



**Australian Government**

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

# **UEPMNT427B Diagnose and repair faults in complex instrumentation equipment**

**Release: 1**

## **UEPMNT427B Diagnose and repair faults in complex instrumentation equipment**

### **Modification History**

Not applicable.

### **Unit Descriptor**

#### **Unit Descriptor**

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

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

This unit deals with the skills and knowledge required to undertake the diagnose and repair of complex instrumentation configuration including, but not limited to, signal characterising equipment, totaliser units, microprocessor control equipment, interface equipment, laboratory and field analysers, ultrasonic and nucleonic equipment.

### **Application of the Unit**

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

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

### **Licensing/Regulatory Information**

#### **License to practice**

#### **3)**

The skills and knowledge described in this unit may require an electrical licence to practise in the workplace. Practice in this unit is subject to regulations directly related to Occupational Health and Safety and where applicable contracts of training such as apprenticeships and the like.

## Pre-Requisites

**Prerequisite Unit(s)** 4)

**Competencies** 4.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed.

Common Unit Group

| Unit Code   | Unit Title                                                     |
|-------------|----------------------------------------------------------------|
| UEPMNT356B  | Maintain instrumentation equipment                             |
| UEENEEI001B | Install and set up transducers and sensing devices             |
| UEENEEE002B | Dismantle, assemble and fabricate electrotechnology components |
| UEENEEE005B | Fix and secure equipment                                       |
| UEENEEE007B | Use drawings, diagrams, schedules and manuals                  |

**Literacy and numeracy skills** 4.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following levels. A description of what each level entails is provided in Section 2.3.1 Language, Literacy and Numeracy.

Reading 4      Writing 4      Numeracy 4

## Employability Skills Information

**Employability Skills** 5)

The required outcomes described in this unit of competency contain applicable facets of Employability

**Employability Skills**

5)

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 Plan and prepare the work

- 1.1 Work requirements are identified from request/work orders or equivalent and clarified/confirmed with appropriate parties or by site inspection.
- 1.2 Occupational Health and Safety standards, statutory requirements, relevant Australian standards, codes of practice, manufacturers' specifications, environmental requirements and enterprise procedures are identified, applied and monitored throughout the work procedures.
- 1.3 Resources required to satisfy the work plan are identified, obtained and inspected for compliance with the job specifications.
- 1.4 Relevant plans, drawings and texts are selected and interpreted in accordance with the work plan.
- 1.5 Correct size, type and quantity of materials/components are determined, obtained and inspected for compliance with the job specifications.
- 1.6 Work is planned in detail including sequencing and prioritising and considerations made, where appropriate, for the maintenance of plan security

| ELEMENT            | PERFORMANCE CRITERIA                                                                                                                                                             |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | and capacity in accordance with system/site requirements.                                                                                                                        |
|                    | 1.7 Co-ordination requirements, including requests for isolations where appropriate, are resolved with others involved, affected or required by the work.                        |
|                    | 1.8 Potential hazards are identified and prevention and/or control measures are selected in accordance with the work plan and site procedures.                                   |
|                    | 1.9 Work area is prepared in accordance with work requirements and site procedures.                                                                                              |
|                    | 1.10 Where appropriate, the teams and individuals roles and responsibilities within the team are identified and, where required, assist in the provision of on-the-job training. |
| 2 Verify the fault | 2.1 Normal performance and function of the equipment is ascertained by consulting appropriate reference sources in accordance with the work plan.                                |
|                    | 2.2 Fault indicators, appropriate technical information/diagnostic techniques are used to verify reported symptoms/faults in accordance with the work plan.                      |
|                    | 2.3 Symptoms are reproduced and monitored if possible, whilst due regard for personnel safety and plant security is observed in accordance with the work plan.                   |
| 3 Find the fault   | 3.1 Required isolations are confirmed where appropriate in accordance with site requirements.                                                                                    |
|                    | 3.2 Fault finding is carried out in conjunction with others involved in, or affected by, the work in accordance with enterprise/job requirements.                                |
|                    | 3.3 Equipment components, wires, cables, terminations and support fixings are inspected for obvious faults in accordance with the work plan.                                     |

| ELEMENT                       | PERFORMANCE CRITERIA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                               | <p>3.4 All appropriate fault finding/diagnostic techniques are identified, selected and used to determine the fault in accordance with the work plan.</p> <p>3.5 All appropriate components are disconnected to enable accurate test measurements of suspected faulty components without the concern of "back feed" readings in accordance with the work plan.</p> <p>3.6 Test and measurement instruments are used in accordance with manufacturers' job requirements.</p>                                                                                                                                                                                                                                                                                         |
| 4 Determine cause of fault    | <p>4.1 All appropriate personnel are consulted in order to obtain as many details relating to the faulty equipment as possible in accordance with the work plan.</p> <p>4.2 Appropriate use is made of any information from fault indicators and maintenance records in accordance with the work plan.</p> <p>4.3 Valid conclusions about the nature and cause of the fault are reached from analysis of available evidence in accordance with the work plan.</p>                                                                                                                                                                                                                                                                                                   |
| 5 Repair or rectify the fault | <p>5.1 Required isolations are confirmed where appropriate in accordance with site requirements.</p> <p>5.2 Appropriate repair procedures are undertaken in conjunction with others involved in, or affected by, the work in accordance with the work plan.</p> <p>5.3 Faulty, worn, damaged or unsecured components are replaced, repaired or secured in accordance with the work plan.</p> <p>5.4 Parts and components are selected and replaced as required in accordance with appropriate specifications and the work plan.</p> <p>5.5 Components disconnected for testing are reconnected having been proven free of faults and all terminations are then checked to ensure they are electrically and mechanically sound in accordance with the work plan.</p> |

**ELEMENT****PERFORMANCE CRITERIA**

|                     |     |                                                                                                              |
|---------------------|-----|--------------------------------------------------------------------------------------------------------------|
|                     | 5.6 | All faults are repaired or rectified in accordance with the work plan.                                       |
|                     | 5.7 | Final job inspection is performed and permits are relinquished as required in accordance with the work plan. |
| 6 Complete the work | 6.1 | Work is completed and appropriate personnel notified in accordance with site/enterprise requirements.        |
|                     | 6.2 | Work area is cleared of waste, cleaned, restored and secured in accordance with site/enterprise procedures.  |
|                     | 6.3 | Plant, tools and equipment are maintained and stored in accordance with site/enterprise procedures.          |
|                     | 6.4 | Work completion details are finalised in accordance with site/enterprise 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 diagnosing and repairing faults in complex instrumentation equipment.

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

The extent of the Essential Knowledge and Associated Skills required follows:

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T1 Evidence shall show that knowledge has been acquired for safe working practices of:

- Relevant Environmental, Occupational Health and Safety legislation and regulations
- Relevant plant and equipment, its location and operation
- Technical drawings and manufacturers manuals
- Introduction to and typical arrangements of power production plant
- Relevant state and territory regulations
- Instrumentation principles and practices
- Instrument calibration techniques
- Electronic principles
- relevant Australian standards
- equipment and material required to perform the work
- isolation procedures
- fault finding and diagnostic techniques
- repair techniques
- complex instrumentation equipment
- electrical fundamentals
- test and measurement instruments
- engineering and electronic workshop practice
- Distributed control systems
- Programmable logic controller

T2 Specific skills needed to achieve the Performance Criteria:

- Apply Relevant Environmental, Occupational Health and Safety legislation and regulations
- Interpret Technical drawings and manufacturers manuals
- Apply relevant state and territory regulations
- Apply electronic principles
- Apply instrumentation principles and practices
- Apply instrument calibration techniques

## REQUIRED SKILLS AND KNOWLEDGE

- apply relevant Australian standards
- use tools and relevant equipment
- use test and measurement instruments
- verify and identify faults
- use appropriate fault finding and diagnostic techniques
- determine the cause of faults
- repair faults
- identify and select materials for the job
- apply electrical fundamentals
- carry out work completion details
- apply distributed control theory
- communicate effectively
- apply data analysis techniques and tools
- Apply engineering and electronic workshop practices

## Evidence Guide

### EVIDENCE GUIDE

**9)** This provides essential advice for assessment of the competency standard unit and must be read in conjunction with the Performance Criteria and the Range Statement of unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this competency standard unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

### Overview of Assessment

#### 9.1)

Longitude 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's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or 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. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment. Activities associated with normal every day work have a bearing on the decision as to how much and how detailed 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 practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included 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 pre-requisites 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 – UEP12". 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 6) of this unit

- Demonstrate an appropriate level of employability skills
- Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures
- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - The knowledge and application of relevant sections of Occupational Health and Safety legislation, statutory legislation, enterprise/site safety procedures; enterprise/site emergency procedures.
  - Preparation and planning of work; Verification techniques; Diagnostic and fault finding techniques and procedures associated with electrical work; Repair techniques and procedures; Completion of work procedures
  - Dealing with an unplanned event by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

**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.

Competency Standards should be assessed in the workplace or simulated workplace and under the normal range of workplace conditions.

Assessment of this unit will be supported with documentary evidence, by means of endorsement stating type and application of work.

In addition to the resources listed above in Context of assessment', evidence should show competency working, in limited spaces, with different types of plant and equipment as well as different structural/construction types and methods and in a variety of environments.

**Method of  
assessment****9.4)**

This unit shall be assessed by methods given in 1.3.00 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 recommended concurrent assessments with this unit, however in some cases efficiencies may be gained in terms of learning and assessment effort being concurrently managed with allied competency standard units where listed.

Nil

## Range Statement

### RANGE STATEMENT

**10)** This relates to the competency standard 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.

Equipment may include CO<sub>2</sub>; H<sub>2</sub>; PH; dissolved O<sub>2</sub>; conductivity and optical density analysers; recorders; nuclear devices; smart transmitters; magflow meters; coal feeders; belt weigher; PLCs; ultrasonic sensors; hydraulic control equipment; turbine supervisory equipment; detectors; test equipment; transducers; pneumatic controllers; fire panels; T/C converters; electronic controllers; wear monitors; printers; printer circuit boards; UV sterilisation equipment; gas detection equipment and surge suppression equipment.

Materials may include lubricants; cleaning solvents; gasket materials and leak test solution.

Components may include gas analyser; sensing elements; liquid analyser sensing elements; columns; thermal/conductive detectors; infra-red sources; filters; chopper motors; balancing motors; servo motors; chart drives; relays; load cells; tachometers; PLC input/output blocks; amplifying modules; servo valves and plug-in PCBs.

Test and measurement instruments may include multimeter; standard gases; decade box; d.c., I/V standard; potentiometer; radiation meter; hand-held communicator/programmer; frequency counter; frequency generator; CRO, variac and specialised test equipment.

Fault find and diagnostic techniques may include linear approach; half split rule; sensory detection/insulation/resistance and continuity test.

Fault find and diagnostic techniques may include linear approach; half split rule; sensory detection; insulation/resistance and continuity tests.

Fault indicators may include indication lamps; LEDs; alarms and flag relays.

Work may be performed on line.

Work completion details may include plant and maintenance records; job cards; check sheets and on device labelling updates.

Work site environment may be affected by nearby plant or processes, e.g. heat, noise, dust, oil, water and chemical.

Isolations can refer to electrical/mechanical or other associated processes.

Generic terms are used throughout this Training Package for vocational standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms are given in Section 2.1 Preliminary Information and Glossaries.

## Unit Sector(s)

Not applicable.

## Competency Field

Competency Field 11)

Maintenance.