



Australian Government

Department of Education, Employment and Workplace Relations

UEPMNT503A Diagnose and Repair Faults in Instrumentation Systems

Release: 1

UEPMNT503A Diagnose and Repair Faults in Instrumentation Systems

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor 1)

This unit deals with the skills and knowledge required to diagnose and repair of instrumentation systems and all ancillary equipment including, but not limited to, PC operating systems, distributive control systems, programmable logic control systems, process control systems.

Application of the Unit

Application of the Unit 3)

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 3.1)

The skills and knowledge described in this unit may require an electrical licence to practice 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) 2)

Competencies 2.1) CSU(s):

There are no prerequisite units.

Employability Skills Information

Refer to the Evidence Guide

Elements and Performance Criteria Pre-Content

5) 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 for the work	<p>1.1 Work requirements are identified from request/work orders or equivalent and clarified/confirmed with appropriate parties or by site inspection</p> <p>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 procedure</p> <p>1.3 Resources required to satisfy the work plan are identified, obtained and inspected for compliance with the job specifications</p>

ELEMENT	PERFORMANCE CRITERIA
	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 plant security and capacity in accordance with system/site requirements
	1.7 Coordination 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 the 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.

ELEMENT	PERFORMANCE CRITERIA
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
	3.4 All appropriate fault finding/diagnostic techniques are identified, selected and used to determine the fault in accordance with the work plan
	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
	3.6 Test and measurement instruments are used in accordance with manufacturer's instructions and job requirements
4 Determine cause of fault	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
	4.2 Appropriate use is made of any information from fault indicators and maintenance records in accordance with the work plan
	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
5 Repair or rectify the fault	5.1 Required isolations are confirmed where appropriate in accordance with site requirements
	5.2 Appropriate repair procedures are undertaken in conjunction with others involved in, or affected by, the work in accordance with the work plan
	5.3 Faulty, worn, damaged or unsecured components

ELEMENT	PERFORMANCE CRITERIA
	are replaced, repaired or secured in accordance with the work plan
5.4	Parts and components are selected and replaced as required in accordance with appropriate specifications and the work plan
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
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

6) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired diagnosing and repair faults in instrumentation systems.

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

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

- Occupational Health and Safety standards
- Relevant statutory requirements and codes of practice
- Relevant Australian standards
- Equipment and material required to perform the work
- Isolation procedures
- General layout of plant/work site and operation of its equipment
- Instrument systems
- Repair techniques
- Regulatory aspects
- Electrical fundamentals
- Test and measurement instruments
- Engineering and workshop practice
- Distributed control
- Programmable control
- Communication principles

Specific skills needed to achieve the Performance Criteria:

- Apply Occupational Health and Safety standards
- Follow relevant statutory regulations and codes of practice
- Apply relevant Australian standards
- Carry out work in a logical and safe manner
- Use tools and relevant equipment

REQUIRED SKILLS AND KNOWLEDGE

- 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 regulatory aspects theory
- Apply electrical fundamentals theory
- Carry out work completion details
- Apply distributed control theory
- Apply programmable control theory
- Communicate effectively
- Apply data analysis techniques and tools.

Evidence Guide

EVIDENCE GUIDE

8) Evidence Guide: 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 the competency standard 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

8.1)

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, 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 in this regard.

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 practised. These points are raised for the assessors to consider when choosing an

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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

8.2)

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 - UEP06". Evidence shall also comprise:

- A representative body of Performance Criteria 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:

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- 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) Essential Knowledge and Associated Skills of this unit
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated performance across a representative range of contexts from the prescribed items below:
 - Evidence of recognition of potential hazards in the workplace.
 - Evidence that symbols are identified and used for Occupational Health and Safety signs.
 - 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.
 - 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

Context of and specific resources for assessment

8.3)

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

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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 method and in a variety of environments.

Method of assessment

8.4)

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

8.5)

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

EVIDENCE GUIDE**Key competencies 8.6)**

Evidence that particular key competencies have been achieved within this unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	Example of Application	Performance Level
How are ideas and information communicated within this competency?	Refer to the following example of application: Explain ideas and actions, make suggestions for alternative actions and deal with contingencies and non-routine situations.	2
How can information be collected, analysed and organised?	Refer to the following example of application: Information with regard to operations, faults and maintenance may be observed and monitored for analysis and organised into records and reports.	2

How are activities planned and organised?	Refer to the following example of application: Planning the required activity, to include co-ordination and use of equipment, materials and tools to avoid backtracking and rework.	2
How is team work used within this competency?	Refer to the following example of application: Coordinate activities of the team and provide appropriate support to other team members in completion of work tasks to meet the team's goals.	2
How are mathematical ideas and techniques used?	Refer to the following example of application: Calculation of time to complete routine projects, operations, tasks, estimation of distances, levels, loads and material requirements.	2
How are problem solving skills	Refer to the following example of application: Determine solutions which focus on long and	2

How are activities planned and applied?	Refer to the following example of application: short-term resolution of work task problems.	
How is use of technology applied?	Refer to the following example of application: Access, communicate, measure and provide information to monitor operations and performance of plant and equipment.	2

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		Example of Application
1	Developing and using skills within a real workplace	Refer to the following example of application: Completion of tasks within an acceptable timeframe and performance with some supervision.
2	Learning to learn in the workplace	Refer to the following example of application: Comprehension and application of theoretical knowledge to well-developed skills.
3	Reflecting on the outcome and process of work task	Refer to the following example of application: Focused on improvement in own and other team member's performance in the workplace.
4	Interacting and understanding of the context of the work task	Refer to the following example of application: Working understanding of the processes and systems which apply to the workplace.
5	Planning and organising the meaningful work task	Refer to the following example of application: Achieving work tasks in a timely manner and ensuring that the work team achieves its stated work goals.
6	Performing the work task in non-routine or	Refer to the following example of application: Seek advice and apply solutions to problems relevant to the

How are activities planned and contingent situations	Refer to the following example of application: workplace environment.	
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Range Statement

RANGE STATEMENT

7) 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.

Inspection should be planned with the appropriate parties to determine access, conditions and work requirements.

Systems may include process control systems, PLCs, hydraulic control systems, turbine supervisory systems, water ingress protection system, flame surveillance systems, compressor surge control systems and fire detection/suppression systems.

Materials may include cables, solder/flux, lubricants, cleaning solvents, contact cleaners, connectors, adhesive and sealants.

Components may include power supplies, relays, PLC input/output blocks, printed circuit boards, protection devices, switches, transformers, servo valves, positioners, converters, controllers, function cards and transmitters.

Test and measurement instruments may include multimeter, decade box, DC I/V standard, potentiometer, hand-held communicator/programmer, frequency counter, function generator, CRO, LCR bridge, logic analyser and specialised test equipment.

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

Fault indicators may include indication lamps, LED's, alarms and flag relays.

Work may be performed with system 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 Volume 2, Part 1.

Unit Sector(s)

Not Applicable

Literacy and numeracy skills

Literacy and numeracy skills 2.2)

Participants are best equipped to achieve 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 5 Writing 5 Numeracy 5

Competency Field

Competency Field 4)

Maintenance.