PARTICIPANT HANDBOOK

Electronics | Language: English

ASSEMBLY LINE OPERATOR

Assembly Line Operator

SECTOR: ELECTRONICS

SUB-SECTOR: IT Hardware

OCCUPATION: Manufacturing

REFERENCE ID: ELE/Q4301

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Chapter 1
Introduction

Learning Outcome:

At the end of the session, students would be able to:

- Elaborate the Job role of an assembly line operator

Unit 1.1: Job Role of the Assembly Line Operator

Unit Objective:

At the end of this unit, students would be able to:

- Determine the Job role of an assembly line operator
- List the qualifications of the assembly line operator
- Discuss the duties and responsibilities of the operator

Determine the Job role of an assembly line operator-

Assembly line operator is an individual or a worker, who construct parts and joins them together to make products like, automobiles, aircrafts, household appliances and electronics. An assembly line is a fabricating process, in which interchangeable parts are added in a series, to create a finished product. For the benefit of assembly line time of production is shortened, cost of equipment accelerated, labour along with management worked hard to keep up with the changes

Fig 1.1.1 assembly line operator

The job role of the assembly line operator would include:

- Assembly line workers would have to look through small details, and be able to differentiate between the colour of wires and electrical products

- The worker must have the adeptness, to manipulate, and put together or assemble parts

- Skill of mathematics help to operate equipment and computers at their work

- The fact they have to deal with machines and mechanised control, the mechanical knowledge and skill of the individual have to be sound enough

- Physical stamina is an important attribute of the job role, because they would require to stand for long, lift heavy components at work

- The worker should be able to decrypt technical manuals and schematics to properly assemble an equipment or an electronic device

List the qualifications of the assembly line operator-

Qualification of the assembly line operator are listed below in the table

	Qualification	Description
1	The amplitude level	Must have a high school certificate or something which is equivalent
2	Level of degree	Manufacturing technology computer science technology, or any other training that has been specially taken
3	Experience	On the job training is applicable
4	Skills	Ability to use various kinds of machine, mechanical skill and knowledge, physical stamina and to decrypt technical manuals and schematics, and to assemble electrical parts for a finished product

Table 1.1.1 list of qualification of the assembly line operator

Discuss the duties and responsibility of the operator-

Duties of the assembly line operator- every job role has a duty to perform the duties of the assembly line operator would include:

- Administration of all operations , ensuring safety working with all equipment's, evaluation of working with the equipment , maintain accuracy of the same

- The assembly line operator begins by decrypting technical manuals and reading the schematics

- They measure the parts and trim and shape the tools to the size which is accurate for usage for construction
- The worker with the help of screws and bolts connect the parts together basically by wielding
- Tools and tasks vary from industry to speciality, a worker who is a construction assembly line operator would have different tools compared to an electromechanical worker
- The responsibility of the assembly line operator would assemble parts
- Read and interpret blueprints, diagrams, drawings, specifications and others
- Inspection of wiring installations, and assembling of parts of modules
- Assembling of electronic and electrical systems
- Building of products like computers, electronic control devices and sensory activity equipment
- Assess or test the functional equipment

Summary:

- **Assembly line operator** is an individual or a worker, who construct parts and joins them together to make products like, automobiles, aircrafts, household appliances and electronics
- Assembly line workers would have to look through small details, and be able to differentiate between the colour of wires and electrical products
- The worker must have the adeptness, to manipulate, and put together or assemble parts
- Physical stamina is an important attribute of the job role, because they would require to stand for long, lift heavy components at work
- The worker should be able to decrypt technical manuals and schematics to properly assemble an equipment or an electronic device
- The assembly line operator begins by decrypting technical manuals and reading the schematics
- Tools and tasks vary from industry to speciality, a worker who is a construction assembly line operator would have different tools compared to an electromechanical worker
- Building of products like computers, electronic control devices and sensory activity equipment

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Exercise:

1. _____would have to look through small details
   a) Assembly line workers
   b) Teachers
   c) Peon

2. Skill of _____help to operate equipment and computers at their work
   a) Mathematics
   b) Geometry
   c) Algebra

3. The assembly line operator begins by _____technical manuals and reading the schematics
   a) Decrypting
   b) Encrypting
   c) Password

4. The worker with the help of screws and bolts connect the parts together basically by _____
   a) Wielding
   b) Cutting
   c) Drilling

5. Building of products like_____, electronic control devices and sensory activity equipment
   a) Computers
   b) Television
   c) Laptop

Activity:

➢ Ask the trainees to start an interacting between themselves
➢ This is 'an ice breaker session', in which the trainees will come to know about each other
➢ This can be followed by a small GD round\
➢ GD- Group Discussion

Chapter 2

Perform Kitting and Assembly

Learning Outcome:

At the end of the session, students would be able to:

- Explain basic electronics involved in the hardware

- List the different types of IT hardware products and functionalities

- Identify different components and their specific function of different modules

- Illustrate handling specific expensive modules such as processors, hard disks

- Discuss different modules in hardware equipment for example SMPS, drivers, hard disk, battery, mother board in case of a desktop

- Identify the different models assembled in the plant and their requirement

- List the Electrostatic Discharge (ESD) and precautionary steps

Unit 2.1: Explain basic electronics involved in the hardware

Unit Objective:

At the end of this unit, students would be able to:

- Identify the components and modules according to the bill of materials (BOM)

Kitting- this is more or less like assembling. It is a process where the individual separates the tools, but usually all the related items are packed, grouped and finished together as one unit. In other words group of some materials from which a finished product is achieved through assembling**. For example; a computer assembled from kit**

The components and modules according to the bill of materials (BOM)-

Bills of materials- bills of materials, is a well-rounded list that not only contains the raw materials but also a list of assemblies, raw materials, sub- assemblies, quantity, parts and component needed to construct an equipment or machine. Virtually every item that is needed by the manufacturer is included in a BOM. Basically BOM depends exactly on what kind of equipment is being manufactured. But basically **BOM is of two types**- one is when the equipment is getting engineered for the manufacturers, and the other one is when the product has been shipped and rolled out for the customers.

Let us discuss the key items of BOM firstly; a good BOM would definitely include all these items:

	Key items	Description
1.	BOM level	Each and every part or assembly in the BOM must get the number or level, that will explain all in itself where it will fit in the hierarchy of the BOM, for easier understanding of the BOM
2.	Part number	It is very important that the BOM parts must be numbered properly, so that anyone who is involved in the manufacturing process will have an ease to refer and identify parts in an instant. It is important and critical that each part will have only one number for easy identification and avoiding confusion
3.	Part name	Every part name must have a unique name of itself that will help the manufacturer to identify the parts at one instance, without taking help from other sources
4.	Phase	It is to be made sure that all the parts in the BOM must be marked with a life cycle stage, the parts that are in the verge or in the process of being completed , a term like devising can be used , and for parts that are not yet approved terms like in process or not released can be used. These terms are helpful when new manufacturing is in process, for an easier understanding and for tracking easily
5.	Description	A general information must be attached to every part, so that it is easier for the manufacturers to identify and make a comparison between similar parts
6.	Quantity	The number of parts that is provided for an assembly must be specified so that purchasing of the BOM is feasible
7.	Unit of measure	It is very essential that the unit of measure is specified how much quantity is used for every part or material must be mentioned. This information will provide that correct quantities are purchased and provided to the assembly lines
8.	Procurement type	Every part or material must be recognised as something that is bought off the shelf or the manufacturing has taken place according to project specification
9.	Reference designators	When an item or product includes a circuit board that is printed or printed circuit board assemblies(PCBA's) the BOM must include reference designators as to how the PCBA's fit into it
10.	BOM notes	Lastly note that carries additional information must be included so that whoever uses the BOM

Components are the list of items needed for the various processes to make a product. Components according to the BOM would include:

	Component type	Description
1	Sub-assemblies	A sub- assembly is an item that has been manufactured, which is used as a constituent, in a level higher in BOM. Every sub- assembly has its own BOM and is manufactured according to the jobs(components, revision, routing)
2	Phantom- assemblies	Phantom- assemblies stand for components and are used for products that are manufactured in a customised manner. Phantom-assemblies does not include revision or routing specified
3	Raw materials	Raw materials are those items that will be incorporated with the BOM parent in some way or the other **BOM parent-** it is a multi- level BOM, also known or referred to as indented BOM, it gives us a picture of parent and child relation, and depicts the structure of hierarchy of assemblies and the other component's attached to it
4	Purchased parts	These are simply raw materials that are bought or purchased from an outside supplier, simply to be assembled with a BOM parent

Speed entry for facilitating component entry-

- Components are entered within the components tab in the BOM main screen
- To facilitate rapid selection of components to the main screen of BOM speedy entry function is used

Assigning of components to associated routing sequences-

- it is important to assign components to associated routing sequence when they are being used
- when a job is processed, print of the components are associated with the job traveller
- sequence assignments also enables job materials and sequence to appear on the job issues screen which are selectively issued

Facility to import CAD programme to other source-

- file- data format- BOM- BOM components can be used for utilising to import materials or component from CAD program or other source

- components must be existing among themselves as stock items

- this must be revised from time to time and edited with the source file for assigning of components to associated sequence

Determining the sort order-

- the line number field is used to determine the sort order on the screen

- the programme allots a value on the basis of 10 in the order that components are made to entered

The quantity of usage depends on the BOM –

- the component usage quantity entry depends on two types :
  - if the type of BOM is 'BOM" "Phantom" or "one off" enter the net quantity that is required for a unit of item parent
  - if the type of BOM is batch, it is required to enter the total quantity in order to specify the batch size in the upper panel

Select the fixed quantity when usage is not varying with the job quantity –

- for the selection of the fixed quantity, checkbox is to be selected when there is no varying in job quantity

- For example- a tool may be used for one job type and the disposed of. In this case a fixed quantity usage will be applied

Using of component references-

- There is an option of printing on the job traveller by attaching multiple references to it

- For example- the manufacturers of circuit board uses references to designate the location of the component

Using of component job notes in alteration to references-

- It is an informal alternative way to use reference

- Job notes can be entered for any reference

Using of component replace screen for maintenance of mass-

- Whenever there is a need to replace a mass of the existing component with the other component

- It is recommended to use the component replace screen for doing this in batch process

Summary:

- **Kitting-** this is more or less like assembling. It is a process where the individual separates, but usually all the related items are packed, grouped and finished together as one unit

- **Bills of materials-** bills of materials, is a well-rounded list that not only contains the raw materials but also a list of assemblies, raw materials, sub- assemblies, quantity, parts and component needed to construct an equipment or machine

- basically **BOM is of two types-** one is when the equipment is getting engineered for the manufacturers, and the other one is when the product has been shipped and rolled out for the customers

- Components are entered within the components tab in the BOM main screen

- To facilitate rapid selection of components to the main screen of BOM speedy entry function is used

- it is important to assign components to associated routing sequence when they are being used

- for the selection of the fixed quantity, checkbox is to be selected when there is no varying in job quantity

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Exercise:

1. _____this is more or less like assembling. It is a process where the individual separates the tools
   a) Kitting
   b) Knitting
   c) Speaking

2. _____is a well-rounded list that not only contains the raw materials
   a) Bills of materials
   b) Materials
   c) Knowledge

3. Choose the type of component
   a) Sub- assemblies
   b) BOM notes
   c) SOS

4. _____are entered within the components tab in the BOM main screen
   a) Components
   b) Resources
   c) Facilities

5. the selection of the fixed quantity_____ is to be selected when there is no varying in job quantity
   a) toolbox
   b) checkbox
   c) assembler

Unit 2.2: List the different types of IT hardware products and functionalities

Unit objective:

At the end of this unit, students would be able to:

- Define IT hardware
- List different types of IT hardware and its functionalities

Definition of IT hardware- in IT or information technology; hardware is the physical aspect of the computer, electromechanical areas, telecommunications and other areas. The term has paved its way as a process to differentiate between the programme of the computer known as **software** that is fed in to the computer. Hardware is the electronic circuit, the other components of the computer which is physical. Other components of hardware would include:

- implication of hardware is on its permanence and the fact being that it is invariable
- Whereas software can easily be changed. An entirely new programme can be uploaded in the computer, and the user will experience a total new thing
- Hardware is a collective term that includes more things than the computer like cables, connectors, power units, keyboard, mouse, printer, monitor speakers
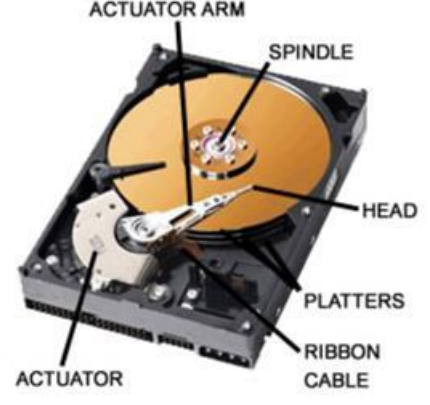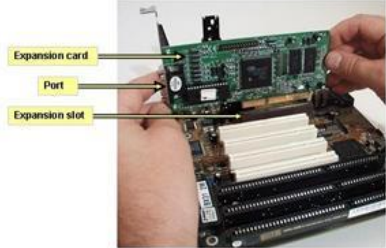

Fig 2.2.1 IT hardware

List different types of IT hardware products and its functionalities –

Different computers are built with different hardware, though there are similarities between most, here is a list of components of hardware that is sure to be found inside every PC's:

Component	Role	Images
Mother board- the electronic infrastructure of the system	- Basically motherboard gives permission to all the other components in the system to work as team players - The basic job of the motherboard is to collect information, provide power and pass it on to the appropriate place - It allows connection between all the other components - The mother board does not have any impact on the performance of the system directly - It determines what components will be installed - Every connection to and from the motherboard is labelled and decoded - Connection that are improper to the motherboard can cause irreparable damage - Improper connection would lead to failure of booting the computer - And forcibly doing something that will not fit into the computer will damage the system amounting to irreparable loss	

Component	Role	Images
CPU(central processing unit) It is a calculator which is very powerful, the brain of the system	• It is the brain of the system, if the CPU is removed from the computer then the system won't ever work • It is the most expensive component of the computer system • Before installation of the CPU chip instructions must be read thoroughly • The CPU also known as APU(Accelerated Processing Unit) reads the instruction in the memory and perform execution accordingly • The CPU must be compatible with the motherboard for connection	
RAM(Random Access Memory) the short term memory of the computer system	• RAM is the short term memory of the system but it is the primary memory • RAM works till the time computer is powered up; it is a volatile component, as soon as the computer gets turned off memory in the RAM is lost • All the other memory is called secondary memory, because data stored in the secondary storage media(usually the disk drives)has no direct communication with the micro-processor • Any data is first transferred to the RAM, so that processing can take place • Primary memory includes, DRAM,SRAM, ROM	

Component	Role	Images
Hard drives/ disks (it is this permanent memory of the system)	- hard drives are the secondary memory of the system, where all the memory is stored - secondary memory is divided into two parts - internal devices are designed in such a way that it is to be placed inside the computer all the times - examples would include hard disk, solid state disk drives - external devices would be plug and play media that is used to transfer files between the computers - examples would be optical disks, external disk drives and flash disks	
Case(the casket that holds all the components together)	- not all the mother boards are meant and will fit in a definite case and all cases are not meant to fit for all motherboards - there is a specific kind of case that is fitted for every motherboard - the right case suited for the motherboard shall take advantage of the motherboard - if a case has jack and microphone on the front of the case the motherboard must take advantage of it - USB ports at front is always an added advantage, the purpose being you do not have to reach the backside of your computer if you want to switch on the camera - When the case is bought it must be kept in mind that the motherboard and the case is compatible with each other - The larger the case, the less it gets heated up, and there is more room to add or repair parts as the case maybe - One disadvantage that follows is that it consumes on lots of space	

Component	Role	Images
Optical drive and their advantages	• Optical drives were once very important, but pen drive has paved its way • it was an initial method of installing a software in the computer • as it is an inexpensive way of installing programmes, it is still used in the desktops • but their importance is fading away as more software are available online • but still it is very useful in watching movies	
Expansion cards	• the easiest upgrade for a computer is the expansion card • there are three types of expansion cards AGP, ISA and PCI • the trendiest and t newest technology being PCI and PCI express • AGP and ISA are not found in computers presently, they belong to a much older version • The most common upgrade to be found in the expansion card is video card and sound card • RAID controllers and hard drives in solid state are connected via an expansion card	
Fans (the solution to cooling and the most important part)	• For ensuring proper airflow there is a fan that is there in the processor heat sink • The desktops are installed with two fans in the case the intake and the exhaust fan • The sizes vary differently, but the most common one being, 80mm and 120 mm • Larger fans are quitter than the smaller fans, as the smaller fans have to spin quicker for generation of the similar airflow	

Ports- ports are used parts of the motherboard to surface with electronics both outside and inside the computer

1. **Serial**- a technology that was used often to connect mouse or modem. Serial ports are sometimes used now for specialized applications like industrial automation systems and also scientific instruments. They are out-dated at the present moment and PS/2 or USB ports have taken its place by Circa 2000

Fig 2.2.1 Serial Port

2. **PS/2 –** these are now out-dated and were once used to connect keyboard and mouse to the computer. They have been replaced by USB ports as following the popular standard. This trend of USB port over PS/2 have started in Circa 2004

Fig 2.2.2 PS/2

3. **Parallel-** these ports are meant to connect joysticks, and printers. Just like PS/2 parallel has been phased out and USB port has paved its way

Fig 2.2.3 Parallel port

4. **USB-** it is an abbreviation for Universal Serial Bus it is defined as the cables and the connectors that provides connection and communication between computers and electronic devices. Bus is defined as the communication system that helps to transfer data inside or between the computers

Fig 2.2.4 USB port

5. **Slots –** slots are the opening where the circuit board is inserted for adding new capabilities. All PC's are equipped with slots for memory, support for special devices and graphic capabilities
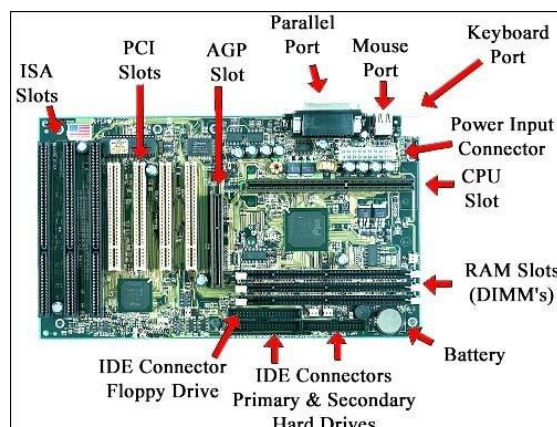

Fig 2.2.5 Slots

6. **Graphics card –** graphic card are installed in all computers, their work is to convert the signals into video signals so that images can be seen on the monitor. They are inbuilt in the CPU itself. For efficient working the graphic cards come with a board memory

Fig 2.2.6 graphic card

6. **Sound card –** the sound card also referred to as audio card, the work of the audio card is to facilitate sound to and from the computer under the control of the computer programmes. Till the year 1988 the speaker of the PC was the only source that produced sound or audio

Fig 2.2.7 sound card 1

Summary:

- in IT or information technology; hardware is the physical aspect of the computer, electromechanical areas, telecommunications and other areas

- Hardware is the electronic circuit, the other components of the computer which is physical

Other components of hardware would include:

- implication of hardware is on its permanence and the fact being that it is invariable

- Whereas software can easily be changed. An entirely new programme can be uploaded in the computer, and the user will experience a total new thing

- Hardware is a collective term that includes more things than the computer like cables, connectors, power units, keyboard, mouse, printer, monitor speakers

- The basic job of the **motherboard** is to collect information, provide power and pass it on to the appropriate place

- The **CPU** also known as APU(Accelerated Processing Unit) reads the instruction in the memory and perform execution accordingly

- **RAM** works till the time computer is powered up; it is a volatile component, as soon as the computer gets turned off memory in the RAM is lost

- hard drives are the secondary memory of the system, where all the memory is stored

- **USB-** it is an abbreviation for Universal Serial Bus it is defined as the cables and the connectors that provides connection and communication between computers and electronic devices

- **Ports-** ports are used parts of the motherboard to surface with electronics both outside and inside the computer