



Australian Government

Department of Education, Employment and Workplace Relations

UEENEEB101A Operate and maintain amateur radio communication stations

Release: 1

UEENEEB101A Operate and maintain amateur radio communication stations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit deals with operation and maintenance of amateur radio communication stations suitable to HF, VHF and SHF communication using multiple modes of operation. It encompasses correct operating procedures, safe working practices, following written and oral instruction and procedures, basic testing techniques, dismantling and assembling apparatus, disconnecting and reconnecting components, and operating to the Standard Licence Level as prescribed by the Australian Communication Media Authority.

Application of the Unit

Application of the Unit 2)

This unit may apply to persons entering work in electrotechnology and may be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice 3)

The skills and knowledge described in this unit do require an Australian Communications and Media Authority (ACMA) license to practice in the workplace provided equipment is not connected to permanent installation wiring at voltage above 50 V a.c. or 120 V d.c. However,

License to practice**3)**

practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

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.

UEENEEE1 01A Apply Occupational Health and Safety regulations, codes and practices in the workplace

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 3

Employability Skills Information**Employability Skills****5)**

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 operate an amateur radio communication station.	1.1 OHS procedures for a given work area are identified, obtained and understood through established routines and procedures
	1.2 Established OHS risk control measures and procedures are followed in preparation for amateur radio activities
	1.3 The nature of the operation of activity is identified to be within the Amateur Radio Standard Licence Conditions Determination
	1.4 Sources of materials that may be required for the Amateur Radio activities are identified and utilised according to manufacturer specifications and established routines and procedures
	1.5 Interference to other services is recognised and attended to by good operating practices, and advice is sought from the ACMA to ensure interference to other services does not occur
	1.6 Resources, tools, apparatus and testing devices needed to carry out work are obtained and checked for correct operation and safety
2 Operate an amateur radio communication station.	2.1 Established OHS risk control measures and procedures for carrying out the work are followed
	2.2 The need to test or measure equipment is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures

ELEMENT	PERFORMANCE CRITERIA
	2.3 Circuits/apparatus are checked as being isolated where necessary in strict accordance with OHS requirements and procedures
	2.4 Radio communications operating practices and procedures are demonstrated and are in accordance with established requirements
	2.5 Amateur radio communication station is operated in accordance with Standard Licence Operator's level as prescribed by the Australian Communication Media Authority
	2.6 Methods for dealing with unexpected situations are selected on the basis of safety, discussions with appropriate persons and specified work outcomes
	2.7 Set-up is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles
3 Maintain an amateur radio communication station	3.1 OHS work completion risk control measures and procedures are followed.
	3.2 Modules/sub-assemblies are tagged during the dismantling to help ensure correct and efficient reassembly and stored to protect them against loss or damage.
	3.3 Apparatus is dismantled and assembled in accordance with manufacturer guidelines.
	3.4 Repairs are affected efficiently without damage to other components, apparatus or circuits and in accordance with established procedures
	3.5 Repairs are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices
	3.6 Apparatus is assembled in an appropriate sequence with all modules/sub-assemblies and parts correctly placed, secured and connected in

ELEMENT	PERFORMANCE CRITERIA
	accordance with manufacturer guidelines and industry practice
	3.7 Repaired radio equipment, where appropriate, is tested and returned to service to ensure operating parameters are not exceeded
	3.8 Procedures for referring non-routine events to appropriate authorities are followed
	3.9 Work and operating area is cleaned and made safe in accordance with established procedures
4 Identify and assemble amateur radio communication equipment and associated apparatus	<p>4.1 Established OHS risk control measures and procedures for carrying out the work are followed</p> <p>4.2 Requirements for the item to be assembled are identified</p> <p>4.3 Item is assembled in accordance with established procedures and relevant engineering standards</p> <p>4.4 Assembled unit is tested to ensure that the operating parameters of the station will not be compromised</p> <p>4.5 Adjustments are made to the equipment where required to optimise reception</p> <p>4.6 Commission the equipment as constructed for on air performance.</p>
5 Complete work and maintain reports	<p>5.1 OHS work completion risk control measures and procedures are followed</p> <p>5.2 Work site is cleaned and made safe in accordance with established procedures</p> <p>5.3 Adjustment settings are documented and appropriate person(s) notified in accordance with established procedures</p>

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 carrying out radio station operation, basic maintenance and assembly of radio communication equipment.

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

KS01-EB101A Amateur radio communication principles, operation and maintenance

Evidence shall show an understanding of amateur radio communication principles, operation and maintenance practices, and technical overview, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Nature of Amateur Radio encompassing:

- Nature of Amateur radio
- Types of licences
- Allocation of frequency bands

T2. Licence Conditions encompassing:

- Conditions of licences
- Purpose of the Amateur Service
- Communications by Amateur stations
- Distress and Urgency signals
- Station identification
- Amateur call signs
- Secret messages
- Entertainment not permitted
- Amateur frequency bands and emissions
- Permitted power output
- Notification of change of address
- Harmful interference
- Authorised use of Amateur stations
- Inspection of Amateur licences
- Restriction of operation to avoid interference
- Use of the Licence Condition Determinations

T3. Mathematics used for Amateur radio operation encompassing:

- addition, subtraction, multiplication and division
- fractions, percentage, and decimal notation

REQUIRED SKILLS AND KNOWLEDGE

- units and sub-units; (mega, kilo, UNIT, micro, and pico)
- calculations using simple formulae

T4. Amateur radio technical basics encompassing:

- Mains power overview
- Mains power supplies overview
- Voltage and current overview
- Resistance overview
- Ohm's Law overview and the relationship between voltage, current and resistance
- Power in DC circuits overview including calculations related to power in a DC circuit using current and voltage, current and resistance or voltage and resistance.
- Capacitance overview
- Inductance overview
- AC circuits overview
- Impedance and reactance overview
- Tuned circuits overview
- Transformers overview
- Solid state devices overview

T5. Transmitters and Receivers – basic overview encompassing:

- Block diagrams of simple transmitters
- Mixers
- Modulation
- Amplifiers
- Transmission quality
- Receiver parameters and terminology
- Simple block diagrams of a Receiver
- Frequency converters
- IF amplifier
- Automatic Gain Control
- Transceivers

T6. Transmission lines and Antennas overview encompassing:

- Transmission line basics
- Baluns
- Standing waves
- Antenna Matching Units (ATU)
- Antennas
- Identification of common antennas
- Radiated Power

T7. Propagation overview encompassing:

REQUIRED SKILLS AND KNOWLEDGE

- Electromagnetic radiation
- Ionosphere

T8. Interference and Electromagnetic Compatibility (EMC) overview encompassing:

- Interference - Points of entry into electronic equipment
- Filters
- EMC

T9. Operating Practices and Procedures overview encompassing:

- Equipment practices
- Authorised frequencies and emissions
- Requirement not to transmit on frequencies in use
- Operating practices
- Operating through a repeater
- Make an all-stations call and change frequency
- Transmitter measurements
- Correcting simple equipment maladjustments
- Recognised abbreviations
- Phonetic alphabet

T10. Safety overview encompassing:

- Dangerous voltages
- Electrical safety - equipment to be approved
- Awareness of State Electricity Authority requirements
- Electrical earthing
- Fuses
- Correct fuses to be used
- Replacing fuses
- Station layout for safety
- Power lead safety
- Know location and desirability of a mains OFF switch
- Actions to be taken in the event of an accident involving electricity
- Electric shocks
- Call for help – use of resuscitation techniques
- Battery safety
- Antennas and safety
- Radio waves can be dangerous
- Safe distance from an antenna
- Antenna erection
- Securing and siting antennas
- Lightning protection

REQUIRED SKILLS AND KNOWLEDGE

- Safe use of headphones
- Station security

T11. Measurements encompassing:

- Frequency measurements
- RF Power measurements
- SWR measurements
- Multimeter measurements

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit. It must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

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)

The Australian Communications and Media Authority and the Wireless of Australia have established agreed minimal assessment requirements for licensing of amateur radio stations, including the minimal requirements for assessors.

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 is to 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, regulatory requirements 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 have a bearing on the decision as to how much and how detailed 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:
- Operate and maintain an amateur radio station, dismantling and assembling apparatus and disconnecting and reconnecting components including:

- A Following manufacturer service instructions and licence conditions determination for radio station assembly and dismantling, including transmitter, power, measurement and adjustment.
- B Demonstrating on HF and VHF correct operating procedure as prescribed by the Australian Communications and Media Authority.
- C Connecting and disconnecting components to radio equipment manufacturer requirements and appropriate engineering requirements, including minor soldering
- D Identifying common types of transmission lines, coaxial connectors, antennas and symbols.
- E Assembling a radio frequency choke used for the elimination of potential interference.
- F Testing a coaxial cable for continuity and standing wave ratio, including explaining how to correct a high standing wave ratio, and demonstrating the use of a signal strength metre.
- G Demonstrating the correct use of voice repeaters with and without continuous tone coded squelch system (CTCSS) and/or dual tone multi frequency signalling.
- H Correctly using an amateur radio according to ACMA licence and standard operating procedures
- I 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 must 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.
- Relevant Australian and International standards for the assembly and operation of an amateur radio station.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

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

Note:

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

The resources used for assessment should reflect current industry practices in relation to assembling, dismantling and operating an amateur radio station, including the assembly of an antenna, power supply unit or an equivalent circuit.

**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

assessment 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.

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 must be demonstrated in relation to carrying out the operation and maintenance of an amateur radio communication station.

The operation and maintenance shall be limited to:

- the requirements as prescribed by the Australian Communications and Media Authority, Amateur Operator Certificate of Proficiency (Standard) Syllabus Documentation and Licence Conditions Determination, and
- Assembly of an antenna and power supply or equivalent item of apparatus to industry standards, that may include minor soldering

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)

Broadcast