



Australian Government

UEENEEH134A Fault find and repair electronic medical equipment

Release 3

UEENEEH134A Fault find and repair electronic medical equipment

Modification History

Release	Action	Core/Elective	Details	Points
3	Update		Correct Prerequisite title UEENEEH114A - Troubleshoot resonance circuits in an electronic apparatus	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers fault finding and repairing the electronic aspects of electronic medical equipment. The unit encompasses safe working practices, interpreting process and circuit diagrams, applying knowledge of medical process controls to logical diagnosis procedures, rectifying faults, safety and functional testing and completing the necessary service documentation.

Application of the Unit

Application of the Unit 2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

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 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.

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

UEENEEE1 04A Solve problems in d.c. circuits

UEENEEH1 Repair basic electronic apparatus faults by

Prerequisite Unit(s)**4)**

02A	replacement of components
UEENEEH1 11A	Troubleshoot single phase input d.c. power supplies
UEENEEH1 12A	Troubleshoot digital sub-systems
UEENEEH1 13A	Troubleshoot amplifiers in an electronic apparatus
UEENEEH1 15A	Develop software solutions for microcontroller based systems
UEENEEH1 38A	Fault find and repair complex power supplies
AND	
UEENEEH1 14A	Troubleshoot resonance circuits in an electronic apparatus
UEENEEH1 69A	Solve problems in basic electronic circuits
OR	
UEENEEG1 01A	Solve problems in electromagnetic devices and related circuits
UEENEEG1 02A	Solve problems in low voltage a.c. circuits

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 4 Writing 4 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 fault find and repair.	1.1 OHS procedures for a given work area are obtained and understood.
	1.2 Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3 Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4 The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.
	1.5 Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.6 Tools, equipment and testing devices needed to

ELEMENT**PERFORMANCE CRITERIA**

		diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2	Fault find and repair	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 Logical diagnostic methods are applied to diagnose in electronic medical equipment faults employing measurements and estimations of system operating parameters referenced to system operational requirements. 2.5 Suspected fault scenarios are tested as being the source of system problems. 2.6 Source of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of electronics. 2.7 Faults in the electronic components of the system are rectified to raise global positioning system to its operation standard. 2.8 System is tested to verify that the system operates as intended and to specified requirements. 2.9 Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements. 2.10 Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes. 2.11 Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding

ELEMENT	PERFORMANCE CRITERIA
3 Complete and report fault finding and repair activities.	environment or services and using sustainable energy practices.
	3.1 OHS work completion risk control measures and procedures are followed.
	3.2 Work site is made safe in accordance with established safety procedures.
	3.3 Rectification of faults is documented in accordance with established procedures.
	3.4 Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

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 fault finding and repairing in electronic medical equipment.

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

KS01-EH134A **and repair**

Electronic medical equipment fault finding

Evidence shall show an understanding of electronic medical equipment fault finding and repair, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Medical equipment principles

- Equipment categories, types, functions and operation
- Hazards and safety procedures
- Causes of failure
- Safety testing requirements and methods
- Categories and examples of medical equipment are:
 - Cardiovascular systems including: blood warmers, cardiac catheterisation systems, defibrillators,
 - electrocardiogram(ECG) machines, electrocardiogram(ECG) monitors, heart-lung machines, infusion
 - pumps, intra-aortic balloon pumps, pacemakers, syringe pump and cardiac output measurement
 - equipment.
 - Respiratory systems including: anaesthetic delivery and monitoring units, medical gases, oxygen concentrator, pulse oximeter, respiratory humidifier, respiratory support units and ventilators.
 - Neurological systems including: electroencephalograph (EEG recorder), electromyograph (EMG recorder) and intracranial pressure monitoring (ICP).
 - Renal systems including: haemodialysis machine, CVVH machine and peritoneal dialysis.
 - Medical imaging including: x-ray equipment, computerised axial tomography (CT scan), magnetic resonance imaging (MRI), nuclear medicine and diagnostic ultrasound equipment.
 - Physiological equipment including: blood pressure monitors, foetal cardio-tocograph, infant care systems, multiparameter systems, thermometry, telemetry, networking and patient warmers.
 - Miscellaneous equipment including: electrosurgery, electric stimulators, and endoscopy and laparoscopy systems, laser, operating microscopes, therapeutic

REQUIRED SKILLS AND KNOWLEDGE

diathermy and ultra sound.

T2. Medical equipment, anatomy and physiology and infection control

- Nature of infection
- Control of microbial growth
- Infection control strategies
- Body systems

T3. Medical equipment safe working practices

- Risk management and assessment of risk encompassing:
 - Principle and purpose of risk management, and
 - Processes for conducting a risk assessment
- Hazards associated with medical equipment, encompassing:
 - Infections
 - Toxic materials
 - Electrical components
 - Radiation
- Risks and control measures associated with working with medical equipment

T4. Fault finding and repair

- Typical faults, their symptoms and cause
- Fault diagnosis procedures and testing
- Component replacement
- Equipment adjustments

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:
 - Fault find and repair electronic medical equipment as described in 8) and including:

A	Applying logical diagnostic methods.
B	Using fault scenarios to test the source of system faults.
C	Identifying faults and competency needed to rectify them.
D	Rectifying faults in system electronics.
E	Verifying that the system operates correctly.
F	Documenting fault rectification...
G	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 outcome 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 diagnosing and rectifying faults in electronic medical equipment.

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 fault finding and repairing at least four faults system faults in four different types of a representative range of electronic medical equipment.

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