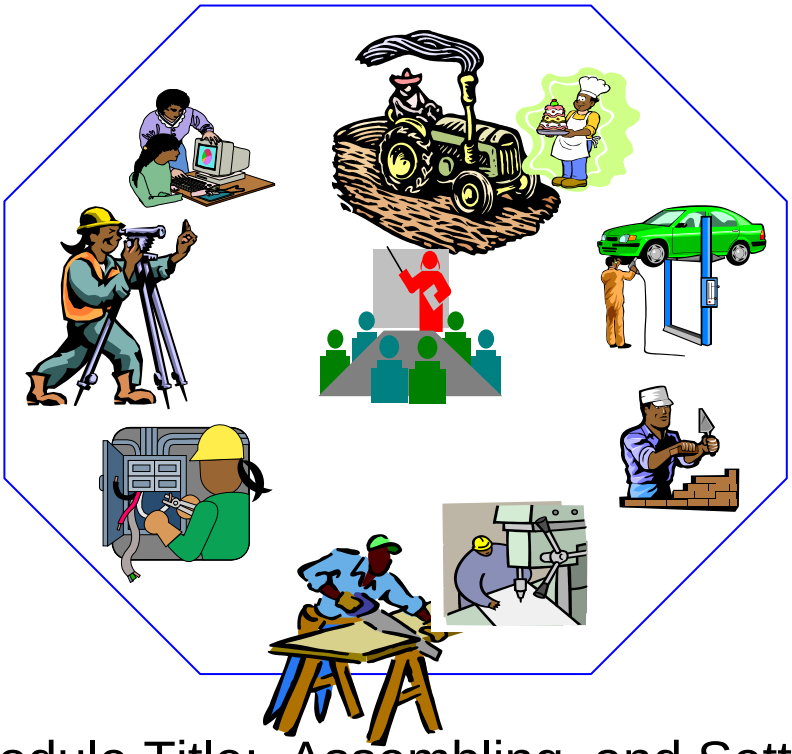
Intermediate Home/Office Electrical/ Electronic Equipment III

Based on Dec, 2020 Version OS and Dec, 2020 Version Curriculum



Module Title: Assembling and Setting-up Home/Office Electrical/Electronic Equipment

LG Code: (1-4) LG (5-7)

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Bishoftu, Ethiopia

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LG #5	LO #1- Prepare to install home/office electrical/electronic equipment

Instruction sheet

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

- Prepare to install home/office electrical/electronic equipment
- .Install home/office electrical/ electronic components and systems
- Complete installation work and report.

This guide 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:

- Preparing to install home/office electrical/electronic equipment
- .Installing home/office electrical/ electronic components and systems
- Completing installation work and report.

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”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
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9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

- **Information Sheet 1- Prepare to install home/office electrical/electronic equipment**

1. 1 OHS procedures for a given work area

INTRODUCTION

Occupational health and safety is of key importance for working industry to safeguard interests of working personnel. It is of prime importance for a personnel working in hazardous environment, to make their life always secure and safe. It adapts working environment to workers for the promotion and maintenance of their physical, mental and social well-being for workers in all occupations. The question of occupational health and safety is a global issue and is now taking a new turn with most countries having safety department an essential part of their work culture.

This is largely due to the industrial and agricultural outgrowth and development in the developing countries and the emergence of new products and product processes from these occupational health and safety places. machine-operated in the main productive sectors, such as manufacturing, mining engineering and agriculture. Hence, it can affect the potential occupational health.

These underdeveloped and developing countries import heavy machinery and equipment to aid and speed up the work process, not only in the industrial production sector, but also to services and commerce. This has for technical advancement through a change in the structure of labour force as a whole including a rise in employment of women. As would be expected, the health problems would also differ. For example, more detailed study and the efficiency of people in the workplace and occupational psychosocial factors would be required in the services industry. This obviously raises a new challenge for occupational health and safety practice in most of the underdeveloped or developing countries because the expertise is not yet advanced there as compared to the already developed countries. The advantage of the health service in developing countries is locally on a national level. The positive effect of occupational health service locally may be observed in reducing work-related long-term health

ill-effects and work-related injuries.

The advent of skilled labour and the skilled labour is globally 1os in demand in every department of industry, especially in countries where there is shortage of skilled labour. Keeping this in mind, we need to possibly think and secure lives of skilled labour in a health hazard-free working environment.

The interest of workers, employers, government and public lies in making working conditions healthy, safe and hazard-free. Although, it seems simple and obvious, this idea has not yet gained meaningful universal recognition. Still one can find working personnel risking their precious life to get a task completed, which can account for work-related injuries and raise the percentage in work-related deaths. Human life needs to be safe and secure in every possible way, especially when they risk their life to lead a task to its perfect completion. This means inclusion of the idea of healthy safety measures of utmost importance in risky conditions of work. Millions of people in industrial world today work in conditions that can possibly be unsafe or would lead to work related injuries and diseases, resulting in severe illnesses later on in their lives e.g. respiratory and cardiovascular diseases, hearing loss, musculoskeletal and reproductive disorders, mental and neurological illnesses. An increasing number of workers in industrial countries complain about psychological stress and overwork, which can lead to sleep disorders, depression, fatigue and burn-out syndromes, as well as with elevated risks of cardiovascular diseases. A good number of workers in developing countries and similar number of workers in industrial countries (with a few exceptions) could possibly be exposed to occupational health hazards. Even in advanced economies, a large proportion of work sites are not regularly inspected for occupational health and safety.

Safety is defined as the protection from harm, danger, risk, accident or injury. It is very necessary in usual lives to follow the safety rules and regulation at all the works. Almost all the accidents usually occur due to lack of safety. Therefore safety is the most important in any industrial or occupational setup.

Need of occupational health and safety

- We have to ensure in all business about the care of workers and all the persons involved in business for good health all the time.
- It provides employees lives and health.
- Occupational safety and health rules can decrease worker injury and illness.

1.2 Occupational Health

It is concerned with the identification and control of the danger arising due to physical, chemicalb and other work places hazards to maintain a healthy working environment. The hazards may cause due to chemical agent, heavy metals, physical agents, electricity, dangerous machinery etc. The prime goal of existence of man power inside industry to get maximum output from their mental and physical health. Therefore the health of work force must be considered on the top of management agenda. To ensure their healthy life they must have a proper and concrete planning. Some of the factors to be considered while planning for their health issues are listed below:

- Standard working hours
- Weekly / medical / casual leave
- Hygienic canteen facility for meal
- Pure drinking water
- Rest room
- Hygienic wash room
- Ambulance facility

1.3 Occupational Hygiene

It is the discipline of anticipating, recognizing, evaluating and controlling health hazards in the working environments with the objective of protective worker health, well-being and safe Iguarding the community at large.

I. **Anticipation**: The identification of hazards and its associated effects on the health is called anticipation.

II. **Recognition**: It is the process to establish hazardous place or agent at the work place.

III. Evaluation: It is the measure of hazards which can be evaluated with the help of some tools or technique.

Self-Check -1	**Written Test**

Directions: ***For the Following Questions You are Given Four Alternatives then Choose the Correct Answer and circle***

1, Recognition It is the process to establish hazardous place or agent at the work place. *(3 pt each)*A, true B, false *(3 pt each)*

2, The identification of hazards and its associated effects on the health is called anticipation.

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Note: Satisfactory rating 4 and above points Unsatisfactory below 4 points

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

○ Information Sheet 2- Safety hazards

2.1 Electrical Safety

Electrical Troubleshooting can be hazardous. Ensure you take the proper precautions. Electricity has long been recognized as a serious workplace hazard, exposing employees to electric shock, electrocution, burns, fires and explosions.

2.2 Troubleshooting Regulations

There are numerous regulations, which have been developed to keep the worker safe while on the job. These regulations, which are typically developed by government and other regulatory bodies, can vary from region to region depending on the jurisdiction and even from company to company. Be sure you are familiar with the regulations that apply to you some of the things these regulations may address are:

- What distance you must maintain from live electrical apparatus. This distance is dependent on the voltage level and training.
- What type of safety equipment must be worn when performing certain troubleshooting tasks?
- What type of test equipment must be used and under what conditions.
- What special work procedures are required to perform various tasks?
- What training is needed to perform various tasks? For example, a person with specific training is allowed to be closer to live electrical apparatus than an untrained person.

2.3 Troubleshooting Hazards

Troubleshooting can introduce many new safety concerns especially when inspecting equipment that is energized. Testing often requires the troubleshooter to temporarily connect test instruments to “live” terminals, which may involve opening enclosures or cabinets that normally are locked or bolted closed to protect workers. This introduces two main hazards:
1. *Shock Hazard.* If you were to contact live equipment with your body or a tool you are holding the current flowing through your body could cause severe injury, burns, and even death.
2. *Flash Hazard*. If you are in the vicinity of equipment that fails and causes an electric arc, the flash, heat and shrapnel caused by the arc can also be life threatening.

1. Shock Hazard

What causes shocks?
Electricity travels in closed circuits, normally through a conductor, but sometimes a person’s body an efficient conductor of electricity mistakenly becomes part of the electric circuit. This can cause an electrical shock. Shocks occur when a person’s body completes the current path with:

- both wires of an electric circuit;

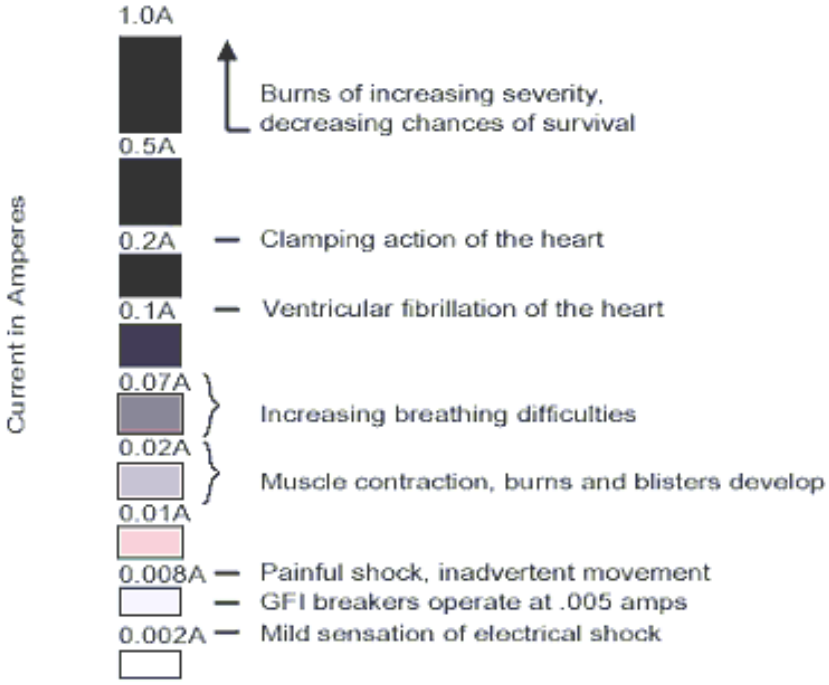
- one wire of an energized circuit and the ground;
- A metal part that accidentally becomes energized due, for example, to a break in its insulation.

When a person receives a shock, electricity flows between parts of the body or through the body to a ground or the earth.
What effect do shocks have on the body?
An electric shock can result in anything from a slight tingling sensation to immediate cardiac arrest. The severity depends on the following:

- the amount of current flowing through the body,
- the current's path through the body,
- the length of time the body remains in the circuit, and
- the frequency of the current

The following table shows the general relationship between the amount of current received and the reaction when current flows from the hand to the foot for just 1 second.

Physiological Effects of Current on the Body



2.3.1 Protecting Against Shock Hazards

Electrical equipment is generally designed to minimize electrical hazards. This is normally

done through:

- The use of guards and barriers,
- Grounding of equipment cases
- Use of proper insulation
- Installation of protective electrical devices

However, the hazards cannot be totally eliminated. You may have to replace equipment, open an enclosure or even perform tests on live equipment.
In order to protect you from these hazards, safe work practices have been developed. Some examples are:

- ✓de energizing electric equipment before inspection or repair,
- ✓keeping electric tools properly maintained,
- ✓exercising caution when working near energized lines And
- ✓Using appropriate protective equipment.

Following safe work practices is an important way that you can protect yourself from electrical hazards.

Lockout/Tag out

One work practice that is extremely important to the trouble-shooter because of the testing and repair work performed is Lockout/Tag out. Here is what OSHA says about Lockout/Tag out.
Proper lockout/tag out procedures protect you from the dangers of the accidental or unexpected start-up of electrical equipment and are required for general industry by OSHA (Occupational Safety and Health Authority) Standard 1910.333, Selection and Use of Work Practices. Requirements for construction applications are in 29 CFR 1926.417, Lockout and Tagging of Circuits. These procedures ensure that electrical equipment is de energized before it is repaired or inspected to protect you against electrocution or shock.
The first step before beginning any inspection or repair job is to turn the current off at the switch box and padlock the switch in the OFF position. This applies even on so-called low-voltage circuits.

Fig 2.1 **Tag out**

The switch or controls of the machine or equipment being locked out of service clarifies to everyone in the area which equipment or circuits are being inspected or repaired.

Only qualified electricians who have been trained in safe lockout procedures should maintain electrical equipment. No two of the locks used should match, and each key should fit just one lock. In addition, one individual lock and key should be issued to each maintenance worked authorized to lock out and tag the equipment. All employees who repair a given piece of equipment should lock out its switch with an individual lock. Only authorized workers should be permitted to remove it.

2.4 Flash Hazards

If you are familiar with electric arc welding, then you are aware that the small arc created by the welding equipment can generate enough heat to melt metal as well as generate enough UV rays to burn your skin.

In the case when electrical equipment fails causing an electrical arc, the energy released during the arcing can be many, many times greater than the welding arc and can cause severe flash burns. The burns fall into one of three categories:

- **First Degree**: the outer skin layer is damaged, it is painful, but since the growth areas are not damaged, the skin is quickly regrown and no scarring is left.
- **Second Degree**: the outer skin layer is severely damaged and blistering usually occurs. Healing is much longer as it occurs from the deeper sweat glands and hair follicle areas. Scarring is often the result.
- **Third Degree**: complete destruction of the skin and growth areas. If the burn is small healing may occur from the sides, however skin grafting is usually required.

Protecting Against Flash Hazard

Hard hats, safety glasses, gloves and work boots with electrical insulation rating give the worker protection during normal work, however in the event of circuit or switchgear failure resulting in a thermal arc being created, much greater protection is required.

The following is some general information on protecting against flash hazards. Be sure to **review the appropriate legislation and your company policies** before attempting to work near live electrical apparatus.

Flash Protection Clothing

Clothing can be made from many different materials. These materials have an **A**rc **T**hermal **P**erformance Exposure **V**alue (ATPV) associated with them which is defined as the amount of heat energy that the fabric will handle deflect or absorb. Some of these materials offer better protection against the heat caused from an arc than others.

Here are some examples

- Synthetic material like nylon, rayon or polyester should never be worn when working on or near energized electrical equipment because it is flammable and has a tendency to melt and stock to skin when exposed to high temperatures.
- Cotton blends with synthetic material should not be worn near electrical equipment for the same reasons.

- ❖ Pure cotton provides a minimum barrier to arc temperatures, but can ignite quickly. It does
  burn and fall away rather than stick to the skin.
- ❖ Materials like cotton or cotton blends treated with a flame retardant chemical provide a minimum level of flame resistance. Some chemical treatment degrades with repetitive laundering.

In general, all clothing including undergarments should be 100% cotton. Flame resistant clothing should then be worn over this when working on or near energized electrical equipment. When combined in layers, the fabrics gain significant rating from the air space between them, and multiple layers have much higher ratings than the sum of the individual ratings.

Safety Glasses

For normal work clear lenses are adequate, however for flash protection like that required for live work, troubleshooting, switching and applying or removing grounds, then flash rated eye protection is required. In some cases full face protection is required.

Occupational Hazards

Occupational hazards are very closely related with the occupational health. It occurs commonly because of negligence in safety. If the industrial organizations follow the standard safety measures that definitely lead to decrease in such kind of danger due to various types of hazards. Occupational hazards can be can be categorized as follows:

- ➢ Related to hygiene
- ➢ Related to tools and machine
- ➢ Related to flammables/explosives
- ➢ Related to the working at height
- ➢ Related to the noise
- ➢ Related to the electricity
- ➢ Related to the fire

Occupational Disease

Occupational disease in general caused by pathetic work or working condition. Sometimes the diseases develop due to repetitive work, weight lifting, biological and chemical related work, stress and other psychological disorder. Resulting different kind of occupational diseases developed are categorized as:

- ➢ Tennis elbow
- ➢ Allergy
- ➢ Hearing loss
- ➢ Asthma
- ➢ Lungs disease
- ➢ Lead poisoning

Self-Check -1	**Written Test**

Directions: ***For the Following Questions You are Given Four Alternatives then Choose the Correct Answer and circle***

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Note: Satisfactory rating 4 and above points Unsatisfactory below 4 points

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

- **Information Sheet 3- Checking testing devices & equipments**

3.1 Basic Testing Techniques

3.1.1 The Multimeter

Once you have determined the most probably cause of a fault, you must either prove it to be the problem or not. This can sometimes be done by careful inspection but in many cases the fault will be such that you cannot identify the problem component by observation and analysis alone.

Here, test instruments can be used to help narrow the problem area and identify the problem component.

General Meter Rules

There are many types of test instruments used for troubleshooting. Some are specialized instruments designed to measure various behaviors of specific Equipment. There are other types of test instruments such as multimeters which are more general in nature and can be used for most electrical measurement. A typical multimeter can measure AC and DC Voltages, Resistance and Current.

Before you use a meter to make a test you should know what the meter will read if the circuit is operating normally. You should make your prediction of the reading expected, based on the circuit schematic. If the reading is anything other than your predicted value, you know that this part of the circuit is being affected by
the fault.

You should always check the meter before using it to troubleshoot.

- For a voltmeter, test the meter on a known voltage source before using. Your meter should read the correct voltage.
- For an ohmmeter, touch the meter leads together. The display should read 0 ohms or very near this. With the leads apart it should read OL (infinity).

Meter Precautions

Here are some more Do's and Don'ts for using a meter.

- Be familiar with its features. Read the instruction manual before using.
- Ensure it is safe to use – no obvious damage to the meter or the meter leads.
- Be sure the test leads are in the correct sockets and the rotary switch is in the correct position for the desired measurement.
- Never measure resistance in a circuit when power is applied.
- Never apply more than the rated voltage between any input jack and ground.
- Keep your fingers behind the finger guards on the test probes when making measurements.
- To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator appears.

Testing Live vs. Dead

One of the first things you must decide is whether the circuit can be alive or must be dead while testing.

Performing certain tests while a circuit is alive can be very helpful. However, some companies have policies that ban (or restrict) testing live circuits while troubleshooting. Before doing any testing makes sure you check your company's policy. This module does contain certain techniques used to test a de-energized circuit. itting and adjusting machine components and attachments

Types of Faults

Faults can generally be categorized into either open circuits or short circuits. Open circuits occur when there is a break in the circuitry. This could be a broken wire, loose connection, burned out component, etc. Short circuits occur when two or more components, which should be isolated, come in contact with each other. For example, the insulation on wiring could decay and the conductors short together or short to ground.

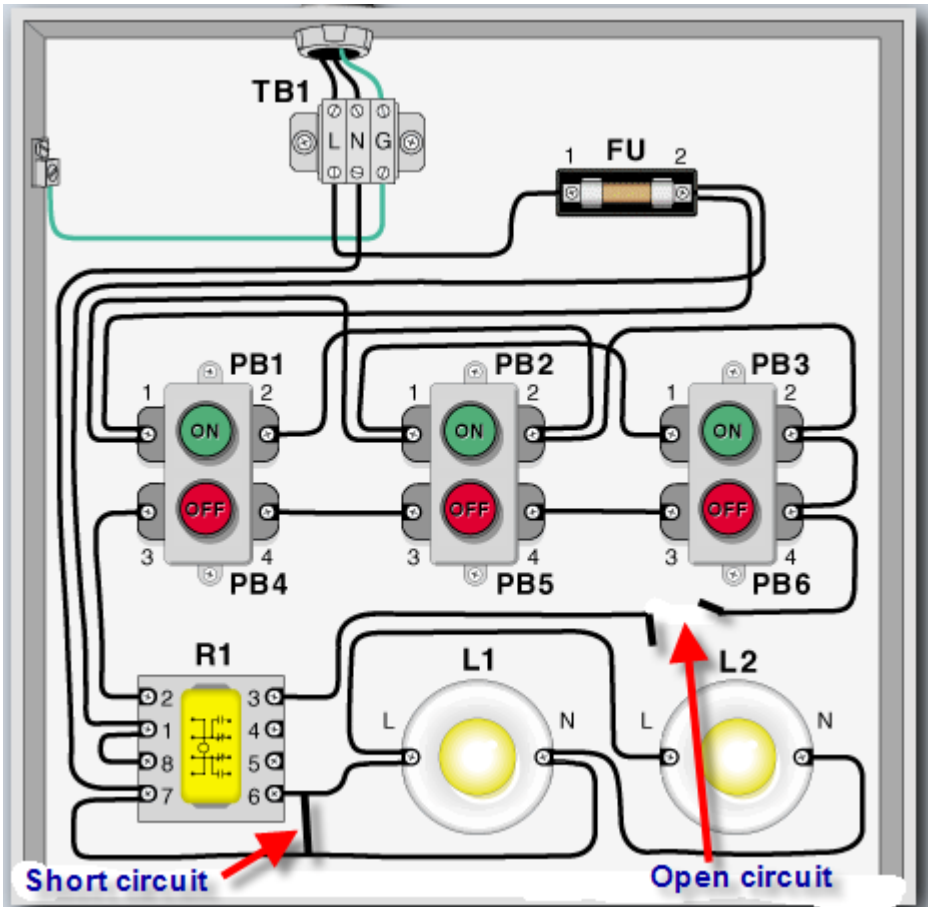


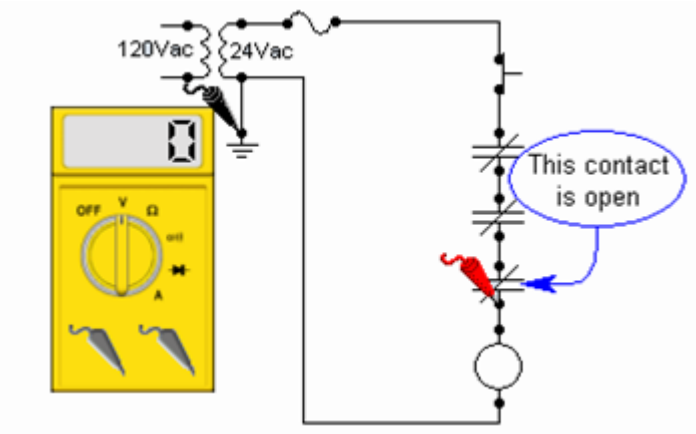
Fig3.1 Sectionalizing Circuits with Meters

Sometimes you will be faced with a problem that there are few useful observations and the problem area is a large portion of the circuit. It may not be feasible to begin testing all the components in the problem area. You should still start with the component you identified as the most probable cause. If this component is not the actual cause, the meter readings will provide you with information that reduces the size of the problem area and points you in the direction of the fault. This is called sectionalizing. The meter techniques described in this section use this concept in determining where to test.

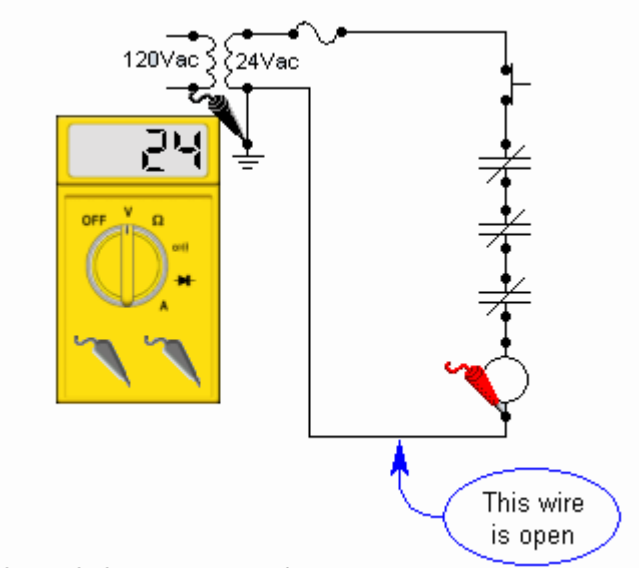
3.1.2 Using a Voltmeter

Voltmeters are the best tool to use for finding open circuits – if you can safely turn the power on. Once you know it is an open circuit and have determined the general area of the fault, get your voltmeter out and check that it is working on a known source.

Connect the negative lead to a known reference. The negative (neutral or ground if on AC) supply is preferable. Test through the affected circuit with your other lead, making sure all necessary switches are closed. The wire or device between the last point you test full voltage and the first place you don't get full voltage is where the open circuit is located.



Don’t forget about checking the neutral path. When you get full voltage at the positive terminal of a device that is supposed to be operating and isn’t, don’t stop! Carry on through the return path (Negative or neutral).



3.13 Using an Ohmmeter

When using an ohmmeter you must first shut off and lock out the power supply.
Using a connection wiring diagram, determine the location of the component which you feel is the most probable cause. Next disconnect a wire from the component which will eliminate possible parallel paths and then test for continuity. You should be careful to identify any wires you disconnect and be sure they are reconnected in the proper locations. When making your tests you should connect one meter lead to either side of the open point and then test across the component, or to ground.

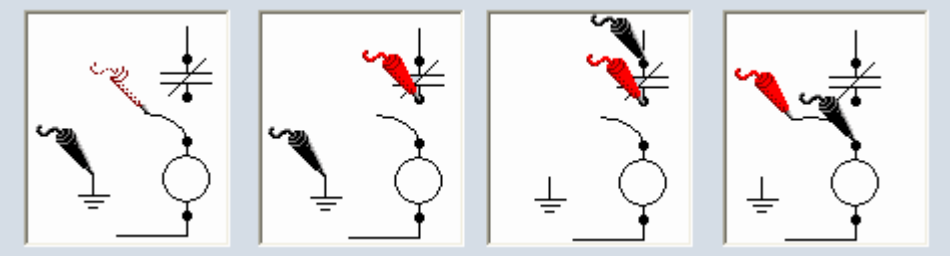
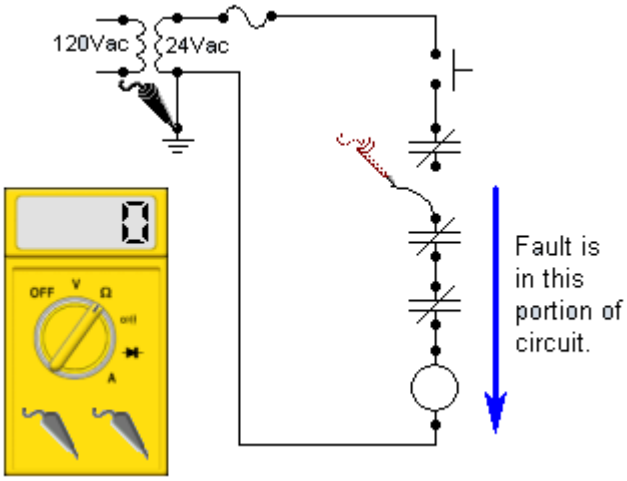


Fig-Some Ohmmeter Connection Options

Using an Ohmmeter to find Short Circuits

Short circuits allow voltages and currents to flow in the wrong parts of a circuit, which causes malfunctions. These tend to be easier to find with an ohmmeter. The most common type of short circuit is a short to ground.



To find this type of fault, first lock out the circuit. Next disconnect and remove a wire at the component you have identified as your most probable cause. Then connect one lead of the ohmmeter to a ground point and the other lead to the suspected component. If your meter reads very low, then the fault is below the open point. Otherwise the fault is above the open point.

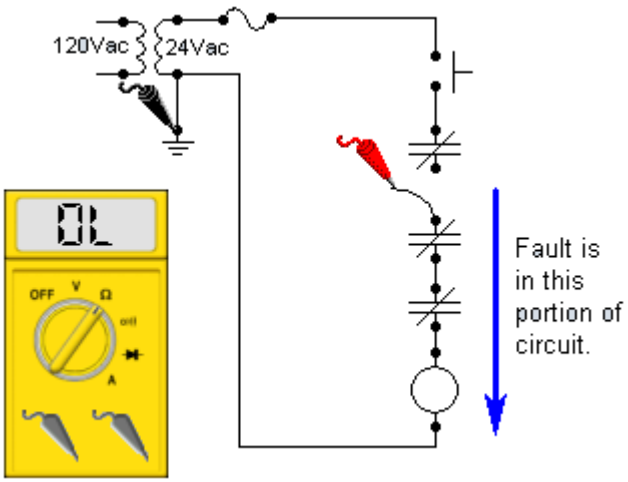
Reconnect the wire and disconnect another in the direction of the fault. Take the readings, Continue this process until the meter no longer sees the fault. The last component tested is therefore the cause of the fault.

Using an Ohmmeter to find Open Circuits

Sometimes you can't energize a device for testing even though the fault is an open circuit. Here, you have to use an ohmmeter.

To find this type of fault, first lock out the circuit. Next disconnect and remove a wire at the component you have identified as your most probable cause. Then connect one lead of the ohmmeter to a ground point and the other lead to the suspected component. If your meter reads infinity, then the fault is below the open point. Otherwise the fault is above the open

point.



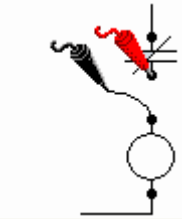
Reconnect the wire and disconnect another in the direction of the fault. Take the readings. Continue this process until the meter no longer sees the fault. The last component tested is therefore the cause of the fault.

3.1.4 Using an Ammeter

With an ammeter, you can measure the current flowing through a circuit. This can be very useful when your other test instruments (voltmeter and ohmmeter) are not appropriate. For example, measuring the current in each phase of a 3 phase motor can provide very important clues as the motor behavior.

There are two ways to use an ammeter.

The first way is to connect the meter leads into the appropriate sockets on the meter and then insert the meter into the circuit. To do this you must first lockout the circuit, disconnect a terminal where you want to test and then connect the leads between the terminal and the wire as shown. When using this method you must be sure that the current you are about to measure will not exceed the maximum value for the meter.



Another option for measuring current (AC current only) is to use a clamp-on probe instead of the meter leads. One end connects into the appropriate sockets on the meter and the other end consists of a spring operated circular clamp, which can be clamped around a wire. The clamp is really a small transformer that can sense the current flowing through the wire and send this information to the meter to be displayed.

This type of reading has the advantage that you do not need to disconnect any wires in the circuit. This type of ammeter is used in Smutch's troubleshooting simulators

Self-Check -3	**Written Test**

Directions: ***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 *(3 pt each)*

2, Troubleshooting is used in many fields such as engineering, system administration, electronics, automotive repair, and diagnostic medicine. *(3 pt each)*A, true B, false *(3 pt each)*

3, write basic steps of Troubleshooting.

Note: Satisfactory rating 4 and above points Unsatisfactory below 4 points

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

LG #6	LO #2: Prepare to install home/office electrical/electronic equipment

Instruction sheet

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

- Read and interprete drawings
- Check circuits/machines/plant
- Install components & accessories
- Termination
- Place and securing
- Sett functional controls

.Home/office electrical/electronics unit This guide 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:

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○ Information Sheet 1- Reading and interpreting drawings

1.1 Uninterrupted Power Supply (UPS)

UPS is an electronic device that continues to supply electric power to the load for certain periods of time during a loss of main power from electricity board or when the power fluctuates from normal limits.
The generic standard for UPS system defines the limits on the amplitude and duration of deviation of the output voltage acceptable for switching power supply loads.

To make a power supply uninterruptable, we need energy storing backup for the period of time in the form of battery, an AC-DC Charger, and AC-DC Inverter.

Types of UPS

1. **Stand By**
2. **Inline**
3. **Online**

Stand by UPS includes a transfer switch that switches the load to the battery /inverter, in case the primary AC Power source fails. The transfer time typically is 1-5 ms and the power to the load will be interrupted.

Inline UPS also called as line interactive UPS which under normal condition

smoothes and to some degree regulates the input AC voltage by a filter and a tap changing transformer.

The bidirectional inverter/charger is always connected to the output of the UPS and uses a portion of AC power to keep battery charged. When the power fails, the transfer switch from AC to Battery and provides output power.

Online UPS always delivers all or at least a portion of the output power through its inverter even under normal conditions. There are two types of online convertors 1) Double conversion and 2) Delta Conversion.

Double Conversion Online UPS is continuously processing the whole power through series connected AC-DC rectifier /charger and DC-AC inverter.

1. Delta Conversion UPS includes an additional “Delta Convertor” that delivers a portion of the output power directly to the load and provides the power .

Virus

By completing this you will be able to understand viruses and its threats

Virus and its threats

A virus is a computer program which can copy itself or infect the system without the knowledge of the user.

A virus can spread from one system to the other system, whenever a file with virus in an infected system is accessed from another system.

Some viruses may cause damage to the system by infecting the files, deleting the files, formatting the hard disk etc.

To protect the system from virus one should have knowledge of each program or a file they download into their computer. Since it is difficult, we can use anti-virus software which can help the system by protecting it from virus.

Tips and tools to prevent virus into the system

Keep anti-virus software up-to-date and make sure that it is working properly Scan the files

with anti-virus software before you download it from the Internet and execute it .

Be careful while exchanging the files between the systems through disks or through network .While using the disk make sure that it is write protected, so that it prevents from accidental deletion and changes made to the files on the disk.
While using Microsoft office make sure that macro virus protection option is enabled.

Note: A Macro virus is a computer virus that infects Microsoft word and similar application by inserting some undesirable text into the documents or by making some changes to the documents

Take backup of the files which you feel important .This will help you in recovering the file when it is completely affected by virus

Scan the system with anti-virus software daily and keep your operating system up to date with all the latest patches Some viruses start executing as soon as they appear on the Outlook Express preview pane. So disable that option

Beware of the latest virus threats which may help you in detecting them and take the appropriate action to avoi it

List of anti virus tools available for preventing virus in to the system are given below:

AVG free , Quick Heal, Avira Anti virus , Cleanwin Anti virus,cleaner4.2, AVG Internet security, Bit defender free edition, Bit defender anti virus 2008, Avast 4 Home edition, McAfee Avert Stinger

Tips to deal with a few common PC problems

1. **Problem: Computer does not Power up / start up**

Initial Steps:

Make sure that the PC's power cable is plugged firmly into a wall socket or power strip and that the power strip is on

Try plugging the PC or the power strip into another wall socket

Ensure that the power cable is firmly connected to the PC's power- supply outlet Check to see that the power supply is switched to the "on" position

Make sure that the power supply is switched to the voltage appropriate to your region

Attach a working power cable to the PC's power supply and plug it in Unplug all external devices from the PC -- including a CD drive or digital camera -- except the monitor. If the computer powers on without the devices, add the peripherals back in one at a time until you can identify the problem device Unplug all external devices from the PC -- including a CD drive or digital camera -- except the monitor. If the computer powers on without the devices, add the peripherals back in one at a time until you can identify the problem device.

If none of these steps solves the problem, check to see if your computer is still under warranty and send it back to the manufacturer. If the warranty has expired and you are comfortable doing so, proceed to the Advanced Steps below. Otherwise, talk to your volunteer consultant.

Advanced Steps

- Unplug the computer and open the PC's case. Verify that the power supply is connected to the motherboard Make sure that all internal cables are connected and that all of the PCI expansion cards and RAM chips are tightly seated
- Examine the motherboard for noticeable signs of damage, such as cracks or burns. If you see problems, there's a good chance you'll need a new motherboard or a new computer.
- Remove the RAM and PCI cards and unplug your hard drive(s). Depending on your drive, you'll see either a wide, flat, gray IDE cable; a thinner red Serial ATA (SATA) cable; or a round gray or black SCSI cable. Plug in the power cable. If the computer turns on, begin plugging in additional cables and modules until you identify the faulty component
- Replace your power supply with a known working one or a with new one. If none of these steps work, your motherboard or processor is likely fried. Consider taking it to a repair shop or replacing the computer altogether

Procedure to replace power Supply:

• Turn off your computer and all the peripherals (such as your monitor, printer, modem, and scanner).

• Unplug your PC and all the peripherals from their outlets. After that, unplug all peripherals from the back of the computer.

:

- computer case or panels to expose the interior of your PC. The power supply is enclosed in a metal box located in the corner of your computer case.

2. Problem: Computer Powers up/ starts off, but Monitor is blank. Initial Steps:

Ensure that your computer can boot normally and that all of the usual power lights are on Make sure that the monitor is plugged firmly into a working wall socket or power strip and that the power strip is on

- ✓ Try plugging the PC or power strip into another wall socket Verify that the monitor's power button is switched to the "on" position
- ✓ Make sure the monitor's brightness and contrast controls are properly adjusted (check your monitor's manual for information on how to do this) Check to see that the monitor cable is plugged firmly into the back of the display and that the pinned end is tightly screwed into the computer's video output on the back of the case
- ✓ Remove the existing cable and replace it with a known working monitor cable. Connect it to the display and to the computer
- ✓ Obtain a working monitor and hook it up to your PC. If this display works, contact a technician or buy a new monitor. If the monitor does not work, your video card may not be working and you'll need to open the desktop's case .If none of these steps solves the problem, check to see if your computer is still under warranty and find out how to send it back. If the warranty has expired, unplug the computer, open up the PC's case, and proceed to the Advanced Steps below.

Examine the video card for noticeable damage. If you spot defects or burnt components, you'll likely need a new video card

Reseat the video card.

Inspect the RAM and all drive cables to make sure they are all tightly seated and connected. If you find loose components or connections, tighten them.

If your display is still not working, contact a repair shop or consider replacing the

video card (or try swapping in a compatible card). To replace the card yourself.

3. **Problem: Computer won't Boot From Hard Drive (not able to get to Windows**

Splash Screen)?

Initial Steps:

Make sure that there is no bootable media in your floppy or CD drive

Listen to make sure your hard drive is spinning. If you don't hear or feel motion, or if you don't see an error message on the screen, proceed to the advanced steps given below:

Remove all external drives or devices and try restarting the computer

If you receive a series of beeps or error messages, write them down, as they could be instrumental in diagnosing your problem. Beep codes vary by manufacturer, so consult your BIOS documentation for more in-depth info on what those beeps mean. Otherwise, proceed as follows

Enter your computer's BIOS (access key varies by machine; usually you'll need to push the F1 or Delete key as the computer boots) and write down the current settings before proceeding further Keep an eye out for any built-in diagnostic tools; you might be able to find an error by using these.

If no diagnostic tools exist, go to the BIOS's hard drive section and make sure it's configured as "Auto."

If the BIOS has an auto detect feature, run it to make sure that it can actually detect your hard drive

- If your BIOS has an optimized default option, try loading it and rebooting
- If the BIOS has a failsafe default option, try loading it and rebooting
- Attempt to enter your PC in Safe Mode. (As your computer boots,
- quickly press the F8 key.) If you can get in, run Windows' built-in diagnostic tool to check your drive for bad sectors and file system errors .While still in Safe Mode, scan your computer for viruses, Trojans, spyware, and

other threats that could be causing problems/ If none of these steps solves the problem, check to see if your computer is still under warranty and find out how to send it back.

If the warranty has expired, unplug the computer, open up the PC's case, and proceed to the Advanced Steps.

Advanced Steps:

Make sure that the hard drive is firmly connected to both the power supply and the motherboard

Reseat the video card

Clear the CMOS by resetting the jumper on the motherboard. Before you do so, consult the motherboard or computer's documentation and be very careful while handling these components

If your computer has more than one stick of RAM, remove them all and try adding them back, starting with the slot closest to the processor. If the PC boots with one and not the other, you likely have a faulty stick of RAM

Make sure that the correct hard drive is set as the primary (master) drive and that the proper cable is connected. (See the back of the hard drive to set master and slave settings

Replace the hard drive cable(s) with known working ones.

Remove the PC's main power supply and replace it with a known working one.

If none of this works you may want to take the drive in for service or replace it altogether. If at all possible, back up your data first

4. **Problem: Windows won't Boot (After BIOS POST has been completed) or PC crashes. Initial Steps**

Make sure that there isn't a disk in your floppy or CD drive Remove external drives or devices

Enter the Windows Advanced Options menu by pressing the F8 key during the BIOS's Power-On Self Test (POST). Select the option for "Last Known Good Configuration." (Note: if this works, you will lose any recently installed software or newly created files.)

Enter the Windows Advanced Options menu, boot into Safe Mode with networking, and perform a system restore ,While in Safe Mode run your antivirus and anti-spyware programs. Remove any detected threats

If that fails, attempt to back up your data using back-up software, burn files to a CD, or consult a professional. You may eventually have to reformat your hard drive and reinstall Windows.

Advanced Steps:

Enter the Windows Advanced Options menu and choose the option that enables the bootlog.

Restart, then boot into Safe Mode to compare the new bootlog and the original one. If you get error messages that certain drivers aren't loading correctly, write those down, and update or remove the faulty devices via Windows' Device Manager. You can then reinstall the drivers manually or ask Windows to locate a driver for the device

Insert your Windows Emergency Startup disk or the original CD-ROM and go to the Recovery Console. From there, you can attempt to restore the master boot record, the first logical sector on your hard drive where the BIOS loads a program to boot your computer

5. **Problem: The PC does not boot, the power and HDD LED does not come on, and**

there is no display on monitor.

Check that your main power cable is plugged into the ATX power supply.

Make sure you have connected the ATX power connector to the motherboard.

Check if the cable for the power switch at front of the PC is connected to the correct

pins on the motherboard.

6. **Problem: The power LED comes on but the PC does not boot, there is no display on monitor.**

Check if the processor is firmly into the socket. Check CPU jumpers to verify if CPU frequency is correctly set.

6) Problem: The power LED comes on but the PC does not boot, there is no display on monitor.

Check if the processor is firmly into the socket. Check CPU jumpers to verify if CPU frequency is correctly set.

7) Problem: The PC does not boot, but is beeping.

Different BIOS manufacturers use various number of beeps to indicate faults with various hardware. In an Award BIOS motherboard you will get following kinds of beeps:

1 long 2 short: Graphics card is not securely into place, or faulty.

1 long 3 short: Graphics card is not securely into place, or faulty video memory.
Continuous beeps: No memory, or memory not securely into place, or could be faulty.
Continuous high/low beeps: No CPU, or CPU not securely into place, or could be faulty.

Please refer to your motherboard manual to confirm what the beeps are trying to tell you.

8) Problem: The PC boots but the CPU speed is incorrect.

The CPU frequency jumper setting is incorrect. Refer to your motherboard manual to set it correctly.

9) **Problem: The HDD is not being detected by the BIOS.**

Check if you connected the IDE cable to the motherboard correctly.

Check wether the pin 1 on the IDE cable connected to pin 1 on the IDE sockets on both motherboard connector and HDD connector.

check if the HDD jumper is set to master and any other device sharing the same cable

is set to slave.

10) Problem: Cannot access my CD/DVD-ROM in DOS mode, hence cannot install Windows.

This is because the CD/DVD-ROM device driver is not installed.

Install the manufacturer supplied device driver.

If you do not have a device driver disk, you can use the windows boot disk which will provide

Self-Check -2	**Written Test**

Directions: ***For the Following Questions write the correct answers***

1.Draw the general block diagram of ups (3 pt each)
2. Write the types of UPS? (3 pt each)
3.Mention a few pc problem? (3 pt each)

Note: Satisfactory rating 4 and above points Unsatisfactory below 4 points

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

○ Information Sheet2 - Checking circuits/machines/plant

2.1 Sound card trouble shooting

I. Making sure that you have a card and drivers for the installation

- ✓ First, be sure that you have a sound card installed on your system and have speakers or headphones connected to it.
- ✓ The sound card is usually a card in the back of your machine, although some newer machines have them installed on the motherboard.
- ✓ Check that the wire from your speakers or headphones is connected to the "Speaker Out" or " Spk Out" slot on the back of your machine.

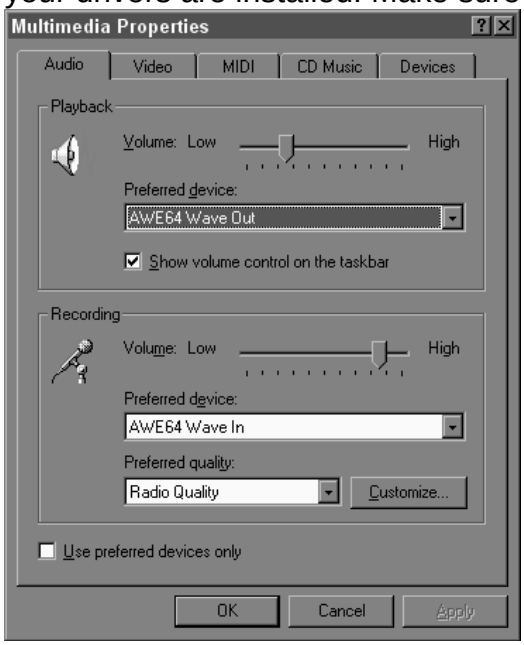
Once you have checked these connections and you know that you have a sound card and headphones or speakers, follow this guide:

Check that you have the drivers for the card installed:

1. In Windows 95/98/NT, go to "Start" - > "Settings" - > "Control Panel" and double click the "Multimedia" icon. This should bring up the "Multimedia Properties" box

2. On the Audio tab, you should see two areas: Playback and Recording. If these are greyed out and have "None" listed under preferred device for these sections, then your sound card drivers have not been installed

3. If you have a device listed here, such as "AWE64 Wave Out" or "Sound Blaster 16" then your drivers are installed. Make sure to check the "Show volume



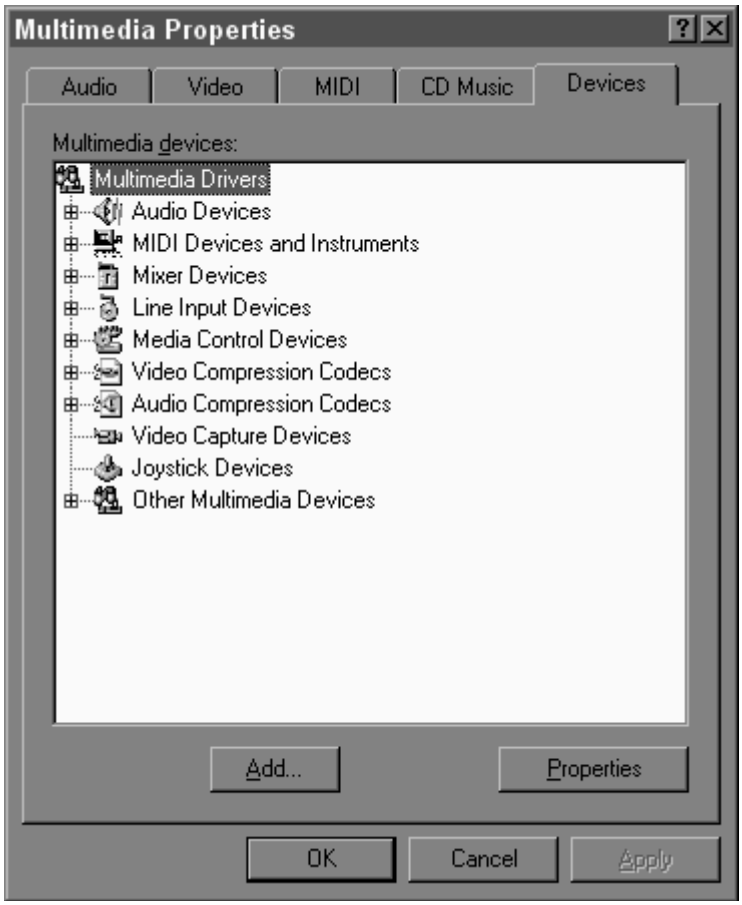
Control on the taskbar" option

If you do not have drivers installed.

1. Consult your sound card documentation or follow this basic guide on how to install drivers for your sound card.

2. You will need the disk or CDROM that was given to you along with your sound card initially

3. Switch to the "Devices" tab of the Multimedia Properties box



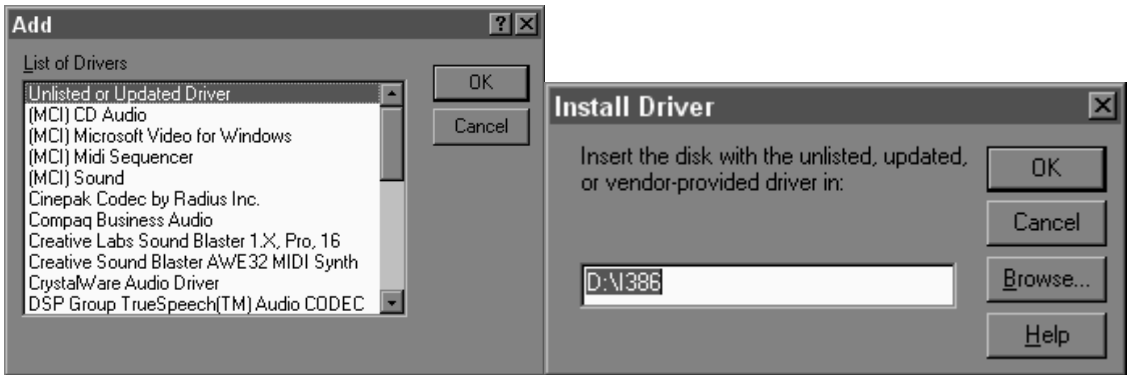
4. Click "Add."

5. Choose "Unlisted or Updated Driver" and click "OK."

6. Enter the path to the disk or CDROM that came with the Sound Card and hit "OK."

7. Select your card and click "OK"

8. Your machine may need to reboot



II. **Checking Sound Levels and Speaker Volume**

Once you know you have a card and drivers installed, check the volume and make sure it is at an audible level.

1. Go to the system Volume Control by double clicking the small speaker icon next to the "Time" field on the taskbar. If you do not have this icon, follow the instructions above on getting to the "Multimedia Properties" box and cli "Show volume control on the taskbar." (Actual Volume Control Options may vary slightly depending on your configuration.)
2. Make sure the "Play Control" or "Master “and the "Wave" controls are set to a high enough level and make sure that your speakers have the volume turned up high enough
3. If the sound level available from your card is too low, you may need to use headphones or amplified speakers. Before doing this you should ensure that both master volume and "wave" levels are set to their maximum, and not muted.
4. If you add speakers be sure the power supply is plugged in, and the power switch is on

Troubleshooting Video Card

• Resolving video card problems can be costly if you opt to replace the hardware when a problem does occur.

• Before you take such drastic measures, you should consider other solutions such as updating the driver. Here are some of the common problems that can arise from video cards and some suggested solutions.

Video Cards

There are several video-related components that are responsible for displaying the characters. The hardware components include: the monitor, video card (also referred to as the video adapter card), and the motherboard. Problems with any of these components can cause problems with your computer's display.

For a quick refresher, the video adapter card is a board that is plugged into your computer's system board and monitor to provide display capabilities.

There are many different types of video cards available on the market. However, most are susceptible to the same common types of problems.

A few common video card related problems along with the possible trouble shooting tips are discussed below:

One common problem that occurs is that the operating system, such as Windows XP, never appears. In other words, the computer starts up but nothing appears on the monitor.

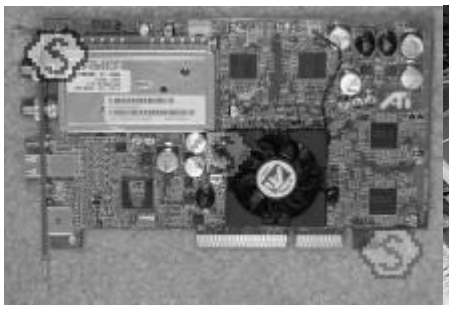
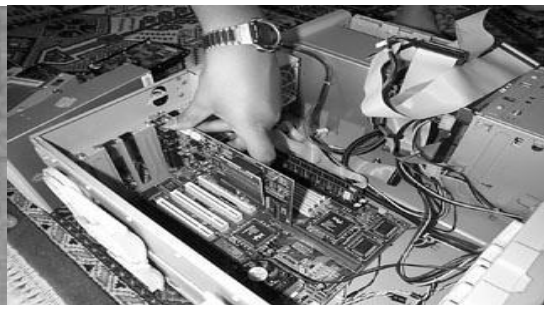
- Assuming that you have already ruled out the monitor as being the source of the

problem, your next step should be to take a look at the video card.

- This particular problem can be caused from several different things such as a video card that is not properly seated or a loose connection from the video card to the monitor.

❖ Troubleshooting this problem will require you to locate the video card inside your computer and verify the following:

- Assuming that the video card adapter is separate from the motherboard, you should check that the card is properly seated.
- Sometimes one end of the card may come out of the slot when it is initially screwed, resulting in no display appearing on the monitor.
- Verify the correct jumper settings for video cards that are mounted to the motherboard. This will require you to check the documentation that was sent with the hardware.

- The cable running from the monitor to the video port may also be the one of the reason for the problem.
- Examine the monitor cable to ensure that there are no broken or bent pins. A bent pin can usually be straightened using a pair of sharp-nosed pliers. In the case of a broken pin, you will need to contact the manufacturer of the monitor to determine if the cable can be replaced.
- Also check that the cable running from the monitor to the VGA port is secure. Although these may seem like simple trouble shooting steps, it is often the simple ones that people over looked.

Operating System does not appear

❖ If the contents of the start up process appear on the monitor but the display is blank after it is complete, this would indicate that there is an operating system video related problem.

- For example, an incorrect video driver may have been installed such as one that is not compatible with the operating system.

❖ Trouble shooting this problem in Windows XP

o. you will have to start the computer in Safe Mode by pressing [F8] when the Starting Windows message appears.

- From the boot menu select the Safe Mode option. This will force Windows XP to start using the standard VGA driver, instead of the video driver that is used when the operating system is started normally.
- Once the computer is started in Safe Mode, you can install the correct video driver using Device Manager. These steps are outlined in detail under the heading "Updating

Video Drivers" later in the article.

- The video problem discussed above can also be the result of over clocking. This is a popular method used to get more performance out of a hardware component such as a video card adapter. However, it can result in display problems.

The problem can once again be resolved by starting Windows XP is Safe Mode and configure the video card to operate at its default speed.

Poor Display

A poor display on a monitor can mean a number of different things like -

- Images may appear to be fuzzy

Text that appears on the screen may be distorted and difficult to read.

- The monitor may flicker.

A poor display can also lead to other problems such as headaches and sore eyes. Therefore, this is definitely a problem that you are going to want to correct as soon as possible.

A poor display can be caused by a number of different things. You should first verify that the latest driver for the video adapter has been installed. You can determine which driver version is currently installed in Windows XP by completing the steps outlined below:

1. Right click the Windows desktop and click Properties.
2. From the Display Properties dialog box, click the Settings tab.
3. Click the Advanced button.
4. Click the Adapters tab.
5. Click the Properties button under Adapter Type as shown below.
6. Click the Driver tab.

- Select the Properties button under Adapter Type to locate specific driver information including the driver version.
- You can find the version information beside the Driver Version field. Compare this version with the latest version on the manufacturer's Web site.
- If the driver needs to be updated complete steps four through seven listed under the section entitled "Updating Video Drivers".
- If the latest driver is installed, you may need to adjust the resolution and refresh rate (this is the rate at which the video card redraws the screen) for the video adapter card. Incorrect display settings can cause problems with your display.

Screen Resolution

• To configure display settings, right click the Windows XP desktop and click Properties to open the Display Properties dialog box.

• Select the Settings tab shown below to change the resolution settings. Use the slider under Screen resolution to adjust the settings. Typically, a 17inch monitor will have a default resolution of 800x600.

.

Self-Check -2	Written Test

Directions: ***For the Following Questions write the correct answers***

1.write the reasons why poor display occur in computer (4 pt each)

2.Mention a few sotware problem in computer? (3 pt each)

Note: Satisfactory rating 4 and above points Unsatisfactory below 4 points

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

LG #6 LO #2- Installing electronic system

Instruction sheet

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

- Reading and interpreting drawings
- Checking circuits/machines/plant
- Installing components & accessories
- Home/office electrical/electronics unit
- Termination
- Placing and securing
- Setting functional controls

This guide 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:

- Reade and interprete drawings
- Check circuits/machines/plant
- Install components & accessories
- Home/office electrical/electronics unit
- Termination
- Place and secure
- Sette functional controls

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”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

- **Information Sheet 1 Reading and interpreting drawings**
-

1.1 Basic Methods of Fault Diagnosis Documentation

In this section we will look at three basic methods used for diagnostic documentation.

These are:

a) Symptom charts

b) Algorithm charts

c) Functional charts

Structured Functional Block Diagrams

This form of diagnostic aid is based upon the use of block diagrams designed to describe the complete system or sub-system. Such diagrams show the logical interconnection and interaction between the various parts of the system. The various blocks on such diagrams represent identifiable functions and are called ‘functional blocks’.

By definition, a function is an activity to modify something; it is intrinsically complete and contains all necessary services. It acts on the logic flow-path which maybe:

• Feedstock

• Control signals

• Service supplies

This approach often uses a nested hierarchy of block diagrams (as shown in the following diagram) together with a set of accompanying test data sheets. The top level diagram describes the overall system with the selection of functions represented on the diagram sufficient to permit the fault to be isolated to within a single major functional breakdown of each

of the blocks on the following diagrams. This process is repeated until generally we are down to a particular printed circuit board, hydraulic valve etc. At this point the maintainer must be advised what to do.

INTRODUCTION

Fault diagnosis is the process of identifying and characterizing a fault when a failure occurs. It is, therefore, an essential step to take before product-repair. In this study, we ask how conventional users diagnose faults in household appliances and how the design of these appliances facilitates or hampers the process of fault diagnosis. To investigate this we qualitatively analyse the content of iFixit's online repair forum for three products: kitchen blenders, vacuum cleaners, and refrigerators. First, we develop a conceptual analysis framework based on the literature. Second, using conventional content analysis, we correlate facilitating and hampering features with the appliances' design. The process of fault diagnosis can be described by the subsequent actions of fault detection, fault location and fault isolation. Our results show that consumers detect faults by noticing five types of symptoms. Subsequently, two distinct diagnosis approaches can be distinguished. One follows a trial and error approach where the user performs diagnosis actions which usually result in replacing a potentially defective component until the symptoms disappear. The other occurs when the symptoms are error codes; the defective part can be more accurately identified, and the diagnosis is straightforward. The results also show that appliances are not designed to make fault diagnosis easy. Access to and visibility of components are often blocked, making fault isolation challenging. User manuals commonly lack relevant explanations, for instance when symptoms are different from error codes. Based on these findings, we propose a number of design recommendations to facilitate fault diagnosis for household appliance users.

2.2 Principles of Systematic Fault Diagnosis

Diagnosis of faults requires a logical and disciplined approach. Frequently, past experience or detailed knowledge will help. Also an intuitive approach can be used but must be accompanied by a deductive technique. Faults can be classified as:

Positive fault − sustained fault

Intermittent fault − irregular, harder to find

Tools for the Job

Your standard of work is related to the quality and completeness of the tools available to you. Traditionally this has been:

- ✓ Trade skill
- ✓ Knowledge of plant
- ✓ Problem solving ability

Today your ability to diagnose and repair faults largely depends on levels of documentation and test results.

Documentation

Documentation should be:

- ✓ Aimed at the level of the maintenance
- ✓ Structured in a standard format

Logical, precise and factual − no irrelevant material

Self-Check 1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Write classiications o ault diagnosis?(4pts)
2. Deine ault diagnosis?(4 pts)

○ Information Sheet2. Checking circuits/machines/plant

2.1 Replacing defective parts/components

Repair or replace

The decision to replace or repair an item must be made with a clear understanding of the relative values of each. The following points should be considered in a repair versus replacement decision:

• Whether replacement parts are available in a reasonable time frame and whether or not the part can be repaired in a reasonable manner and time.

• Whether the law allows or prohibits repair of a scheduled item by any other than the manufacturer or accredited person.

• Whether the repair can be guaranteed for a specific period.

• Repair will take less time than awaiting spares or vice-versa.

• The cost of replacement modules exceeds the gain from production in a fast changeover.

• The efficacy of the repair, that is, how long it may be expected to hold and its effect on efficiency of operation, particularly with makeshift-repairs and substitution of components.

• The loss of warranty.

• The general condition of the component, that is, is the system likely to fail in other places as a result of the repair. This is a part of the old adage “new wine in old wineskins”. If a unit or assembly is in a generally poor condition through age or misuse, the fitting of a new component or sub-assembly can increase strain on other parts.

In a like manner, consideration must be given to the effect of mixing new components with old, particularly if the new component has been upgraded.

Careful consideration should also be given to whether the failure of a component indicates the likely failure of similar components. Metal fatigue failure in one part of a casting, for example, may indicate the unsuitability of the whole casting.

The answer to the question posed depends on a number of local factors and can only be made on the spot for a given module, unit or item in a system.

Fault Condition Reporting

While repairs are under way it is sometimes necessary to hand over the work or the equipment to someone else. If this is to work efficiently you must be able to pass on all relevant information. This is also important to ensure the safety of all personnel while the system is not in its usual operating condition.

The steps involved are:

1. Document all changes to normal operational line-up either in the log or, if the system is in use, on forms supplied for this purpose. You should also make notes in your personal journal.

2. Set out work schedules in accordance with safe practices and nominated company procedures. This may require you to document all notifications given to relevant persons together with Authority to Carry Out Running Repairs, Work Permits, Clearance Certificates, Tags(Danger and Out of Service, etc.) Locks and Sentinels in operation or other applicable special precautions.

3. Highlight any special precautions or fallback procedures relating to operation of running equipment.

4. Prepare a concise report on the current status of the repair being undertaken including personnel involved, equipment or tooling obtained, equipment or tooling ordered or required, parts availability, strip-down status of the machine and estimated completion time.

5. Pass on findings in regard to component condition or potential weaknesses found during dismantling and other information necessary for the person taking over to make informed decisions.

6. Where practical, carry out a tour of inspection with the new person of the affected plant, pointing out areas of concern and activities under way.

7. Ensure they have understood you and have a clear picture of the situation and its implications.

Printer Mounting Direction

LG #7	LO #3- Installing electronic system

Instruction sheet

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

- Cleaning work site
- Completion of documentation
- Observing protocols in reporting procedure

This guide 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:

- Cleane work site
- Completion of documentation
- Observe protocols in reporting procedure

Learning Instructions:

- Read the specific objectives of this Learning Guide.
- Follow the instructions described below.
- Read the information written in the “Information Sheets”. Try to understa
- what are being discussed. Ask your trainer for assistance if you have hard time understanding them
- Accomplish the “Self-checks” which are placed following all information sheets.
- Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
- If you earned a satisfactory evaluation proceed to “Operation sheets
- Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
- If your performance is satisfactory proceed to the next learning guide,
- If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

○ Information Sheet 3. Completion of the installation work

Electronics Lab – Getting Started

Following are the basic stuff needed for setting up an electronics lab,

- A decent workbench
- A set of shelves/racks/peg boards/component organizer cabinets for quick access to devices & components
- Good lighting/power strips

- **What You Need In an Electronics Lab?**

David L. Jones has created a very good video in which he explains things you need in an electronics lab. In 30 minutes he lists everything that you need in a killer electronics lab (David calls it a "decent" lab!). In case you are too lazy to go through the video, I have summarized his list below. It is not easy to get the devices he has mentioned in India (ask your friends or get it via sites like shop your world). Check out David's video – How to setup an electronics lab,

- **Setting Up Your Electronics Lab**

Following is the list of recommended gadgets for your electronic lab. The approximate budget for the entire set is around $1200,

- 2 Multimeters to measure current/voltage at the same time (Extech EX330 and AM220). Extech has micro-amp range and temperature sensor. Get a thermo probe as well.
- Get a pocket multimeter and voltage detection probe (EX330 comes with non-contact voltage detection unit which lights up near mains)
- Digital oscilloscope (RIGOL – DS1052E)
- CRT analog oscilloscope, 20Mhz dual channel
- Function generator for creating signals (Instek GFG-8219A for analog or Wavetek model 22 or Instek SFG-1003 for digital)
- Power supplies (more than one is recommended, dual tracking fixed or variable supply, constant current setting, build one yourself – high power stuff is usually not needed)
- Soldering iron with soldering station (Hakko FX-888 or Hakko 936 with a variable temperature setting, use a chisel type tip for soldering iron)
- Hot air rework station (Atten 858D)

- Solder (standard 60/40 multicore, use thin solders with less than 0.5mm diameter. Solder spool stand and multicore solder wick is also recommended)
- De-soldering pump
- Flux pen
- Tweezers (get stainless antimagnetic ones, and get a set with varying tip shapes)
- Get a pair of goggles and fume exhauster or a simple desktop 12v fan for safety
- Magnifying glasses preferably head mounted (for example, to inspect solder joints). If you are getting magnifying lamps, get a 5 diopter one
- Assorted set of connectors
- Assorted set of side cutters
- Assorted set of pliers
- Get a decent combination wire stripper or use side cutters
- Small size spanner set and Allen key set
- Hot clue gun
- Assorted set of small files & and a nibbler
- X-Acto knife
- Engineering ruler and digital vernier calipers
- Assorted set of screw driver kits
- Magnetizer/demagnetizer for screwdriver and crimp terminal connectors
- Assorted set of clips (banana plug, alligator clip etc.)
- Tapes (duct tape, cello tape etc.)
- Assorted set of wires
- Standard double size breadboard with pre-shaped jumper wires
- Strip boards with strip board cutters
- Electronic cleaning solvent and air duster
- Electronic component kits (resistors, capacitors, LEDs, chips etc.)
- Anti-static work mat/ anti-static wrist strap

Pre-built Electronic Workbenches

If you have plenty of money, you can buy a pre-built electronic workbench. I found a couple of good ones on sale on Amazon. Some of these come with plug points and storage cabinets. These are probably overkill for hobby electronics.

Peg boards

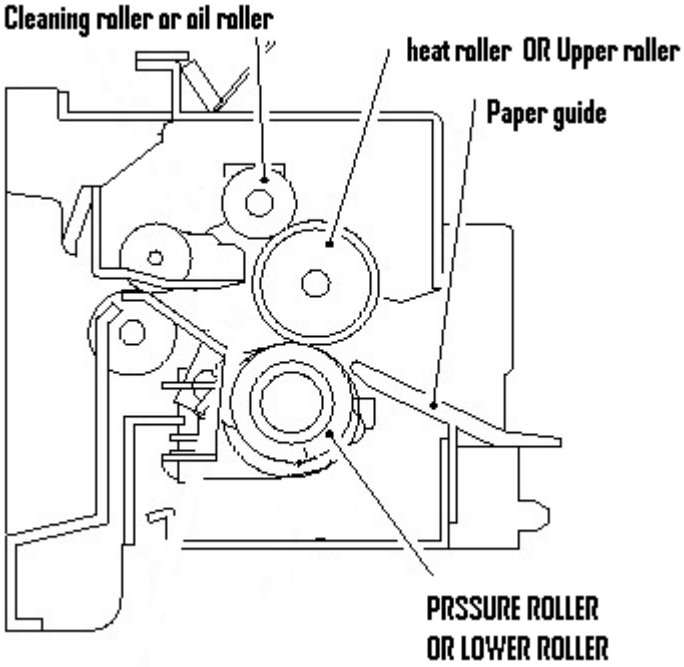
Peg boards are the best way to organize things like scissors, side cutters, pliers, spanners, screw drivers etc. The main advantage of peg boards is that all items are easily accessible and all of them are visible all the time. Here are some of the good ones I found on Amazon,

Storage Cabinets

There is a wide range of storage cabinets available for storing electronic components. You need a couple of them and proper labeling of drawers are essential to keep things organized. I like the range from Akro-Mills. Check out the various storage cabinets available

3.2 Copier assembling

Fixing Assembly



Fixing assembly prates

1) Heater lamp is used to realize the heat energy.

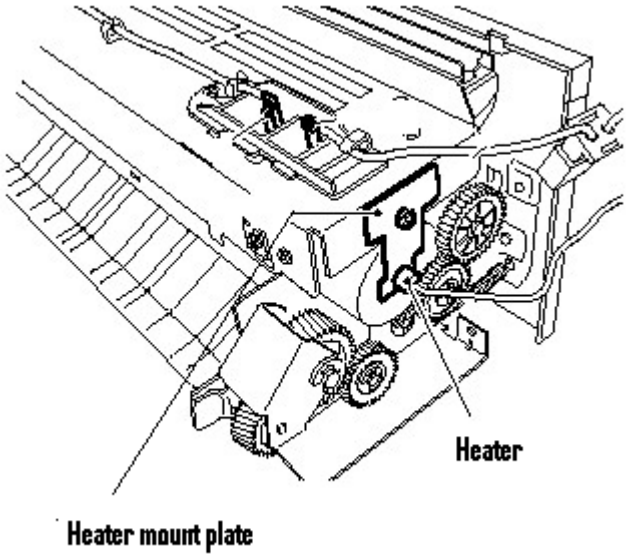
2) Thermal switch to protect over heating of heater lamp

3) Thermistor temperature sensitive resistor to supply temperature information to the microprocessor.

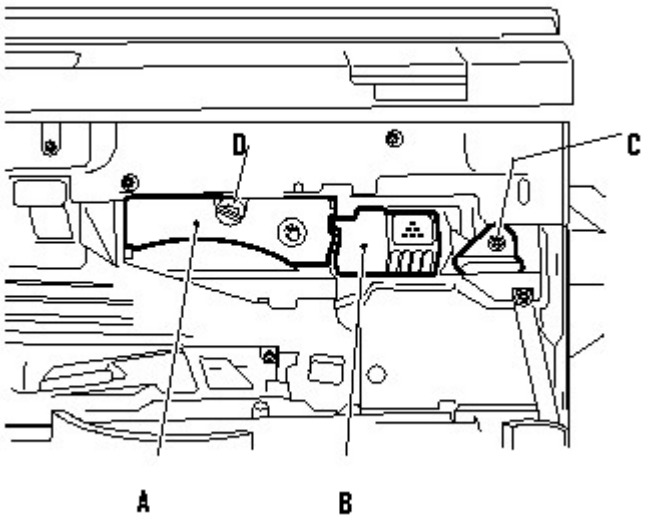
4) Paper guide used to guide the paper in proper position.

5) Delivery sensor to sense the normal excitation of paper.

The upper and lower rollers of the fixing assembly are driven by the main motor (M1).



Developing Assembly and Drum unit

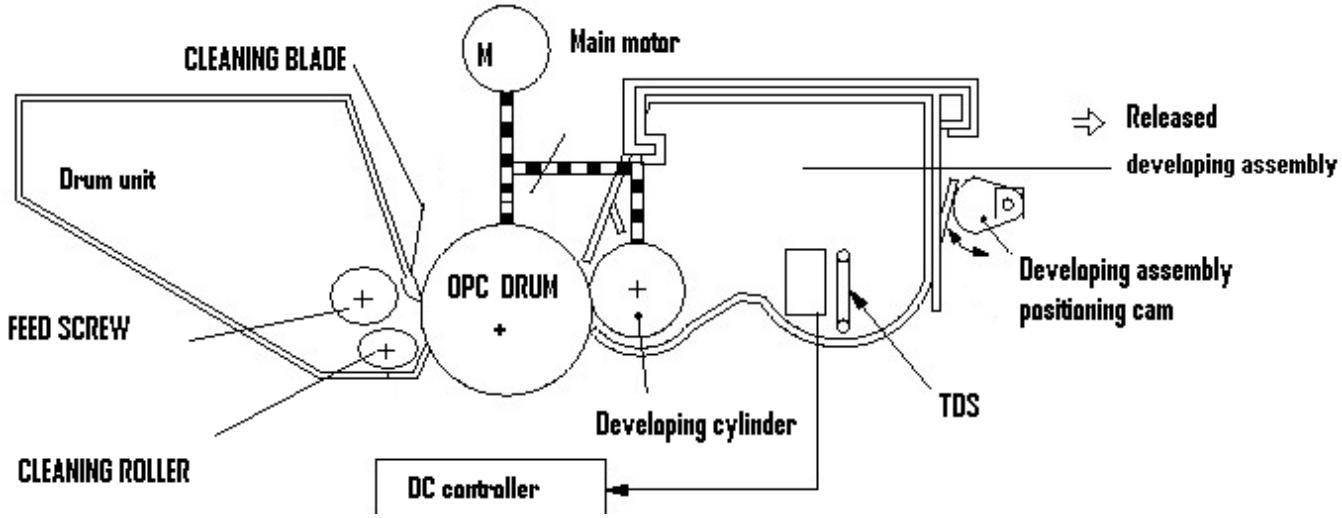


[A] Drum unit.

[B] Developing assembly.

[C] Developing assembly release lever.

[D] Screw



- **Developing Assembly: -** which contains the following main parts,

1) Toner: - A mixture of carbon and metallic oxide and other chemical gradients used for effective copy process.

2) **Developer or magnetic cylinder**: - used for uniform contact b/n the toner and OPC and charge the toner.

3) **Toner limiting blade**: - to limit the flow of toner.

4) **Mixer**: - for uniform toner distribution

5) TDA (toner density sensor):- to sense the amount of toner.

6) Bearings: - to ensure proper rotation of developer roller.

7) Copper connecters give good electrical connections.

- **Drum unit**

1) OPC drum: - Organic Photoconductor main parts copier for image formation system.

2) Primary charger corona wire: - used to charge the OPC positively or negatively, it is made from tungsten elements.

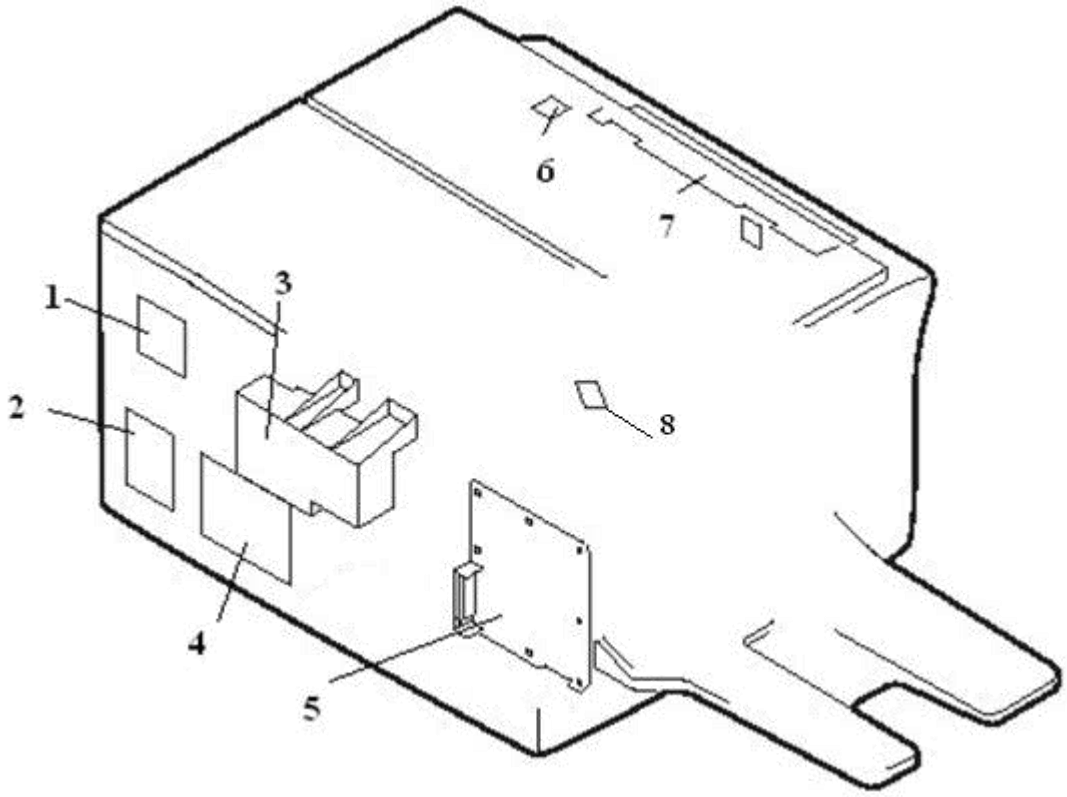
3) Primary corona wire cleaner: - used to clean the tungsten wire and protect from dust and rust.

4) Primary charger corona grid plate: - which ensure effective ionization of the air and protect the corona wire from mechanical damage.

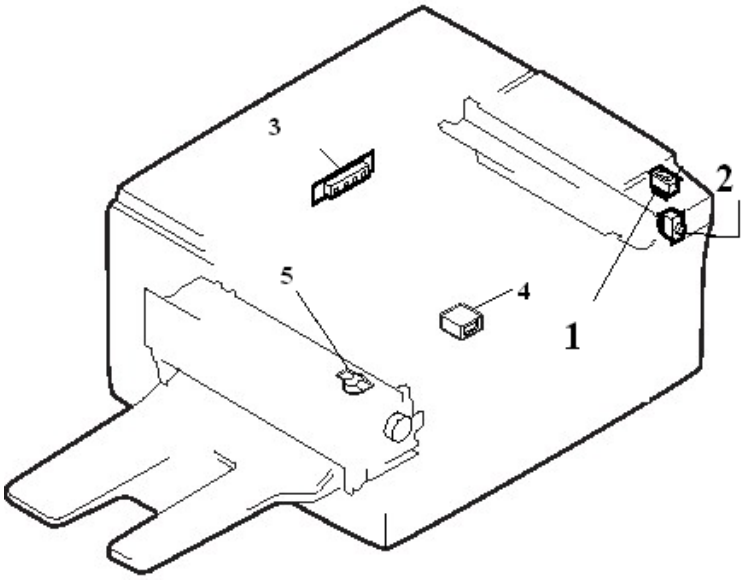
5) Cleaning blade: - which clean the toner from the drum mechanically.

6) Waste tank: - stores the waste toner which scraped from the drum.

7) Cleaning roller: - receive scraped toner from the cleaning blade then roll and give to the feeder screw. The feeder screw transport used toner to the empty spaces of the waste tank the toner accumulate there.



Name	***Function***	
1) Lamp regulator PCB	***Controlling scanning lamp voltage.***	
2) Noise filter PCB	***Preventing noise comes from the line.***	
3) High voltage transformer PCB	***Supplying high voltage for primary and transfer assemblies and developing bias.***	
4) Power supply assembly	***Powering the fixing roller heater and supplying DC power to the copier.***	



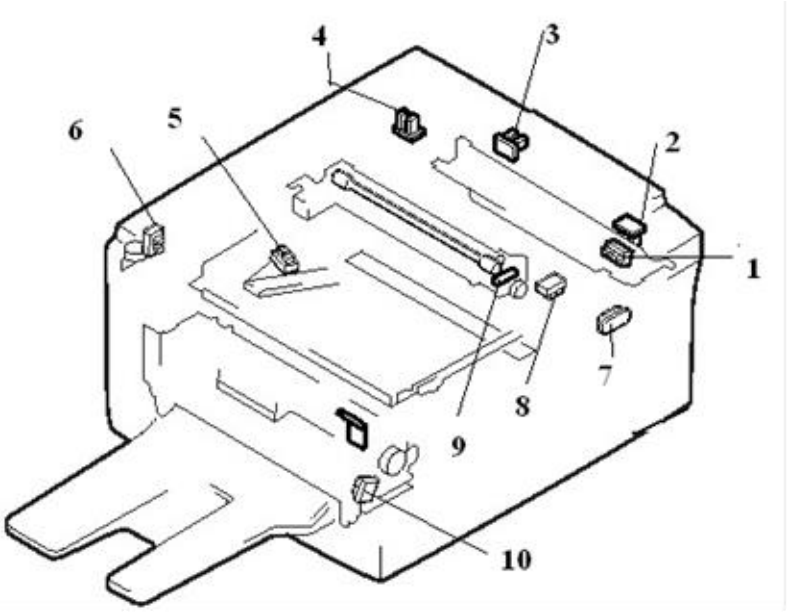
1Power switch
2.Front door switch
3.Cassette size sensor
4. Total counter
5. Thermal switch

Self check: 3	

Question 1

Symbol	Name	Function
	Switch	?
	Thermal switch	?
	Counter	?

QUASTION-2



1. ***Discuss and Write the name and purposes of each part listed above one up to teen and also identify the actual places in the copier.***

Operation sheet - 2	Cleaning printers

Purpose: This operation enumerates the proper procedure for Photo copy machine servicing by cleaning external part.

Equipment, Tools and Materials:

- ✓ Job Order Form
- ✓ Ballpen
- ✓ Faulty equipment
- ✓ Service Manual
- ✓ Appropriate Tools and devices
  - Multi-tester
  - Screw Driver
  - Pliers
  - Electrical Contact cleaner
  - Air-blower

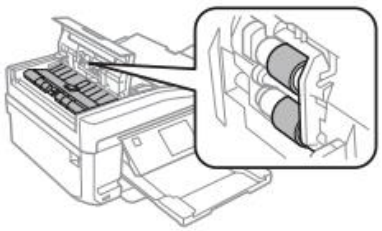
Conditions or Situations for the Operation:

- Consider that the event took place in an appliance service center/workshop.
- The Trainee is the service technician

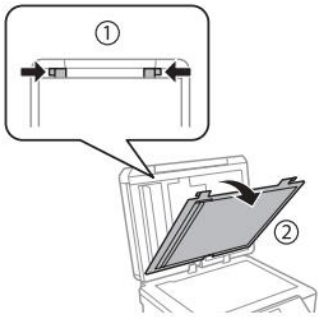
Procedure:

- ☐ Turn off the printer, then disconnect the power cord from the back of the printer.

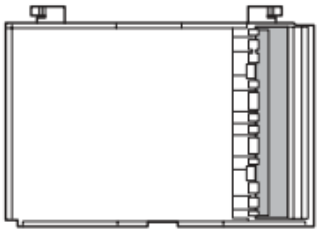
- ❑ If the glass surface is stained with grease or some other hard-to-remove material, use a small amount of glass cleaner and a soft cloth to remove it. Wipe off all remaining liquid.
- ❑ Open the ADF cover and use a soft, dry, clean cloth to clean the roller and the interior of the ADF (only for products with ADF function).



- ❑ Do not press the surface of the scanner glass with any force.
- ❑ Be careful not to scratch or damage the surface of the scanner glass, and do not use a hard or abrasive brush to clean it. A damaged glass surface can decrease the scan quality.
- ❑ Remove the document mat as shown in the illustration (only for products with ADF function).



- ❑ Use a soft, dry, clean cloth to clean the inside of the document mat (only for products with ADF function).



Precautions:

- ✓ Apply Kaizen/5's
- ✓ Use appropraite Safety rules

Quality Criteria:

- ✓ The trainee should be able to perform the following procedures accordingly

List of Reference Materials

1. Printer and Photocopier Troubleshooting and Repair Collection
2. ttps://www.researchgate.net/publication/257541214
3. Sustainable management of waste electrical and electronic equipment in Latin America
4. ELECTRICAL INSTALLATION MAINTENANCE 130 K to 12 – Technology and Livelihood Education
5. Managing electrical risks in the workplace

The trainers who developed the TTLM

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