ELECTRICAL/ELECTRONICS EQUIPMENT SERVICING
Level – II

Based on April 2022, Curriculum Version 1

Module Title: Maintaining and Repairing Electric Domestic Appliance

Module Code: EIS EEES2 M08 0322

Nominal duration: 80 Hours

Prepared by: Ministry of Lobar and Skill

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Addis Ababa, Ethiopia

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Acknowledgement

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Acronyms

AC..…… Alternating current

DC…… Direct current

OHS ……Occupational health and safety

LAP …… learning assistance program

LED……light emitting diode

PCB……printed circuit boar

ESD……electrostatic discharge

DMM……digital mustimeter

VOM……volt ohm meter

GFCI ……. Ground Fault Circuit Interrupter

Introduction to the Module

In Electrical/electronic equipment servicing filed; the Maintaining and repairing electric domestic appliance project helps to know (Toaster, flat iron, pressure cooker, Blender, coffee maker and waffle maker, Onion chopping, Coffee grinding). It includes diagnosing faults, dismantling, re-assembling, testing and preparing reports Connect and terminate electrical wiring Systems.

This module is designed to meet the industry requirement under the Electrical/electronic equipment servicing occupational standard, particularly for the unit of competency: **Maintaining and repairing electric domestic appliance.**

Module units

- Set up the unit, tools, equipment, and workstation
- Determine the unit's faults
- Unit maintenance/repair
- Unit repair test

Learning objectives of the Module

At the end of this session, the students will able to:

- Prepare unit, tools, equipment and workstation
- Diagnose faults of the unit
- Maintain/repair the unit
- Test repaired unit

Module Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Unit one: Set up the unit, tools, equipment, and workstation

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Workplace maintenance
- Necessary tools and testing equipment
- Set up and organize equipment's
- Repair & maintenance equipment
- Service manuals and service information

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Prepare workplace for maintenance
- Prepare necessary tools, and test instruments
- Set and arrange equipment's
- Verify repair & maintenance equipment
- Require service manuals and service information

1.1. Workplace maintenance

In every electronic work, it is a must to prepare first the necessary tools, materials, equipment and well organized workplace needed as well as the information. Some of The following list of tools, materials, and equipment/but not limited/ are needed in maintaining and repairing domestic electronically controlled equipment/appliances and a sample of workshop organization shown below.

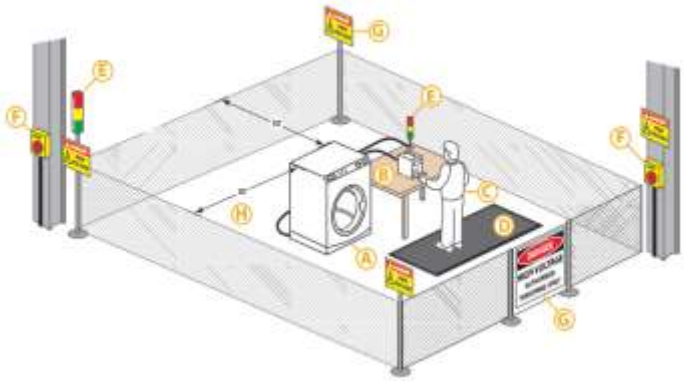


Figure 1.1 workshop organization

A	DUT – This large DUT prevents you from using a product safety enclosure. Instead, other precautions must be taken to ensure a safe testing station.
B	The Hipot Tester – tester used to test the DUT.
C	Test Operator.
D	High Voltage Insulation Mat – This isolates you from ground which provides an additional means of protection when operating high voltage equipment.
E	Signal Tower Light – gives an indication as to the status of the testing area. A green light indicates the Hipot tester is not outputting high voltage and the test area is safe. A red light indicates that the Hipot tester is active and to stay clear of the test area.
F	Emergency Stop Button – An E-stop button is located on the perimeter of the test area. In the event of an emergency, someone outside the test area can hit the E-Stop button to immediately cut off power to the entire test station.
G	Warning Signs4 – Mark the testing area with clearly posted signs that read: DANGER-HIGH VOLTAGE TEST IN PROGRESS. UNAUTHORIZED PERSONNEL KEEP AWAY.

H	Sectioned Off Test Area – Since the size of the DUT restricts the use of an enclosure, this test area is sectioned off by a mesh fence to keep unauthorized personnel away from the testing station. NEC (National Electric Code) and NFPA (National Fire Protection Agency)5 stipulate that any unqualified workers shall not come within 10 feet of an EXPOSED energized circuit.

Table 1.1 workshop organization

1.2. Necessary tools and test equipment

Preparing tools, test instruments: same of are listed below but not limited

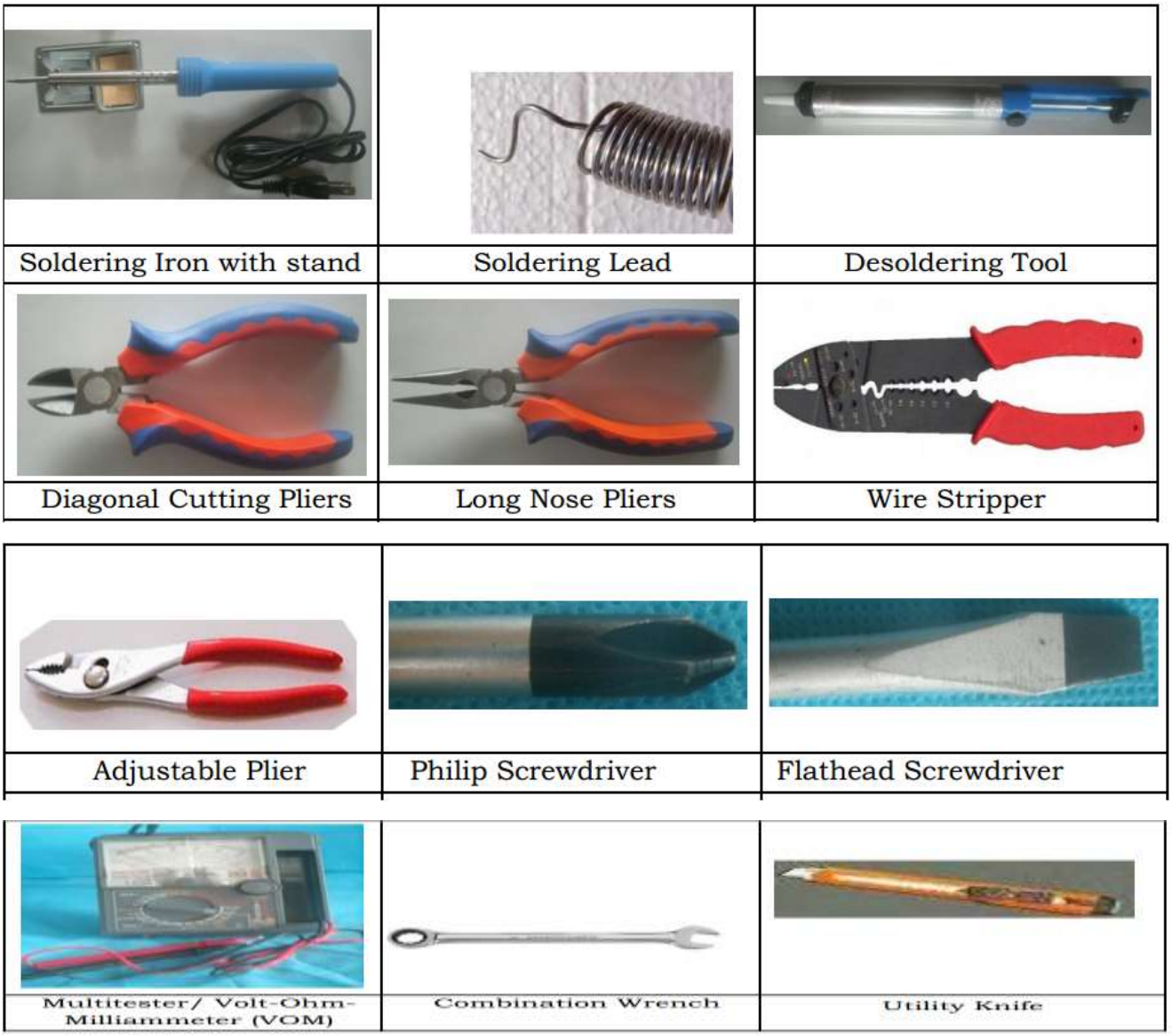


Figure1.2 tools, test instruments

1.2.1. Personal Protective Equipment

Personal Protective Equipment (PPE) is defined in the Occupational Safety and Health Administration (OSHA) as a tool used to protect workers from injury or illness caused by having contact with the dangers (hazards) in the workplace, whether they are chemical, biological, radiation, physical, electrical, mechanical and other. Exposures to hazards are reduced using PPE.

The types of Personal Protective Equipment

Personal Protective Equipment can be classified according to target organs potentially affected of the risk of danger. Identification of hazard and risk assessment of a job, process and activity must be done first before deciding which type of PPE to be used.

	Organ	Source of danger	PPE
1	Eye	splashes of liquid chemicals or metals, dust, catalyst powder, projectiles, gas, steam and radiation.	safety spectacles, goggles, face shield, welding shield
2	Ear	the sound with the noise level more than 85 dB.	ear plug, ear muff, canal caps.
3	Head	crushed by falling objects, hit by hard objects, rotating objects entangled hair	helmets, bump caps.
4	Respiratory	dust, steam, gas, lack of oxygen (oxygen deficiency).	respirators, breathing apparatus
5	Body	extreme temperatures, bad weather, splashes of liquid chemicals or metals, a blast from a leaking pressure, penetration of sharp objects, dust contaminated	boiler suits, chemical suit, vest, apron, full body suits, jackets.
6	Hand and Arm	extreme temperatures, sharp objects, crushed by heavy objects, electric shock, chemicals, skin infections.	gloves, armlets, mitts.
7	Foot	slippery floors, wet floors, sharp objects, falling objects, chemical splashes and liquid metals aberration.	safety shoes, safety boot leggings.

Table 1.2 Personal Protective Equipment

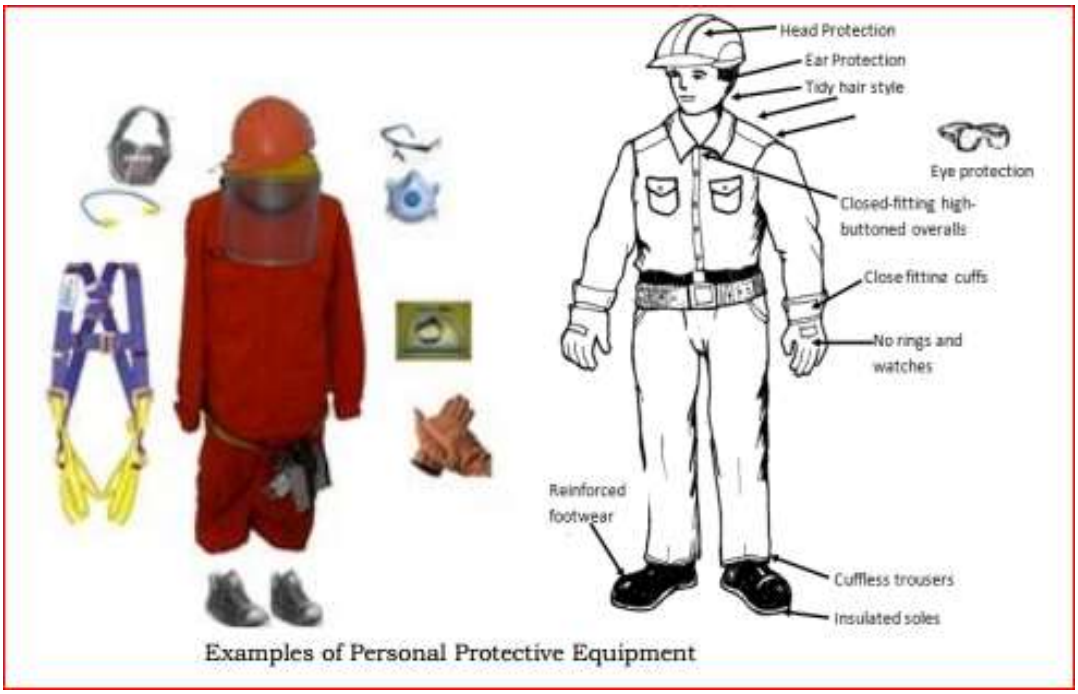


Figure 1.3 Personal Protective Equipment

1.3. Set up and organize equipment's

1.3.1. Setting Workplace for repair

Building maintenance is work undertaken to keep, restore or improve every facility i.e. every part of a building, its services including maintenance operations to a currently acceptable standard and to sustain the utility and value of the facility.

The objective of setting workplace is: -

(i) To preserve machinery, building and services, in good operating condition.

(ii) To restore it back to its original standards, and

(iii) To improve the facilities depending upon the development that is taking place in the building engineering.

1.3.2. Setting up a Safe Workstation

One of the best ways to prevent injury is to ensure that the test station is set up safely and securely. Test stations can be setup with or without direct protection depending on your requirements. Direct protection means that the operator cannot physically come into contact with an energized DUT/device under test/ while a test is running.

Sample Proper Arrangement and storage of tools and equipment

Figure 1.4 tools and equipment

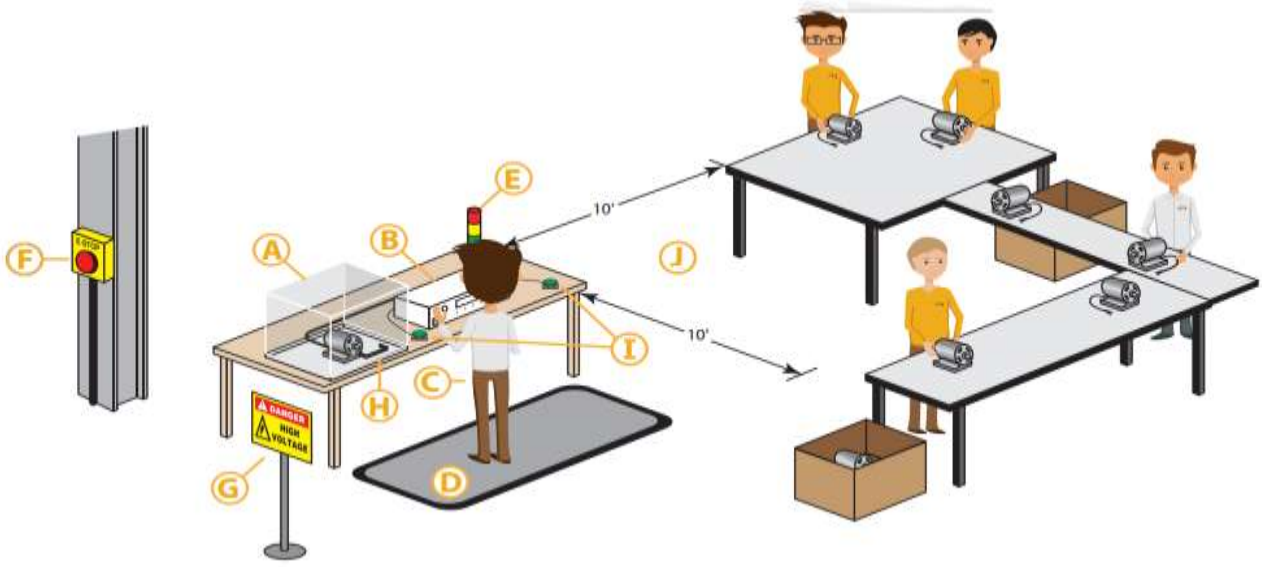


Figure 1.6 Safe Workstation

Station with protection against electric shock.

1.4. Repair & maintenance equipment

Maintenance recommendations are based on industry standards and experience in Reclamation facilities. However, equipment and situations vary greatly, and sound engineering and management judgment must be exercised when applying these recommendations. Other sources of information must be consulted (e.g., manufacturer=s recommendations, unusual operating conditions, personal experience with the equipment, etc.) in conjunction with these maintenance recommendations.

Types of maintenance

Maintenance is work done to correct, reduce, or counteract wear, failure, and damage to equipment. Maintenance of electrical and electronic equipment is divided into two main categories: PREVENTIVE (routine) and CORRECTIVE maintenance.

- **Preventive maintenance: -** consists of mechanical, electrical, and electronic checks to determine whether equipment is operating properly. It also consists of visual inspections of cabling and equipment for damage and to determine if lubrication is needed.
- **Corrective maintenance: -** isolates equipment failure by means of test techniques and practices; it also replaces defective parts and realigns or readjusts equipment to bring it back to proper performance

Maintenance and test procedures

Maintenance activities fall into three general categories:

A. ***Routine Maintenance:*** **-** Activities that are conducted while equipment and systems are in service. These activities are predictable and can be scheduled and budgeted. Generally, these are the activities scheduled on a time-based or meter-based schedule derived from preventive or predictive maintenance strategies. Some examples are visual inspections, cleaning, functional tests, measurement of operating quantities, lubrication, oil tests, and governor maintenance.

B. ***Maintenance Testing:*** **-** Activities that involve using test equipment to assess condition in an offline state. These activities are predictable and can be scheduled and budgeted. They may be scheduled on a time or meter basis but may be planned to coincide with scheduled equipment outages. Since these activities are predictable, some offices consider them “routine maintenance” or “preventive maintenance.” Some examples are governor alignments and balanced and unbalanced gate testing.

C. *Diagnostic Testing:* – Activities that involve using test equipment to assess the condition of equipment after unusual events, such as equipment failure/ repair/replacement or when equipment deterioration is suspected. These activities are not predictable and cannot be scheduled because they are required after a forced outage. Each office must budget for these events. Some examples are governor troubleshooting, unit balancing, and vibration testing.

Maintenance procedures

- Prepare necessary tools, test instruments and personal protective equipment in line with job requirements
- Acquire service manuals and service information required for repair /maintenance as manufacturer's specifications
- Conduct complete check-up of electronically-controlled domestic appliances
- Document the identified defects based on check-up conducted

1.5. Service manuals and service information

Service manual is the full written information provided by the manufacturer regarding the equipment. This service manual usually accompanies the equipment at time of purchase. A service manual consists of some or all of the f/f

1. Safety & precautionary measures during dissembling
2. Dismantling or blow-up diagram
3. Block diagram of the equipment
4. Circuit diagram
5. PCB lay out
6. Parts-list
7. Service manual/schematic diagram/parts list
8. Operating instructions/User's/Owner's manual
9. Component data sheet/handbook

Service information
Record all information during maintaining/repairing electronically-controlled domestic appliance.

This may include but not limited to:

1. Job report sheets 2. Job order 3. Bill of materials 4. Customer index 5. Service flowchart 6. stock and inventory record 7. Requisition slips (for acquisition of parts) supplier index

Directions: Provided with the defective domestic appliance use Maintain and Repair Form to gather and document the information about the appliance at hand. Follow the procedures below:

Resources:

Domestic appliance: ----------

Receiving/Check-up Form

Procedure:

1. Conduct an initial interview to the owner of the appliance.
   - Ask what the problem is.
   - Request for the details of the problem (how does it happen/since when/ nature of

the problem)

2. As serviceman, you must confirm the problem/ complain.

3. Make an initial inspection/ testing of the appliance.
   - Physical appearance
   - Operating controls
   - Power cord **etc**.

4. Take note of the information gathered and observed.
5. Accomplish Receiving and Repair Form.

Receiving and Repair Form

Customer's name: _____

Address:

_____

Product/ Brand name: _____

Serial no:

_____

Complain: _____

_____

Electric…… Checklist (e.g. Refrigerator, washing machine, flat iron)

Part of equipment	**condition**	
	good	**defective**
Power cord		
Power switch		
.		
.		

customer's Signature_____ Date Repaired: _____

technician's Signature_____ Date Checked: _____

Self-check-1

Test-I Choose

Instruction: For the Following Questions You Are Given Four Alternatives Then Choose the Correct Answer and circle**.**

1, Activities that involve using test equipment to assess the condition of equipment after unusual events **(3 pt each)**

A, Routine Maintenance B, Diagnostic Testing C, Maintenance Testing D, all

2, Isolates equipment failure by means of test techniques and practices. **(3 pt each)**

A Diagnostic Testing B, Corrective maintenance C, Preventive maintenance D, Maintenance Testing

3, consists of mechanical, electrical, and electronic checks to determine whether equipment is operating properly. **(3 pt each)**

A Diagnostic Testing B, Corrective maintenance C, Preventive maintenance D, Maintenance Testing

4, The objective of setting workplace is **(3 points)**

A, To preserve machinery, building and services, in good operating condition.
B, To restore it back to its original standards, and
C, To improve the facilities depending upon the development that is taking place in the building engineering. D, all

5, A service manual consists of some or all of the f/f **(3 points)**

A, Safety & precautionary measures during dissembling
B, Dismantling or blow-up diagram
C, Block diagram of the equipment
D, All

6.Record all information during maintaining/repairing electronically-controlled domestic appliance. This may include but not limited to: **(3 points)**

A, Job report sheets B, Job order C, Bill of materials D, Block diagram of the equipment E, all

7, Service manual is the full written information provided by ----------. **(3 points)**

A, manufacturer B, Technician C, seller D, teacher

Test II: short Answer writing

Instruction: Identify the tools, equipment and materials in maintaining and repairing a domestic equipment's and Write your answers on a separate sheet. ***(10 pt each)***

1	2	3	4	5
				
6	7	8	9	10
				

1. ---------- 2. ----------3. ----------4. ----------5. ----------
6.----------7. ----------8. ----------9. ----------10----------

Test III: Say true or false

1**,** one of the best ways to prevent injury is to ensure that the test station is set up safely and securely. A, True B, False

2, Test stations can be setup with or without direct protection depending on your requirements.

A, True B, False

Note: Satisfactory rating – above 60% Unsatisfactory - below 60%

You can ask you teacher for the copy of the correct answers

Operation sheet-1

Operation Title: Techniques for Preparing Workplace/equipment for maintenance

Purpose: To Prepare Workplace/equipment for maintenance

Instruction: Using the figure below and given equipments to Workplace/equipment for maintenance. You have given 30Minut for the task and you are expected to Preparing Workplace/equipment

Tools and requirement

- ✓ Multimeter
- ✓ Utility knife/stripper
- ✓ Wrenches (assorted)
- ✓ Allen wrench/key
- ✓ Screws (assorted)
- ✓ Pliers (assorted)

Procedures:

1. Prepare necessary tools, test instruments and personal protective equipment in line with job requirements**.**
2. Acquire service manuals and service information required for repair /maintenance as manufacturer's specifications.
3. Conduct complete check-up of electronically-controlled domestic appliances**.**
4. Document the identified defects based on check-up conducted

Quality Criteria: use service manuals and service information for maintenance.

Precautions: use the given necessary tools, test instruments.

LAP Test -1

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 4 hours.

Task 1. Preparing Workplace/equipment for maintenance

Task 2 Verifying maintenance history with the company procedures

Task3 Acquiring Service manuals and service information

Task4 Setting Workplace for repair

Task 5 Preparing tools, test instruments and personal protective equipment

Unit two: Diagnose the unit's faults

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Electronic-controlled domestic appliances
- Procedure for pre-testing
- System defect/fault symptoms in domestic equipment
- Troubleshooting procedures implementation
- Circuit testing and isolation
- Recording the outcomes of diagnostic and testing procedures
- customer service advice/information

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify electronically-controlled domestic appliances
- Pre-testing procedure
- Identify System defect/fault of domestic equipment symptoms
- Implement troubleshooting procedures
- check and isolate Circuits
- Document results of diagnosis and testing procedures
- Advising/informing Customers service

2.1. Electronically-controlled domestic appliances

Electronic control is also referred as electronic regulation that is done to an appliance, situation or load by electronic devices. Domestic appliances are commonly controlled directly or manually using electrical switches and timers. Some of these electronic controlled domestic appliances are Toaster, flat iron, pressure cooker, Blender, coffee maker and waffle maker, Onion chopping, Coffee grinding

In electronic devices, transformer is commonly used not just to reduce the supply voltage (220VAC) but also to isolate the load from the power source.

A. Step-up Transformers

- A transformer in which the secondary voltage is greater than the primary voltage is called a step-up transformer
- The ratio of secondary voltage (Vsec) to primary voltage (Vpri) is equal to the ratio of the number of turns in the secondary winding (Nsec) to the number of turns in the primary winding (Npri) **Vsec/Vpri = Nsec/Npri**

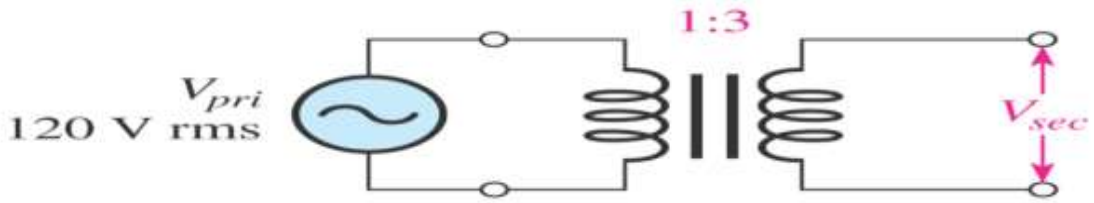


Figure 2.1 step up transformer

B. Step-Down Transformer

- A transformer in which the secondary voltage is less than the primary voltage is called a **step-down transformer**
- The amount by which the voltage is stepped down depends on the turns ratio• The turns ratio of a step-down transformer is always less than 1

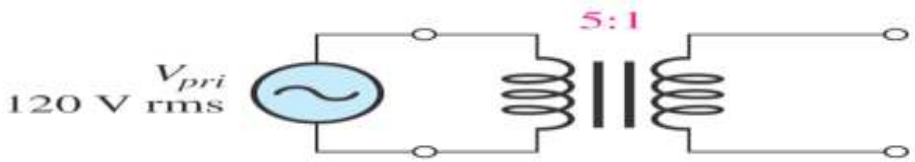


Figure 2.2 Step Down Transformer

The Transformer as an Isolation Device

• Transformers are useful in providing electrical isolation between the primary circuit and the secondary circuit because there is no electrical connection between the two windings.

- In a transformer, energy is transferred entirely by magnetic coupling DC Isolation.

• A transformer does not pass dc; therefore, a transformer can be used to keep the dc voltage on the output of an amplifier stage from affecting the bias of the next amplifier.

• The ac signal is coupled through the transformer between amplifier stages.

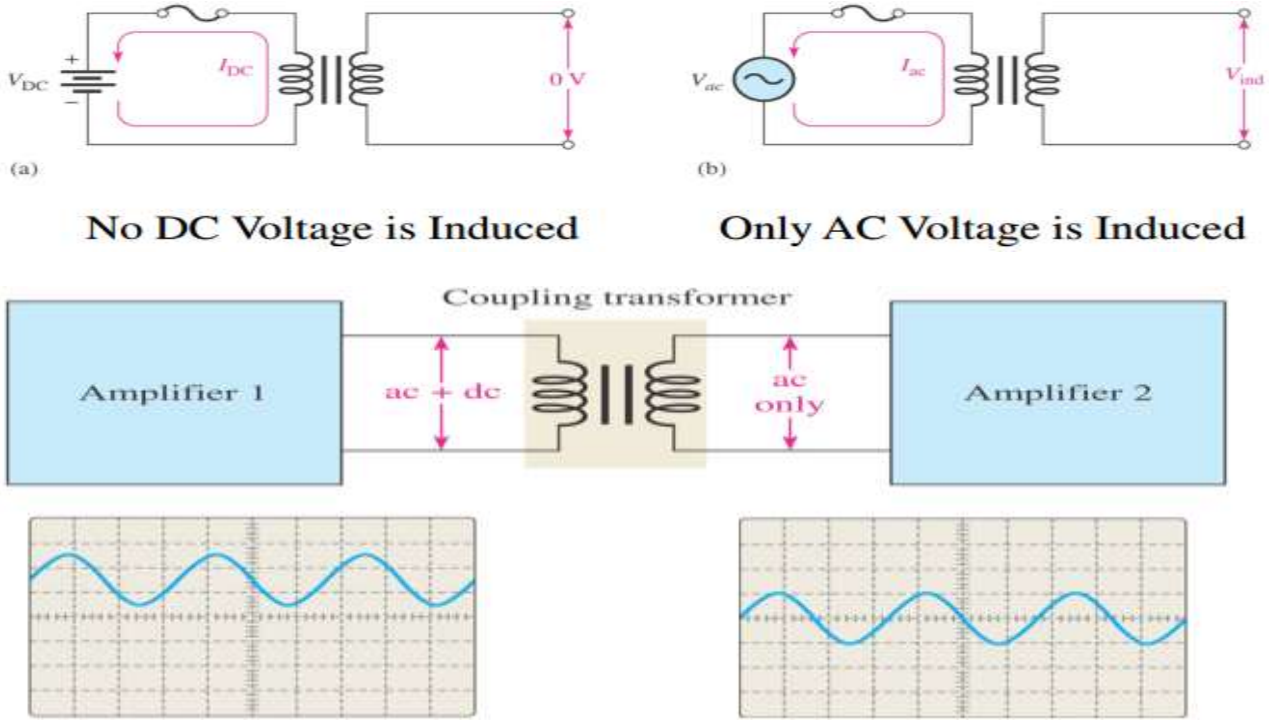


Figure 2.3 isolation transformer

Power Line Isolation

• Transformers are often used to electrically isolate electronic equipment from the ac power line

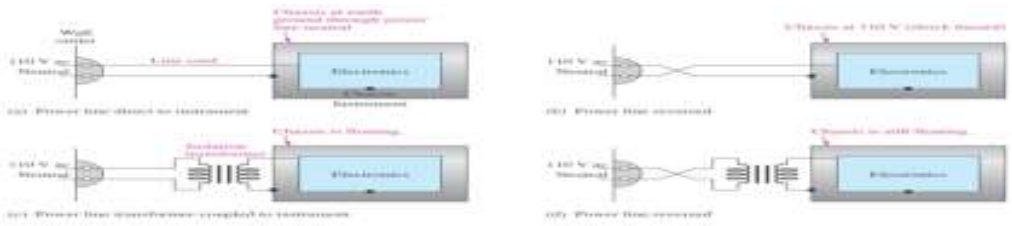


Figure 2.4 Testing of transformer

2.1.1. Driers, Blender, coffee maker and Toaster

Blender

Blender is one of the important home/domestic equipment widely used in homes and restaurants for food mixing. Commonly known as mixer.

Figure 2.5 Blender

1. Before you begin blending, please review all instructions of the electronic manual carefully. Familiarize yourself with all warnings, warranty issues, what could avoid the warranty, would could cause damage to the blender and/or injury to you or bystanders, and anything else in order to perform appropriate blender blade and container maintenance.

2. Keep the blender, blade, and/or container out of reach of children who might be too young to safely operate the blender.

3. No, the blade cannot be stopped by hand during operation. Most obstructions won't stop the blade from turning. Please do not ever put your hand and/or any part of your limbs into the container during blending operation.

4. To be safe, if you have to remove an object from the blade and/or container, remove the container from the blender base and only then stick your hand into the inside of the container to remove that object (and do that at your own risk – blades are sharp and could cut your fingers).

5. Use the appropriate capacity that it can hold which is leveled.

Figure 2.5 front and top description

On the top please note Blender details which are important to know and understand for your effective and safe blending operation. In order to blend safely and effectively without spilling or a mess associated to blending, always blend only with ingredients or content in the container and the appropriate lid and cap on top of the blender base and container.

OMNI V Blender Operating SPEED Control Keypad

The OMNI Keypad, as seen to the above, is equipped with 3 speeds: Low, Medium, and High Speed push touch-key buttons. The electronic and waterproof keypad also features 35, 60, and 90 second timer settings, and also a Pulse Button. Just push your selection until you feel a little resistance.

A. **In order to turn on the blender:**

1. First plug in the power cord into your 110 Volt outlet if you bought a 110 Volt Blender, or into a 220-volt outlet if you bought a 220-volt blender. The operating circuit amperage should be a minimum of 15 amps with the 110-volt power supply and 8 amps with the 220-volt power supply.
2. Switch the ON/OFF switch to the very left in Red to ON until you see the light on the ON/OFF Main Power Switch.
3. Then select your speed or timer setting, or pulse. If you selected the Pulse button, the blender will only operate for as long as you hold down the PULSE button. If you use any of the **TIMER or SPEED selections**, you need to push once and then let go. This will cause the Blender Blade to run according to the selection you have made. If you want to prematurely turn off your blending cycle, you can push any of the operating functions (buttons) including the Main Power Switch and the PULSE button once. If you push any of the functional operating switches twice while blending, you are turning off the cycle with the first time push and you will turn it back on in the new function when pushing it the second time .

   Before operating your blender, make sure that there is no water on the blender base, on top of the container cushion, or near the bottom of the blender base housing Power Plug/Cord Storage Area and Rubber Feet. Although the OMNI Blender is equipped with a seal/gasket on top under the housing where the drive socket is, it still could vacuum in / suck in water into the inside of the motor housing through any of its openings for venting. Water will obviously cause damage to the motor and/or any of the electronic switches.

If during the blending your container splashes (this can happen at times if you put too much watery liquid over 50 oz in the container - It won't happen with creamy smoothie or soup and sauce blending content)- make sure you have a towel close by to quickly wipe off and absorb any water around and/or on the blender. Never submerge the blender into water or partially cover it. Electrical shortening and shock (bodily harm) could be the result...

Also, make certain that the vent-in and vent-out areas (to keep the motor cool) on the blender are never covered or obstructed. They are on the bottom and on the sides. Besides that this would void the warranty, the blender could stop working, overheat, etc... (Actually the Safety Switch / Overload Switch on the back of the blender is also a switch that prevents the motor from overheating).

coffee maker

There are different types of coffee maker machine. One is gravity filter coffee maker

Gravity filter coffee maker

Figure 2.6 coffee maker machine

• This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the

hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be done by children unless they are older than 8 and supervised.

• Make sure your electricity supply matches the voltage shown on the appliance.
• Ensure all packaging materials and any promotional labels or stickers are removed from the appliance before the first use.
• Always inspect the appliance before use for noticeable signs of damage. Do not use if damaged or has been dropped.
• Do not use this appliance if the lead is damaged

• Always use the appliance on a dry, level, heat resistant surface.
• Unplug from the mains when not in use and before cleaning. Allow to cool before cleaning the appliance. To disconnect, turn the socket to “off “and remove the plug from the mains socket.
• Do not use any accessories or attachments with this appliance other than those recommended by Lakeland.
• To protect against fre, electric shock or personal injury, do not immerse cord, plug or unit in water or other liquids. Do not use near the sink.
• Do not leave the lead hanging over the edge of a kitchen table or worktop. Avoid contact between the lead and hot surfaces.
• For indoor use only.
• For domestic use only.
• This appliance should be used for preparation of drinks as described within the instructions for use that accompany it.

• Always ensure that your hands are dry before removing the plug from the mains socket. Never pull the plug out of the mains socket by its lead.
• To avoid injury or possible fre, do not cover the appliance when in use.
• Do not connect this appliance to an external timer or remote control system.
• An extension cable may be used with care. The electrical rating of the cable should be least as great as the appliance. Do not allow the cable to hang over the edge of the worktop or touch any hot surfaces.
• This appliance complies with the basic requirements of Directives 04/108/EC (Electromagnetic

Compatibility) and 06/95/EC (Safety of Domestic Electrical Appliances).

• **WARNING:** A cut off plug inserted into a 13amp socket is a serious safety (shock) hazard. Ensure the cut off plug is disposed of safely.

• **CAUTION:** The plastic bags used to wrap this appliance or the packaging may be dangerous. To avoid risk of suffocation, keep these bags out of reach of babies and children. These bags are not toys.

• Do not place the appliance on or near a gas or electric oven, or any hot surfaces.

• Do not move the appliance while it is switched on.

• Only use the carafe with this appliance, it must never be used on a hob or in a microwave. Do not put the hot carafe down onto a wet or cold surface. Do not use the carafe if it is damaged. Ensure the carafe is securely on the base before switching on the appliance.

• Ensure the carafe lid is securely in place when using the Gravity Filter Coffee Maker and when pouring coffee. Do not use force when putting the lid on the carafe.

• The water tank must be flled with water to at least the '**¼ litre/2 cup MIN**' mark, before it is switched on. Do not fll beyond the '**1¼ litre/10 cup MAX**' mark, or the appliance may spit boiling water.

A. INSTRUCTIONS FOR USE

• Fill the carafe with clean cold water, to the amount you require using the cup measurements on the side.

• Always fll beyond the '**¼ litre/2 cup MIN**' mark, but do not exceed the '**1¼ litre/10 cup MAX**' mark on the carafe and the water tank, or the appliance may spit boiling water.

• Lift the water tank lid and pour in the water from the carafe.

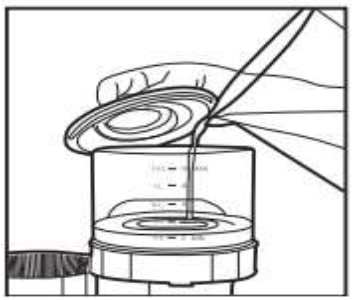


figure 2.7 carafe with cold water

• Put the water tank lid back onto the water tank with the ‘front’ mark facing you and the vents towards the back of the machine. Ensure the water tank lid is fully closed.

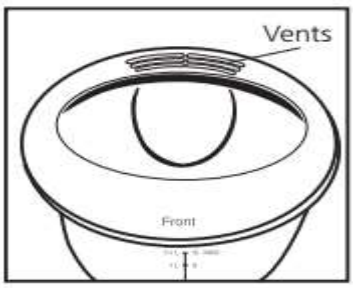


Figure 2.8 openings water tank

• Slide the brewer handle to the left in the direction of the arrow to open the brewer, and remove the filter basket and permanent filter.

• Add your coffee to the permanent filter, or alternatively use a paper filter. For each cup of coffee (125ml), add 7.5 grams of ground coffee into the filter, or one level measuring spoon. Do not fall beyond the **‘MAX’** mark inside the permanent filter.

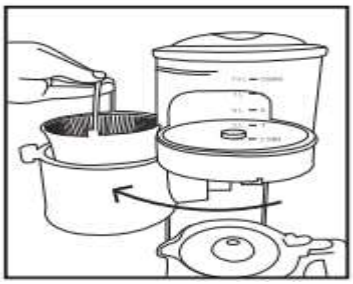


Figure2.9 powdered coffees into filter

• Place the filter into the filter basket.

• Place the filter basket back inside the filter holder, it will only ft one way, with the handle folded forwards so it lies flat.

• Close the brewer by sliding it to the right until the handle clicks into place at the front of the coffee maker.

• Plug in the coffee maker and switch it on at the socket.

Figure 2.10 Plug in the coffee

• Slot the empty carafe onto the hot plate.

• The pourer is on a spring, which will move upwards when the jug is put onto the hot plate. The hole in the carafe lid will line up with the pourer when the carafe is in position on the hot plate, so the coffee can filter straight into the carafe. Ensure the carafe is securely on the base.

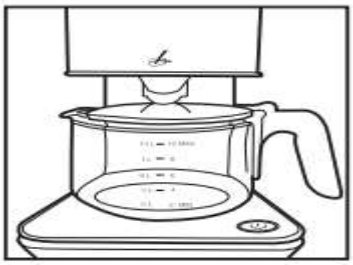


Figure 2.11 coffee brewing

• Press the **on/off** button, it will illuminate and the water in the tank will start to heat up.

• Once boiled, the water will automatically start to filter through the brewer into the carafe.

• Do not remove the carafe from the hot plate during brewing.

• The hot plate will keep your coffee warm for around 40 minutes after brewing has started, then automatically switch off.

• Press the **ON/OFF** button to turn the coffee maker off to stop the coffee brewing mid cycle; when the carafe has been emptied; or when you no longer want to keep the coffee warm. Always remove the used coffee filter from the appliance immediately
after brewing.

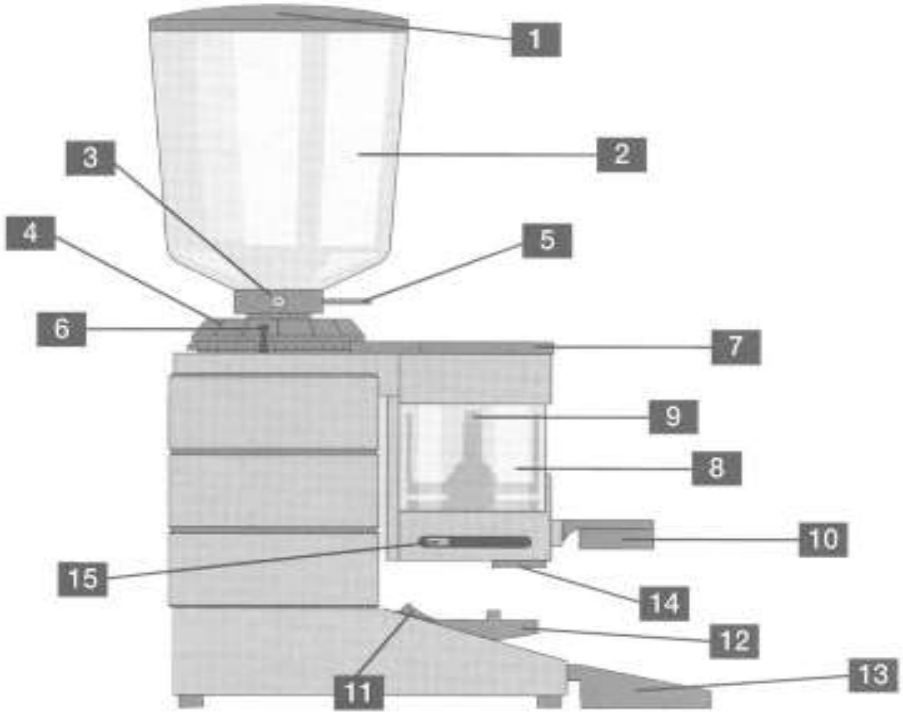
• During brewing, condensation will form underneath the water tank lid. When brewing has finished, take off the lid to help the condensation evaporate and stop it running back into the water tank. Take care, steam/water could be hot when you take of the lid.

2.1.2. Onion chopping and Coffee grinding

➢ Coffee grinding

The coffee grinder is designed to be used only for grinding roasted coffee beans and dis-pensing the ground coffee obtained from the grinding process. For safety reasons, it should never be used for any other purposes.

- Improper use of the machine for operations other than the above can constitute a safety risk to persons and to the equipment.
- Never work the machine with wet hands or naked feet.
- Avoid wetting the outer surface of the grinder. If it does get wet during operation, or even when not operating, unplug it immediately and dry it thoroughly.
- It is very important for your safety to make sure before turning the coffee grinder on that the hopper (2) is well-attached to the adjustment platen (4) by means of the lock screws (3). If not, when the coffee grinder is turned on, the grinding teeth starts to spin and can be easily touched with the fingers.
- Never run the coffee grinder without the hopper (2) correctly in place and attached by the locks crews (3).
- Do not run the grinder continuously for more than 30 minutes at a time
- When filling the hopper (2), make sure no objects (nectie, scarf, hair jeweler etc.) accidentally fall into the hopper or the adjustment platen.
- A thermal protector prevents overheating of the electric motor coils, cutting off power when the temperature rises above the the maximum admissible level due to a malfunction like continued blockage of the rotor



1. Coffee bean hopper lid
2. Coffee bean hopper
3. Hopper-grinder adjustment platen lockscrews
4. Grinder adjustment platen
5. Trap for feeding beans to grinder
6. Grinder adjustment trigger
7. Ground coffee feeder lid
8- Ground coffee feeder
9. Ground coffee adjustmnet screw
10. Ground coffee press
11. On/Off switch
12. Coffee machine filter holder support
13. Coffee collection tray
14. Ground coffee feeder outlet
15. Feeder handle

Figure 2.12 Coffee grinding

Grinding coffee beans

Turn on the grinder using the grinder On/Off switch (11). The beans will pass through the grinder and the ground coffee will fill the ground coffee feeder (8).

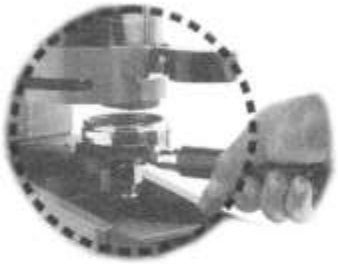
When the ground coffee feeder (8) is full, stop the grinder using the On/Off switch (11).

Only for models with automatic stop feature:

After starting the coffee grinder using the On/Off switch (11), the machine stops automatically when the ground coffee feeder (8) is full. When the level of ground coffee in the feeder (8) drops to a certain level, the coffee grinder starts up automatically, refills the feeder (8) and shuts down automatically once the feeder is full.

Obtaining a measure of ground coffee

Place the coffee machine filter holder on the filter holder support (12), located right below the feeders ground coffee outlet (14).



Pull the feeder handle (15) towards you to obtain a single measure. Release the handle for it to return to its position.

Place the coffee machine filter holder under the ground coffee press (10) and press upwards to pack the ground coffee.

If you want to keep the ground coffee feeder (8) full at all times (although this is not necessary), turn on the grinder every time you remove a measure and turn it off when the feeder (8) is full (remember that this operation is automatic in models with automatic stop feature).

Adjusting coffee grinding level

You can adjust the degree of grinding (more finely/coarsely ground) by adjusting the grinder by means of the grinder adjustment platen (4) as follows:

To obtain more finely ground coffee

- Turn of the coffee grinder using the On/Off switch (11).
- Keep the adjustment trigger (6) pressed to free the adjustment platen (4) and turn the platen TO THE RIGHT as indicated by the "F" arrow on the platen (4)
- Release the adjustment trigger (6) and make sure the adjustment platen (4) cannot turn.

To obtain more coarsely ground coffee

- Turn of the coffee grinder using the On/Off switch (11).
- Keep the adjustment trigger (6) pressed to free the adjustment platen (4) and turn the platen TO THE LEFT as indicated by the "G" arrow on the platen
- Release the adjustment trigger (6) and make sure the adjustment platen (4) cannot turn.

If the adjustmet platen (4) is completely removed from its emplacement, the grinder teeth are fully exposed, with the consequent hazard if the grinder is turned on. Never operate the coffee grinder without all its moving parts correctly in place.

Adjusting ground coffee amount dispensed by the coffee grinder

You can adjust the ground coffee feeder to obtain a small measure (minimum 5 g.) up to a large measure (maximum 12 g.) as follows:

To obtain a smaller measure

- Turn of the coffee grinder using the On/Off switch (11).
- Remove the ground coffee feeder lid (7).
- Turn the ground coffee screw to the right
- Replace the ground coffee feeder lid (7).

To obtain a larger measure

- Turn of the coffee grinder using the On/Off switch (11).
- Remove the ground coffee feeder lid (7).
- Turn the ground coffee screw to the left
- Replace the ground coffee feeder lid (7).

Problem	Cause	Solution
Coffee grinder doesn't start	No electric supply	Check the electricity supply. Check the position of the ON/OFF switch (1).
Coffee grinders grinding teeth don't turn	The problem is usually due to the presence of foreign objects in the coffee beans to be ground	Turn off the coffee grinder immideately and unplug the machine from the mains outlet.
		If you notice that the coffee grinder has overheated due to blockage of the grinding teeth, wait untill cooled off completely
		Follow the grinder cleaning instructions to remove the foreign object.

Table 2.2 Troubleshooting Coffee grinding

- **A clothes iron**

A clothes iron, also called a flatiron or simply an iron is a small appliance: a handheld piece of equipment with a flat, roughly triangular surface that, when heated, is used to press clothes to remove creases/irregular shapes. It is named for the metal of which the device is commonly made, and the use of it is generally called ironing. Ironing works by loosening the ties between the long chains of molecules that exist in polymer fiber materials. With the heat and the weight of the ironing plate, the fibers are stretched and the fabric maintains its new shape when cool. Some materials, such as cotton, require the use of water to loosen the intermolecular bonds. Many materials developed in the twentieth century are advertised as needing little or no ironing.

- Flat iron/clothe iron-is the name of a small home electrical appliance.
- Ironing is the process of using the device /straighten the cloth.

Parts and Features

1. Automatic Shutoff Reset Button/Light*
2. Spray and Blast Buttons
3. Adjustable Steam Knob Dial
4. Water Fill Cover
5. Spray Nozzle
6. Water Window
7. Temperature Control
8. Soleplate
9. Heel Res
10. Power Light
11. Cord

Main parts and their use

- **Sole Plate**: The sole plate, or base, of the iron is flat and roughly triangular in shape. The modern metal of choice for sole plates is aluminum coated with a non-stick material. The sole plate, which is heated and applied to wrinkle clothing, allows a user to concentrate on small areas that need extra attention.
- **Thermostat:** Modern flat irons have thermostats built into them to let a user control the sole plate temperature. More delicate/filmy or smooth fabrics require little heat while heavy duty fabrics require much more heat. The thermostat is essentially a spring with power contacts on the end mounted on a metal post. Electricity passes through the contacts to heat the sole plate.

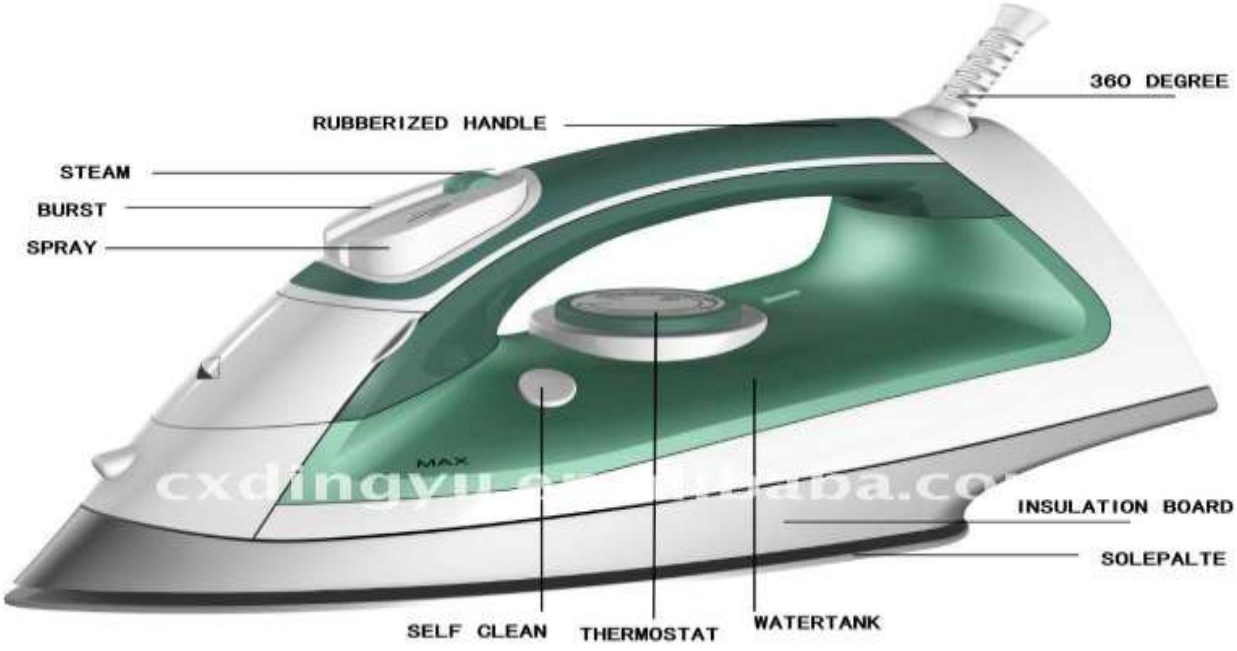


Figure 2.13 Flat iron/clothe iron

There are different models of steam irons

- **Water Reservoir:** The water to create the steam is stored in the reservoir. When a user presses a button on the iron to release steam, the water is superheated and released as steam.

- **Handle:** Manufacturers generally make modern steam iron handles from injection-molded plastic that won't melt. The handle, which allows a user to handle the iron without being burned, also holds the controls for the thermostat and steam release.
- **Power:** Most irons have a power cord to access electricity needed to heat the water to steam and to heat the sole plate to the desired temperature.

Modern irons for home use can have the following features:

- A design that allows the iron to be set down, usually standing on its end, without the hot soleplate touching anything that could be damaged;
- A thermostat ensuring maintenance of a constant temperature;
- A temperature control dial allowing the user to select the operating temperatures (usually marked with types of cloth rather than temperatures: "silk", "wool", "cotton", "linen etc.);
- An electrical cord with heat-resistant silicone rubber insulation;
- Injection of steam through the fabric during the ironing process;
    - ✓ A water reservoir inside the iron used for steam generation;
    - ✓ An indicator showing the amount of water left in the reservoir,
    - ✓ Constant steam: constantly sends steam through the hot part of the iron into the clothes;
    - ✓ Steam burst: sends a burst of steam through the clothes when the user presses a button;
    - ✓ (advanced feature) Dial controlling the amount of steam to emit as a constant stream;
    - ✓ (advanced feature) Anti-drip system;
- **Cord control:** the point at which the cord attaches to the iron has a spring to hold the cord out of the way while ironing and likewise when setting down the iron (prevents fires, is more convenient, etc.);
- A retractable cord for easy storage;
- (advanced feature) non-stick coating along the sole plate to help the iron glide across the fabric

- (advanced feature) Anti-burn control: if the iron is left flat (possibly touching clothes) for too long, the iron shuts off to prevent scorching and fires;
- (advanced feature) Energy saving control: if the iron is left undisturbed for several (10 or 15) minutes, the iron shuts off to save energy and prevent fires.
- Cordless irons: the iron is placed on a stand for a short period to warm up, using thermal mass to stay hot for a short period. These are useful for light loads only. Battery power is not viable for irons as they require more power than practical batteries can provide.
- (advanced feature) 3-way automatic shut-off(advanced feature) self-cleaning

problems	Things to Check
Iron won't heat	✓ Is the iron plugged in and the outlet working? Check the outlet by plugging in a lamp. ✓ Is Temperature Control Dial turned to a fabric setting? ✓ If auto shutoff model, is the Reset Button/Light Illuminated? If not, push to reset
Water is leaking out of the iron	✓ Do not overfill the water tank. ✓ If steam ironing, is Adjustable Steam Knob in a steam ✓ position that matches Temperature Control Dial steam Range? Did the iron have enough time to preheat? ✓ If dry ironing, make sure the Adjustable Steam Knob is in the dry iron position
Iron won't steam	✓ Check the water level. ✓ Is the Adjustable Steam Knob in the STEAM position? ✓ Has the iron had enough time to preheat?
Iron leaves spots on clothing.	✓ ALWAYS empty the water tank of the iron after Using. Water left in the tank may discolor clothing and soleplate
Wrinkles not removed	• Check Temperature Control Dial is set to Correct fabric.
Iron too hot	• Check Temperature Control Dial and set to lower Setting. Let iron cool down 5 minutes before Continuing.

Common problems and trouble shooting

Table 2.3 trouble shooting of Flat iron/clothe iron

2.2. Pre-testing procedure

Pre testing is the process of testing before the post testing is done to identify the defect /faulty parts of the electronically controlled domestic equipment.

Why Test?

There are four main reason why you should safety test your products prior to shipment

1. Safety	Ensure that the product is not going to pose a hazard to the end user.
2. Quality	Detect workmanship defects and prevent faulty components from being installed.
3. Cost Control	Identify production problems before a product is shipped, preventing costly recalls.
4. Liability	Prevent product liability suits because the responsibility of performing electrical safety tests ultimately rests on the manufacturer

Table 2.4 safety test

General pre testing procedures.

1. Visual inspection of the unit with power off
2. Interview of customer re history of unit
3. Be sure you understand how the domestic appliance (washing machine, micro-oven, refrigerator etc.) Operates. If possible, read the operation's manual first for its function and additional features.
4. Operate the appliance according to manual to confirm defects
5. Determine what the problem really is.
6. Perform preliminary inspection to locate where the problem has originated.
7. Perform closer inspection into the suspected parts or components.
8. Use appropriate instrument in initial testing of the appliance.
9. Plan your approach to repair the problem.

2.3. System Defect/Fault Symptoms

A fault is defined as a disturbance in an electrical system of such magnitude as to cause a malfunction of that system. It must be remembered, of course, that such disturbance may be the secondary effects of mechanical damage or equipment failure. Actual electrical faults, or should one say faults that are caused by 'electricity', are rare and are confined in the main too bad design and/or installation or deterioration and ageing.

Troubleshoot and Fault localizing

Trouble shooting means finding the problem that is occur in the equipment. Before you begin to troubleshoot any piece of equipment, you must be familiar with safety rules and procedures for working on electrical equipment. These rules and procedures govern the methods you can use to troubleshoot electrical equipment (testing procedures.) and must be followed while troubleshooting.

Next, you need to gather information regarding the equipment and the problem. Be sure you understand how the equipment is designed to operate. It is much easier to analyze faulty operation when you know how it should operate. Operation or equipment manuals and drawings are great sources of information and are helpful to have available. If there are equipment history records, you should review them to see if there are any recurring problems. During trouble shooting schematic diagram is important to see components of the equipment and to find the fault easily and to reduce the time required to find the fault in different components of the equipment.

Functional block diagram is simple than schematic diagram but for maintenance it is better to use schematic diagram. That is, functional block diagram is simply used to explain how the equipment operates or the operation of the circuit. So to locate different parts of the equipment schematic diagram is preferable.

When trouble shooting is carry out we should have service data that gives the value of each component, the block diagram and the output of each block. Therefore, it is important to detect the fault easily.

Service data includes theory of operation, schematic diagram, functional block diagram, spire part lists, troubleshooting procedures and alignment procedures.

The following are some common problems that can occur when using the Lakeland Gravity Filter Coffee Maker. Please review the problems, their possible cause and any corrective action that should be taken.

A. Care and cleaning

• Switch off and unplug the coffee maker from the socket before cleaning and when not in use. Always allow the coffee maker to cool down completely before cleaning.

• Before the first use and after every use, clean each part thoroughly.

• Check all parts before reassembly.

• Never immerse the coffee maker in water or any other liquid.

• To clean the outer parts of the coffee maker, wipe with a clean damp cloth and dry before storing. Do not immerse in water.

• Wash the carafe, filter basket, permanent filter, water tank lid and measuring spoon in hot soapy water, rinse and dry thoroughly. These parts are also dishwasher safe.

• Always remove the used coffee filter from the appliance straight away after brewing.

• Store the coffee maker with the power cable loosely coiled. Never wrap it tightly around the base unit. Use the cord storage to tidy excess cord.

• Do not use steel wool, or abrasive cleaners or materials.

• If the coffee maker is not going to be used for a period of time, empty the water tank completely, by turning it upside down.

A. Visual inspection: - is important to localize the faulty component during trouble shooting. Fault localizing means determining the functional unit or the electronic equipment responsible for the indicated fault. In the initial inspection of any equipment, first open the equipment to look at it. There are several things that can observe by using our sense of organs. Such as broken parts, burned resistors, open wires and poor

connections, there can be smoke or smell, damaged or worn out parts. Many troubles can be located with initial inspection using our senses. The final solution involves application of our knowledge of electronic circuit operation and understanding of proper usage of the test equipment. In this step by using test instruments we can check the continuity (open circuit), short circuit, ground etc and also input output tests on the proper units is performed in order to locate the one that was actually at fault.

Testing is an experiment in which the system is exercised and its resulting response is analyzed to check its behavior. If incorrect behavior is detected, the system is diagnosed and locates the cause of the misbehavior. Diagnosis requires the knowledge of the internal structure of the system under test.

The task of detecting and diagnosing fault on appliances lies on technicians. Successful fault finding calls for an additional skill set, including the ability to:

- devise a plan;
- think logically;
- select and use a range of test equipment;
- make a detailed record of the process.

B. Steps to Fault Finding

Step 1 - Prepare

- Are there any safety issues?
- What test equipment do you intend to use?
- Document your findings!

Step 2 - Observe

- Are there signs of damage - overheated components, melted insulation, frayed wire, bad solder joints?
- Can you smell burning or overheating?
- Take voltage measurements from a working circuit.
- Take voltage measurements from the faulty circuit to compare.
- Document your findings!

Step 3 - Identify the problem subsystem

- Which subsystems are operating correctly?
- Where does the problem seem to lie?
- Document your findings!

Step 4 - Suggest possible causes

- Check likely components:
- Switches, fuses and bulbs tend to wear out or burn out.
- Check possible components:
- Motors, relays, inductors - components with coils - may overheat.
- Check connections:
- Look for faulty connections or loose contacts which may offer high resistance.
- Look for stray connections that can short-circuit.
- Look for breaks that create open-circuit conditions.
- Document your findings!

Step 5 - Test and repair

- Be safe! Remember -
- capacitors can store electrical charge and give electric shocks;
- Inductors can store energy in a magnetic field and give electric shocks.
- Take measurements around the circuit, but mentally predict what they should be.
- In this way, home in on the problem component(s), and replace it(them), observing all safety procedures.
- Next, re-test the system to ensure that no other faults exist.
- Document your findings!

2.3.1. Common faults and their symptoms:

Short circuit:

- zero volts between positive and 0V power rails everywhere;
- power supply output voltage restored when the circuit is removed from the supply;
- excessive current drawn from power supply;
- the fuse protecting the circuit may ‘blow’;
- zero ohms between power rails, (with circuit removed from power supply.)

open circuit:

- zero volts between positive and 0V power rails at one end of the circuit, but not the other;
- part of the circuit may function while another part does not;
- reduced or zero current drawn from power supply.
- reverse connection:
- can occur in ‘polarised’ components - ones which only work when connected the ‘right’ way round, e.g. diodes, LEDs, transistors and some capacitors;
- can be the result of the power supply or battery being connected to the circuit the ‘wrong’ way round;
- produces an unusual voltage drop across the component.
- incorrect value or faulty component:
- an incorrect value can be identified by examining the component against that specified in the circuit diagram;
- a faulty component may show signs of overheating or mechanical damage;
- both produce an unusual voltage drop across the component.
- incorrect component:
- can be identified by examining the component against that specified in the circuit diagram;
- produces an unusual voltage drop across the component.

2.3.2. Importance of Testing

In Today ‘s Electronics world, more time is required for testing rather than design and fabrication. When the circuit/device is developed, it is necessary to determine the functional and timing specifications of the circuit/device. When the multiple copies of a circuit are

manufactured, it is essential to test each copy to verify whether the manufacturing process has introduced any flaws. In order to meet the requirements of the consumer, it is essential to test the circuit effectively, before it is released into the market.

Good Testing leads to:

- Better quality products
- Good brand value for company
- Total Customer satisfaction improves yield in manufacturing

A. Testing Principle

During testing, a set oftest stimulus are applied to the inputs of the Circuit/Device under test (CUT/DUT) and the output responses are analyzed. Circuits that produce the correct output responses for all input stimuli are considered as fault-free and the circuits that fail to produce a correct response are assumed to be faulty.

2.3.3. Types of Testing

Manual testing and Automated Testing*:*

Devices can be tested in two ways, manually and automatically. Testing Devices with human intervention is referred as Manual test. Testing devices with the help of programs or tools with minimal human intervention is referred as Automation test. Before Automation testing of any device, one must know how to test the particular device manually.

To identify system defects and fault symptoms follow the following basic steps

Observe systematic pre-testing procedures in accordance with manufacturer's instructions
Check and isolate circuits using specified testing procedures
Document results of diagnosis and testing accurately and completely within the specified timeframe Explain identified defects and faults based on the result of diagnosis and testing Provide data/information regarding the status and serviceability of the unit as per procedure

Electronically controlled domestic equipment defect/fault identification Checklist (e.g. Refrigerator, washing machine, flat iron …….)

Part of equipment	**condition**	
	good	**defective**
Power cord		
Power switch		
.		
.		
.		
.		

- customer's Signature_____ Date Repaired: _____
  technician's Signature_____ Date Checked: _____

2.4. Troubleshooting procedures

Troubleshooting is a form of problem solving, often applied to repair failed products or processes. It is a logical, systematic search for the source of a problem so that it can be solved, and so the product or process can be made operational again. Troubleshooting is needed to develop and maintain complex systems where the symptoms of a problem can have many possible causes.

- Troubleshooting is used in many fields such as engineering, system administration, electronics, automotive repair, and diagnostic medicine. Troubleshooting requires identification of the malfunction(s) or symptoms within a system. Then, experience is commonly used to generate possible causes of the symptoms. Determining which cause is most likely is often a process of elimination - eliminating potential causes of a problem.

Finally, troubleshooting requires confirmation that the solution restores the product or process to its working state

Basic steps of Troubleshooting

Step1 analysis

Step2 problem identification/replication

Step3 action plan

Step4 implementation

Step5 testing

Step 6 documentation

Step7 follow up

Figure 2.14

Figure 2.15 steps of Troubleshooting

2.5. checking and isolating Circuits

how to test them. Once you've gotten over this hurdle, you have to write test procedures specifying exactly how the board will be tested. Remember, you want *to* test all the circuits; otherwise, you can't be sure the board will work properly under all normal operation conditions.
Once you've written the test procedures, you have to assemble all the necessary test equipment: oscilloscopes, voltage sources, current sources, meters. and so on.

2.5.1. Manual testing

Now, connect all this equipment to the appropriate points on the pc board. Some of those points may be hard to reach. If **you** have many boards to test, vou may want to build a fixture to simplify connecting the test leads.
Finally, turn on the equipment, apply known inputs to the circuit, **check** the outputs and determine if the circuit is operating **properly.** And, oh yes, if the circuit is not operating properly, find the defective part and replace it.

The term **automatic test equipment (ATE) applies to** many forms of programmable, computer-controlled *test* **instruments** and **systems.** This **equipment is** used in **many stages** of the manufacturing process, including:

- Component manufacturing
- Quality assurance
- Income inspection
- PC board testing
- System testing
- Field service

2.5.2. What Es an in-circuit sestet?

It's a tester that tests each component on a pc board, one at a time. And it does this while the component is "in-circuit," that is, while it's connected to other components on the board. A divide-and-conquer approach is taken. First, the tester checks the loaded pc board for unwanted shorts and opens. Then, it isolates and tests each separate component on the board, one at a time.

The tester performs all the manual procedures that were described:

- Writes test procedures
- Connects the test equipment to the board
- Turns the equipment on and sets it up
- Applies known input signals and checks outputs
- Determines if the circuit is OK
- Locates defective components when the circuit is not OK and last, but not least,
- Repeats this for all the circuitry on *the* board

In-circuit testing's

Test the individual components on fully assembled pc board: It must **have** access to all the circuit nodes on the board. Obviously, to test each component individually, the raster must be able to connect test instruments to each pin of **each** component. Also, it must be able to **isolate** each component-under-tc5t from surrounding components. Since components. Inter connected on the board, some special isolation techniques are needed to prevent the component-under-test from being affected by other components.

Analog testing

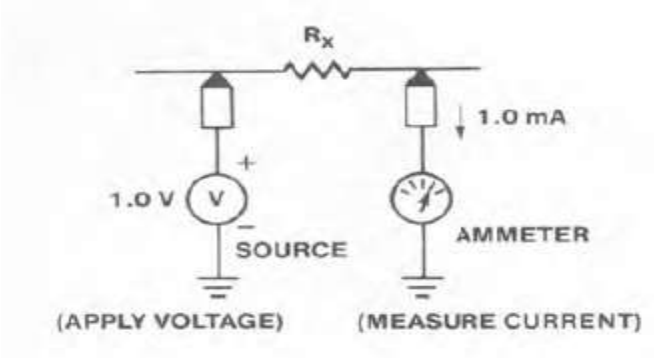
To perform analog testing. the tester uses the following instruments:

- DC Current Source
- DC Voltage Source
- DC Voltmeter
- DC Ammeter (Current filter)
- AC Impedance measurement **module**

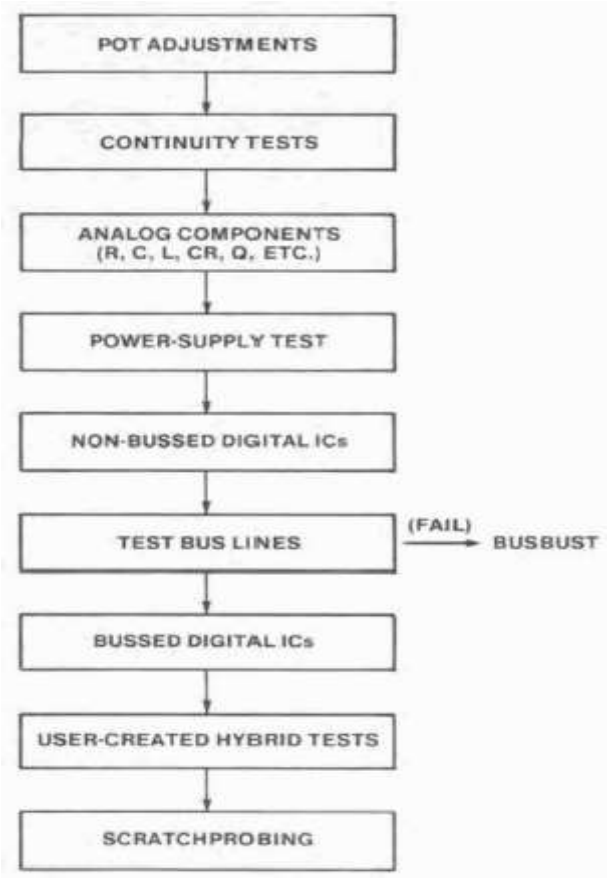
Now, the question is, how can the taster connect any one of these instruments to any one of hundreds of' circuit node. on *the* hoard. Isolating and testing analog components Suppose you wanted to test an analog component, such as a Resistor. that is not connected in a circuit. You could apply a known voltage across that resistor, measure the
Resulting current, and calculate resistance by using Ohm's **Law:**

R=V/I.

For example, if the applied voltage were 1.0 V and the measured current were 1.0 mA, the calculated resistor value would be



Test program



Example of electronic circuit testing

Method of identifying non-functional tools and equipment

1. **Visual inspection.** It refers to the visual observation of an expert on the appearance of the tools and equipment.

2. **Functionality.** Vibration or extra noise from the operation means problems on parts and accessories started to develop.

3. **Performance.** When there is something wrong with the performance of either hand tools or equipment they need an immediate repair or maintenance.

4. **Power supply (for electrically operated only).** Failure to meet the required power supply, malfunction will occurs in the part of hand tools or equipment.

5. **Person's involved.** It refers to the technical person who has the knowledge and skills about the technology.

2.6. Documenting Results of diagnosis and testing

Documentation

The organizational Unit is to keep testing and inspection records which are to be stored on a shared system drive.

Record to be kept by:	Organisational Unit, Academic Unit
Records	Records of inspection and testing of electrical equipment, including: • register of all electrical equipment • record of formal inspection and tests • repair register and • record of all faulty equipment showing details of services or corrective actions.
To be kept for:	Records should be kept in alignment with the Records Management Policy and Guidelines

Table 1 diagnosis and testing

- Complete, accurate, and current documentation is essential to an effective maintenance program. Whether performing preventive, predictive, or reliability centered maintenance, keeping track of equipment condition and maintenance—performed and planned—is critical.

- Maintenance recommendations contained in this volume should be used as the basis for establishing or refining a maintenance schedule. Recommendations can be converted into Job Plans or Work Orders in MAXIMO or another maintenance management system. Once these job plans and work orders are established, implementation of well-executed maintenance is possible.
- The maintenance recordkeeping system must be kept current so that a complete maintenance history of each piece of equipment is available at all times. This is important for planning and conducting an ongoing maintenance program and provides documentation needed for the Power O&M Reviews.
- Regular maintenance and emergency maintenance must be well documented as should special work done during overhauls and replacement. The availability of up-to-date drawings to management and maintenance staff is extremely important. Accurate drawings are very important to ongoing maintenance, testing, and new construction; but they are essential during emergencies for troubleshooting. In addition, accurate drawings are important to the continued safety of the staff working on the equipment.

2.7. Customers service

After all the information has been gathered, the service advisor returns with the customer to the advisor's desk in the service department. At this point, the advisor takes all of the information gathered to generate a repair order, which is the beginning of the record stored in the computer system. The repair order is the document used to authorize the work being requested by the customer and any additional recommendations they have approved. After this has been generated, the next step is to give an accurate cost estimate to the customer and let them review the repair order.

After the initial part of the service agreement has been completed, the service advisor is then responsible for ensuring that the customer is aware of a timeline for the repair and forgathering appropriate contact information. Once the repair has been authorized the communication and relationship building continues throughout the service process between the advisor and the customer. For example, if the advisor were to tell the customer that the repair will be done right away, but the car is in the shop for the entire day, the advisor would not be providing an accurate representation of the repair. Each instance is different: Some customers

may be in for only a routine oil change and may opt to wait for the vehicle to be repaired. That is why it is crucial to provide accurate repair estimates with timelines, So that there are no questions or flags raised that could affect how the customer trusts the Dealership.

Reporting a Diagnosis

Customers bring their machines into the service department for a variety of reasons: one of the main reasons customers return to the dealership is that they want factory-certified technicians to diagnose their machines issues. Customers expect the dealership of their equipment to be the expert, and they understand that such expertise might come with a premium cost. Dealerships have this level of legitimacy typically as an assumption, something that local shops have to build up over time with their customer base. The service advisor is the main point of contact for the repair estimate. After the technician performs the multipoint inspection and diagnoses the vehicle, it is their job to gather the quote for necessary parts and hours to complete the job. They pass this information onto the advisor to call the customer and report their findings. This quote may also include other recommendations found by the technician during their diagnostic.

- Advising is used when an employee's problems impact performance and is intended to mitigate any further action, including formal disciplinary action. The employee should solve the problem and your role is to be positive, supportive, and encouraging in that process. (Refer to the Toolkit documents, "Counseling Your Employees, The 2-Minute Challenge" and "Counseling Your Employees, The Role of a Good Supervisor".)

  Advising customers depend on: -

  How to safe from accidents

  How to use equipment

  How to safe the equipment rom adults

  When/how to clean the equipment

Self-check-2

Test-I: Choose

Instruction: For the Following Questions You Are Given Four Alternatives Then Choose the Correct Answer and circle

1, To be trouble shooter one must be a knowledge of A, tools needed B, basic electronic/electrical component C, basic electronic/electrical ckt analysis D, all of the above

2, Advising customers depend on (3 pt)

A, how to safe from accidents B, how to use equipment's C, how to safe the equipment's roomfuls D, When/how to clean the equipment's E. all

3. Make an initial inspection/ testing of the appliance. (3 pt each)

A. Physical appearance

B, Operating controls

C. Power cord . D. all

Test-II: Say true or false.

1, Troubleshooting is used in many fields such as engineering, system administration, electronics, automotive repair, and diagnostic medicine.

2, write basic steps of Troubleshooting.

3, Hot Test is the test performing with power source.

4, which one is the method to identifying non-functional tools and equipment.

Test III: short Answer writing

1. write Types of tasting?
2. Write down Basic steps of Troubleshooting?
3. Write down analog testing instruments?

Operation sheet-2

Operation Title: Reassemble units Techniques

Purpose: To Reassemble Units Techniques

Instruction: Using the figure below and given equipments to Reassemble Units Techniques. You have given 30Minut for the task and you are expected to write the answer on the given line.

Tools and requirement

- ✓ Multimeter
- ✓ Utility knife/stripper
- ✓ Wrenches (assorted)
- ✓ Allen wrench/key
- ✓ Screws (assorted)
- ✓ Pliers (assorted)

Procedures:

1. Visual inspection of the unit with power off
2. Interview of customer re history of unit
3. Be sure you understand how the domestic appliance (washing machine, micro-oven, refrigerator etc.) Operates. If possible, read the operation's manual first for its function and additional features.
4. Operate the appliance according to manual to confirm defects
5. Determine what the problem really is.
6. Perform preliminary inspection to locate where the problem has originated.
7. Perform closer inspection into the suspected parts or components.
8. Use appropriate instrument in initial testing of the appliance.
9. Plan your approach to repair the problem.

- **Quality Criteria:** the given Single phase power supply is troubleshooting properly.
- **Precautions:** use the given multimter without damage.

LAP Test-2	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks within 4 hours.

Task 1. Check electronically-controlled domestic appliances

Task 2. Pre-test procedure

Task 3. Identify System defect/fault symptoms

Task 4. Use testing instruments in accordance with user manuals and safety procedures

Task 5. Implement Proper troubleshooting procedures

Task 6. Test circuits

Task 7. Explain Identify defects and faults

Task 8. Check Control settings/adjustments

Task 9. Document Results of diagnosis and testing

Task 10. Advise/inform customers regarding the status and serviceability

Unit Three: Unit maintenance/repair

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Utilization of Personal Protective Equipment
- Electrostatic discharge (ESD) protection procedure
- defective parts/components
- Unit cleaning

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Using Personal protective equipments
- Electro-static discharge (ESD) protection procedure
- Replacing soldering & mounting defective parts/components
- Performing cleaning of unit

3.1. Personal protective equipment

Occupational Safety and Health (OHS) is a cross-disciplinary area concerned with protecting the safety, health and welfare of people engaged in work or employment. The goal of all occupational safety and health programs is to foster a safe work environment. As a secondary effect, it may also protect co-workers, family members, employers, customers, suppliers, nearby communities, and other members of the public who are impacted by the workplace environment.

It may involve interactions among many subject areas, including occupational medicine, occupational (or industrial) hygiene, public health, safety engineering / industrial engineering, chemistry, health physics.

Risks include acute and chronic health effects, for example, irritation or cancer, and physical effects such as fires or explosions. The hazards are physical and health hazards.

A **hazard** is something that can cause harm, eg electricity, chemicals, working up a ladder, noise, a keyboard, a bully at work, stress.

Risk is the chance or probability that a person will be harmed or experience an adverse health effect once to a hazard. It may also apply to situations with property or equipment loss. A risk is the chance, high or low, that any hazard will actually cause somebody harm.

Figure 3.1. hazards

For example, working alone away from your office can be a hazard. The risk of personal danger may be high. Electrical repair is a hazard. If someone accidentally turned on the power the worker's life will be in a 'high-risk' category.

Risk assessment

A. Risk assessment is the process where you:

1. identify hazards
2. analyze or evaluate the risk associated with that hazard
3. determine appropriate ways to eliminate or control the hazard

B. Factors that influence the degree of risk include:

1. how much a person is exposed to a hazardous thing or condition
2. how the person is exposed (e.g., breathing in a vapor, skin contact), and how severe are the effects under the conditions of exposure

3.2. Electro-static discharge (ESD) protection

What is ESD? Electrostatic Discharge is a high voltage event from the release of electrical energy caused by static electricity or electrostatic induction.

ESD can cause permanent damage to electronics and integrated circuits.

ESD Principle Protect the IC by suppressing incoming transient voltage to an acceptable level (Output of Vc: Clamping voltage).

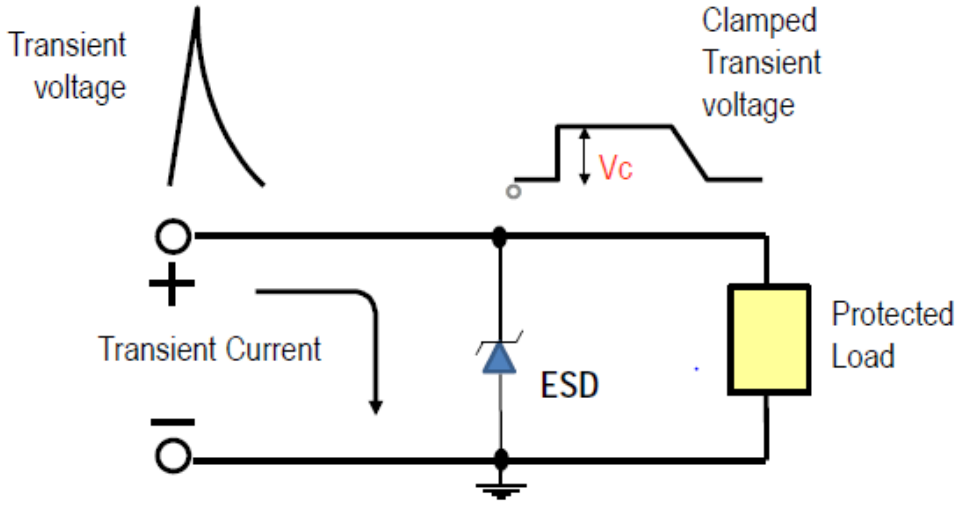


Figure 3.2. Electrostatic Discharge

3.2.1. Types of ESD

1) **Sparks** – A spark is triggered when the electric field strength exceeds approximately 4-30kV/cm. This may cause a very rapid increase of free electrons and ions in the air, temporarily causing the air to abruptly become an electrical conductor. eg, lightning.

2) **Corona discharge** – A corona discharge occurs between a highly curved electrode (eg, tip of pen) and an electrode of low curvature (eg flat plate)

3) **Brush discharge** – A brush discharge occurs between an electrode with a curvature between 5mm and 50mm and a voltage of about 500 kV/m. The resulting discharge paths have the shape of a brush.

3.2.2. ESD Simulations

There are three models for assessing the survivability/susceptibility of electronic devices to ESD:

1)Human Body Model, HBM

2)Machine Model, MM

3)Charged Device Model, CDM

1. **Human Body Model - HBM**

- Simulates ESD from human contact.
- A person accumulates static electricity from walking or moving and discharges the static through the IC. The leads become the conductive path to a grounded surface due to contact.

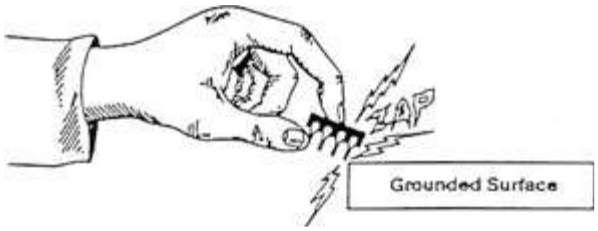


Figure 3.3. Human Body Model

- HBM (Human Body Model) test circuit simulates ESD from human contact and consists of 100pF and 1.5KΩ to simulate the equivalent capacitance and resistance of a human body.
- The capacitor is charged to a predetermined high voltage from an external source, and then suddenly discharged through the resistor into an electrical terminal of the device under test (DUT).

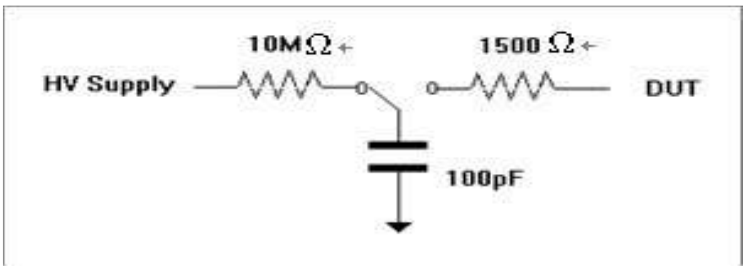


Fig3.4 Human Body Model (HBM) test circuit

2. Machine Model - MM

This simulates the discharge of static electricity accumulated from machines and equipment (i.e. moving mechanical arms, test probes, etc.)

The test circuit consists of charging a 200pF capacitor to a predetermined high voltage from an external source, and then suddenly discharging the DUT through an electrical terminal.

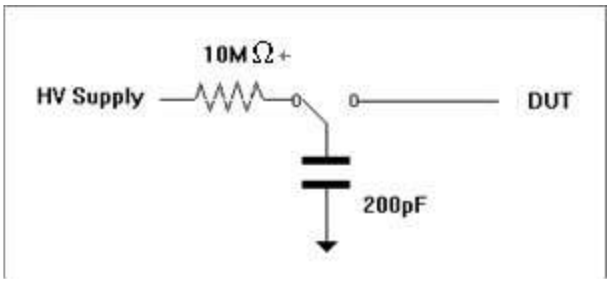


Fig3.5 Machine Model (MM) test circuit

3. **Charged Device Model – CDM**

•The CDM test simulates how the device acts when the device itself has an electrostatic charge and the effects of the discharge when it comes in contact with a metallic surface. This type of discharge is the most common type of ESD in electronic devices and is the main cause of ESD damage during the manufacturing process.

•CDM discharge depends mainly on parasitic parameters of the discharge and is strongly dependent on the size and type of component package.

CDM Scenario：

When the IC slides from the packaging tube, friction causes static to form on the device. The IC discharges as the terminals contact a grounded surface (i.e. metal table), or when the part is picked up with metallic tweezers

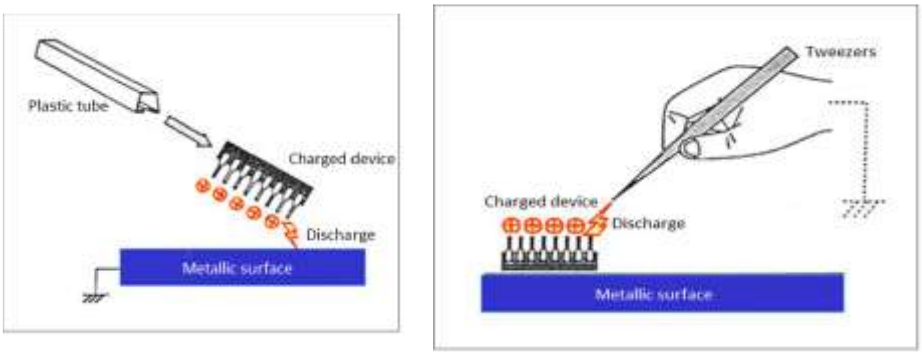
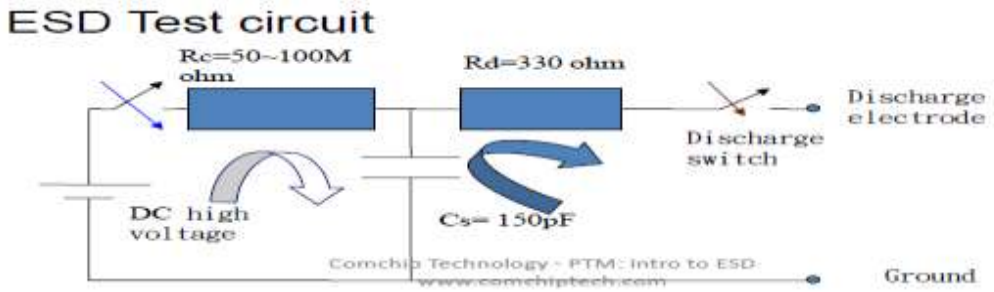


Fig3.6 CDM Scenario

3.2.3. Electrostatic discharge testing (CDM)

Simulates ESD in a charged device at 150pF and 330Ω. The capacitor is charged to a specific high voltage from an external source, and then suddenly discharged through the resistor into an electrical terminal of the device under test (DUT).



IEC – International Electro Technical Commission: standards & specifications

61000: Electromagnetic Compatibility (EMC)

Parts 1, 2, & 3: General, Environment, Limits

Part 4: Testing & Measurement Techniques

4-2: Electrostatic Discharge Immunity

4-3: Radiated, RF, Electromagnetic Field Immunity

4-4: Electrical Fast Transients/Burst Immunity

4-5: Surge Immunity

3.2.4. ESD Protection Procedure

1. Anti-static kit can be purchased from a computer or electronics store. The main component is an ESD wrist strap with a wire several feet long having an alligator clip at the other end.
2. Before troubleshooting any domestic appliance, wear an ESD wrist strap and wear it as you go under the covers, handle ICs, and circuit boards.
3. Put the adjustable strap around your wrist. If you are wearing an ESD wrist strap connected to frame or ground, it drains static charges of your body, thus, it prevents damaging ESD sensitive devices.
4. Attach the clip at the end of the wire to an electrical ground connection or metal framework of the washing machine.
5. If you work on a washing machine without a conductive wrist strap, touch an electrical appliance such as a lamp or the screw in a wall outlet cover plate before touching the PCB. An electrostatic discharge of just a few hundred volts is too small to feel in most cases but can be usually deadly to ESD sensitive devices. Also avoid wearing clothes that easily produce a static charge, such as knits and wools and limit your movements as much as possible, especially on carpets while working on electronic circuits of a washing machine.

3.3. Replacing Defective parts/components

Operation of an electric flat iron, parts and functions

The domestic Electric Flat Iron was the first of the household heating devices to receive universal recognition. From the power source at home, electricity flows through a flat cord passes through a thermal fuse and a temperature control going to the heating element. Heating element is insulated by a mica insulator from the body and it heats up the sole plate for the purpose of removing wrinkles from fabric. With the heat and the weight of the ironing plate, the fibers are stretched and the fabric maintains its new shape when cool. Some materials such as cotton require the use of water to loosen the intermolecular bonds. Many materials developed in the twentieth century are advertised as needing

little or no ironing. Modern irons for home use can have the following feature:

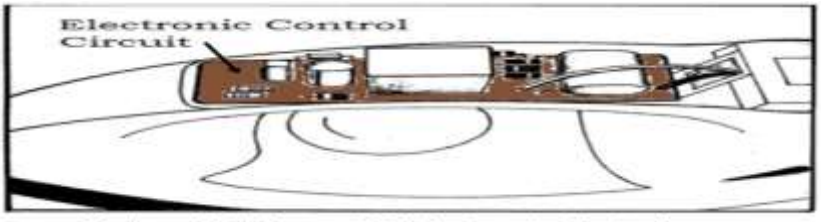
1. a method of setting the iron down 2.a thermostat to ensure maintenance of constant temperature

3. a temperature control dial (usually marked with types of cloth) 4. an electrical cord with heat resistant Teflon insulation 5. a steam features

6. a cord control/ anti-burn control/ energy-saving control/ cordless iron

figure3.7 Electric Flat Iron

Example of Common Electric Flat Iron



Modern Flat Iron with Electronic Control

Figure 3.8 Electric Flat Iron

Basic Parts of Flat Iron

1. **AC line cord** is used to connect the unit to power source.

Figure 3.9 AC line cord

2. **Selector Switch** is a type of switch used to select the amount of heat required in ironing different types of fabrics. It can be a rotary or slide type.

Figure 3.10 Selector Switch

3. **Thermal Fuse** is a safety protective device used to cut-off the circuit when the temperature rises at above normal as designed for the unit. It also protects the unit from damage when overheating and
short circuit occurs.

Figure 3.11

4. **Heating Element** is a form of nichrome wire that assembles properly inside the high temperature metallic tube in flat iron to provide heat.

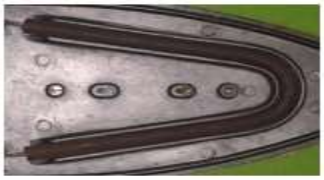


Figure 3.12. Heating Element

5. **Soleplate** is a base metal that serves as fabric pressing part made of metal where the heating element is placed

Figure 3.13 Soleplate

6. **Handle** is the part of a flat iron by which it is carried or controlled

Figure 3.14 Handle

7. **Body/Case** is used to protect the internal parts of the flat iron and serve as shield for the heat and protection of the hand of the user.

figure 3.15 Body/Case

8. **Neon/Pilot Lamp** is used to indicate that electricity is flowing along the heating element.

figure 3.16 Neon/Pilot Lamp

9. **Thermostat Assembly** is used to regulate the temperature.

Figure3.17 Thermostat

10. **Electronic Control** is the added feature of modern electric flat iron which can act as timer or automatic power cut-off switch for additional protection.

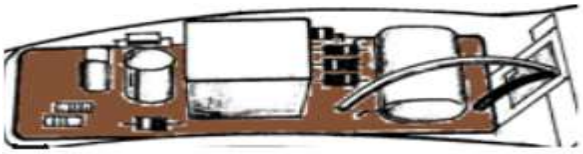


figure3.18 Electronic Control

Note: To avoid a circuit from overload, do not operate another high wattage appliance on the same circuit. If an extension cord is absolutely necessary, a 16A cord should be used with a 220V iron. Cords rated for less amperage may overheat. Care should be taken to arrange the cord so that it cannot be pulled or rippled over.

Sample Schematic Diagram

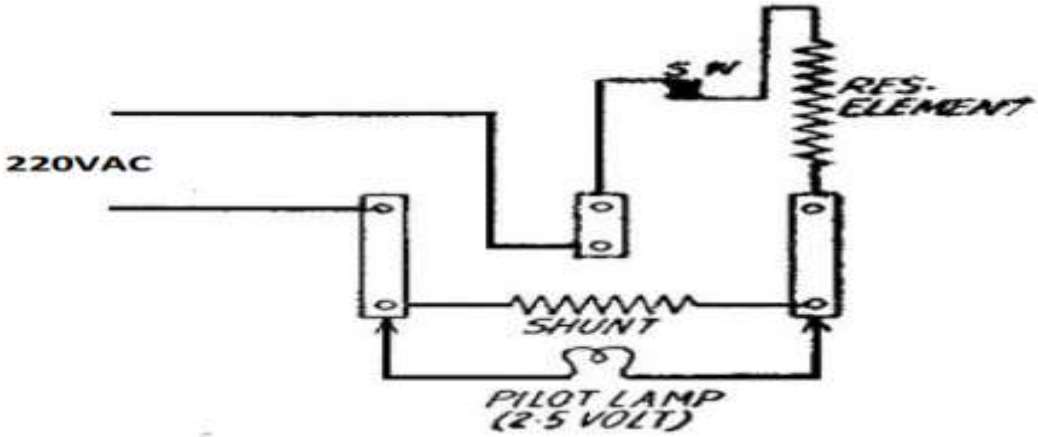


Figure3.19 Flat Iron Schematic

Parts of Thermostat Assembly

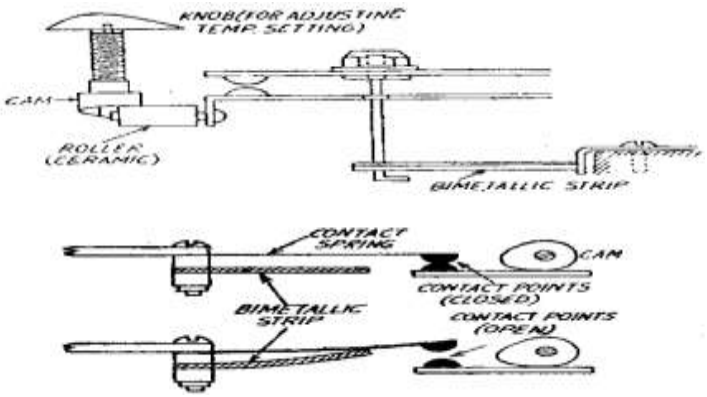


Figure3.20 Parts of Thermostat

Heating as one of the effects of electricity

electricity is also converted into another usable power like heat. When an electric current flow through a wire some loss occurs and this loss is almost inevitable, more the resistance of wire, more the loss. This loss is due to the electrical resistance of wire is mainly responsible for the heating effect of electric current.

The more electrical resistance of the wire, the more generated heat. The fixed atoms of the wire resist the flow electrons and as a result, there are collisions and as the kinetic energy converts into heat energy we see that the wire is getting hot.

Electric heating has several advantages: it can be precisely controlled to allow a uniformity of temperature within very narrow limits; it is cleaner than other methods of heating because it does not involve any combustion; it is considered safe because it is protected from overloading by automatic breakers; it is quick to use and to adjust; and it is relatively quiet.

For these reasons, electric heat is widely chosen for industrial, commercial, and residential use. Resistance heaters produce heat by passing an electric current through a resistance: a coil, wire, or other obstacle which impedes current and causes it to give off heat. Heaters of this kind have an inherent efficiency of 100% in converting electric energy into heat. Devices such as electric ranges, ovens, hot-water heaters, sterilizers, stills, baths, furnaces, and space heaters are part of the long list of resistance heating equipment.

Procedure in Pre-Testing and Troubleshooting an Electric Flat Iron

1**. Determine the specific problem by asking the symptom.**

a. Ask the owner/operator of the electric fan of what is the symptom of the unit.

b. Request for the details of the symptom (how does the symptom happen) and how long it has been observed).

2. Operate the device. Make sure that you know how to operate an electric flat iron. If not, review the operating manual as well as the service manual (if available) of the unit prior to its testing and operation

a. If you have worked on the same unit before, test out to see if it operates in the same way.

b. Determine the last time it has been modified/repaired.

c. You must recognize the symptom/ complain of the owner to the unit.

3. Perform visual inspection of the unit.

a. Prepare the tools needed and remove the cover ready for inspection.

b. Apply careful physical inspection of the parts/components. (Look for burned and broken components; Inspect for loose connections or broken wires)

4. If all looks fine, test the unit for resistance checks.

a. Get the multitester and set it at range Rx1. Connect the test probes to each of the plug terminals, the reading must be infinite having the temperature control at zero position.

b. Then, adjust slowly the temperature control, decrease in resistance should be observed. If this happen, the unit might be in good condition. For safety, place one probe across to the plug terminals and the other probe to the body. There should be very high (infinite) resistance. If there's something different, refer to troubleshooting guide on this lesson.

5. Record your findings for future reference.

How to use an electric flat iron

1. Adjust the temperature selector to a minimum position before plugging cord into electrical outlet.

2. Pre-heat the unit at least 2 minutes before using.

3. To improve dry ironing results, sprinkle the garments with water evenly at least one hour before ironing.

4. Unplug iron by gripping plug and pulling it from the outlet. Never pull the cord.

Diagnosing and Troubleshooting Procedure/ Guide:

SYMPTOM: Flat iron not energized.		
POSSIBLE DEFECTIVE PART	**PROCEDURE**	**CORRECTIVE MEASURE**
Power Cord	Measure the continuity of the power cord using ohmmeter.	Replace power cord.
Thermal Fuse	Measure the continuity of the fuse using ohmmeter.	Replace fuse.
Selector Switch	Check for the alignment of the switch to the thermostat.	Align the selector switch.
Thermostat	Measure the continuity of the power cord using ohmmeter.	Replace thermostat.
Heating Element	Measure the continuity of the heating element.	Replace heating element.

SYMPTOM: Intermittent Power or Heat		
POSSIBLE DEFECTIVE PART	**PROCEDURE**	**CORRECTIVE MEASURE**
Thermostat	Check the contact points for accumulated carbon or dirt.	Clean the contact points with fine sand paper. Adjust the temperature knob if necessary.

Table 3.1 Diagnosing and Troubleshooting

TROUBLESHOOTING, MAINTENANCE AND CLEANING TIPS

Troubleshooting

6. Conduct a *quick* diagnosis of the trouble symptom and repair the defective set in the *shortest possible time*. Do not troubleshoot an electric flat iron unless you have determined the fault.

7. Secure a circuit diagram.

8. If the iron doesn't heat, make sure power is on to the outlet, check the electrical cord, and check the thermostat.

9. Always suspect a faulty contact on mechanical switch circuit rather than defective electronic/electrical parts.

5. If the iron produces too much or too little heat, test the electrical cord for loose wiring and connection. Also test and, if needed, adjust calibration of the thermostat.

6. Use Personal Protective Equipment. Maintenance and Cleaning

1. Turn-off and unplug the electric flat iron and make sure it's cool before cleaning.

2. Check the owner's manual for your iron to learn the specified manufacturer's suggestions for cleaning.

3. You may use a sponge and commercial soleplate cleaner or baking soda and water to remove dirt buildup on the soleplate. Rinse well with water and dry. Don't submerge an electric flat iron in water or cleaning liquid. If needed, use very fine emery cloth or sand paper to remove scratches and burns on the soleplate. Don't use harsh abrasives.

REASSEMBLING AND TESTING AN ELECTRIC FLAT IRON

Reassembling Procedure:

1. After replacing the defective part of the appliance, prepare the parts for reassembling. Make sure that there are no missing parts or component and as well as the screws.
2. Review the operating and service manual if available.
3. Fix all the disassembled parts in the housing/compartment, considering the fittings, lock etc.
4. Wires should be in their proper places and loose parts should be tightened to avoid damaged due to misalignment.
5. All sides of the housing should fit. See to it that Selector Switch is moving appropriately and the rest of the movable parts.
6. Clean the unit before doing the testing procedure.

Testing Procedure:

1. Set the ohmmeter to Rx1.Test the AC plug to determine the continuity of the power line to the heating element. Reading must be around 14 ohms.
2. Energize the unit to check its functionality. Move the Selector Switch slowly. Within a minute or two, the unit should operate normally. If not, review the documentation and troubleshoot again.

3.4. Cleaning of unit

Cleaning is an essential process within electronics manufacture and has been used for many years to remove potentially harmful contaminants during PCB manufacture. Such contaminants include flux, solder and adhesive residues, and other more general contaminants such as dust and debris present from other manufacturing processes.

Cleaning PCBs has been a vast topic for many years, particularly so since the ban of CFCs and HCFCs. These products offered solvency power, low surface tension properties to dissolve, remove and dry within minutes any parts of any de-sign. The electronic industry has grown so rapidly since the 80s, that today, nearly 50% of any individual's belongings are composed of electronics: e.g.: Mobile phones, remote controls, TVs, radios, cars, IPods, computers, HiFi, hard discs, memory sticks, cameras, videos, refrigerators, dish and laundry washers, cars, planes, satellites, implants, etc…

Since the 90s, the electronic evolution has been exponential, and the miniaturization has advanced proportionally. The introduction of such new small parts not only raised some design problems, but also some practical aspects such as handling and some reliability problems. In meantime, the suppliers of solder fluxes and pastes had to adjust new formula-tions for the new markets, the new demands and the new regulations.

Accordingly, the electronic suppliers adapted their production to the customers' demands with cleanable and no clean fluxes, also called consumable devices. The non-consumable devices such as medical implants, military tools, satellites, safety parts for cars, trains, medical equipments and many other products, should be reliable and thus cleaned. To achieve a good cleaning result, it is worth understanding the various parameters present and the physical laws which are ruling this chemical operation.

Cleaning has a cost and it should be adapted to the needs while maintaining stability in time, efficiency, quality and performance.

1) Miniaturization

Today, miniaturization is a hundred times greater than during the 80's. This reduction in size means reduction of solder pads and also amount of flux residues. But it also means a reduction of space between legs and board/components. Today, size of components are down to 0, 1mm.In addition, the components became of high capacity with resistors, diodes, quartz, selfs, BGA and others. The reliability of these components should be always increased. This miniaturization

should not become a reason of instability and unreliability. The cleanliness should be performed and pass the norms.

2) Contaminants

The contaminants on a circuit board are mainly composed of: organics such as natural and/or synthetic rosins, ions, acids, solder balls, fingerprints, and particulates of PCBs. The lead-free alloys need higher soldering temperatures than the standard Sn/Pb which are carrying significant evolutions on the fluxes to be used. These fluxes are most of the time more active and must resist to higher reflow profiles. They present more risks than the one formerly used , and the temptation is high to choose production parameters allowing shining soldering pads. The ionic cleaning of the PCBs is then more critic-cal before tropicalisation, but will also help to control the assembling process and help to establish final assembly life-time. The ionic contamination is a good quality indicator for the long term reliability. Please see next Figure

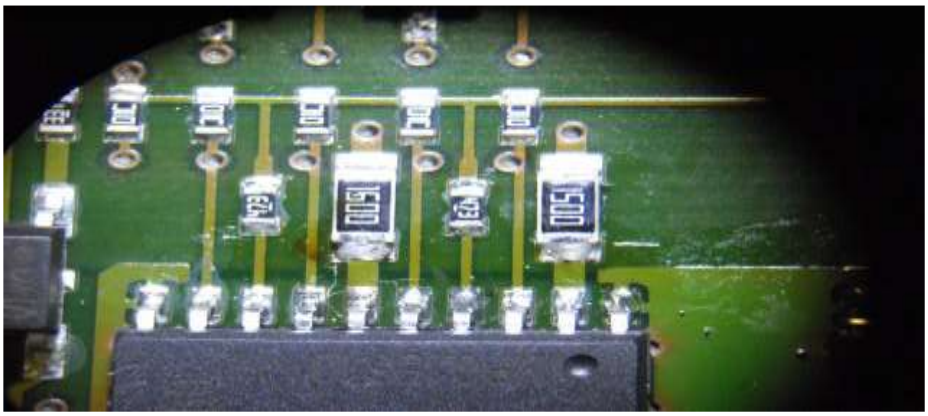


Figure 3.21 cleaning of the PCBs

3) Specifications set up

Every end-user has his own typical specifications which are depending on his own or his customers. For this study, the specifications have been taken as described i. Six hundred PC Bs for trials were produced in large quantities to triple the cleaning results (Figure 3.22). Each trial contains 30 components. All residues must disappear, including the con-taminants under the components. No fingerprint, particle or dust should remain, including residues of cleaning products. The components, the rosins, the under fill and the substrate should not be damaged by

the cleaning operation. The part should be dried at the end of the washing step. The ink markings should be resistant to the cleaning.

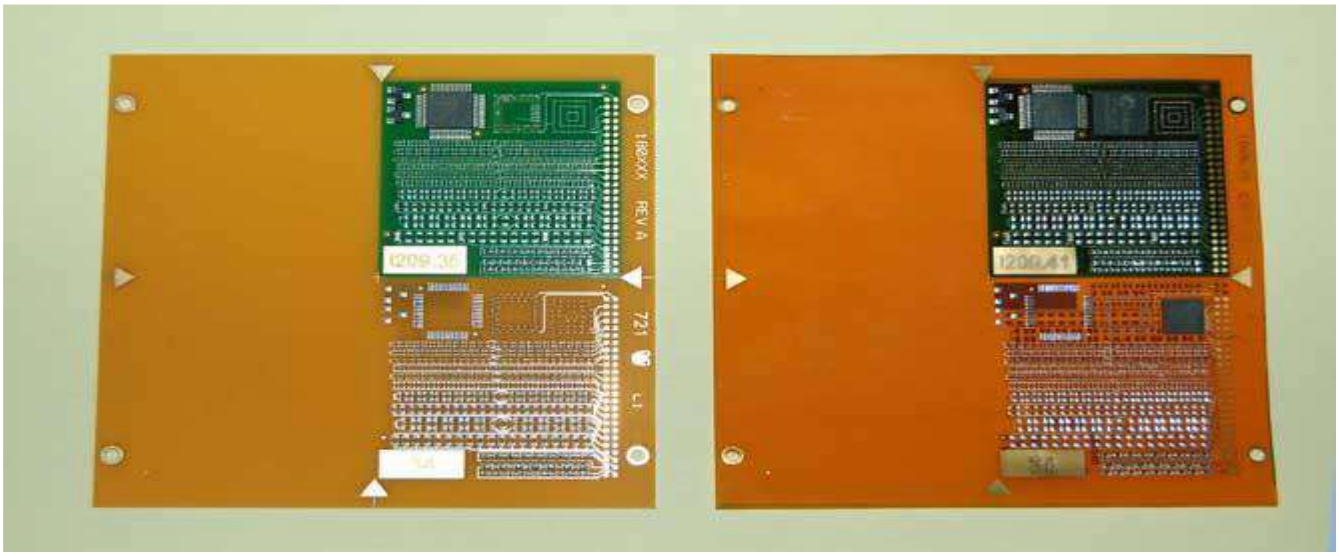


Figure 3.22 cleaning operation

4) Cleaning products available

The most important part of the job is to remember which chemical families are available in the market. The cleaning products available can be classified in five different families: The detergents, the light petroleum distillates, Formulated hydrocarbons, Brominated solvents, glycols and fluorinated solvents.

GENERAL RECOMMENDATIONS FOR CLEANING

- Electronic devices in both clinical and non-clinical areas become contaminated with microorganisms, which are transmitted via contaminated hands. Follow the guidance in Table 3.2 for electronic cleaning and disinfecting devices.
- Unless there is a protective, washable cover for the electronic mobile device it should not come into contact with the patient environment.
- Replace computer components when:
- Grossly contaminated e.g. saturated with blood or body fluids or
- Cleaning doesn't remove visible soil, e.g., keyboards.

Equipment	Minimum frequency	Product
Mobile electronic devices taken into the patient's room, but not directly into the patient environment, for activities, such as charting in an electronic health record, order entry, or data collection, e.g., computer or workstation on wheels, tablets, wireless laptops	Before use on the next patient; and when visibly soiled	Follow manufacturer's instructions for use for specific recommendations. • Use a disposable soft, non-abrasive, lint-free damp cloth or wipe, pre-moistened with a ready to use (RTU) AHS provided cleaner/**disinfectant**. • Squeeze out excess liquid before use. • Never spray products directly onto electronic devices Examples of disinfectants that may be indicated in the manufacturer's instructions for use: • Alcohol swabs and wipes (often used for phones, mouse, pagers) • Combination products such as alcohol/quaternary ammonium e.g. CaviWipes® • Hydrogen peroxide products such as accelerated hydrogen peroxide (AHP) products e.g. Virox RTU®, Accel®, Oxivir®, Percept Wipe® Example a of product not usually recommended: • Sodium hypochlorite (bleach) such as Clorox® Do not use compressed air to clean electronic devices, e.g., keyboards
Mobile electronic devices taken into the patient's room and used directly in the patient environment, e.g., pager, smart phone, cell phone, or personal digital assistant	Before contact with a patient or patient's environment; after contact with a patient or patient's environment; and when visibly soiled	
Telehealth equipment in all clinical areas	Before use on the next patient; when equipment leaves the patient environment; and when visibly soiled	
Fixed electronic devices including key boards used in the patient environment, e.g., wall-mounted computers	Daily; when visibly soiled; and at discharge	
Electronic devices including keyboards used near the patient environment, e.g., computers in the hallway and outside the patient's room	Daily, and when visibly soiled	
All other fixed electronic devices located in clinical areas, e.g., nursing station.	Daily, and when visibly soiled	

Equipment	Minimum frequency	Product
Electronic devices in public areas for patient use.	Daily, and when visibly soiled	
Desk phones	Daily	• Use alcohol swabs or wipes. • Other cleaning wipes such as CaviWipes®, Lysol®, and Green Works® may leave a residue which can compromise the keys and affect the internal electronics.

Table 3.2 electronic cleaning and disinfecting devices

Self-check – 3

Test-I Choose

Directions: For the Following Questions You Are Given Four Alternatives Then Choose the Correct Answer and circle

1, One of the ff is not The double burner solar stove main component? *(3 pt each)*

A. Heater coil B. Heat controller C. Battery D. Charge controller . E. none of the above

2. The base metal part of electric flat iron that presses the fabric.

A. AC Cord C. Neon/Pilot Lamp

B. Body/Case D. Sole Plate

3. Connects the unit to power source.

A. AC Cord C. Neon/Pilot Lamp

B. Body/Case D. Sole Plate

4. It is a hand tool used in holding, gripping and cutting of wires.

A. Blade cutter B. Pliers

C. Screwdriver D. Soldering iron

5. It is a measuring instrument used to check continuity and resistance of a circuit. A. Ammeter B. Ohmmeter C. Voltmeter D. Wattmeter

Test II: short Answer writing

Instruction: write short answer for the given question

1. How to use an electric flat iron?

2. Write down Basic Parts of Flat Iron?

3. Write down Reassembling Procedure for Flat Iron?

Test III: Say true or false

1.Testing methods and standards are set for Direct Discharge and Air Discharge.

2.Electrostatic Discharge is a high voltage event from the release of electrical energy caused by static electricity or electrostatic induction

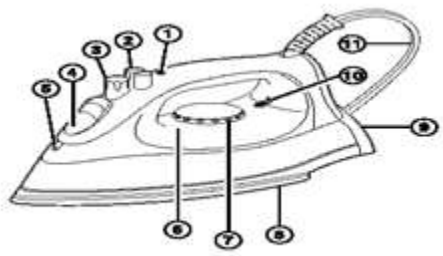
3. During use of a coffee maker A cut off plug inserted into a 13amp socket is a serious safety (shock) hazard. Ensure the cut off plug is disposed of safely

Operation sheet-3

Operation Title: Completing maintain/repairing Service

Purpose: To maintain/repairing Service

Instruction: Using the figure below and given equipments maintain/repairing Service. You have given 40 Minut for the task and you are expected to write the answer on the given line.



Tools and requirement

- ✓ Single phase power supply
- ✓ Multimeter
- ✓ Soldering iron
- ✓ Flux
- ✓ Lead

Steps in doing the task

1.Conduct a quick diagnosis of the trouble symptom and repair the defective set in the shortest possible time. Do not troubleshoot an electric flat iron unless you have determined the fault.

2. Secure a circuit diagram.

3. If the iron doesn't heat, make sure power is on to the outlet, check the electrical cord, and check the thermostat.

4. Always suspect a faulty contact on mechanical switch circuit rather than defective electronic/electrical parts.

5. If the iron produces too much or too little heat, test the electrical cord for loose wiring and connection. Also test and, if needed, adjust calibration of the thermostat.

6. Use Personal Protective Equipment. Maintenance and Cleaning

- **Quality Criteria:** the given power supply is troubleshooting properly.
- **Precautions:** use the given multimter without damage.

LAP Test-3

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks within 4 hours.

Task 1. Occupational Health and Safety's

Task 2. Electro-static discharge (ESD) protection procedure

Task 3. Replacing Defective parts/components

Task 4. Soldering/mounting Repaired or replaced parts/components

Task 5. Performing Control settings/adjustments in conformity with service-manual specifications

Task 6. Performing Repair activity within the required timeframe

Task 7. Observing Care and extreme precaution during handling the unit/product as per procedures

Task 8. Cleaning with standard procedures

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Unit Four: Unit repair test

This learning unit is developed to provide the trainees the necessary information regarding the following content coverage and topics:

- Assembly of repaired units
- Reassembled unit final testing and cleaning
- Adherence to Service completion procedures and documentation
- Waste Materials Disposal

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Reassembling repaired units
- Final testing and cleaning reassembled units
- Complying Service completion procedures and documentations
- Disposing Waste materials

4.1. Assembly of repaired units

Reassemble units: -is the process of assembling each parts of the appliance.

1. After replacing the defective part of the appliance, prepare the parts for reassembling.
2. Review the operating and service manual if available.
3. Fix all the disassembled parts in the housing/compartment, considering the fittings, lock etc.
4. Wires should be in their proper places and loose parts should be
5. All sides of the housing should fit accordingly.
6. Moving parts must move as it can be moved by hand and free from obstructions.
7. Tightened to avoid damaged due to misalignment.
8. Clean the unit before doing the testing procedure.
9. perform final test.

4.2. Reassembled unit final testing and cleaning

Post-testing Procedure:

1. Test the resistance at the AC plug to determine the continuity of the power line to the AC unit. A resistance reading must be observed as you turn the switch to ON position. This indicates that the circuit connection is good.
2. In the case of electronically-controlled domestic equipment, there is no resistance reading as you test the AC plug. The reason is that there is a low-voltage power supply circuit that controls the functions of the appliance.
3. Energize the unit to check its functionality. Plug the AC cord to the power source (the switch is at OFF position and power ON button for electronically-controlled must be OFF too). Turn the switch accordingly and observe if the unit functions as it should be. In the case of electronically-controlled, press button one at a time observing the behavior. This time, the unit should operate normally. If not, review the documentation and the problem for the second time.

Testing Procedure:
1. Test the resistance at the AC plug to determine the continuity of the power line to the AC unit. A resistance reading must be observed as you expect in normal.
2. Energize the unit to check its functionality. Press button one at a time observing the behavior. This time, the unit should operate normally. If not, review the documentation and the problem for the second time.

Following are definitions of three categories of test that shall apply:

4.2.1. **Operational Test**

- That procedure required to ascertain only that a system or unit is operable. These tests should require no special equipment or facilities other than that installed on the aircraft and should be comparable to the tests performed by the flight crews.
- It is not intended that the operational test of the unit shall meet the specifications and tolerances ordinarily established for overhaul, or major maintenance periods.

4.2.2. **Functional Tes**ts

- That procedure required to ascertain that a system or unit is functioning in all aspects in accordance with minimum acceptable system or unit design specifications. These tests may require supplemental ground support equipment and should be more specific and detailed than an operational test. It should contain all necessary information to perform proficiency tests to maintain system or unit reliability at an acceptable level, without reference to additional documents.

4.2.3. **System Test**

- That procedure containing all adjustment specifications and tolerances required to maintain system and/or unit performance at maximum efficiency and design specifications. It shall be self-contained and may duplicate other tests. It is normally used at major maintenance periods.

4.3. Service completion procedures and documentation

Completing Service Based on manual

Record all information during maintaining/repairing electronically-controlled domestic appliance**.** This recorded Service information may include but not limited to:

- job report sheets
- job order
- bill of materials
- customer index
- service flowchart
- stock and inventory record
- requisition slips (for acquisition of parts) supplier index
- Apply **5S** - Sort, Systematize, Sweep, Sanitize, and Self-Discipline for service compilation.

The Organizational Unit is to keep testing and inspection records which are to be stored on a shared system drive.

Record to be kept by:	Organisational Unit, Academic Unit
Records	Records of inspection and testing of electrical equipment, including: • register of all electrical equipment • record of formal inspection and tests • repair register and • record of all faulty equipment showing details of services or corrective actions.
To be kept for:	Records should be kept in alignment with the Records Management Policy and Guidelines

- Complete, accurate, and current documentation is essential to an effective maintenance program. Whether performing preventive, predictive, or reliability centered maintenance,

keeping track of equipment condition and maintenance—performed and planned—is critical.

- Maintenance recommendations contained in this volume should be used as the basis for establishing or refining a maintenance schedule. Recommendations can be converted into Job Plans or Work Orders in MAXIMO or another maintenance management system. Once these job plans and work orders are established, implementation of well-executed maintenance is possible.
- The maintenance recordkeeping system must be kept current so that a complete maintenance history of each piece of equipment is available at all times. This is important for planning and conducting an ongoing maintenance program and provides documentation needed for the Power O&M Reviews (section .
- Regular maintenance and emergency maintenance must be well documented as should special work done during overhauls and replacement. The availability of up-to-date drawings to management and maintenance staff is extremely important. Accurate drawings are very important to ongoing maintenance, testing, and new construction; but they are essential during emergencies for troubleshooting. In addition, accurate drawings are important to the continued safety of the staff working on the equipment.

4.4. Waste Materials Disposal

Electronic waste, or e-waste, refers to all items of electrical and electronic equipment (EEE) and its parts that have been discarded by its owner as waste without the intent of re-use It includes a wide range of products – almost any household or business item with circuitry or electrical components with power or battery supply. the definition of e-waste is very broad. It covers six waste categories:

1. Temperature exchange equipment, more commonly referred to as cooling and freezing equipment. Typical equipment includes refrigerators, freezers, air conditioners, heat pumps.
2. Screens, monitors. Typical equipment includes televisions, monitors, laptops, notebooks, and tablets.

3. Lamps. Typical equipment includes fluorescent lamps, high intensity discharge lamps, and LED lamps.

4. Large equipment. Typical equipment includes washing machines, clothes dryers, dish-washing machines, electric stoves, large printing machines, copying equipment, and photovoltaic panels.

5. Small equipment. Typical equipment includes vacuum cleaners, microwaves, ventilation equipment, toasters, electric kettles, electric shavers, scales, calculators, radio sets, video cameras, electrical and electronic toys, small electrical and electronic tools, small medical devices, small monitoring and control instruments.

6. Small IT and telecommunication equipment. Typical equipment includes mobile phones, Global Positioning Systems (GPS), pocket calculators, routers, personal computers, printers, telephones.

Each product of the six e-waste categories has a deferent lifetime profile, which means that each category has deferent waste quantities, economic values, as well as potential environmental and health impacts, if recycled inappropriately. Consequently, the collection and logistical processes and recycling technology differ for each category, in the same way as the consumers' attitudes when disposing of the electrical and electronic equipment also vary.EEE products have been categorized into various groupings by pieces of national legislation taking into account their original purpose, size, composition and/or weight.

1. Large household appliances, such as large cooling equipment like refrigerators, freezers, or equipment for cookers, microwave ovens, etc.
2. Small household appliances, such as cleaning equipment like vacuum cleaners and irons.
3. Information technology (IT) and telecommunication equipment, personal computers, laptops, printers, photocopiers, telephones, cell phones, modems, routers, tablets, data processing management equipment, etc.
4. Consumer electronics, such as radios, televisions, video cameras, musical instruments, etc.
5. Lighting equipment, fluorescent lamps, compact fluorescent, excluding incandescent lamps for homes.
6. Electrical and electronic tools (except fixed industrial tools of great significance) like crushing equipment for coatings.
7. Toys or sporting and leisure equipment, video consoles, trains, electric cars, etc.
8. Medical devices (with the exception of all implanted and infected products), such as cardiology

equipment, radiotherapy, dialysis, etc.

9. Monitoring and control instruments, such as smoke detectors, thermostats, control panels, etc.
10. Vending machines for drinks, automated teller machines (ATMs), etc.

The characteristics of each of these categories will determine the best treatment process and disposal for their respective equipment after EoL. The logistics of collection, management and recycling of this equipment should be carried out according to its characteristics. E-waste can come from household, professional, industrial, institutional or other uses. Its generation depends on several factors, including the useful life of the equipment (e.g., computers, televisions, etc.), the need for renewal of the equipment by users (e.g., mobile phones) and major technological changes (e.g., the global system for mobile communications (GSM) to the universal mobile telecommunications system (UMTS) mobile telephony). For example, according to Step Initiative and the Massachusetts Institute of Technology (MIT), the average lifespan of a mobile phone is estimated at three to five years. (GSMA, 2014) This use should be taken into account as it highly contributes to the rapid growth of e-waste globally.

Sustainable management of e-waste

The majority of the e-waste and its components are recycled or reused by formal or informal programmers, depending on the recycling capacities of the country where the e-waste is generated. If e-waste is properly managed, business opportunities can be created to meet the need for reconditioning of equipment and recovery of raw materials. Governments, non-governmental organizations (NGOs) and the ICT sector consider e-waste management a tool and opportunity for sustainable development. (ITU, 2014) E-waste is a complex mixture of hazardous and non-hazardous materials that requires specialized processes of collection, transportation, segregation, treatment and disposal. It is important to be familiar with the life cycle of EEE to understand its potential environmental impacts. Figure 4.1 describes the life cycle of EEE and the processes it undergoes once it becomes e-waste.

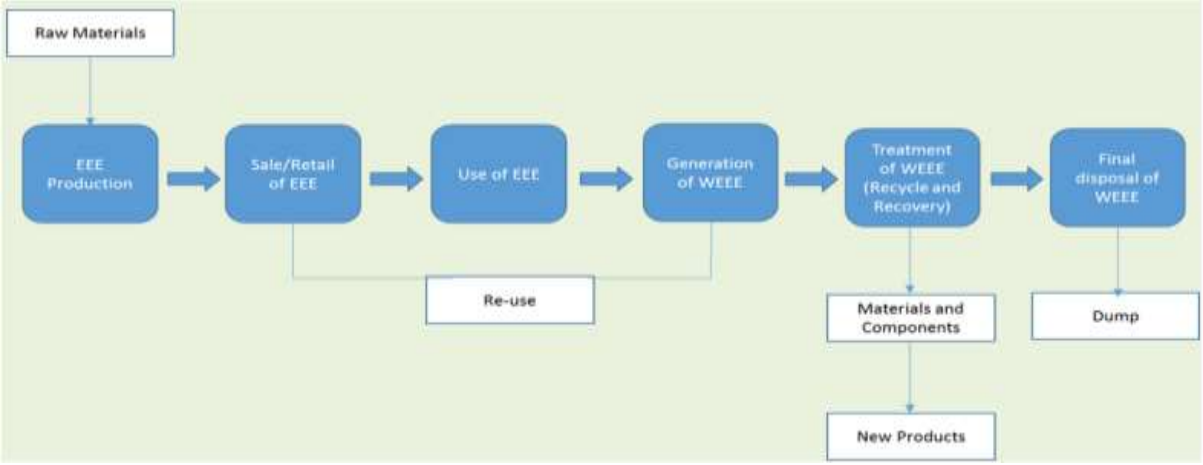


Figure 4.1 life cycle of EEE

There are some basic principles and definitions of environmental sustainability for the management of e-waste.

Reuse: Extension of the end of life of equipment or component parts to be used for the same purpose for which they were originally conceptualized; this may or may not include a change in ownership of the equipment.

This process aims to promote optimal use of available resources, but social or environmental risks associated with poor management should be taken into account.

Dismantling and segregation: This involves careful manual separation of the parts and components of a piece of equipment in disuse. It is suggested that this activity be carried out by authorized recycling companies that specialize in reconditioning.

Recycling and recovery: This process involves the recovery of devices, components and material. The dismantling can be manual or semi-manual. The recovery of materials is part of the WEEE recycling process, especially for metal recovery, which requires specialized facilities and investment.

Refurbishment: This is any process that allows re-utilization of EEE that was previously WEEE. It includes changes in hardware and software.

Final disposition: In the process of final disposal of waste or materials, non-recoverable materials can be disposed of in controlled landfills (dumps) or by incinerating

The principles of reduce, reuse and recycle (3Rs) should also be taken into account for the proper management of e-waste in order to minimize the generation of waste throughout its life cycle by employing innovative and efficient processes and technologies. Reuse is an alternative that should include the implementation of a proper collection and refurbishment process. Reusing products has its limitations; it can only temporarily extend the life of the equipment.

Self-check-4

Test-I Choose

Directions: For the Following Questions You Are Given Four Alternatives Then Choose the Correct Answer and circle

1, one is not the basic principles and definitions of environmental sustainability. *(4 pt each)*

A, Reuse B, Recycling and recovery C, Final disposition D, none of the above

2. One of the f f is not true about equipment handling? (3 pt each)

A. Store equipment in a clean dry storage area.

B. Rinse and clean spray equipment after each use.

C. Clean spreaders and check wheel-driven gears.

D. Clean carts and wheelbarrows after use.

E. None of the above

Test II: Say true or false

1. A post testing unit is the process of testing after assembling of each parts of the appliance.

2. Record all information during maintaining/repairing electronically-controlled domestic appliance

3. A reassemble unit is each parts the process of assembling of the appliance

Test III: short Answer writing

Instruction: write short answer for the given question

1.write the six e- waste categories?

2. write the post testing procedures of a domestic equipment's?

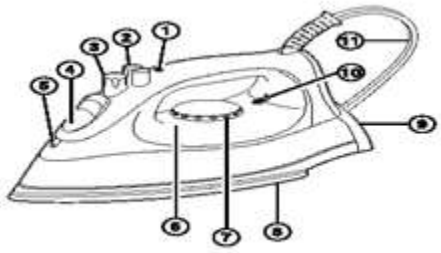
3. write the recorded Service information may include?

Operation sheet-4

Operation Title: Final testing and cleaning

Purpose: To testing and cleaning

Instruction: Using the figure below and given equipments testing and cleaning. You have given 30 Minut for the task and you are expected to write the answer on the given line.



Tools and requirement

- ✓ Single phase power supply
- ✓ Multimeter
- ✓ Soldering iron
- ✓ Flux
- ✓ Lead

Steps in doing the task

1. After replacing the defective part of the appliance, prepare the parts for reassembling. Make sure that there are no missing parts or component and as well as the screws.
2. Review the operating and service manual if available.
3. Fix all the disassembled parts in the housing/compartment, considering the fittings, lock etc.
4. Wires should be in their proper places and loose parts should be tightened to avoid damaged due to misalignment.
5. All sides of the housing should fit. See to it that Selector Switch is moving appropriately and the rest of the movable parts.
6. Clean the unit before doing the testing procedure.

Quality Criteria: the given power supply is troubleshooting properly.

Precautions: use the given multimter without damage.

LAP Test-4

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instruction I: Given necessary templates, tools and materials you are required to perform the following tasks within hours.

Task 1. Test repaired unit

Task 2. Reassemble units Techniques.

Task 4. Final testing and cleaning.

Task4. Completing maintain/repairing Service.

Task5.Disposing Waste materials.

Reference

1. COFFEE MAKER KM 5260 ENGLISH

2. Medical Equipment Maintenance Manual Shower pan construction,

3. K to 12 Basic Education Curriculum Technology and Livelihood Education **Learning Module**

4. ELECTRICAL INSTALLATION MAINTENANCE 130 K to 12 – Technology and Livelihood Education

5. Managing electrical risks in the workplace

6. CENTRAL PUBLIC WORKS DEPARTMENT MAINTENANCE MANUAL

7. **Grade 10GOP – Textbook Funds**

8. 7808-e-facts sheet technician

10. A Consumer's Guide to fnding the right Energy Efcient Vacuum Cleaners

The trainers who developed the Module (training material) preparation

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