



Republic of Rwanda  
Ministry of Education



**RTB** | RWANDA  
TVET BOARD

**CSAPA301**

## COMPUTER PCB AND SYSTEM ASSEMBLING

### ASSEMBLE PCB AND COMPUTER SYSTEM

#### Competence

**RQF Level:** 3

**Learning Hours**



**Credits:** 8

**Sector:** ICT

**Trade:** COMPUTER SYSTEM AND ARCHITECTURE

**Module Type:** Specific

**Curriculum:** ICTNIT3001- TVET Certificate III in computer system and architecture

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<b>Purpose statement</b>	This module describes the skills, knowledge and attitude required to assemble computer system. This module is intended to prepare students pursuing TVET Level 3 in Computer System and Architecture. At the end of this module the students will be able to prepare tools, materials and equipment, assemble PCBA, connect computer system parts.					
<b>Delivery modality</b>	<b>Training delivery</b>	<b>100 %</b>	<b>Assessment</b>		<b>Total 100%</b>	
	<b>Theoretical content</b>	<b>30%</b>	<b>Formative assessment</b>	<b>40%</b>	<b>50%</b>	
	<b>Practical work:</b>			<b>70%</b>		<b>60%</b>
	Group project and presentation	<b>30%</b>				
	Individual project /Work	<b>40%</b>	<b>Summative Assessment</b>		<b>50%</b>	

## Elements of Competency and Performance Criteria

Elements of competency	Performance criteria
<b>1. Prepare Tools, material and Equipment</b>	1.1 Workplace is properly prepared according to the work to be done.
	1.2 Tools, materials and equipment are correctly selected according to the given task and specifications.
	1.3 Equipment is effectively calibrated according to the task to be done
<b>2. Assemble PCBA using SMT</b>	2.1 PCB is correctly loaded into the assembling machine according to the user manual
	2.2 Solder paste are correctly applied to PCB according to the designed circuit.
	2.3 Electronic components are properly mounted on PCB according to the circuit diagram.
	2.4 Mounted components are effectively soldered according to the soldering standard.
	2.5 PCBA is successful tested based on circuit functionality

<b>3. Connect computer system parts</b>	3.1 Computer hardware parts are properly assembled based on SOP.
	3.2 Computer system is successful tested according to the computer system functionality.
	3.3 Assembling report is properly prepared according to the task under taken.

# Course content

Learning outcomes	At the end of the module the learner will be able to:  1. Prepare Tools, material and Equipment 2. Assemble PCBA 3. Connect computer system parts
<b>Learning outcome 1: Prepare Tools, material and Equipment</b>	<b>Learning hours: 10</b>
<b>Indicative content</b>	

## Introduction to computer system assembly

- ✓ *PCBA*
- ✓ *Computer assembly*
- **Preparation of workplace**
  - ✓ Set up working environment
  - ✓ Application of safety procedures
    - Identification and classification of Hazards
    - Hazards control measures
- **Identification of tools, materials and equipment**
  - ✓ SMT line
  - ✓ Hand tools
  - ✓ ESD tools
  - ✓ Personal Protective Equipment (PPE)
  - ✓ Cleaning tools
  - ✓ Diagnostic tools and equipment
  - ✓ SMD components
  - ✓ PTH components
  - ✓ Soldering equipment
  - ✓ Soldering materials
  - ✓ Solvent cleaning equipment

- ✓ PCB
- ✓ Selection criteria of tools, materials and equipment
- **Calibration of equipment**
  - ✓ Description of electrical calibration
  - ✓ Description mechanical calibration
  - ✓ Description Temperature Calibration
  - ✓ Application of Calibration procedures

Resources required for the learning outcome

Equipment	Digital torque meter, Computer, PCB, PCBA,
Materials	Screws, solder flux, solder paste
Tools	Screw drivers, ESD tool kit(Tweezer, Antistatic wrist strap, Antistatic mat),diagnostic tools
Facilitation techniques	Brainstorming Demonstration Group discussion Individualized work
Formative assessment methods / (CAT)	Written assessment Oral presentation Performance assessment

**Learning outcome 2: Assemble PCBA using SMT**

**Learning hours: 50**

Indicative content

- **Introduction to PCB**
  - ✓ *PCB elements*
  - ✓ *Types of PCBs*
- **Identification of PCBA technologies**
  - ✓ *Surface Mount Technology*

✓ *Through hole Technology*

✓ *Mixed technology*

● **Description of Surface Mount technology for PCBA**

✓ *Types of SMT Components*

- Surface Mount Component Characteristics
- Passive Surface Mount Components
- Active Components: Ceramic and plastic Packages
- Ball Grid Arrays (BGAs)

✓ *Types of Surface Mounting technologies*

- Type III SMT
- Type I SMT
- Type II SMT

● **Perform SMT PCB Assembly process**

Resources required for the indicative content

Equipment	SMT Line (SMT Loader, Solder Paste Mixer, Solder Paste Printing Machine, Solder Paste Inspection machine (SPI), Pick and Place Machine, Reflow Machine), Automatic Optical Inspection (AOI), X-Ray inspection machine, ESD Tester, PPEs, Soldering Station, wave soldering machine, solvent cleaning equipment, conveyor belt
Materials	SMD, PTH components, Solder Paste, deionized water, PCB, SMT adhesive, soldering flux, soldering wire
Tools	Diagnostic tools, ESD tools
Facilitation techniques	Demonstration and simulation Group work Practical exercise Individualized
Formative assessment methods /(CAT)	Written assessment Oral presentation Performance assessment

**Learning outcome 3: Connect computer system parts**

**Learning hours: 20**

Indicative content

- **Description of computer hardware parts**
  - ✓ Input
  - ✓ Output
  - ✓ Storage
  - ✓ Processing
  - ✓ Communication
    - Cables
    - Buses
- **Connection of Desktop Computer parts**
  - ✓ Power Supply
  - ✓ Motherboard
  - ✓ Adapter cards
  - ✓ Internal Drives
  - ✓ Drives in external bays
  - ✓ Internal Cables
  - ✓ Display
- **Connection of Laptop Computer parts**
  - ✓ Internal parts
  - ✓ Lid
- **Test of assembled computer**
  - ✓ Running the power on self-test (POST)
  - ✓ Interpretation of computer beeps
  - ✓ Interpretation of computer indicator LEDs
- **Documentation of Assembly report**

Resources required for the indicative content	
Equipment	Digital Torque meter, power supply tester, ESD tester, PPEs
Materials	monitor, keyboard, Computer case, Power supply, Motherboard, CPU, Heat sink/fan assembly, Thermal compound, RAM module(s), Motherboard standoffs and screws, Adapter cards, HDD, CD/DVD Drive, Floppy Drive, SATA data cable, PATA data cable, Floppy Drive cable, laptop battery
Tools	Anti-static wrist strap, anti-static mat, Screw Drivers, Screw feeder, ESD Tray
Facilitation techniques	Demonstration and simulation Group work Practical exercise Individualized
Formative assessment methods /(CAT)	Written assessment Oral presentation Performance assessment Product based assessment

**Integrated/Summative assessment (For specific module)**

**Integrated situation**

ABX GROUP Hotel is a well reputed facility located in KIGALI City, which host international and government meetings and provides accommodation of both locals and abroad visitors

Last year ABX GROUP hotel was bidding for hosting a meeting organized by QWERTY company Ltd and that bidding was for 700 million Rwf. Unfortunately, ABX GROUP Hotel didn't get that tender because of missing CCTV System and that CCTV system was an important element for getting that tender because QWERTY company Ltd needed more security of the staff and their equipment.

As a CCTV technician you are hired by ABX GROUP to install and maintain CCTV System in 3 conference rooms (2 cameras for each room) and 2 Entrance gates (1 camera each gate) to facilitate the hotel in delivering good services and stay competitive with others.

you have to provide the cost of the installation. After installation you are requested to submit a report of work done. duration of the work is 4hrs.

#### Resources

Tools Crimping tool, Wire stripper, Drilling machine, Hammer, Ladder, Pliers, Screw drivers

Equipment	Computer, Monitor, Power Supply, Switch, Storage devices, Cameras, Recording Devices (NVR/DVR)
Materials/ Consumables	Internet bundles, Connectors, Cable ties, trunks, Pipes, Screws, Wall Mounts, Power extension, Labelling tags, CCTV Power supply box

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
<b>Plan CCTV system installation</b> (20%)	CCTV installation requirements are properly identified based on-Site survey findings	Site survey is done			5
		CCTV System requirement are analyzed			4
	Cost is properly Estimated as per CCTV diagram	Items are identified			3
		Items cost are Estimated			4

		Total cost is Estimated			4
<b>Deploy CCTV equipment</b>  (25%)	Tool, materials and equipment are properly selected based on CCTV installation requirements	Tools are selected			3
		Materials are selected			3
		Equipment are selected			4
	CCTV equipment are properly fixed based on CCTV diagram	Cameras are fixed			3
		Controller devices are fixed			3
		Trunking is fixed			3
	CCTV devices are properly connected based on CCTV diagram	Cameras are connected			3
		Controller devices are connected			3
<b>Configure CCTV System</b>  (30%)	CCTV accounts are correctly set according to the user privileges	Default password is changed			4
		Recording storage is set			4
		CCTV user accounts are created			2
		Factor authentication is applied			2
	IP addresses are correctly configured based on type of CCTV camera	Static IP address are assigned			3
		Dynamic IP address is configured			3
	CCTV system is properly documented based on CCTV functionalities	Introduction is written			3
		CCTV system requirements			3
		CCTV system settings			3

		recommendation is written			3
<b>Maintain CCTV system (25%)</b>	Periodical backup is correctly set based on the Client requirements	Schedules are set			2
	CCTV Camera positioning is correctly checked based on coverage area according to the CCTV installation requirements	Camera positioning is adjusted			3
		Cabling is done			3
		Cameras are placed			3
	Security measures are properly checked CCTV system issues are properly handled based on system diagnosis	Physical security is set			3
		Logical security is set			3
	Maintenance report is efficiently elaborated based on the CCTV system status	Title is written			2
		Date is written			2
		Introduction are written			2
		recommendation is written			2
	Total marks		100		
Percentage Weightage		100%			
Minimum Passing line % (Aggregate): 70%					

## References:

1. Atlantic, S. a. (2013). *CCTV Technology handbook*.
2. Butterworth-Heinemann. (2014). *Digital Video Surveillance and Security*.
3. Caputo, T. (2009). *Digital Video Surveillance and Security*. Elsevier Science.
4. Cieszynski, J. ( 2006). *Closed Circuit Television*.
5. Damjanovski, V. (2013). *CCTV- From Light to Pixels*.

6. DiSalvatore, A. (2017). *Security Surveillance Centers: Design, Implementation, and Operation*. Taylor & Francis.
7. Kruegle, H. (1994). *CCTV Surveillance: Video Practices and Technology*.
8. Lento, T. V., Chin, D., & Romanowich., J. (n.d.). *Smart Video Security Handbook: A Practical Guide for Catching Intruders Before They Act*.