



Australian Government

UEENEEH146A Solve fundamental electronic communications system problems

Release: 2

UEENEEH146A Solve fundamental electronic communications system problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers ascertaining correct operation of communications systems and solving fundamental system problems as met in engineering support work functions. It encompasses working safely; problem solving techniques, and the use of a range of measuring devices, providing solutions derived from measurements to predictable problems in electronic communication systems.

Application of the Unit

Application of the Unit 2)

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 3 level.

Licensing/Regulatory Information

License to practice 3)

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also

License to practice**3)**

subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

Pre-Requisites**Prerequisite Unit(s)****4)****Competencies****4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH1 13A Troubleshoot amplifiers in an electronic apparatus

Literacy and numeracy skills**4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading 5 Writing 5 Numeracy 5

Employability Skills Information

Employability Skills 5)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit
Performance Criteria describe the required performance needed to demonstrate achievement of the element.
Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT

PERFORMANCE CRITERIA

1 Prepare to solve fundamental problems in electronic communications systems.	1.1 OHS procedures for a given work area are identified, obtained and understood.
	1.2 Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3 Safety hazards, which have not previously been identified, are noted and established risk control measures are implemented.
	1.4 The nature of the problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.5 Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.

ELEMENT	PERFORMANCE CRITERIA
	1.6 Tools, testing devices, and materials needed to carry out the work are obtained and checked for correct operation and safety.
2 Solve fundamental problems in electronic communications systems.	2.1 OHS risk control measures and procedures for carrying out the work are followed.
	2.2 The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3 Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4 Knowledge of fundamental characteristics communication system components and transmission media is applied to solving system problems.
	2.5 Logical approaches are used to solve system problems from measure and calculated values as they apply to communication systems.
	2.6 Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.7 Problems are solved without unnecessary damage to apparatus, circuits, the surrounding environment or services and using sustainable energy practices.
3 Complete work and document problem solving activities.	3.1 OHS risk control work completion measures and procedures are followed.
	3.2 Work site is cleaned and made safe in accordance with established procedures.
	3.3 Reports are written outlining system problem and justifying solutions used.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and solving fundamental problems in electronic communications systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EH146A

Fundamental electronic communications systems

Evidence shall show an understanding of fundamental electronic communications systems, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Requirements of a Radio Communications System

- Safety
- Communications system requirements
- Notion of decibels including dB, dBm, dBmV, dBuV
- Antenna Types
- Modulation
- Baseband signals
- Bandwidth
- Wavelength and frequency
- Radio spectrum

T2. Optical Communications Principles

- Safety
- Optical fibre fundamentals
- Optical fibre parameters
- Typical optical link
- Bit rates

T3. Wave Propagation

- Half wave dipole
- Radiation patterns
- Polarisation
- Propagation modes

T4. Modulation Concepts and Amplitude Modulation (AM)

- Modulation principles
- Sidebands
- Types of modulation (Analog and digital modulation)

REQUIRED SKILLS AND KNOWLEDGE

- Circuit verification of the modulation process
- AM envelope
- Diodes as modulators/demodulators
- Modulation index, Percentage, Spectral content, Over modulation
- Calculating sideband frequency and power of AM signals
- Bandwidth requirements for radio services
- Bandwidth measurement
- The diode demodulator circuit.

T5. Introduction to Frequency and Phase Modulation

- Typical deviations
- Carson's rule
- Sideband distribution
- Carrier and sideband power
- Phase modulation
- Pre-emphasis/ De-emphasis
- Limiter stage
- FM detectors

T6. The superheterodyne Receiver

- The TRF receiver
- AM superheterodyne receiver block diagram
- RF and IF amplifier
- Image and intermediate frequencies
- FM superheterodyne receiver
- Sensitivity, selectivity and image rejection
- Measurements of receiver parameters
- Binary Digital Modulation/Demodulation

T7. Supplementary Receiver circuitry

- AFC and AGC systems

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment 9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit 9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
 - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
 - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
 - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
 - Demonstrate an appropriate level of skills enabling employment
 - Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
 - Solve fundamental problems in electronic communications systems as described in 8) and including:

- A Applying knowledge of communication system and transmission media characteristics.
- B Using logical and methodical approaches to solving system problems.
- C Solving system problems.
- D Providing written justification for solutions used.
- E Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment 9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to solving fundamental problems in electronic communications systems.

Method of assessment 9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

**Concurrent
assessment and
relationship with
other units** **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by reporting on fundamental issues related to an electronic communications system.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electronics

