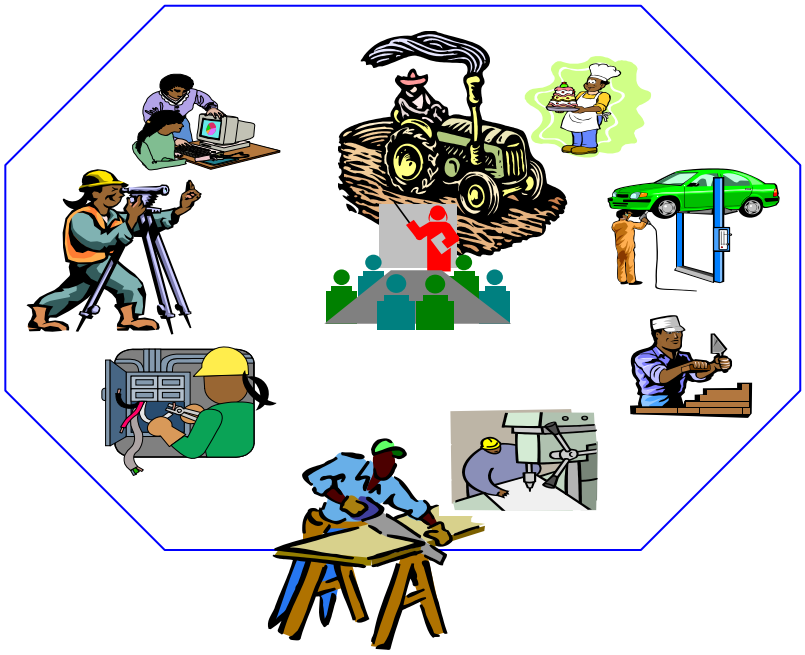
Intermediate Communication and Multimedia Equipment Servicing Level III

Based on May, 2011 V2 OS and Dec, 2020 V1 Curriculum



Module Title: Commissioning Communication and Multimedia Equipment

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L #26	LO #1- Prepare to commission electronics and communications systems

Instruction sheet

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

- Obtaining and understanding OHS procedures for a given work area.
- Following established OHS risk control measures and procedures.
- Noting and implementing Safety hazards that have not been previously identified
- Consulting appropriate personnel to ensure the work
- Identifying system operating parameters by reviewing system specifications and component technical data.
- Obtaining tools, equipment, applications, and testing devices
- Checking preparatory work to ensure no unnecessary damage has occurred and complies with requirements.
- Checking circuits as being isolated, where necessary

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:

- Obtaining and understanding OHS procedures for a given work area.
- Follow established OHS risk control measures and procedures.
- Not and implementing Safety hazards that have not been previously identified
- Consult appropriate personnel to ensure the work
- Identify system operating parameters by reviewing system specifications and component technical data.
- Obtain tools, equipment, applications, and testing devices
- Check preparatory work to ensure no unnecessary damage has occurred and complies with requirements.
- Check circuits as being isolated, where necessary

Learning Instructions:

Read the specific objectives of this Learning Guide.

1. Follow the instructions described below.
2. 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.
3. Accomplish the “Self-checks” which are placed following all information sheets.
4. 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).
5. If you earned a satisfactory evaluation proceed to “Operation sheets
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Information Sheet 1 Obtaining and understanding OHS procedures for a given work area

1.1 Obtaining and understanding OHS procedures for a given work area

A safe and healthy workplace does not happen by chance or guesswork. You have to think about what could go wrong at your workplace and what the consequences could be. Then you must do whatever you can (in other words, whatever is 'reasonably practicable') to eliminate or minimize health and safety risks arising from your business or undertaking

General OHS in Trouble shooting is Just as with ammeters, voltmeters require safety precautions to prevent injury to personnel and damage to the voltmeter or equipment.

The following is a list of the minimum safety precautions for using a voltmeter:

- Always connect voltmeters in parallel.
- Always start with the highest range of a voltmeter.
- Reenergize and discharge the circuit completely before connecting or disconnecting the voltmeter.
- In dc voltmeters, observe the proper circuit polarity to prevent damage to the meter.
- Never use a dc voltmeter to measure ac voltage.
- Observe the general safety precautions of electrical and electronic devices

The following safety precautions and operating procedures for ohmmeters are the minimum necessary to prevent injury and damage.

- Be certain that the circuit is De-energized and discharged before connecting an ohmmeter.
- Do not apply power to a circuit while measuring resistance.
- When you are finished using an ohmmeter, switch it to the OFF position if one is provided and remove the leads from the meter.
- Never touch the test leads while the handle is being cranked

As with other meters, the incorrect use of a multi-meter could cause injury or damage. The following safety precautions are the MINIMUM for using a multi-meter.

- De-energize and discharge the circuit completely before connecting or

- Disconnecting a multi-meter.
- Connect the multi-meter in series with the circuit for current measurements, and
- In parallel for voltage measurements.
- Circuits Observe proper dc polarity when measuring dc.

When you are finished with a multi-meter, switch it to the OFF position, if Available. If there is no OFF position, switch the multi-meter to the highest ac.

Self-Check1	Written Test

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

1. which one of the following is multi meter safety precautions (5pts)

   A. In parallel for voltage measurements
   B. In series for voltage measurements
   C. Switch the multi-meter to the lowest AC.
   D. Connect the multi-meter in parallel for current measurements

Note: Satisfactory rating -3 and above **Unsatisfactory - below 3points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 2 Following established OHS risk control measures and procedures

Established OHS risk control measures and procedures in preparation for the work are followed Check the equipment before you turn on for testing,

- Attention when using test instruments
- Inject proper amount of audio/video signal
- Proper handling of measuring device
- Use heat sink while soldering and disordering
- Disconnect battery when AC source is used
- Disconnect AC screw when DC battery is used,
- Impedance of speaker must be greater or equal to impedance of amplifier,
- Unplug AC supply during installation,
- Remove shorted speaker,
- Proper handling of electrician hand tools**.**

Accident: An unpleasant, unexpected, unforeseen or unintended happening sometimes resulting from negligence that results in injury, loss, damage, etc, and is caused by a mistake or machine failure or natural disaster. Accidents must be prevented by precautions and safety measures and safety management.

Safety: a quality or condition of being safe from 'danger, injury, damage, loss, accident'.

Safety devices: Devices which ensure safety against injury or loss, e.g. safety glasses, safety ear-thing, etc.

Security: State of sense or safety protection or defense against attack, interference etc

Precaution: Care or measure taken beforehand against possible danger.

Caution: A word or sign by which warning is given.

Training must be provided to maintain competencies and to ensure new workers are capable of working safely

Control measures are more effective where there is regular review of work procedures and consultation with your workers and their representatives.

If maintenance processes reveal new hazards, or existing hazards that are not being addressed, you will need to perform a review of your control measures

Control measures need regular monitoring and maintenance to ensure they remain effective. You should decide what is required when you implement the control and establish a schedule for routine checks and maintenance appropriate to the controls

- Save time
- Increase quality
- Decrease accident
- Save labor
- To carryout effective maintenance

Appropriate areas to organize materials under maintenance/ troubleshooting Free from oils and inflammable materials Appropriate personal protective Equipment's (PPE)

Self-Check2	Written Test

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

1. One of the following is the advantages of OHS before maintenance work(5pts)

A. Increase accident

B. Save time

C. Decrease quality

Note: Satisfactory rating -3 and above **Unsatisfactory – below 3 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 3 Noting and implementing Safety hazards that have not been previously identified

Safety hazards that have not previously been identified are noted and established risk control measures are implemented

For effective implementation, organizations should develop the capabilities and support mechanisms necessary to achieve the safety and health policy, objectives and targets. All technical should be motivated and empowered to work safely and to protect their long-term health, not simply to avoid accidents. These arrangements should be:

- underpinned by effective staff involvement and participation through appropriate consultation, the use of the safety committee where it exists and the safety representation system and,
- Sustained by effective communication and the promotion of competence, which allows all employees and their representatives to make a responsible and informed contribution to the safety and health effort.

There should be a planned and systematic approach to implementing the safety and health policy through an effective safety and health management system. The aim is to minimize risks. Risk Assessment methods should be used to determine priorities and set objectives for eliminating hazards and reducing risks. Wherever possible, risks should be eliminated through the selection and design of facilities, equipment and processes. If risks cannot be eliminated, they should be minimized by the use of physical controls and safe systems of work or, as a last resort, through the provision of PPE. Performance standards should be established and used for measuring achievement. Specific actions to promote a positive safety and health culture should be identified. There should be a shared common understanding of the organization's vision, values and beliefs on health and safety

Self-Check3	Written Test

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

Directions: write short answer: (5 pts in each)

1. What are the techniques for Preventing Safety hazards?
2. Write the steps followed during establish Safety hazards of equipment.

Note: Satisfactory rating -10 and above **Unsatisfactory – below 10 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 4 Consulting appropriate personnel to ensure the work

Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site.

Consultation is a two-way process between you and your workers where you talk to each other about health and safety matters listen to their concerns and raise your concerns seek and share views and information, and consider what your workers say before you make decisions. In the work place successful frontline manager needs communication skills to ensure their message is understand and interprets in the way it was intended our aims at effective work place is to build effective work place relations to serve the needs of our clients businesses. Effective work place relations don't just happen, like all good relationship, good work place relations must be developed and maintained.

Contributing to work group activities may overlap with others general lists or special lists public sector work activities such as:-

- Acting ethically
- Complying with legislation
- Working effectively
- Working with diversity
- Assisting with specific technical supports
- Undertaking basic procurement
- Working safely

Elements performance criteria of work group activities

- Establish work group parameters, role & responsibility
- Participating in the work group
- Assisting /assist/ work group members

Self-Check4	Written Test

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

1, Write the elements performance criteria of work group activities (5pts)

Note: Satisfactory rating -3 and above Unsatisfactory – below 3 points

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 5 Identifying system operating parameters by reviewing system specifications and component technical data.

System operating parameters are identified by reviewing system specifications and component technical data.

Specific Objectives of identify system specifications and component technical data

- To understand reading of schematic diagram
- To develop skill, knowledge and attitude about component
- To increase the skill of circuit design by using different soft ware
- To progress manufacturing sector especially small enterprise.
- To identify the basic components for the system
- To simulate the overall designed circuit in protest software.
- To implement the simulated result.

The definition of system requirements begins with the user who can represent many points of view and impose numerous constraints on the system. The job of the systems analyst is to make sure all points of view are included and constraints considered in defining requirements. There are also categories of requirement that must be identified. Users have a set of functions or capabilities that they want, but they also want certain levels of performance from the system. In addition, the analyst must consider how requirements can be validated, whether functions are to be defined in phases, and how to merge the different input into a coherent, testable statement of system requirements. The following sections address these issues and provide a framework for assessing the completeness of an approach for identifying and specifying system requirements

Use test instrument required to job according user manual

- Safety (work safety requirements and economy of material with durability)
- Knowledge in application and observation of required procedure
- Reading and interpreting electronics schematic symbol and symbol diagram
- Explain /identify defects and fault procedure

Check and isolate using specified testing circuit procedure materials, tools /instruments and equipment uses and specification

- Identification of hand and power tools
- Prepare care and use of tools
- Identification use of test & measuring instruments
- proper care use of test measuring instruments
- analysis of trouble and isolation techniques

Self-Check 5	Written Test

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

write short answer(5 pts)

1, write the Specific Objectives of identify system specifications and component technical data

Note: Satisfactory rating 5 and above **Unsatisfactory 5 below**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 6 Obtaining tools, equipment, applications, and testing devices

Test equipment is necessary for determining proper set-up, adjustment, operation, and maintenance of electrical systems and control panels. Tools are used by every shop in Facilities Management. The misuse of hand tools in industry is the cause of about seven to eight percent of all compensable injuries each component.

Preparing procedures are: selecting appropriate tools, consumable materials and measuring instruments. It needs attention in selecting tools and materials in which all tools and materials must be applied what application they are designed

Fig6.1Soldering Iron

Fig 6.2Soldering Iron Stand

Testing and commissioning is to be carried out on installations to ensure that they are safe and meet the design requirements.

The following items are used for basic measurement of voltages, currents, and components

in the circuit under test

MULTIMETER

The multi meter measures multiple electrical properties, including voltage, current, resistance and DC voltage and current. Multi meters are available as analog or digital devices and the newer ones feature some sophisticated bells and whistles such as Bluetooth and thermal imaging cameras

fig 6.3 digital multi meter

VOLTAGE TESTER

It's crucial to know when a wire or device is 'live' as if you work on wire while live, there can be dangerous consequences. Used for a quick safety check to ensure there is no voltage in an electrical wire or device, voltage testers are an absolute must. If you can, grab a non-contact voltage tester. These can detect electricity without touching the wire or outlet.

WIRE STRIPPERS

With a variety of holes to ensure you can work with different sizes of wire, strippers are used to cut and strip insulation from electrical wire. The handle should always be comfortable to hold and easy to grip. Some strippers will even include cutting teeth so you can trim the wire ends at the same time.

CIRCUIT FINDER

It's not always easy to find the circuit directory in every single home and at times, when present, the service panel is very rarely matched with the complementary breaker. Thank goodness for circuit finders – simply plug the transmitter into the outlet and the detector will figure out where the matching directory is. Circuit finders are also handy to simply trace a circuit.

SCREWDRIVERS AND NUT DRIVERS SPECIFIC TO ELECTRICIANS

They may not seem like trade-specific tools and indeed, they're not. In fact, most people around the world will have some form of screw or nut driver in their own personal toolbox. However, there are some screw and nut drivers that have been manufactured specifically for electrical work.

Fig 6.4 Screw drivers

Failing the specific drivers, ensure you always shave Philips head and flathead screwdrivers with you at all times. Whether it's removing and installing cover plates, outlets, switches or other devices, they'll always come in handy. Ensure you have a range of sizes as well.

PLIERS

A good pair of pliers is a must-have for any and every electrician. Handles should be easy and comfortable to grip and should open and close smoothly. It's also a good idea to have several sizes to accommodation different jobs. Besides from the traditional pair of pliers, there are others that will most definitely come in handy.

Side-cutting and diagonal cutting – used to cut wires to specific lengths.

Needle-nose or long nose – with thin, grasping ends, these pliers make it easier to reach small space

Self-Check 6	Written Test

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

Directions: write short answer: (5 pts)

1. Describe the equipment that used for basic measurement of voltages, currents, and components in the circuit under test.

Note: Satisfactory rating 5 and above Unsatisfactory below 5points

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 7 Checking preparatory work to ensure no unnecessary damage has occurred and complies with requirements

Preparatory work is checked to ensure no unnecessary damage has occurred and complies with requirements. Many problems have simple solutions. Don't immediately assume that your problem is some combination of complex or complicated failures. For a TV, it may just be a bad connection or blown fuse. Remember that the problems with the most appalling impact on operation like a dead TV usually have the simplest solutions.

The kind of problems we would like to avoid at all costs is the ones that are intermittent or difficult to reproduce: Sometimes, just letting the problem bounce around in your head will lead to a different more successful approach or solution.

- Don't work when you are really tired - it is both dangerous (especially with respect to TVs) and mostly non-productive (or possibly destructive).
- Whenever working on precision equipment, make copious notes and diagrams. You will be eternally grateful when the time comes to reassemble the unit. Most connectors are keyed against incorrect interchange of cables, but not always.
- Apparently identical screws may be of differing lengths or have slightly different thread types. .

  The best location will also be relatively dust free and allow you to suspend your troubleshooting to eat or sleep or think without having to pile everything into a cardboard box for storage.
- Another consideration is ESD - Electro-Static Discharge. Some components (like ICs) in a TV are vulnerable to ESD. There is no need to go overboard but taking reasonable precautions such as getting into the habit of touching a safe ground point first.

- WARNING: even with an isolation transformer, a live chassis should not be considered a safe ground point. When the set is unplugged, the tuner shield or other signal ground points should be safe and effective.
- A basic set of precision hand tools will be all you need to disassemble a TV and perform most adjustments. These do not need to be really expensive but poor quality tools are worse than useless and can cause damage. Needed tools include a selection of Philips and straight blade screwdrivers, socket drivers, needle nose pliers, wire cutters, tweezers, and dental picks For adjustments, a miniature (1/16" blade) screwdriver with a non-metallic tip is desirable both to prevent the presence of metal from altering the electrical properties of the circuit and to minimize the possibility of shorting something from accidental contact with the circuitry. A set of plastic alignment tools will be useful for making adjustments to coils and RF transformers.
- A low power (e.g., 25 W) fine tip soldering iron and fine rosin core solder will be needed if you should need to disconnect any soldered wires (on purpose or by accident) or replace soldered components. A higher power iron or small soldering gun will be needed for dealing with larger components.
- **CAUTION:** You can easily turn a simple repair (e.g., bad solder connections) into an expensive mess if you use inappropriate soldering equipment and/or lack the soldering skills to go along with it. If in doubt, find someone else to do the soldering or at least practice, soldering and disordering on a junk circuit board first! See the document: Troubleshooting and Repair of Electronic Equipment for additional information on soldering and rework techniques.
- For thermal or warm-up problems, a can of 'cold spray' or 'circuit chiller' (they are the same) and a heat gun or blow dryer come in handy to identify components whose characteristics may be drifting with temperature.
- Cleaning of unit is performed in accordance with standard procedures

Self-Check 7	Written Test

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

Directions: Write short answer -(5 pts)

1. Write the Troubleshooting and Repair of Electronic Equipment

Note: Satisfactory rating -5 and above **Unsatisfactory – below 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 8 Checking circuits as being isolated, where necessary

Circuits are checked as being isolated, where necessary, in strict accordance OHS requirements and procedures.

All electrical installations have an isolation means at least at the consumption metering point. Isolation has the purpose of protecting against electrical hazards electric shock, burn and ballistics - the effects of bend flash. The isolation should remain safe so as to prevent a reconnection of the electrical supply Isolate the voltage All line, unbiased, and protective conductors should be tested to prove they are dead. Electricians who regularly work on installations that have been energized should be equipped with devices for proving that conductors are dead

Measure of the separation of signal levels on adjacent ports of a Circulator is called as Isolation. It is measured in dB. The greater the isolation value lesser will be the interference from a signal on one port relative to an adjacent port.

To isolate a circuit, you need to terminate the flow of electricity through it.

- Decide whether you want to isolate a complete circuit or a particular electrical appliance.
- Flip the trip switch or remove a fuse in your fuse box by hand if you want to completely isolate a circuit such as the lights or wall sockets
- Identify correct isolation point or device.
- Check condition of voltage indicating device, such as a test lamp or two-pole voltage detector.
- Switch off installation/circuit to be isolated.
- Verify with voltage indicating device that no voltage is present

Electricians who regularly work on installations that have been energized should be equipped with devices for proving that conductors are dead

Basic rules for circuit safe However, e very isolation procedure should include the following basic steps:

- Shut the plant down.
- Identify all energy sources and other hazards.
- Identify all isolation points.
- Isolate all energy sources.
- De-energies all stored energies.
- Locking out all isolation points.
- Tagging.
- Testing isolation procedure

Safe isolation has long been a procedure carried out by a competent person in order to safely isolate electrical circuits or equipment before electrical work is undertaken. Energized the supply to the distribution board before the circuits connected to it were complete, to provide a supply to a socket-outlet

- Safety is a state of mind.
- Always think when using a tool:
- good condition sized right for the job the proper working condition
- Every tool was designed to do a certain job.
- Use it for its intended purpose.
- Use tool holders.
- Do not force tools beyond their capacity or use "cheaters" to increase their capacity.
- safe your work in a vise whenever possible. Never hold small work in your hand when using a screwdriver.
- Screw drivers or other pointed tools should never be carried in clothing pockets. Use tool belts designed for carrying tools.
- Should not have broken claws or handles. Check for loose handles. Always use proper size and weight for the job.
- Cutting tools should be kept sharp to ensure good smooth cutting. Always use proper handles.

- Screwdriver points should not be badly worn and handles should be in good condition. Use the proper size and type of screwdriver for the job.
- Wrenches, if adjustable, must work freely and adjust properly. Always use the proper size for the job.
- Always wear the PPE required for the job. Protect your eyes, hands, ears and other body parts. Keep clothing out of your work.
- Identify correct isolation point or device. For all work on low voltage electrical equipment or circuits, it is important to ensure that the correct point of isolation is identified. When isolating the main source of energy, it is also essential to isolate any secondary source (such as standby generators, uninterruptable power supplies and micro generators).
- Check condition of voltage indicating device —such as a test lamp or two-pole voltage detector.
- Switch off installation/circuit to be isolated. It should never be assumed that equipment is dead because a particular isolation device has been placed in the OFF position.
- Verify with voltage indicating device that no voltage is present.It is important to ensure that the correct point of isolation is identified before proving dead. Adequate precautions should be taken to prevent electrical equipment which has been made dead, is carried out on or near that equipment, from becoming electrically charged during that work.

Re-confirm that voltage indicating device functions correctly on proving unit. Use proving unit to confirm that the voltage on the indicating device is functioning correctly. The following are used for stimulus of the circuit under test.

- Power supplies
- Signal generator

- Digital pattern generator
- Pulse generator
- Oscilloscope (Displays voltage as it changes over time)
- Frequency counter (Measures frequency) And connecting it all together:
- Test probes

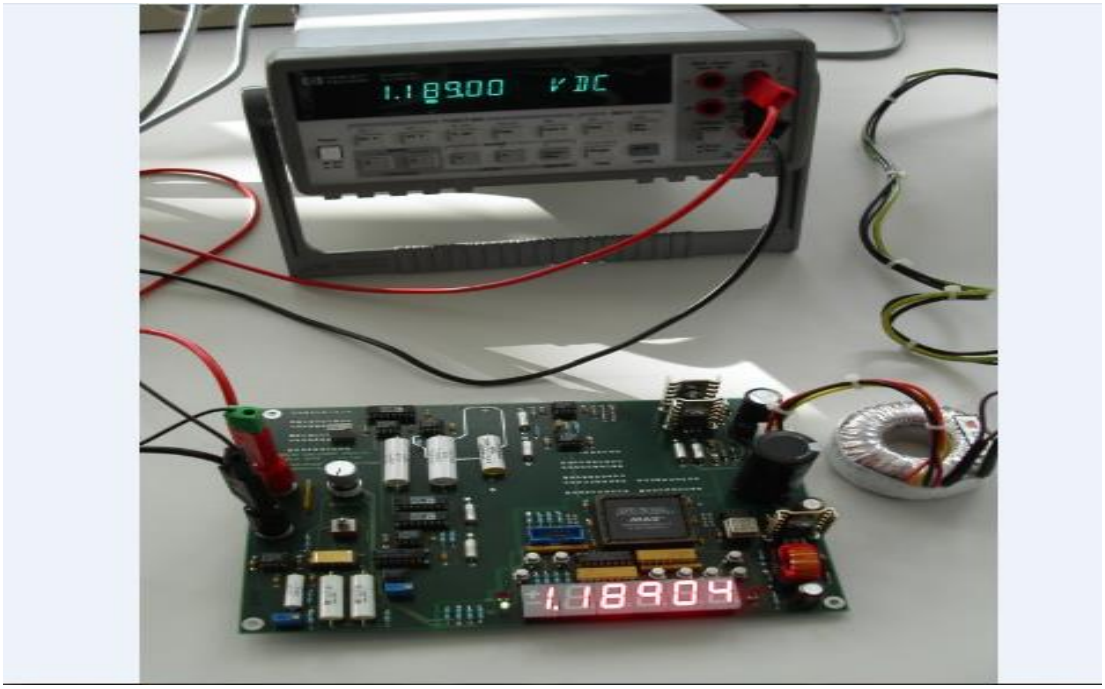

Fig 8.1Oscilloscope measuring circuit voltage

Self-Check 8	Written Test

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

Directions: Write short answer: (10pts)

1. Write the basic rules for circuit safety

Note: Satisfactory rating -5 and above **Unsatisfactory – below 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Operation Sheet 1	**Obtaining and checking tools, equipment and testing devices**

1.identify the required electrician hand tools and test measurement

PROCEDURE:-

Step 1: Follow safety procedure and rule

Step 2: Select the appropriate tool

Step 3: Identify the appropriate tools

Step 4: Write their function of each selected tools and measurement

PRECAUTIONS:-

You should not forget to wear your PPEs.

QUALITY CRITERIA:

- **Did the learner wear PPE?**
- **Did the learner identify required material?**

Operation Sheet 2	Checking circuits as being isolated, where necessary

1. Check circuits correctly

PROCEDURE:

Step 1: Follow safety procedure and rule

Step 2: Select the appropriate tool and test material

Step 3: Identify the appropriate circuit

Step 4: Write their function of each circuit

PRECAUTIONS:-

You should not forget to wear your PPEs.

QUALITY CRITERIA:

- **Did the learner wear PPE?**
- **Did the learner identify required material?**

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools, materials and equipments you are required to perform the following tasks within 5 hour.

Task 1: identify the required electrician hand tools and test measurement

task2:Check circuits correctly

L #27	LO 2Commission electronics and communications systems

Instruction sheet

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

- Following OHS risk control measures and procedures
- Connecting and setting up testing/measuring devices
- Making measurements and adjustment to electronics and communications equipment
- Making decisions for unexpected situations.
- Selecting methods for dealing with unexpected situations on the basis of safety and specified work outcomes
- Performing systems' commissioning procedures
- Carrying out commissioning efficiently

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:

- Follow OHS risk control measures and procedures
- Connect and setting up testing/measuring devices
- Make measurements and adjustment to electronics and communications equipment
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Information Sheet 1 Following OHS risk control measures and procedures

Risk control measures are actions that are taken in response to a risk factor that has the potential to cause accident or harm in the workplace.

Electrical accidents are largely preventable through safe work practices. Examples of these practices include the following:

- 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.
- Carelessness more than any other factor is what causes experienced technicians to have electrical accidents

The control measures can either be designed to reduce the risks or eliminate them completely, with the latter obviously being preferred.OHS risk control measures and procedures for carrying out the work are followed. Using an electrical meter safely and efficiently is perhaps the most valuable skill an electronics technician can master, both for the sake of their own personal safety and for proficiency at their deal. It can be daunting at first to use a meter, knowing that you are connecting it to live circuits which may anchorage critical levels of voltage and current.

This concern is not unfounded and it is always best to proceed cautiously when using meters. The most common piece of electrical test equipment is a meter called the multi meter. Multi meters are so named because they have the ability to measure a multiple of variables: voltage, current, resistance, and often many others, some of which cannot be explained here due to their complexity.

In the hands of a trained technician, the multi meter is both an efficient work tool and a safety device. In the hands of someone uninformed and/or careless, however, the multi meter may become a source of danger when connected to a "live" circuit.

There are many different brands of multi meters, with multiple models made by each manufacturer sporting different sets of features. The multi meter shown here in the following illustrations is a "generic" design, not specific to any manufacturer, but general enough to teach the basic principles of use.

Best risk assessment control measures

- Elimination. We have already discussed this earlier on in this post, and elimination should always be the first control measure you consider.
- Substitution. Substitution is the second best control measure you could use.
- Engineering controls.
- Administrative controls.
- Personal protective clothes and equipment

Self-Check 1	Written Test

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

Directions: Write short answer: (5 pts)

1. write best risk control measurement?

Note: Satisfactory rating -5 and above **Unsatisfactory – below 5points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 2 Connecting and setting up testing/measuring devices

Testing/measuring devices are connected and set up in accordance with requirements for a particular system. The following items are used for basic measurement of voltages, currents, and components in the circuit under test

When an ammeter is placed in series with a circuit, it ideally drops no voltage as current goes through it.

In other words, it acts very much like a piece of wire, with very little resistance from one test probe to the other.

Consequently, an ammeter will act as a short circuit if placed in parallel (across the terminals of) a substantial source of voltage. If this is done, a flow in current will result, potentially damaging the meter:

- Voltmeter (Measures voltage)
- Ohmmeter (Measures resistance)
- Ammeter, e.g. Galvanometer or Millimeter (Measures current)
- Multi meter e.g., VOM (Volt-Ohm-Millimeters) or DMM (Digital Multi meter) (Measures all of the above)
- LCR meter - inductance (L), capacitance (C) and resistance (R) meter (measure LCR values)

Self-Check 2	Written Test

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

Directions: Write short answer: (5 pts)

1, What function multi meter?

Note: Satisfactory rating -5 and above **Unsatisfactory – below 5points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 3 Making measurements and adjustment to electronics and communications equipment

Measurements and adjustments are made to electronics and communications equipment to provide optimum system performance in accordance with system specifications and/or regulatory requirements

OSCILLOSCOPE PROBES

The oscilloscope probes that came with your Laboratory Kit are switchable between 1X and10X. When set to 1X, the oscilloscope will display the actual signal to scale. When set to 10X,the oscilloscope reading will be one tenth of the actual signal.

PROBE COMPENSATION

Before using the oscilloscope probe, the oscilloscope must be calibrated, or compensated, toaccount for the nonideal effects that the probe has on voltage measurements. Oscilloscopeprobes should be compensated every time they are used, especially if the probes are being usedwith a different oscilloscope than last time the probes were compensat The following stepsdescribe how to compensate the oscilloscope probes.Compensate both of the oscilloscopeprobes that came with your Laboratory Kit.

- Connect the scope probe to channel 1.
- Attach probe tip and reference lead (ground) to the PROBE COMP connectors locatedbetween the channel 2 and channel 3 terminals.
- Switch the oscilloscope probe to 10X.
- Press the AUTOSET button. You should see a square wave similar to the one in Figure .
- Adjust the oscilloscope probe until you see a square wave with a flat top.

Turning On The Oscilloscope

To turn on the oscilloscope, press the power on button on the lower left-hand side of the oscilloscope. Shortly afterwards, you will see a boot screen, and then a start up screen. Press the

MENU OFF button to proceed.

Oscilloscope Screen

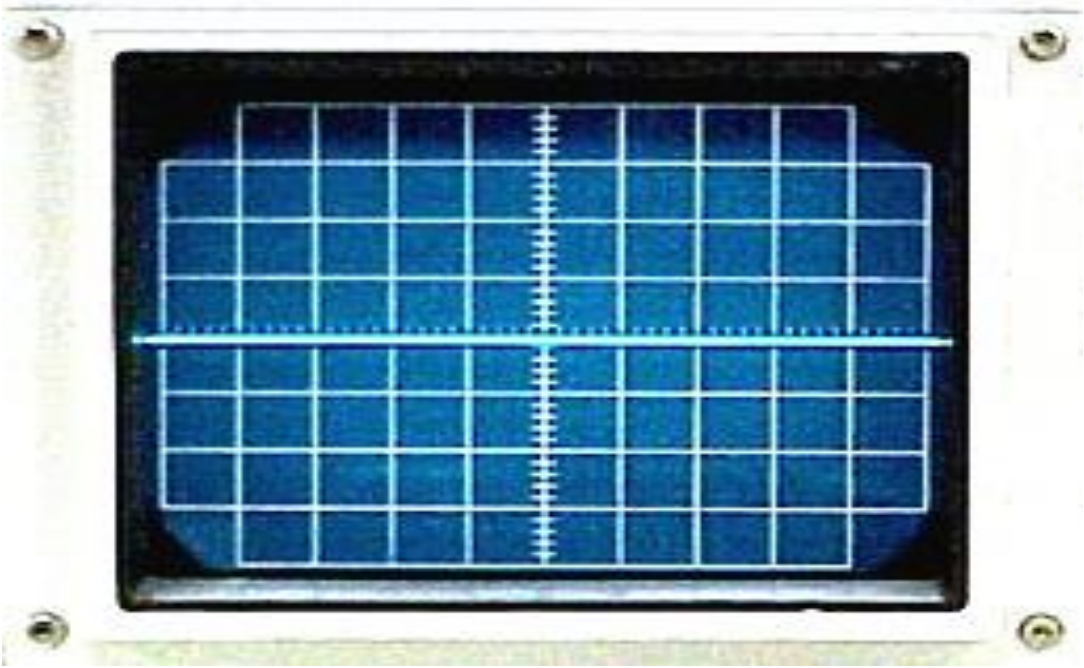


Figure 2. Oscilloscope Screen

The elements of the screen are as follows:

- Waveform baseline icon. Shows the zero volt level of the waveform.
- Channel indicator.
- Channel scale factor.
- Time per division.
- Trigger slope.
- Date and time.
- Trigger level icon.
- Visual representation of waveform.

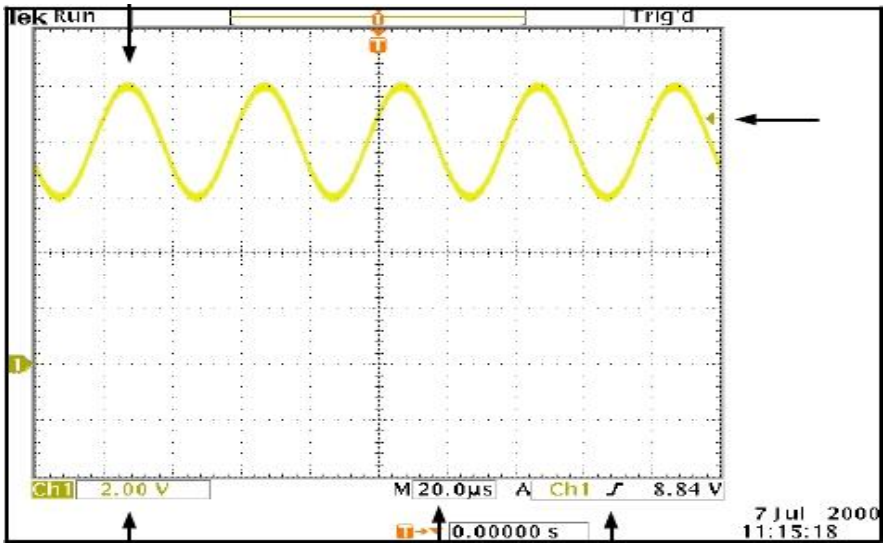
OSCILLOSCOPE SETTINGS

As for the arbitrary/function generator, the default settings of the oscilloscope can be manu allychanged, and are retained when the oscilloscope is turned off.

- Fortunately, the oscilloscope settings can be restored to the factory settings. It is a go od practiceto reset the oscilloscope to factory settings after it is turned on and before any measurements aretaken. This way you can always begin working with the scope f rom the same initial setting.

  To restore the oscilloscope to factory settings, press the SAVE/RECALL button at the t op of theoscilloscope.
- Two menus will be displayed: one on the bottom of the screen and one on the righthan d side of the screen (see Figure 3). From the bottom menu, press the button bellow “Recall
- Factory Setup.” Then press the button on the right hand side menu to confirm the ch ange. Theoscilloscope is now set to factory settings. Press the MENU OFF button, which is located nextto the lower left side of the screen, to remove the menu.

Figure 3. Recalling Factory Setup



Self-Check 3	Written Test

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

Directions: Write short answer: (5 pts)

1,Write measuring instruments.

Note: Satisfactory rating -5 and above **Unsatisfactory – below 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 4 Making decisions for unexpected situations

Decisions for dealing with unexpected situations are made from discussions with appropriate person and job specifications and requirements.

Keys to help successful of making decisions

- Communication not only at work, but in all your relationships.
- Personal contact is important to success workplace communication.
- Develop a network; make an effort to become friends with people in different department.
- Always be courteous in your communications with others, the words" thank you" show that you appreciate a person's efforts. Try to saying "would you please" instead of just please".
- Be consistent and clear in your workplace communications.
- Compromise decreases the tensions associated with conflict.
- Listen to what others are saying and show interests in the conversation.
- You cannot hold a person's interest if you have nothing to say.
- Effective communication skills in workplace communication.
- Conflict resolution and negotiating.
- Improving leadership and management skills.
- Public speaking skills.

Making good decisions -the appropriate style of decision-making varies according to the particular situation. Experienced managers and teams know when and how to make decisions, based on a set of general principles and applying these in the context of an understanding of the local environment, the people and the priorities. Decisions can be made by a variety of methods, which take into consideration such issues as time and other resource constraints and information availability. To make

more informed decisions regarding transportation issues, there is a need both for good project management and also the careful management of stakeholder relations. Later in this section, principles for good decision-making are provided. By using these principles as a guide when managing a project, a more successful outcome should result. A framework needs to be developed for each project to work within and one that provides a clear outline of how, when and who will make key decisions. Using this as a guide, both project team members and stakeholders can follow the process, being clear about the activities to be undertaken and the subsequent decisions that are made. Based on experience drawn from a range of transport projects, guide maps has defined a general six-stage transport decision-making process that covers the main stages from project conception to completion

Techniques for effective decision making at work: - communication is becoming greater, while we spend a lot of time and effort on the skills and we need to do our job, such as accounting & finance skills, marketing skills, strategic development skills, improving communication at work requires strong interactive communication skills and we don't seem to put as much effort in to these as we should to be effective.

Four common skills to become more effective at work

- Organizing your thoughts: - Think about what you want to say before you say it.
- Observe those around you: - If you are new to a company or department, observe the workplace culture. Notice that:-
- How everyone interacts with one another,
- How they respond ,and
- How they approach others.
- React appropriately:- if someone puts you on the spot and you are not sure what to say. Instead of feeling under pressure to say what first come to mind take some time to consider your response, it's natural to want to answer right away and it take some practice to stop and think about your response.
- Body language:-Try to be aware of what your body is saying, you don't want it to give yourself away.

Self-Check 4	Written Test

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

Write short answer : (5 pts)

1.What are the Keys to help successful of making decisions-

Note: Satisfactory rating 5 and above **Unsatisfactory – below 5points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 5 Selecting methods for dealing with unexpected situations on the basis of safety and specified work outcomes

Methods for dealing with unexpected situations are selected on the basis of safety and specified work out comes. Employers and workers cooperate to identify and select methods for eliminating, preventing, or controlling workplace hazards. Controls are selected according to a hierarchy that uses engineering solutions first, followed by safe work practices, administrative controls, and finally personal protective equipment (PPE). A plan is developed to ensure that controls are implemented, interim protection is provided, progress is tracked, and the effectiveness of controls is verified.

An event incongruent with expectations as determined by base rate probabilities that is, the average probability of the event occurring and the contextual information available surrounding the event; it may be normal, abnormal or emergency in nature; it may also be frequent, infrequent or novel, or the absence of an expected event. In aviation, surprise often results when something that is expected to happen, in fact, does not.

This creates a twofold problem:

First, if the expectation is great enough, one may “see” or “hear” what is expected, even if it is not there. For example, many pilots in “get ready” accidents claim the gear-down-and-locked indicator lights were illuminated and the gear warning horn was not on. In some cases, the area microphone for the cockpit voice recorder clearly recorded the equipment warning horn.

In the other case, if a pilot does not know what to expect in a situation, then informational cues may be ignored or a large number will be viewed as unexpected,

Self-Check 5	Written Test

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

Directions Write short answer: (5 pts)

1. Write the basic Rules for Safety

Note: Satisfactory rating 5and above **Unsatisfactory – below 5points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 6 Performing systems' commissioning procedures

Systems' commissioning procedures are performed in accordance with requirements.

Commissioning is the process of planning, documenting, scheduling, testing, adjusting, verifying, and training, to provide a facility that operates as a fully functional system per the Owner's Project Requirements.

According to Approved document L, commissioning is the process of taking a system from a state of static completion to working order, and includes setting-to-work; regulation (that is, testing and adjusting repetitively) to achieve the specified performance; calibration, setting up and testing of the associated. The goal of the Commissioning Process is to enhance the quality of the delivered project by focusing the design and construction team on the Owner's goals for a functional and energy efficient building. The earlier a Commissioning Provider is involved in the project process the greater the chance there is for the Commissioning Provider to influence corrections without increased costs later.

Commissioning means to run that same machine or device that was installed. to convert that dead machine into working condition properly according to the desired parameters on safe condition is known as commissioning

Establish documentation requirements associated with the commissioning process

Pre-commissioning (PC) is a electronics procedure that includes checking the functional operability of elements within the system in order to ensure the system is ready for commissioning start-up

Electrical Commissioning Process

- Design Phase
- Construction Phase
- Sample Test Procedures
- Final Test Procedures
- Specification Coordination
- Acceptance Phase
- Post Acceptance Phase
- Scheduling
- Operational &Manual

- Information and testing
- Installation
- Shop Drawing Reviews
- Design Review
- Field observation –early systems
- Functional Testing
- The objective of commissioning works

The key components of a performance measurement and control system include:

- Setting realistic expectations that are measurable
- Thinking through how to continuously capture measuring information
- Developing strategies and tactics capable of accomplishing clearly defined expected outcomes
- Monitoring/tracking feedback from actual results
- Taking corrective action when there is a deviation between actual and predicted results

Self-Check 6	Written Test

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

Directions: choose the correct answer: (5 pts)

1. Which one of the following comes under Acceptance Phase

A. Testing .

B. Design Phase

C. Field observation early

Note: Satisfactory rating -3and above Unsatisfactory – below 3points

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 7 Carrying out commissioning efficiently

7.1 Carrying out commissioning efficiently

Commissioning is carried out efficiently without unnecessary waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles Commissioning to be successful, and more importantly, meaningful, the process must be properly defined. Start by assigning a single responsible individual, a Commissioning Team Leader. Establish a multidiscipline team to be a part of the commissioning documentation approval and development. But the Commissioning Team Leader (CTL) cannot do it by himself or herself. Even if time were not an issue, no one can have the technical expertise in all areas to develop meaningful tests and procedures. Much of the administrative aspects can be typical or require only minor modifications, and other templates/formats are useful. Including the development of Inspection Checklists and testing requirements in Architectural/Engineering consultant's or equipment integrator's scope of work can be effective financially and technically.

The design engineers of record are most qualified to know what needs to be inspected and tested. However, the engineers of record must be familiarized on basic procedures as to how to develop proper formats for the specific Client, which can be accomplished by examples and written procedures. Much of the test requirements are routinely identified as part of the project specifications, which must be referenced or included in the Commissioning Plan or confirmed as part of a verification checklist.

Writing the entire Commissioning documentation can be accomplished completely by electrical consultants, but they must be adequately trained on the Owner's procedures. Complete outsource plan writing can be less effective than having an internal CTL at the Owner to at least develop the backbone of the document and coordinate/insert outsourced Inspections and Tests forms and requirements. Once the Commissioning documentation is written, who will do the Inspections and Tests. Again cannot do all inspecting and testing (nor will be qualified to do so) by himself/herself. Assistance is needed. For Inspections, electrical Managers or integrators can

Provide cost effective support in this area. They often appreciate the opportunity to have Inspection

Checklists upfront, since it minimizes punch list items later. This approach usually adds minimal

Additional cost to the project. Most testing is typically performed by traditional testing agencies, such as technical consultants, test and balancers, particulate monitoring companies, etc. as routinely defined in a project's specifications. However, specialized tests often require extra assistance/guidance. A good example is a computerized system; it is often best to require the design engineer of record to write and witness the sequence challenge test. He or she best understands the acceptable outputs of the system and the logic needed. Commissioning for each project must be tailored to its needs, considering internal resource constraints. Another alternative is to outsource the complete commissioning implementation to a commissioning consultant.

Self-Check 7	Written Test

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

Directions Write short answer: (5 pts)

1. What the process of commission?

Note: Satisfactory rating 5 and above **Unsatisfactory – below 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Operation Sheet 1	Connecting and setting up testing/measuring devices

1. Connect and identify test measurement

PROCEDURE:-

Step 1: Follow safety procedure and rule

Step 2: Select the appropriate tool

Step 3: Identify the appropriate tools

Step 4: Write their function of each selected measurement

PRECAUTIONS:-

You should not forget to wear your PPEs.

QUALITY CRITERIA:

- **Did the learner wear PPE?**
- **Did the learner identify required material?**

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools, materials and equipments you are required to perform the following tasks within 5 hour.

Task 1: Connect and identify test measurement

L #28	LO3 Completion and reporting of commissioning activities.

Instruction sheet

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

- Following OHS risk control work completion measures and procedure.
- Documenting adjustment settings
- Cleaning and making work site safe
- Notifying commissioning results and work completion to appropriate person

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:

- Follow OHS risk control work completion measures and procedure.
- Document adjustment settings
- Clean and making work site safe
- Notify commissioning results and work completion to appropriate person

Learning Instructions:

Read the specific objectives of this Learning Guide.

1. Follow the instructions described below.
2. 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.
3. Accomplish the “Self-checks” which are placed following all information sheets.
4. 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).
5. If you earned a satisfactory evaluation proceed to “Operation sheets
6. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
7. If your performance is satisfactory proceed to the next learning guide,
8. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1 Follow OHS risk control work completion measures and procedure

OHS risk control work completion measures and procedures are followed.

- Prepare necessary tools,
- Test instruments and personal protective equipment.
- Tools and equipment for measuring, cutting, drilling, assembling/disassembling.

Tool set includes the following but not limited to:- Pliers, Cutters, crew drivers ,Soldering gun, Multi-meter .Signal generator , oscilloscope, signal finderPersonal protective equipment (PPE) refers to protective clothing, goggles, or other equipment designed to protect the wearer's body from injury by impacts, electrical hazards.

The Inspections and tests shall include the followings:

- Visual inspection;
- Continuity of protective conductor.
- A visual inspection shall be made to verify that the electrical equipment is installed correctly.
- The visual inspection shall include a check on the following items, where appropriate:
- Adequacy of working space, access, and maintenance facilities;
- Connections of component
- Identification of component polarity
- Adequacy of the sizes carrying capacity and voltage drop;
- Correct connections of all equipment with special attention to socket Outlets switches, residual current devices, and protective equipments,
- Presence of fire protection
- Methods of protection against direct contact with live parts (including measurement of distances where appropriate), i.e. protection by insulation of live parts,
- Choice and setting of protective device

Self-Check 1	Written Test

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

Directions Write short answer: (5 pts)

1.Write Personal protective equipment (PPE)

Note: Satisfactory rating 5 and above **Unsatisfactory below 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 2 Documenting adjustment settings

Commissioning is the process of planning, documenting, scheduling, testing, adjusting, verifying, and training, to provide a facility that operates as a fully functional system per Commissioning documents the establishment of standards of performance for building systems, and verifies that designed and constructed work meets those standards. In the planning and development phase of a project, the owner's project requirements

According to Approved document commissioning is the process of taking a system from a state of static completion to working order, and includes setting-to-work; regulation (that is, testing and adjusting repetitively) to achieve the specified performance; calibration, setting up and testing of the associated .

Documents Used in the Commissioning Process

- Design Intent Document
- Electronic Documents
- Electrical t Documents
- Commissioning Plan
- Field Reports
- Electrical Verification Checklists (EVC)
- Functional Performance Tests (FPT)
- Commissioning Issue Log
- Operation & Maintenance Manuals
- Final Commissioning Report

1. Design Intent Document
    - Details the functional requirements of the work and how it will be used.
    - It includes project goals, performance criteria, cost considerations, benchmarks and success criteria.
    - It is translated into the construction documents.
    - It is the ultimate measure of the project's technical success.

2. Electronic Documents:
    - These include a range of documents that vary with the Owner's needs, regulations and laws.

- Includes specifications, drawings and general terms and conditions of the contract.

3. Electrical Documents:
   - These include price agreements, Electrical management process, subcontractor agreements and/or requirements, requirements and procedures for submittals, changes, other Electrical requirements, timeline for completion, and the Electrical Documents.
4. Commissioning Plan:
   - A written plan of how the commissioning process will be accomplished.
5. Field Reports:
   - A document generated after each commissioning agent site visit to record commissioning related event.
   - A formal vehicle to track commissioning issues, their status and resolution.
6. Electrical Verification Checklists (EVC)
   - Activities that must be performed for the proper storage, handling and installation of components.
   - EVC's must be completed by the Electrical prior to Functional Performance Testing

Electrical Verification Checklist **Owner: APTC** **Tel:**_____			
Task no.	Task Description	Technician	
1	**Equipment Delivery and Acceptance Verifications**		

1.1	Note: Record Actual Name Plate Data and confirm unit is as specified in the contract documents Manufacturer: _____ Model Number:_____ Serial Number: _____ Volts/Phase/Hz: _____
1.2	Verify the configuration is as specified in the contract documents
1.3	Verify date of manufacture (verify by date tag or serial number. If date exceeds 16 weeks notify owners and CA)
1.4	Verify unit is free of damage (dents, holes)
1.5	Verify unit is stored in a flat surface in a safe and dry environment
1.6	Verify packing list has been checked and non-mounted parts inventoried and confirmed
1.7	Ensuring the installation complies with all relevant requirements and regulations.
1.8	Verify construction site safety regulation

7. Functional Performance Testing (FPT)

- The purpose of functional performance tests is to demonstrate that the equipment/installation can meet the functional and performance requirements as specified in the general/particular specifications. Functional performance test should proceed from the testing of individual components to the testing of different systems in the installation.
- A procedure designed to verify the functional performance of equipment or systems under a full range of operating conditions and loads, as specified by the contract documents.

- Each test is a written protocol that defines methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems.
- The Contractor performs the FPT's and provides necessary test equipment to complete the tests.
- Any performance deficiencies revealed during the functional performance tests must be evaluated to determine the cause and weather they are part of the contractual obligations. After completion of the necessary corrective measures, the contractor shall repeat the tests.
- if any test cannot be completed because of circumstances that are beyond the control of the technical, it shall be properly documented and reported to the project engineer, who shall then liaise with the relevant parties to resolve the situation.
- The commissioning agent directs, witnesses, and documents the FPT's.

8. Operation & Maintenance Manuals

- Provided by technician at the completion of the project.
- Describes the as-built conditions.
- Describes how systems operate.
- Includes information on products concerning repair and replacement.

9. Final Commissioning Report

- Documents the Activities which occurred during the Building Commissioning Process.
- Provides the Final Results of the overall Building Commissioning Effort.

Self-Check 2	Written Test

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

Directions: Answer all the questions listed below

Write short answer: (6 point each**)**

1. Write use of document Process

Note: Satisfactory rating -6 points and above Unsatisfactory below 6 points

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 3 Cleaning and making work site safe

Work site is cleaned and made safe in accordance with established procedures

- Clean up Keep all walking and working surfaces clean and clear of rubbish
- Pay attention to proper storage. Identify designated areas for storing tools and materials.
- Eliminate hazards.
- Clear away other materials that could cause injury.
- Keep extension cords clear of walkways
- Working area: it is apace where in work shop that trains are practicing practical training & performing project work.
- Walking area: it is an area that trainees work shop technical or trainer pairs through from a place to place like between work bench trainers sitting.
- Storage area: it is a place work shop specially a room that stores different training equipments, Tools & machines should be placed (sort)

Self-Check 3	Written Test

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

Directions Write short answer: (5 pts)

1. How to clean our work site ?

Note: Satisfactory rating -5 and above **Unsatisfactory – below 5 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 4 Notifying commissioning results and work completion to appropriate person

Commissioning results and work completion are notified to appropriate person or persons in accordance with established procedures

Notification is a process in which people share information, ideas, and feelings. This means that 'notification' is not merely the transmission of a message, but the message should be given meaning and understood by the receiver as the sender intended it.

All communication depends on understanding others and having them understand us. Much of our communication is intended to influence what people think and feel. To communicate effectively, it is necessary to develop abilities in speaking, writing, listening, reading and observing. All these abilities play an integral part in our contemporary life-style

To be a successful communicator, you must try to determine the needs of the people to whom you are speaking or writing. You can do this by noticing which goals seem to motivate them. But remember that goals may change rapidly.

The Process of Notification

The notification process involves more than sender—message—receiver. Sometimes it is quite complex and imperfect, and malfunctions can occur easily and may result in miscommunication. This section includes a brief overview of communication elements, concepts, and problems/barriers regarding verbal and nonverbal communication

Self-Check 4	Written Test

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

Directions Write short answer: (5 pts)

1. What is notification means?

Note: Satisfactory rating 5and above **Unsatisfactory below 5points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Operation Sheet 1	Cleaning and making work site safe

1. identify work site safe

PROCEDURE:-

Step 1: Follow safety procedure and rule

Step 2: Select the appropriate tool

Step 3: Identify the appropriate work tools

Step 4: Write their function of each selected work site safe

PRECAUTIONS:-

You should not forget to wear your PPEs.

QUALITY CRITERIA:

- **Did the learner wear PPE?**
- **Did the learner identify required material?**

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

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

Task 1: identify work site safe

List of Reference Materials

The Building Commissioning Handbook By: John A. Heinz, P.E. and Richard A. Casualty, P.E.

https://www.researchgate.net/publication/228485992

Electrical electronics servicing level _1up to level _3 books 3edition

http://creativecommons.org/licenses/by/2.0/deed.en http://www.sxc.hu/

Practicalelectronicshandbooksixthedition Ianr.Sinclairandjohndunton

https://www.oregon.gov/energy/energy-oregon/Pages/Schools-Commissioning-Firms.aspx

Practicalelectronicshandbook,6thedition

Electronics System Design Techniques for Safety Critical Applications part and part ii

[MP4 720p] The Oscilloscope.mp4

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The trainers who developed the TTLM

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