

23.2.0 INSTRUMENTS AND ELECTRONIC FAULT DIAGNOSIS

23.2.01 Introduction

This module it is designed to equip the trainee with knowledge, skills, attitudes and competencies necessary to provide maintenance service of electrical/electronic devices.

23.2.02 General Objectives

By the end of the module unit, the trainee should be able to;

- a) Acquire skills to repair electrical and electronic equipment
- b) Perform tests and diagnosis of electrical and electronic equipment
- c) Appreciate the value of maintenance culture in electrical and electronic trade
- d) Observe safety in electrical and electronic engineering work places

23.2.03 Module Unit Summary and Time Allocation

Instruments and Electronic Fault Diagnosis

Code	Sub module unit	Content	Time Hrs		
			Th.	Pra.	Total
23.2.1	Test Instruments	<ul style="list-style-type: none"> • Types of test instruments • Methods of measurement techniques 	10	12	22
23.2.2	Test Signals	<ul style="list-style-type: none"> • Types of test signals and their characteristics • specifications of signal sources • Test signals in fault diagnosis performance tests 	14	16	30
23.2.3	Maintenance and Service	<ul style="list-style-type: none"> • Types of maintenance • Correct procedure of maintenance and servicing • Maintenance aids • Faults in electrical and electronic systems 	12	24	36

		<ul style="list-style-type: none">• Repair techniques of typical faults of electrical and electronic systems			
Total Time			36	52	88

23.2.1 TEST INSTRUMENTS

Theory

23.2.1T0 *Specific objectives*

By the end of the sub-module unit, the trainee should be able to:

- a) describe various types of test instruments
- b) explain the methods measurement techniques

Competence

The trainee should have the ability to use measuring and test instruments correctly in the electrical and electronic laboratory and other work places

Content

23.2.1T1 Types of test instruments

- i) Multimeter (analogue and digital)
- ii) Cathode Ray Oscilloscope (CRO)
- iii) Spectrum analyzer
- iv) wave analyzer

23.2.1T2 Methods of measurement

- i) Connection of equipment to circuit
- ii) Taking reading

Practice

23.2.1P0 *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:

- a) demonstrate safety in using various test instruments
- b) calibrate measuring instruments before use
- c) connect measuring and test instruments correctly in given electronic systems

Content

23.2.1P1 Safety

- i) low voltages equipment
- ii) high voltage equipment

23.2.1P2 Calibration of instruments

- i) CRO
- ii) signal generator

23.2.1P3 Connection of instruments

- i) signal injector
- ii) signal generator

Suggested Learning

Resources

- i) Calibrating instruments
- ii) Instrument manual
- iii) Cathode ray oscilloscope

23.2.2 TEST SIGNALS

Theory

23.2.2T0 *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:

- a) identify types of test signals and their characteristics
- b) state specification of signal sources
- c) apply various test signals in fault diagnosis and performance tests

Competence

The trainee should have the ability to: correct faults in various electronic systems using test signals

Content

- 23.2.2T1 Types and characteristics of test signals
- i) Types
 - ii) sine squared pulse and bar
 - iii) stair case wave form
 - iv) modulated signals
 - v) pulse signals
 - vi) triangular wave
 - vii) square wave
 - viii) sine wave
 - ix) Characteristics
 - x) duration
 - xi) bandwidth
 - xii) frequency
 - xiii) rise time and fall time
 - xiv) amplitude

23.2.2T2 Specification of signal sources

- i) Attenuation and gain db
- ii) Output impedance
- iii) Stability
- iv) Accuracy

23.2.2T3 Application of test signals

- i) Fault diagnosis:
- ii) Injection of test signals at relevant joints
- iii) interpretation of test results

Practice

23.2.2P0 *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:

- a) safely connect equipment to display test signals on electronic systems
- b) safely inject test signals on electronic systems
- c) interpret displayed test signals at various joints

Content

- 23.2.2P1 Connection of testing equipment to display test
- i) signals
 - ii) sine wave
 - iii) square wave
 - iv) triangular wave
 - v) pulse signals

- vi) modulated signals
- vii) staircase wave
- viii) sine square pulse and bar

23.2.2P2 Injection (insertion) of test signals

23.2.2P3 Interpretation of displayed test signals at various

- i) Joints
- ii) Determination of signal characteristics
- iii) Duration
- iv) Band width
- v) Frequency
- vi) Rise / fall time
- vii) Amplitude

Suggested Learning

Resources

- i) signal modulators
- ii) CRO
- iii) Electronic equipment
- iv) signal injectors
- v) maintenance circuit diagrams
- vi) power supplies
- vii) connecting cables and wires

23.2.3 MAINTENANCE AND SERVICE

Theory

23.2.3T0 *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:

- a) explain the terms maintenance and service

- b) explain types of maintenance
- c) describe correct procedures of maintenance and servicing
- d) select appropriate maintenance aids
- e) explain repair techniques of faults in electronic systems

Competence

The trainee should have the ability to:

- i) maintain and service electrical/electronic systems
- ii) diagnose typical faults on electrical/electronic equipments and remedies

Content

23.2.3T1 Definition of terms

- i) Maintenance
- ii) Service
- iii) The need for maintenance and service

23.2.3T2 Types of maintenance

- i) Preventive
- ii) Routine
- iii) Corrective

23.2.3T3 Procedure for

- maintenance and service
- i) Problem analyses
- ii) Selection of appropriate methods

- iii) Acquisition of necessary aids
- iv) Systematic problem solution
- v) Final testing
- 23.2.3T4 Selection of appropriate maintenance aids
 - i) tools
 - ii) manuals
 - iii) test equipment
 - iv) spares(components)
- 23.2.3T7 Repairing techniques of faults in electronic systems

Practice

- 23.2.3P0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
 - a) safely carry out preventive and corrective maintenance on electronic systems
 - b) safely demonstrate correct procedures of maintenance and servicing
 - c) maintain and service other electronic systems and equipments
 - d) safely repair typical faults on electronic equipments
 - e) safely perform functional and safely tests on

electrical/electronic equipments

Contents

- 23.2.3P1 Preventive and corrective maintenance
 - i) Electronic systems
 - ii) video recorder
 - iii) digital clock
 - iv) tape recorder
 - v) computer system
 - vi) DVD / VCD player
 - vii) Office equipment
 - viii) Domestic electrical/electronic
- 23.2.3P2 Correct procedures of maintenance and servicing of electrical/electronic systems
- 23.2.3P3 Maintenance and servicing on electrical/electronic systems
- 23.2.3P5 Repair of typical faults on electrical/electronic systems
- 23.2.3P6 Functional and safety tests on electrical/electronic equipment

Suggested Learning

Resources

- i) Electronic systems
- ii) Signal generators
- iii) Circuit diagrams
- iv) Functional generators
- v) Tools