



Australian Government

UEENEEH172A Troubleshoot communication systems

Release: 2

UEENEEH172A Troubleshoot communication systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers fault finding and repair of communication systems. The unit encompasses safe working practices, interpreting circuit diagrams, applying logical fault finding procedures, conducting repairs, safety and functional testing and completing the necessary service documentation.

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 may also used to augment formally acquired competencies.

Licensing/Regulatory Information

License to practice

3)

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational

License to practice**3)**

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.

UEENEEH14 Solve fundamental electronic
6A communications system problems

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 3 Writing 3 Numeracy 4

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 find and repair faults	1.1 OHS procedures for a given work area are identified, obtained and understood.
	1.2 OHS risk control measures and procedures are followed in preparation for the work.
	1.3 The nature of the fault is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4 Advice is sought from the work supervisor to ensure the work is co-ordinated effectively with others.
	1.5 Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6 Tools, equipment and testing devices needed to carry out the work are obtained in accordance with established procedures and checked for

ELEMENT	PERFORMANCE CRITERIA
	correct operation and safety.
2 Find faults	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 Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures. 2.4 Fault finding is approached methodically drawing on knowledge of communication systems using measured and calculated values of apparatus parameters. 2.5 Apparatus components are dismantled where necessary and parts stored to protect them against loss or damage. 2.6 Faulty components are rechecked and their fault status confirmed. 2.7 Unexpected situations are dealt with safely and with the approval of an authorised person. 2.8 Fault finding activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Repair fault	3.1 OHS risk control measures and procedures for carrying out the work are followed. 3.2 Apparatus is checked as being isolated where necessary in strict accordance OHS requirements and procedures. Materials required for the repair work are sourced and obtained in accordance with established procedures. Repairs are affected efficiently without damage to other components, apparatus or circuits.

ELEMENT**PERFORMANCE CRITERIA**

		Effectiveness of the repair is tested in accordance with established procedures.
		Apparatus is reassembled, finally tested and prepared for return to customer.
4	Completion and report repair activities	4.1 OHS work completion risk control measures and procedures are followed.
		4.2 Work area is cleaned and made safe in accordance with established procedures.
		4.3 Written justification is made for repairs to apparatus.

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 finding and repairing faults in communication systems.

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

KS01-EH172A troubleshooting

Electronic communications systems

?

T1. AM and FM tuners

- Superheterodyne receivers
- Operational characteristics and techniques used in AM and FM receivers
- Frequency modulation, stereo encoding and de-coding used in commercial FM transmissions
- Amplitude modulation and de-modulation used in commercial AM transmissions
- RF signal requirements for AM tuners
- RF signal requirements for stereo FM tuners

T2. Modulation and de-modulation

- AM principles Radio Communications System (Review)
- Operational characteristics and techniques used in AM
- Amplitude modulation and de-modulation used in commercial AM transmissions
- RF signal requirements for AM tuners
- Modulation
 - Envelope
 - Index and percentage modulation depth
 - Power in carrier and sidebands
 - Over modulation and "splatter"
- Sideband modulation terminology and techniques
- Transmissions

T3. Sideband modulation terminology and techniques

- Double-sideband (DSB),
- Single-sideband (SSB)
- Frequency domain representation
- Double-sideband signal (DSB)

REQUIRED SKILLS AND KNOWLEDGE

- Single-sideband signal (SSB)
- Demodulation requirements for DSB and SSB RF Amplifiers

T4. IF principles

- IF principles and operation
- Intermediate frequency
- Down converters
- Amplification
- The diode demodulator circuit.

T5. RF circuits

- Introduction to RF Amplifiers
- RF Oscillators (eg, Hartley, Colpitts, Clapp)
- RF Mixers
- Attenuators
- Transmission lines – Impedance matching
- Terminations

T6. Frequency and phase modulation Principles

- Time and frequency domain representation, amplitude and frequency
- Frequency modulation (FM) production,
- Phase modulation (PM)
- Digital Encoding
- Spread spectrum
- Equivalent FM and PM (eg. – audio processing)
- Bessel function and distribution of sidebands,
- Modulation
 - Envelope
 - Index and percentage modulation depth
 - Power in carrier and sidebands
 - Over modulation and "splatter"
 - Sideband modulation terminology and techniques
- Bandwidth

T7. Frequency and phase de-modulation Principles

- FM Demodulation Circuits
- Frequency synthesizers (eg, PLL)

REQUIRED SKILLS AND KNOWLEDGE

T8. Antennas

- Principles
- Half wave/quarter wave configurations
- Impedance matching networks
- Polarisation

T9. Transmitter and Receiver systems configurations

- High and low-level AM transmitters
- High and low-level FM transmitters
- Transmitter Power ratings
- Spectral purity (eg. harmonics, spurious emissions and IMD)

T10. RF Filters

- Types (eg. Butterworth, Chebyshev, Bessel and Elliptical)
- Crystal filters
- Mechanical Filters

T11. RF Safety and precautions

- Effects of RF radiation on the human body and work practices to protect against radio frequency radiation.
- Standards, Codes and Regulations of ACMA regulation for power, frequency and antenna gain and Occupational Health & Safety.

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:
 - Find and repair faults in communication systems as described in 8) and including:
 - a. Using methodical fault finding techniques.
 - b. Finding faults efficiently.
 - c. Replacing components without damage.
 - d. Providing written justification for the repairs.
 - 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.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

**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 finding and repairing faults in communication 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)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with 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 using a representative range of communication systems' faults in finding and repairing faults in communication systems.

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