Australian Government

UEENEEH179A Diagnose and rectify faults in digital television circuits and apparatus

Release: 2

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

UEENEEH179A Diagnose and rectify faults in digital television circuits and apparatus

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers fault finding and repair of faults in digital television apparatus. The unit encompasses safe working practices, interpreting diagrams, applying logical diagnostic methods and knowledge of digital television apparatus 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.

UEENEEH176A	Diagnose and rectify faults in electronic 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.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Prepare to diagnose and rectify faults	1.1	OHS procedures for a given work area are identified, 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.

ELEMENT	PERFORMANCE CRITERIA
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 television apparatus.

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

KS01-EH179A Digital television faults

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

T1. Integrated Receiver Decoder IRD (The Set Top Box) encompassing:

- sub-system components (i.e. functional blocks) and their operating parameters
- Basic diagnostic tests

T2. Channel decoders encompassing:

- Method used to determining the analogue to digital converter (ADC) sampling rate.
- Function of the Forward Error Correction (FEC) unit and Reed Solomon (RS) and Veterbi plus interleaving.
- Purpose of the OFDM modulator.
- Principle of operation of an OFDM demodulator and hierarchical (de) modulation.
- Principles of operation of a QPSK demodulator.
- Perform measurements and diagnostic test points in a typical IRD channel decoder.

T3. Conditional access encompassing:

- Purpose of a conditional access module (CAM).
- Access descrambler unit sub-system components (i.e. functional blocks) and their operating parameters
- Function of the component parts of conditional access descrambler unit.
- Purpose of a conditional access module 'smart card'.
- Single chip set top box sub-system components (i.e. functional blocks) and their operating parameters

T4. Repair and maintenance of digital television signal decoding circuitry. encompassing:

- Correct operation of the transport stream processor with reference to typical input and output signal.
- Testing techniques to determine correct operation of the video decoder, audio decoder and PAL encoder

REQUIRED SKILLS AND KNOWLEDGE

- Testing techniques to determine identify faulty data streams.
- Pin connections of a SCART socket.
- Operation of a typical UHF modulator.
- List precautions to be observed when performing tests on functional and non-functional units.
- Identify and replace faulty components in malfunctioning units.
- Perform functional testing after repair.

T5. Describe the basic techniques used to process an analogue signal for integration in a digital broadcasting system encompassing:

- Basic technique of sampling an analogue waveform and assigning quantisation levels to those samples for both video and audio.
- Calculation of the number of pixel's per line and the sampling rate for a range of typical DTV aspect ratios.
- Typical sampling rates for Standard Definition Digital Television (SDTV) and High Definition Digital Television (HDTV) broadcasts.
- Range of different sampling structures used to sample luminance and colour difference signals.
- Determination of the total bit rate required for a required sampling rate.
- Factors limiting digital television picture quality.
- Minimum MPEG video requirements for HDTV and SDTV.
- Factors that create the need for video data compression.

T6. Describe the process used to prepare video data for integration encompassing:

- Major methods used to compress video data.
- How a complete picture frame is assembled from samples, blocks, macroblocks and slices.
- Meaning of the terms DCT coefficients, temporal frequency, and spatial frequency, temporal and spatial redundancy.
- Purpose of the Discrete Cosine Transfer (DCT) processor in the processing of video data compression.
- Relationship between spatial frequencies, DCT coefficients and quantisation levels in the DCT block.
- Compression techniques used to code quantised DCT coefficients.
- How Run Length Coding (RLC) is used to group DCT values into a series of values.
- How Variable Length Coding (VLC or Huffman coding) processes each DCT value according to probability.

T7. Describe the role of the DCT coder encompassing:

- Sub-system components (i.e. functional blocks) and their operating parameters of a DCT coder.
- Typical construction of a Group of Pictures (GOP).
- Individual frames in a GOP sequence that uses forward prediction and

REQUIRED SKILLS AND KNOWLEDGE

bi-directional prediction.

- Purpose of differential coding.
- Structure of a video Packetised Elementary Stream (PES).
- Types of information included in the PES.

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, polices & workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:

- Diagnose and rectify faults in digital television apparatus 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 television apparatus.

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 television apparatus by diagnosing and rectifying at least four circuit faults in two different types of digital television apparatus.

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

Competency Field **11)**

Electronics