



Australian Government

UEEIC0020 Fault find and repair analogue circuits and components in electronic control systems

Release: 1

UEEIC0020 Fault find and repair analogue circuits and components in electronic control systems

Modification History

Release 1. This is the first release of this unit of competency in the UEE Electrotechnology Training Package.

Application

This unit involves the skills and knowledge required to fault find and repair analogue circuits and components in electronic control systems.

It includes fault finding and repairing analogue circuits as well as completing and reporting on fault and repair activities. It also includes analogue circuits and components to logical fault-finding processes, implementing fault rectification, safety and functional testing.

The skills and knowledge described in this unit require a licence or permit to practice in the workplace where work is carried out on electrical installations which are designed to operate at voltages greater than 50 volt (V) alternating current (a.c.) or 120 V direct current (d.c.).

Competency development activities in this unit are subject to regulations directly related to licensing. Where a licence or permit to practice is not held, a relevant contract of training, such as an Australian apprenticeship, is required.

Additional and/or 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 work health and safety (WHS)/occupational health and safety (OHS) regulations.

Pre-requisite Unit

Where prerequisite pathways have been identified, all competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s)

Common Unit Group

UEECD0007 Apply work health and safety regulations, codes and practices in the workplace

UEECD0051 Use drawings, diagrams, schedules, standards, codes and specifications

and

UEECD0043 Solve problems in direct current circuits

or

UEECD0044 Solve problems in multiple path circuits

UEECD0046 Solve problems in single path circuits

Electrical Pathway Group

UEECD0020 Fix and secure electrotechnology equipment

UEEEL0003 Arrange circuits, control and protection for electrical installations

UEEEL0020 Solve problems in low voltage a.c. circuits

UEEEL0023 Terminate cables, cords and accessories for low voltage circuits

UEEEL0019 Solve problems in direct current (d.c.) machines

UEEEL0021 Solve problems in magnetic and electromagnetic devices

UEEEL0014 Isolate, test and troubleshoot low voltage electrical circuits

UEEEL0008 Evaluate and modify low voltage heating equipment and controls

UEEEL0009 Evaluate and modify low voltage lighting circuits, equipment and controls

UEEEL0010 Evaluate and modify low voltage socket outlets circuits

UEEEL0024 Test and connect alternating current (a.c.) rotating machines

UEEEL0025 Test and connect transformers

Instrumentation and Control Pathway Group

UEECD0045 Solve problems in multiple path extra-low voltage (ELV) a.c. circuits

UEEIC0047 Use instrumentation drawings, specifications, standards and equipment manuals

UEEIC0041 Solve problems in pressure measurement components and systems

UEEIC0038 Solve problems in density/level measurement components and systems

UEEIC0039 Solve problems in flow measurement components and systems

UEEIC0043 Solve problems in temperature measurement components and systems

UEEIC0029 Set up and adjust PID control loops

UEEIC0030 Set up and adjust advanced PID process control loops

UEEIC0048 Verify compliance and functionality of instrumentation and control installations

UEEIC0031 Set up and configure human-machine interface (HMI) and industrial networks

Competency Field

Instrumentation & Control

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare to fault find analogue circuits

PERFORMANCE CRITERIA

Performance criteria describe the performance needed to demonstrate achievement of the element.

- 1.1** WHS/OHS requirements and workplace procedures are identified and applied
 - 1.2** Hazards are identified, risks assessed and control measures implemented
 - 1.3** Safety hazards not previously identified are reported on job safety assessment and advice on risk control measures is sought from relevant person/s
 - 1.4** Extent of faults is determined from reports, other relevant documentation and discussions with relevant person/s
 - 1.5** Relevant person/s is consulted to ensure work is coordinated with others
 - 1.6** Tools, equipment and testing devices required to diagnose faults are obtained in accordance with workplace procedures and checked for correct operation and safety
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- 2.1** WHS/OHS risk control measures and procedures for carrying out the work are followed
 - 2.2** Need to test or measure live electrical components is determined in accordance with workplace procedures
 - 2.3** Circuits/machines/plant are checked and isolated in accordance with workplace procedures
 - 2.4** Logical diagnostic methods are applied to electronic control system apparatus faults by employing measurements and estimations of system operating parameters
 - 2.5** Scenarios are tested as suspected cause of system faults
 - 2.6** Fault causes are identified and relevant person/s engaged where fault is outside scope of analogue circuits and components
 - 2.7** Faults in electronic components of control system are

2 Fault find and repair analogue circuits

	rectified
	2.8 System is tested and verified as operating to specified job requirements
	2.9 Unplanned situations are responded to in accordance with workplace procedures in a manner that minimises risk to personnel and equipment
	2.10 Methods for dealing with unexpected situations are selected based on safety and specified work outcomes
	2.11 Diagnosis and rectification work activities are performed using sustainable energy principles and practices without waste of materials, damaging apparatus, the surrounding environment or services
3 Complete and report fault-find and repair activities	3.1 WHS/OHS work completion risk control measures and procedures are followed
	3.2 Work site is made safe in accordance with workplace safety procedures
	3.3 Rectification of faults is documented in accordance with workplace procedures
	3.4 Relevant person/s is notified of system fault rectification in accordance with workplace procedures

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Non-essential conditions may be found in the UEE Electrotechnology Training Package Companion Volume Implementation Guide.

Fault finding and repairing must include at least four of the following faults in analogue circuits and components:

- open circuit
- short circuit
- incorrect or failed connections
- insulation failure
- unsafe condition

- apparatus/component failure
- related mechanical failure

Unit Mapping Information

This unit replaces and is equivalent to UEENEEI124A Fault find and repair analogue circuits and components in electronic control systems.

Links

Companion Volume implementation guides are found in VETNet - -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b8a8f136-5421-4ce1-92e0-2b50341431b6>

Assessment Requirements for UEEIC0020 Fault find and repair analogue circuits and components in electronic control systems

Modification History

Release 1. This is the first release of this unit of competency in the UEE Electrotechnology Training Package.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions on at least two separate occasions and include:

- applying diagnostic methods
- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including implementing risk control measures
- applying sustainable energy principles and practices
- completing and reporting faults and repairs
- consulting relevant person/s
- dealing with unplanned events/situations in accordance with workplace procedures in a manner that minimises risk to personnel and equipment
- documenting fault rectification
- finding and repairing faults of analogue circuits
- identifying, rectifying and determining extent of faults and causes
- isolating circuits/machines/plant
- obtaining tools, equipment and testing devices
- rectifying faults in system analogue circuits and components
- testing and measuring live electrical components
- using fault scenarios to test causes of system faults
- verifying the control system operates correctly.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of:

- amplifier fundamentals, including:
 - the purpose and application of amplifiers
 - the basic characteristics of small signal amplifiers
 - the ideal operational amplifier
- basic operational amplifier configurations, including:

- various operational amplifier circuit configurations and where they are used
- measured and calculated values of gain and output voltage for various operational amplifier configurations
- circuit configurations, including:
 - inverting
 - non-inverting
 - voltage follower
 - summing
 - comparators
 - Schmitt trigger
 - differential configurations
- operational amplifier limitations, including:
 - use of frequency compensation
 - offset null
 - bias compensation
 - slew rate
 - frequency response
 - bandwidth
 - noise figures
- single-stage amplifiers, including:
 - determination of direct current (d.c.) bias conditions for a single-stage amplifier
 - small signal terminal characteristics of single-stage amplifiers
 - effects of coupling and by-pass capacitors in single-stage amplifiers
- amplifier applications, including:
 - operation of multi-stage amplifiers
 - effects of component values and frequency response
 - negative feedback loop in multi-stage amplifiers
 - negative feedback and amplifier parameters
 - effects on the output voltage when amplifiers are subjected to control signal overdrive, bias faults and amplifying device faults
- operational amplifier /diode circuits, including:
 - clippers
 - clamp circuits
 - precision rectifiers
- oscillators, including:
 - oscillator circuits using operational amplifiers
 - sine wave
 - square wave
 - triangular wave
 - sawtooth

- operational amplifier /resistance/capacitance (RC) circuits, including:
 - integrator
 - differentiator
 - function generators
- filters, including:
 - active filter circuits
 - first and second order
 - low, high and band pass circuits
- timers, including operation of typical timer integrated circuits
- power amplifiers including:
 - power output integrated circuits
 - power amplifiers using operational amplifiers
 - power supplies
- multi-stage circuits, including:
 - circuits using several different operational amplifier configurations
 - fault-finding procedures
- analogue circuit faults
- analogue circuits and components in electronic control systems
- diagnostic methods
- relevant job safety assessments or risk mitigation processes, including risk control measures
- relevant manufacturer specifications
- relevant WHS/OHS legislated requirements
- relevant workplace documentation
- relevant workplace policies and procedures
- sustainable energy principles and practices
- system testing and verification techniques.

Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must occur in workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated workplace operational situations that replicate workplace conditions.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Resources for assessment must include access to:

- a range of relevant exercises, case studies and/or other simulations

- relevant and appropriate materials, tools, equipment and personal protective equipment (PPE) currently used in industry
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

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