

1. Module details

Module name

Digital Television Receivers

Module duration

It is expected that students with the appropriate entry knowledge and skills will successfully complete this module in 36 – 40 hours.

Module code

NUE410

Discipline code

0703230

2. Module purpose

This module aims to provide students with the knowledge and skills to undertake appropriate approaches to repair electronic and electrical equipment.

3. Prerequisites

Communications Fundamentals NE039

Digital Electronics 2 NE180

Amplifiers 2 NE183

4. Relationship to competency standards

This module provides part of the underpinning knowledge and skills in the ‘Evidence Guide’ of specific units of competency in the National Electrotechnology Training Package and provides similar support, where mapped, to equivalent units in the National Metals and Engineering Competency Standards. For details refer to the module to unit maps, available from EE-Oz Training Standards.

5. Content

The Set Top Box (Integrated Receiver Decoder IRD)

System Overview

Programming and Control

The Channel Decoder

- Types
- Terrestrial
- Satellite

Cable

Front End Functional Blocks

- Tuner
- A-D Converter
- Types of Demodulator
 - - OFDM Demodulator
 - - QPSK Demodulator
- FEC Decoder

Conditional Access

- Free to Air Channels
- PAY –TV Channels

	<ul style="list-style-type: none"> - - Scrambling <p>Single Chip Set-Top-Box</p> <p>MPEG Decoding</p> <ul style="list-style-type: none"> - Transport Demultiplexer - System on Chip Transport Processor (S-o-C) - Decoding <ul style="list-style-type: none"> - - Video Decoder - - Audio Decoder <ul style="list-style-type: none"> - - - Video/audio decoder - - - SCART Socket <p>UHF Modulator (+PAL encoder and DAC)</p>
6. Assessment strategy	
Assessment methods	<p>Assessment should be progressive reflecting a holistic approach to ensure the module purpose is met. To assist in ensuring validity, reliability and fairness assessment instruments should include practical exercises, assignments and written tests consisting of a number of item types, such as multiple choice, short answer and problem solving.</p>
Conditions of assessment	<p>Learning and assessment will take place in an environment that is conducive to a learner's development.</p>
7. Learning outcome details	
Learning outcome 1	<p>Describe the functional blocks of an integrated receiver decoder (IRD).</p>
Assessment criteria	<ol style="list-style-type: none"> 1.1 Draw a block diagram of the basic components of a integrated receiver decoder unit. 1.2 Outline the role of each block in a basic integrate receiver decoder. 1.3 Discuss the role of the integrated receiver decoder (IRD) control system. 1.4 Discuss the similarities and differences that exist between cable, terrestrial and satellite reception. 1.5 Perform appropriate diagnostic tests for given fault conditions in the integrated receiver decoder using manufacturer's charts, handbooks, specifications and data sheets.

Learning outcome 2	Describe the function of the integrated receiver decoder (IRD) front end.
Assessment criteria	<ul style="list-style-type: none">2.1 Draw a block diagram of a typical channel decoder.2.2 State the method used to determining the analogue to digital converter (ADC) sampling rate.2.3 Describe the function of the Forward Error Correction (FEC) unit and Reed Solomon (RS) and Viterbi plus interleaving.2.4 State the purpose of the OFDM modulator.2.5 Describe the principle of operation of an OFDM demodulator and hierarchical (de) modulation.2.6 Describe the principles of operation of a QPSK demodulator.2.7 Perform measurements and diagnostic tests at appropriate test points in a typical IRD channel decoder.
Learning outcome 3	Demonstrate knowledge of the requirements of conditional access.
Assessment criteria	<ul style="list-style-type: none">3.1 State the purpose of a conditional access module (CAM).3.2 Draw a block diagram of a conditional access descrambler unit.3.3 Describe the function of the component parts of conditional access descrambler unit.3.4 Outline the purpose of a conditional access module 'smart card'.3.5 Draw a block diagram of a single chip set top box.
Learning outcome 4	Demonstrate the knowledge and skills related to repair and maintenance of digital television signal decoding circuitry.
Assessment criteria	<ul style="list-style-type: none">4.1 Determine correct operation of the transport stream processor making reference to typical input and output signal.4.2 Use appropriate test equipment to determine correct operation of the video decoder.

- 4.3 Use appropriate test equipment to determine correct operation of the audio decoder.
- 4.4 Use appropriate test equipment to determine correct operation of the PAL encoder.
- 4.5 Use appropriate test equipment to identify faulty data streams.
- 4.6 Identify the pin connections of a SCART socket.
- 4.7 Describe the operation of a typical UHF modulator.
- 4.8 List precautions to be observed when performing tests on functional and non-functional units.
- 4.9 Identify and replace faulty components in malfunctioning units.
- 4.10 Perform functional testing after repair.

8. Delivery of the module

Delivery strategy

Delivery strategies must be suitable for learning both theoretical and practical aspects described in the module purpose. It is considered that the most effective method to achieve this is by integration of theory and practice where students learn by experimentation, research and reports. It is recommended that learning and assessment be facilitated in a holistic manner that may require learning outcome sequence other than that indicated in the module.

Resource requirements

Resources should be sufficient for students to carry out learning activities on an individual basis.

Suggested Learning Resource:

Adequate and sufficiently representative equipment to undertake appropriate approaches to repair electronic and electrical equipment.

Ibrahim, K.F. Television Receiver Principles. 2nd edition
Addison Wesley Longman Ltd ISBN 0-582-35631-8

Buscombe, C.G. Television & Video Systems.

Operation, Maintenance, Troubleshooting and Repair.

2nd edition. Prentice Hall. ISBN 0-13-442088-8

As 4933.1 – 2000

Digital Television-Requirements for Receivers

**Occupational health
and safety
requirements**

Part 1: VHF/UHF DVB-T television broadcasts.

Aprile, J & Humphris , R. Digital Television

Electronic Fault Information Library. January 2001

Where this module is used in an approved Traineeship or Apprenticeship program learners should be advised to obtain, where available, respective EE-Oz Training Standards¹ **User Guides** (*these outline in detail what training and work performance the Learner is required to undertake for the program*).

A safe and healthy environment will be provided for students and teachers as well as the particular safety procedures followed as part of the learning / teaching activity and content.

¹ EEQSBA – ElectroComms and EnergyUtilities Qualifications Standards Body of Australia Ltd trading as EE-Oz Training Standards (www.ee-oz.com.au)