



Australian Government

UETTDRTS28 Repair, test and calibrate protection relays and meters

Release: 1

UETTDRTS28 Repair, test and calibrate protection relays and meters

Modification History

Release 1. This is the first release of this unit of competency in the UET Transmission, Distribution and Rail Sector Training Package.

Application

This unit covers the repair, calibration and testing of various types of protection relays. These can include electromechanical, analogue, digital electronic and numerical devices. It also involves finding and replacing faulty components, testing to manufacturer or user specifications and proving all functions of the devices under test.

The application of the skills and knowledge described in this unit may require a licence/registration to practice in the workplace subject to regulations for undertaking of electrical work.

Other conditions may apply under state and territory legislative and regulatory licencing requirements which must be confirmed prior to commencing this unit.

Pre-requisite Unit

Common Unit Group

UEENEED104A Use engineering applications software on personal computers

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE102A Fabricate, assemble and dismantle utilities industry components

UEENEEE104A Solve problems in d.c. circuits

UEENEEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEE124A Compile and produce an energy sector detailed report

UEENEEE125A Provide engineering solutions for problems in complex multiple path circuits

UEENEEE126A Provide solutions to basic engineering computational problems

UEENEEG101A Solve problems in electromagnetic devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UEENEEG149A Provide engineering solutions to problems in complex polyphase power circuits

UETTDREL11 Apply sustainable energy and environmental procedures

UETTDREL16 Working safely near live electrical apparatus

UETTDRLS62 Implement and monitor the power system organisational WHS/OHS policies,

procedures and programs

UETTDRTS63 Implement & monitor power system environmental & sustainable energy management policies & procedures

Competency Field

Testing

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Plan for the testing, repair and calibration of protection relays and meters

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) practices/procedures and environmental and sustainable energy procedures, which may influence the testing, repair and calibration of protection relays and meters, are reviewed and determined
- 1.2** Purpose of the testing, repair and calibration of protection relays and meters is established after data is analysed and expected outcomes of the work are confirmed with appropriate personnel
- 1.3** Organisational established procedures on policies and specifications for the testing, repair and calibration of protection relays and meters are obtained or established with appropriate personnel
- 1.4** Testing procedures are discussed with/directed to appropriate personnel in order to ascertain the project brief
- 1.5** Testing parameters are established from organisational established procedures and policies and specifications
- 1.6** Equipment/tools and personal protective equipment (PPE) are selected based on specified performance criteria and established procedures

- 1.7 Work roles and tasks are allocated according to requirements and individual competencies
 - 1.8 Work is prioritised and sequenced for the most efficient/effective outcome, completed within an acceptable timeframe, to a quality standard and in accordance with established procedures
 - 1.9 Liaison and communication issues with others/authorised personnel, authorities, clients and land owners are resolved and activities coordinated to carry out work
 - 1.10 Risk control measures are identified, prioritised and evaluated against the work schedule
 - 1.11 Relevant work permits are secured to coordinate the performance of work according to requirements and/or established procedures
- 2 **Carry out the testing, repair and calibration of protection relays and meters**
 - 2.1 Circuit/systems modelling is used to evaluate alternative proposals as per established procedures
 - 2.2 WHS/OHS and sustainable energy principles, functionality and practices to reduce the incidents of accidents and minimise waste are incorporated into the project in accordance with requirements and/or established procedures
 - 2.3 Testing, repair and calibration decisions of protection relays and meters are made on the basis of safety and effective outcomes according to requirements and/or established procedures
 - 2.4 Mathematical and/or engineering models of the testing, repair and calibration of protection relays and meters are used to analyse the effectiveness of the finished project in accordance with requirements and established procedures
 - 2.5 Technical advice is given regarding potential hazards, safety risks and control measures so that monitoring and preventative action can be undertaken and/or appropriate authorities consulted, where necessary, in accordance with requirements and established procedures
 - 2.6 Essential knowledge and associated skills are applied to

analyse specific data and compare it with compliance specifications to ensure completion of the project within an agreed timeframe according to requirements

- 2.7** Testing, repair and calibration of protection relays and meters is undertaken according to requirements and established procedures
- 2.8** Work teams/groups are arranged/coordinated/evaluated to ensure planned goals are met according to established procedures
- 2.9** Solutions to non-routine problems are identified and actioned, using acquired essential knowledge and associated skills, according to requirements
- 2.10** Quality of work is monitored against personal performance agreement and/or established organisational and professional standards
- 2.11** Strategic plans are developed incorporating organisation initiatives in accordance with established procedures

3 Complete the testing, repair and calibration of protection relays and meters

- 3.1** Final review of test results of tested, repaired and calibrated protection relays and meters is undertaken to ensure they comply with all requirements and include all specifications and documentations needed to complete the project
- 3.2** Appropriate personnel are notified of completion and reports and/or completion documents are finalised/commissioned
- 3.3** Reports and/or completion documents are submitted to relevant personnel/organisations for approval and, where applicable, statutory or regulatory approval
- 3.4** Approved copies of the testing, repair and calibration of protection relays and meters documents are issued and records are updated in accordance with established 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 Companion Volume Implementation Guide.

Unit Mapping Information

This unit replaces and is equivalent to UETTDRTS28A Repair, test and calibrate protection relays and meters.

Links

UET Training Package Companion Volume Implementation Guide is found in VETNet - <https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=229bace1-b7bc-4653-9300-dffb13ecfad7>

Assessment Requirements for UETTDRTS28 Repair, test and calibrate protection relays and meters

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Performance Evidence

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

- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including the use of risk control measures
- applying sustainable energy principles and practices
- using all of the following simple protection schemes:
 - auxiliary
 - overcurrent
 - timers
 - voltage
- using at least three (3) of the following intermediate protection devices:
 - inverse time delay overcurrent
 - voltage regulating relays
 - differential
 - pilot wire
- using at least two (2) of the following advanced protection schemes:
 - multi-zone impedance
 - multi-function feeder protection
 - phase comparison
 - digital current differential
- dealing with unplanned events on at least one (1) occasion.

Knowledge Evidence

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

- procedures for the location and rectification of faults in electrical equipment up to 1000 volts alternating current (a.c.) and/or 1500 volts direct current (d.c.) encompassing:
 - relationship of WHS/OHS to the location and rectification of faults in electrical

- equipment - acts and regulations, identification of personal safety, workplace hazards, working with electrically operated tools and equipment, emergency first aid/resuscitation, rescue from a live electrical situation, and enterprise policies and procedures
- types of drawings - differentiation between symptoms, faults and causes in malfunctioning equipment, fault-finding techniques and procedures
 - fundamental electrical concepts - effects of current, practical resistors, sources of electromagnetic field, series, parallel and series-parallel circuits, electrical measurement, capacitors, inductors and magnetism
 - fundamentals of general appliances - basic principles of appliances (non-mathematical), appliance identification, appliance ratings, basic principles of operation of control equipment and protection devices, fault conditions and symptoms, safe isolation procedures, test equipment, safe testing procedures, including continuity, fault types in appliances and fault-finding procedures (prescriptive)
 - fundamentals of single phase induction motors - basic principles of operation (non-mathematical), motor identification, motor ratings, basic principles of operation of control equipment and protection devices, fault conditions and symptoms, safe isolation procedures, test equipment, safe testing procedures, including continuity, fault types in phase splitting and universal type motors and fault-finding procedures (prescriptive)
 - fundamentals of three phase induction motors - basic principles of operation (non-mathematical), motor identification, motor ratings, motor starter principles, basic principles of operation of control equipment and protection devices, fault conditions and symptoms, safe isolation procedures, safe testing procedures and fault-finding procedures (prescriptive)
 - fundamentals of single and three phase electrical heaters - basic principles of operation, types of electrical heaters, electrical heater identification, electrical heater ratings, basic principles of operation of control and protection devices, fault conditions and symptoms, safe testing procedures and fault-finding procedures (prescriptive)
 - detailed operation of metering devices and principles encompassing:
 - common circuit configurations
 - meters and measurement principles
 - instrument transformer application
 - testing of metering systems and devices
 - implications of market operation
 - detailed operation of fundamental test equipment encompassing:
 - care and safe use
 - operating principles
 - comparison of different operating principle meters used for the same purpose
 - accuracy and loading effects of meters - measurement of voltage, current, power, resistance, insulation resistance, impedance and phase sequence, and the use of oscilloscopes
 - detailed operation of protection test equipment encompassing:
 - care and safe use
 - operating principles

- comparison of different operating principle meters used for the same purpose
- accuracy and loading effects of meters - measurement of timing, voltage, current, resistance, inductance, capacitance, impedance, frequency, phase angle, phase difference, and the use of primary, secondary and gas injection equipment
- protection schemes encompassing:
 - standards, codes, legislation, supply authority regulations and/or enterprise requirements applicable to protection schemes
 - types of protection schemes - reasons for use, application of protection zones around system elements and degree of protection
 - types of feeder protection equipment - overcurrent protection inverse time-current operating characteristics
 - operation of overcurrent protection equipment used on distribution systems
 - operation of automatic circuit reclosers (ACR) and their time-current characteristics
 - types and characteristics of over-current relays
 - coordination methods of a distribution feeder protection scheme
 - earth fault protection used on a distribution feeder
 - operation of a single wire earth return (SWER) 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 conditions involving realistic and authentic activities that replicate operational 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, facilities, equipment and personal protective equipment (PPE) currently used in industry
- applicable documentation, including workplace procedures, relevant industry standards, equipment specifications, regulations, codes of practice and operation manuals.

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