



Australian Government

UEEIC0018 Diagnose and rectify faults in digital controls systems

Release: 1

UEEIC0018 Diagnose and rectify faults in digital controls 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 diagnose and rectify faults in digital controls systems.

It includes preparing, diagnosing and rectifying faults. It also includes completing and reporting fault diagnosis, interpreting diagrams and technical data, applying knowledge of digital systems to logical fault-finding processes, implementing fault rectification, and safety and functional testing.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

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 diagnose and rectify faults

PERFORMANCE CRITERIA

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

- 1.1** Work health and safety (WHS)/occupational health and safety (OHS) requirements and workplace procedures are identified and applied.
- 1.2** Hazards are identified, risks are 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 work is determined from reports, other documentation and discussions with appropriate person/s
- 1.5** Appropriate person/s are consulted to ensure work is coordinated effectively with others
- 1.6** Tools, equipment and testing devices required for diagnosing faults are obtained in accordance with workplace procedures and checked for correct operation and safety

2 Diagnose and rectify faults

- 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 diagnose 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 digital subsystems
- 2.7** Faults in electronic components of control system are 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 unplanned 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 wasting materials, damaging apparatus, the surrounding environment or services
3 Complete and report fault diagnosis and rectification activities	3.1	WHS/OHS work completion risk control measures and workplace procedures are followed
	3.2	Worksite 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.

Diagnosing and rectifying faults in digital control systems must include at least four of the following faults:

- 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 UEENEEI139A Diagnose and rectify faults in digital controls 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 UEEIC0018 Diagnose and rectify faults in digital controls 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 logical 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 fault diagnosis and rectification activities
- dealing with unplanned events/situations in accordance with workplace procedures in a manner that minimises risk to personnel and equipment
- diagnosing and rectifying faults
- documenting fault rectification
- identifying faults, causes and rectification methods
- isolating circuits/machines/plant
- obtaining tools, equipment and testing devices
- preparing to diagnose and rectify faults
- rectifying faults in digital subsystems
- testing and measuring live electrical components
- using scenarios to test causes of system faults
- verifying system operates as intended.

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:

- digital control systems, including:
 - comparison between analogue and digital signals
 - advantages of digital control systems
 - digital/analogue control system
 - logic gates

- truth tables
- digital testing devices
- numbering systems, including:
 - the binary number system
 - the octal number system
 - the hexadecimal number system
 - binary addition and subtraction
 - conversion between numbering systems
 - binary coded decimal (BCD)
 - Gray code
 - the American Standard Code for Information Interchange (ASCII)
- combinational logic networks, including:
 - precautions when handling electronic devices due to electrostatic discharge (ESD)
 - truth tables
 - basic operation and characteristics of logic devices
 - logic probes
 - verification of operation of logic circuits
- logic families and specifications, including:
 - logic families and specifications
 - transistor-transistor logic (TTL)
 - complementary metal oxide silicone (CMOS) logic families
 - the unit load concept
 - specifications and features of TTL, TTL low power Schottky (LS) and CMOS logic families
 - three state and open collector logic
 - input and output voltage characteristics for CMOS and TTL
 - comparison of TTL with CMOS logic families
 - unit load
 - noise margin
 - interfacing different logic families
 - tri-state logic devices
- encoders and decoders, including:
 - weighted and unweighted codes
 - Gray
 - BCD
 - ASCII
 - half and full adder
 - error detection
 - decoder and encoder integrated circuits
 - multiplexer and demultiplexer integrated circuits

-
- flipflops, including:
 - RS flipflops
 - D flipflops
 - JK flipflops
 - truth tables and operation
 - debouncing a switch
 - timing diagrams
 - sequential logic
 - state tables and timing diagrams
- registers, including shift registers and data latches
- counters, including:
 - ripple counters using JK flipflops
 - typical integrated circuit types
 - characteristics and operation
 - ripple counters
 - use of feedback to modify count
 - circuit verification of a ripple counter
 - synchronous counters
 - series and parallel data transfer
 - multivibrators
 - interconnecting digital circuits to perform an application
- digital-to-analogue (D/A) conversion, including:
 - industrial applications of D/A converters
 - summing D/A converters
 - R-2R D/A converters
 - verification of circuit operation of an IC D/A converter
- analogue-to-digital (A/D) conversion, including:
 - industrial applications of A/D converters
 - digital ramp, dual slope, successive approximation and simultaneous (flash) A/D converters
 - verification of circuit operation of an IC A/D converters
- display devices, including:
 - liquid-crystal display (LCD) devices
 - light-emitting diode (LED) devices.
 - operation and characteristics
 - seven segment LED displays
 - drive requirements
 - current limiting
 - multiplexed displays

- seven segment encoding chips
- emerging display technologies
- digital fault finding, including:
 - general fault-finding principles
 - common digital faults
 - digital test equipment
 - locating a fault
- interfacing logic devices to external loads, including:
 - interfacing with a transistor
 - interfacing with a relay
 - solid state switches
 - opto-isolator
 - verification of circuit operation of an opto-coupler
- programmable logic devices, including:
 - programmable logic devices
 - applications of programmable logic devices
 - types of programmable logic devices
 - comparison between different programmable logic devices
 - programmable array logic (PAL)
 - programmable logic devices (PLD)
 - field programmable gate arrays (FPGA)
 - programming and verifying correct operation of a programmable array logic device
- 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
- diagnostic methods including digital fault finding, including:
 - diagnostic tools, equipment and testing devices
 - digital control systems, including comparison between analogue and digital signals
 - numbering systems, including binary number system, octal number system and hexadecimal number system.

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.

Links

Companion Volume implementation guides are found in VETNet - -

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