓ Cutting device leads
  - ✓ Re-bonding the stubs
  - ✓ Replace the components
- **Frequent / common faults of TV receivers and their diagnostic techniques**
- **Conducting after repair test**
- **Reassembling a TV receiver**

Resources required for the indicative content

Equipment	PPE, Soldering station gun, Oscilloscope, DC power supply, Multimeter, Hot air blower, Glue gun machine, Tv receivers, Decoder, Woofer amplifier
Materials	Brush, Glue gun stick, Soldering tin, Solder paste, Paste flux, Liquid flux, Cleaning sponge, PCB cleaner / WD40, Jumper wire, Electronic components
Tools	Antistatic mat, Microscope magnifier, Magnifying lamp, Precision screwdrivers kit, Tweezers, Soldering iron, Pliers and cutters, Blade cutter, Allen keys, Screwdrivers, User manuals
Facilitation techniques & learning activities	• Demonstration • Practical exercise • Trainer guided • Brainstorming • Online video aid
Formative assessment methods	• Written assessment • Oral presentation • Performance assessment • Product based assessment

Learning outcome 4: Repair power audio amplifier	**Learning hours: 15**
Indicative content	
• **Description of power audio amplifiers** ✓ Introduction on power audio amplifiers (classes and applications) ✓ Working principle of a power audio amplifier ✓ Main parts / blocks of power audio amplifier • **Disassembling a power audio amplifier** • **Testing different parts / stages of a power audio amplifier** ✓ Testing the power supply (linear & SMPS) ✓ Testing pre-amplifier stage ✓ Testing voltage regulation stage ✓ Testing amplification stage ✓ Testing cooling system stage ✓ Testing audio power amplifier level meter / indicator ✓ Testing audio power amplifier protection system ✓ Testing selectors, controls, and inlet / outlet systems • **Replacing and repairing defected parts of power audio amplifier** • **Frequent / common faults of audio amplifier and their diagnostic techniques** • **Conducting after repair test** ✓ Hot testing techniques ✓ Cold testing techniques • **Reassembling a power audio amplifier**	
Resources required for the indicative content	

Equipment	PPE , Soldering station gun, Oscilloscope, DC power supply, Multimeter, Hot air blower, Glue gun machine, Audio power amplifiers, Lap top, Loud speakers with crossover network
Materials	Brush, Glue gun stick, Soldering tin, Solder paste, Paste flux, Liquid flux, Cleaning sponge, PCB cleaner / WD40, Jumper wire, Coaxial cables, Speakon, TRS jack, Bananas, Electronic components
Tools	Antistatic mat, Microscope magnifier, Magnifying lamp, Precision screwdrivers kit Tweezers, Soldering iron, Pliers and cutters, Blade cutter, Allen keys, Screw drivers, User manuals
Facilitation techniques & learning activities	• Demonstration • Practical exercise • Trainer guided • Brainstorming • Online video aid
Formative assessment methods	• Written assessment • Oral presentation • Performance assessment • Product based assessment

Learning outcome 5: Repair audio mixer	**Learning hours: 15**
Indicative content	
• **Description of audio mixer** ✓ Introduction on audio mixers (types and applications) ✓ Working principle of an audio mixer ✓ Main parts / blocks of an audio mixer ✓ Audio mixer accessories • **Disassembling an audio mixer** • **Testing different parts of an audio mixer** ✓ Testing the power supply (SMPS, Linear power supply and adaptor) ✓ Testing pre-amplifier ✓ Testing EQ stage ✓ Testing auxiliary section ✓ Testing monitor lever and faders ✓ Testing bus section ✓ Testing meter /displayer ✓ Testing cooling system ✓ Testing selectors, controls, and inlet / outlet systems	

• **Replacing and repairing defected parts of an audio mixer** • **Frequent / common faults of audio mixer and their diagnostic techniques** • **Conducting after repair test** • **Reassembling an audio mixer**	
Resources required for the indicative content	
Equipment	PPE, Soldering station gun, Oscilloscope, DC power supply, Multimeter, Hot air blower, Glue gun machine, Audio mixers
Materials	Brush, Glue gun stick, Soldering tin, Solder paste, Paste flux, Liquid flux, Cleaning sponge, PCB cleaner / WD40, Jumper wire, Coaxial cables, Speakon, TRS jack, Bananas, Electronic components
Tools	Antistatic mat, Microscope magnifier, Magnifying lamp, Precision screwdrivers kit, Tweezers, Soldering iron, Pliers and cutters, Blade cutter, Allen keys, Screwdrivers, User manuals
Facilitation techniques & learning activities	• Demonstration • Practical exercise • Trainer guided • Brainstorming • Online video aid
Formative assessment methods	• Written assessment • Oral presentation • Performance assessment • Product based assessment

Learning outcome 6: Repair synthesizer	Learning hours: 15

Indicative content

- **Description of a synthesizer**
  - ✓ Introduction on synthesizers (types and applications)
  - ✓ Working principle of a synthesizer
  - ✓ Main parts / blocks of a synthesizer
- **Disassembling a synthesizer**
- **Testing different parts of a synthesizer**
  - ✓ Testing the power supply / adaptor
  - ✓ Testing the audio amplifier
  - ✓ Testing keyboard board
  - ✓ Testing command board
  - ✓ Testing display board
  - ✓ Testing main / logic board
  - ✓ Testing cooling system
  - ✓ Testing voltage regulation stage
  - ✓ Testing louder speakers
  - ✓ Testing power and control buttons, and sound inlet / outlet systems
- **Replacing and repairing defected parts of synthesizer**
- **Frequent / common faults of synthesizer and their diagnostic techniques**
- **Conducting after repair test**
- **Reassembling a synthesizer**

Resources required for the indicative content

Equipment	PPE, Soldering station gun, Oscilloscope, DC power supply, Multimeter, Hot air blower, Glue gun machine, Synthesizer, Coaxial cables, Speakon, TRS jack, Bananas, Electronic components
Materials	Brush, Glue gun stick, Soldering tin, Solder paste, Paste flux, Liquid flux, Cleaning sponge, PCB cleaner / WD40, Jumper wire, Flash disk
Tools	Antistatic mat, Microscope magnifier, Magnifying lamp, Precision screwdrivers kit, Tweezers, Soldering iron, Pliers and cutters, Blade cutter, Allen keys, Screwdrivers, User manuals
Facilitation techniques & learning activities	• Demonstration • Practical exercise • Trainer guided • Brainstorming • Online video aid

Formative assessment methods	• Written assessment • Oral presentation • Performance assessment • Product based assessment

Learning outcome 7: Prepare technical report and invoice	**Learning hours: 5**
Indicative content	
• **Identification of main parts of a technical report** ✓ Introduction ✓ Body ✓ Conclusion & recommendations • **Preparation of technical reports** • **Cost estimation techniques** • **Generating invoice (proforma, invoice)**	
Resources required for the indicative content	
Equipment	Computer (Desktop or Laptop), Printer
Materials	Papers, Flash disk, Pens
Tools	Calculator
Facilitation techniques & learning activities	• Practical exercise • Trainer guided • Group discussion
Formative assessment methods	• Written assessment • Product based assessment

Integrated/Summative assessment

Integrated situation

Bank of Kigali branch located in Kicukiro district, Kigali city needs to hire a trained technician that will repair one of its defected smart screen TVs. The TV in question is a 49'' SAMSUNG HD LED smart TV and whenever it is turned ON, there is a presence of sound but no pictures. The TV receiver must be submitted back to the branch within 3 hours, together with related invoice and technical / repair report.

Resources

Tools	Antistatic mat, Microscope magnifier, Magnifying lamp, Precision screwdrivers kit, Tweezers, Soldering iron, Pliers and cutters, Blade cutter, Allen keys, Screw drivers, User manuals
Equipment	PPE, Soldering station gun, Oscilloscope, DC power supply, Multimeter, Hot air blower, Glue gun machine, 49'' SAMSUNG HD LED smart TV, Decoder, Woofer amplifier, Screw driver machine,
Materials/ Consumables	Brush, Glue gun stick, Soldering tin, Solder paste, Paste flux, Liquid flux, Cleaning sponge, PCB cleaner / WD40, Jumper wire, Electronic devices, LVDS cable, Back light spares

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
Learning outcome 1: Conduct pre-repair activities **(30%)**	1.1. Preparation of the workplace and selection of required tools, equipment and materials	The workplace is cleaned			3
		Adequate tools, materials and equipment are selected			3
		Tools, materials and equipment are properly arranged			3
	1.2. Disassembling the smart tv receiver	The user manual is referred on			3
		The cover is unscrewed using appropriate tools			5
		The cover is removed			5
		Adequate labelling disconnection techniques are applied			5

		Smart TV health and safety precautions are respected			3
Learning outcome 2: Repair smart TV receiver **(40%)**	2.1. Localization of the defected part	Adequate testing techniques (cold and hot testing) are applied			4
		Adequate testing / measuring tools or instruments are used			4
		Testing / measuring tools or instruments are correctly calibrated			4
	2.2. Replacement and repair of defected parts	Defected parts are well Di-soldered/removed			7
		Device ratings and specifications are respected			7
		New component are well soldered			7
	2.3. Conduction of after repair testing and smart TV reassembling	Functionality testing is done			3
		Smart TV is correctly re-assembled			4
Learning outcome 3: Prepare technical report and invoice **(30%)**	3.1. Preparation of the technical report	Technical report format is respected			6
		Repair steps contents are followed			6
		Technical recommendations are provided			7
	3.2. Generation of the invoice	Cost estimation is done based on the reality			5
		Invoice format is respected			6
Total marks					**100**
Percentage Weightage					**100%**
Minimum Passing line % (Aggregate): 70%					

References:

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9. Roland, “Fullcompass.com,” 2018. [Online]. Available: https://www.fullcompass.com/common/files/33840-RolandJUNODSSeriesOwnersManual.pdf.