



**Australian Government**

# **UEENEEH180A Diagnose and rectify faults in digital transmission circuits and systems**

**Release 2**

# **UEENEEH180A Diagnose and rectify faults in digital transmission circuits and systems**

## **Modification History**

Not applicable.

## **Unit Descriptor**

**Unit Descriptor**                      **1) Scope:**

### **1.1) Descriptor**

This unit covers fault finding and repair of faults in digital transmission systems. The unit encompasses safe working practices, interpreting diagrams, applying logical diagnostic methods and knowledge of digital transmission systems circuit components, rectifying faults, safety and functional testing and completing the necessary service documentation.

## **Application of the Unit**

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

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 4 level or higher.

## **Licensing/Regulatory Information**

**License to practice**                      **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace provided equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

## License to practice

3)

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures

## Pre-Requisites

Prerequisite Unit(s)

4)

Competencies

4.1)

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

UEENEEH17 Diagnose and rectify faults in electronic  
6A display circuits

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in 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 4 Writing 4 Numeracy 4

## Employability Skills Information

### Employability Skills 5)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability 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.
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## Elements and Performance Criteria

### ELEMENT

### PERFORMANCE CRITERIA

1 Prepare to diagnose and rectify faults	1.1 OHS procedures for a given work area are obtained and understood.
	1.2 Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3 Safety hazards, which have not previously been identified, are documented and risk control measures devised and implemented in consultation with appropriate personnel.
	1.4 The extent of faults is determined from reports and other documentation and from discussion with appropriate personnel.
	1.5 Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others

**ELEMENT**

**PERFORMANCE CRITERIA**

		involved on the work site.
	1.6	Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety.
2	Diagnose and rectify faults	
	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.4	Logical diagnostic methods are applied to diagnose digital television apparatus faults employing measurements of circuit operating parameters referenced to apparatus operating specifications.
	2.5	Suspected fault scenarios are tested as being the source of apparatus problems.
	2.6	Faults in the electronic components of the digital television apparatus are rectified to raise digital television apparatus to its operation standard.
	2.7	Circuits are tested to verify that the apparatus operates as intended and to specified requirements
	2.8	Decisions for dealing with unexpected situations are made from discussions with appropriate persons and consistent with job specifications and requirements.
	2.9	Diagnosis and rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
3 Complete and report fault diagnosis and rectification activities	3.1 OHS work completion risk control measures and procedures are followed.
	3.2 Work site is made safe in accordance with established safety procedures.
	3.3 Rectification of faults is documented in accordance with established procedures.
	3.4 Appropriate person or persons notified, in accordance with established procedures, that apparatus faults have been rectified

## 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 of safe working practices and diagnosing and rectifying faults in digital transmission systems.

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

#### KS01-EH180A

#### Digital television transmission faults

Evidence shall show an understanding of advanced digital television principles, digital television transmission towers and equipment and digital television transmission faults, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. Audio component encompassing:

- Audio Encoding
- Audio Masking
- Audio sub band encoding

T2. Dolby AC-3

T3. MPEG-2 System Layer encompassing:

- PES Packet Construction
- Time Stamps
- Programme Clock Reference (PCR)
- Transport Packet Header
- Programme Specific Information (PSI)

T4. Channel Encoding

- Forward Error Correction (FEC)
- Bit Error Rate (BER)
- Puncturing

T5. Interleaving.

T6. Modulation

- Phase Shift Keying (PSK)
- Quadrature Amplitude Modulation (QAM)
- Orthogonal Frequency Division Multiplexing (OFDM)
- Coded Orthogonal Frequency Division Multiplexing (COFDM)

T7. Hierarchical Modulation.

- Terrestrial Channel Encoder

## REQUIRED SKILLS AND KNOWLEDGE

- Satellite Channel Encoder
- Carrier to Noise Ratio (C/N)

### T8 Single Frequency Networks

- Guard Interval
- Megaframes

T9. The requirements of DTTB program input and monitoring equipment encompassing:

- basic system arrangement - Example is a central router connected to a number of control rooms.
- Terminologies - Examples are Vertical, Multi-level; Tie-line Routing and cross point
- typical signal types processed by a router.
- the purpose of "redundant CPU's and power supply units".
- common control protocols used in routers.
- typical analogue audio and video output voltage levels present at the router.
- typical specifications for digital data signals present at the router.
- function of various test equipment used in DTTB measurements.

T10. The operating characteristics of a digital television terrestrial broadcast (DTTB) transmitter encompassing:

- typical DTTB digital transmission system.
- safety precautions required when working with high power RF transmitters.
- operating characteristics of a typical MPEG encoder.
- operation of a coded orthogonal frequency division multiplex (COFDM) modulator.
- arrangement of subsystem components in a DTTB transmitter
- purpose of an up converter in a DTTB transmitter.
- typical characteristics of a DTTB power amplifier.
- advantages and disadvantages of air and liquid cooling systems used in transmitters.
- typical DTTB transmitter measurements techniques.

T11. The performance requirements of the DTTB combiner and antenna systems encompassing:

- minimum channel separation required between digital and analogue TV channels
- typical specifications of an antenna combiner system.
- the need for combiner systems in DTTB systems.
- typical system faults in combiners and antenna system.

T12. The requirements of remote monitoring and measurement equipment encompassing:

- purpose of control panel indicators and controls.



## **REQUIRED SKILLS AND KNOWLEDGE**

- Process by which the system manages a critical failure. -Example of component failure deemed as critical are power supplies and CPUs
- different system alarm signals.
- periodic equipment self tests and diagnostic routines on DTTB systems.
- DTTB systems fault diagnostic and rectification techniques.
- function of the basic components of a DTTB system.
- typical units of a DTTB Telemetry system

## **Evidence Guide**

### **EVIDENCE GUIDE**

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

### **Overview of Assessment 9.1)**

Longitudinal 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-preferred model for apprenticeships. However, where summative (or final) assessment is used it must 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.

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. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much 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 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 9.2)**

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 – UEE11'. 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 this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination

- legislation, regulations, policies and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
    - Diagnose and rectify faults in digital transmission systems as described in 8) and including:
      - a. Applying logical diagnostic methods..
      - b. Using fault scenarios to test the source of circuit faults.
      - c. Identifying the cause faults using logical diagnostic methods.
      - d. Rectifying faults effectively.
      - e. Verifying that the apparatus operates correctly.
      - f. Documenting fault rectification.
      - g. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

**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.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry

practices in relation to diagnosing and rectifying faults in digital transmission systems.

**Method of assessment**

**9.4)**

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**

**9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

## **Range Statement**

### **RANGE STATEMENT**

**10)** This relates to the 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.

This unit shall be demonstrated using a representative range of digital transmission systems by diagnosing and rectifying at least four circuit faults in two different types of digital transmission systems.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

## **Unit Sector(s)**

Not applicable.

## **Competency Field**

<b>Competency Field</b>	<b>11)</b>
	Electronics