



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **UEENEEH114A Troubleshoot resonance circuits in an electronic apparatus**

**Release: 1**

## **UEENEEH114A Troubleshoot resonance circuits in an electronic apparatus**

### **Modification History**

Not applicable.

### **Unit Descriptor**

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#### **1) Scope:**

##### **1.1) Descriptor**

This unit covers determining correct operation of resonance circuits used in electronic apparatus. It encompasses working safely, problem solving procedures, including the use of voltage, current and resistance measuring devices, providing solutions derived from measurements and calculations to predictable problems in resonance circuits.

### **Application of the Unit**

#### **Application of the Unit 2)**

This competency standard unit is intended for development of competency in either entry-level employment based programs incorporated in approved contracts of training or other approved training programs. It may also be used to augment formally acquired competencies.

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 3 or higher.

### **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

**License to practice****3)**

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 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

AND

UEENEEE1 04A Solve problems in d.c. circuits

OR

**Prerequisite Unit(s) 4)**

UEENEEH1 Solve problems in basic electronic circuits  
69A

For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2

**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)**

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

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
1 Prepare to troubleshoot resonance circuits.	1.1 OHS procedures for a given work area are obtained and understood.
	1.2 OHS risk control work preparation measures and procedures are followed.
	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 and checked for correct operation and safety.
2 Solve in resonance circuits.	2.1 OHS risk control work measures and procedures 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 are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4 Fault finding is approached methodically drawing on knowledge of resonance circuits using measured and calculated values of parameters.
	2.5 Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6 Fault finding activities are carried out efficiently without unnecessary waste of materials or damage to apparatus and the surrounding environment or services and using sustainable

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
	energy practices.
3 Complete work and document troubleshooting activities.	3.1 OHS work completion risk control measures and procedures are followed.
	3.2 Work site is cleaned and made safe in accordance with established procedures.
	3.3 Justification for solutions used to troubleshooting problems is documented.
	3.4 Work completion is documented and an appropriate person or persons notified in accordance with established procedures.

## 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 troubleshooting frequency dependent circuits.

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

#### KS01-EH114A

#### Resonance circuits troubleshooting

Evidence shall show an understanding of resonance circuit troubleshooting, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

##### T1. Basic engineering mathematics

- SI Units
- Using a calculator.
- Basic Algebra
- Applying the laws of indices.
- Simplification of expressions involving square roots.
- Graphs and tables.
- Pythagoras' Theorem and trigonometry ratios.

##### T2. Sinusoidal alternating voltage and current

- Generating a sinusoidal waveform
- Definition of the terms period, peak, peak-to-peak, instantaneous, average, and root-mean-square value
- Calculating the instantaneous value of a sinusoidal waveform
- Calculating the root-mean-square value and frequency of a sinusoidal waveform
- Phase relationship between two or more sinusoidal waveforms
- Common waveforms used in electronic circuitry
- Observation of sinusoidal and other waveforms

##### T3. A.C. measuring equipment

- Operating principles of a cathode ray oscilloscope (CRO)
- Set up, calibration and use of a CRO
- Calibration and limitation of CRO probes
- Analogue and digital a.c. measuring instruments including true root-mean-square reading instruments
- Measurement of the instantaneous, peak, peak-to-peak values and period of sinusoidal and other common waveforms

##### T4. Phase relationships in a.c. circuits

## REQUIRED SKILLS AND KNOWLEDGE

- Phasor representation of sinusoidal waveforms
- Definitions of in-phase, out-phase, phase angle, lead and lag
- Phasor addition of two voltages or currents

### T5. Resistive a.c. circuits

- Ohms law in a.c resistive circuits
- Current and voltage phase relationship
- Power dissipation

### T6. Inductance in a.c. circuits

- Principles of inductance
- Units
- Inductive time constant circuits
- Inductive reactance
- Ohms law in inductive a.c. circuits
- Phase relationships
- Verification of operation of RC time constant circuit

### T7. Capacitance in a.c. circuits

- Capacitive reactance
- Ohms law in capacitive a.c. circuits
- Current and voltage phase relationships

### T8. Series a.c. circuits

- Definition of Impedance
- Impedance
- The impedance triangle
- Voltages distribution
- Vector representation of current and voltages
- Verification of operation of series a.c. circuit

### T9. Parallel a.c. circuits

- Current distribution
- Vector representation of voltage and currents
- Impedance calculations based on total circuit current and voltage
- Verification of operation of parallel a.c. circuit

### T10. Series-parallel a.c. circuits

- Examples of circuit
- Rules for simplification

### T11. Power factor

- Power triangle
- True power



## REQUIRED SKILLS AND KNOWLEDGE

- Apparent power
- Reactive power
- Power factor
- Power factor correction

### T12. Ideal transformer

- Construction and operating principles
- Step-up, step-down, turns ratios, voltage and current ratios
- Autotransformer
- Core losses
- Types of cores and applications
- Volt-Ampere (VA) rating
- Verification of operation of transformer circuit

### T13. Series resonance

- Conditions in a circuit that produce series resonance
- Relationship between resonance and frequency
- Impedance of a series resonant circuit
- Phasor representation of current and series voltage drops in series resonant circuit
- Voltage magnification
- The Q of a coil and its relevance
- Bandwidth and half power points in a resonant circuit
- Selectivity
- Verification of operation of series resonant circuit

### T14. Parallel resonance

- Conditions in a circuit that produce parallel resonance
- Impedance of a parallel resonant circuit
- Vector representation of voltage and parallel branch currents in a parallel resonant circuit
- Current magnification
- Verification of operation of parallel resonant circuit

### T15. Filters

- Purpose of a filter
- Circuits for operation of the following passive filter circuits: high pass, low pass, band stop and band pass
- Bandwidth, attenuation, cut-off, roll off and order of filter
- Measurements and calculations relating to passive filters
- Curves showing the behaviour of various types of filter circuits
- Verification of operation of each filter type

## 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:
  - Troubleshoot frequency dependent circuits as described in 8) and including:

A	Using methodical problem solving methods.
B	Taking measurements correctly and accurately.
C	Calculating parameters correctly and accurately.
D	Providing solution to resonance circuit problems.

- E Providing written justification for the solutions to problems.
- F 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 troubleshooting frequency dependent circuits.

**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:

UEENEEE10 Solve problems in d.c. circuits  
4A

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.

