

1. Module details**Module name****Chrominance and Luminance****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

NUE102

Discipline code

0703230

2. Module purpose

This module will provide students with the knowledge and skill to identify typical waveforms and fault find to component level in the chrominance and luminance sections of a colour television receiver.

3. Prerequisites

NUE101 Introduction to Television.

4. Relationship to competency standards

This module provides some of the knowledge and skills underpinning competence in the following standards: Metals and Engineering Industry National Competency Standards, Units 18.45A, 18.56A, 18.65A. National Electrotechnology Industry Standards, Units NES205, NES302, NES303, NES305, NES306, NES402, NES403, NES406, NES407.

5. Content**Chrominance and Luminance signal processing**

vector representation of the chroma signal

principles of PAL encoding

frequency interleaving

description and function of the ‘colour burst’

block diagram of the colour encoder

weighting

gamma correction

constant luminance

standard colour bar test pattern

Luminance signal processing in the receiver

block and circuit diagram description of video buffer, traps and filters, video amplifiers, frequency compensation, video output

stages, brightness circuit, contrast circuit, black level

clamps/DC restoration, retrace blanking, automatic beam

current limiting

typical faults and fault finding techniques.

Chrominance signal processing in the receiver

chroma decoder (block diagram, typical waveforms)

subcarrier regeneration (detailed block diagram, typical

waveforms, typical faults, fault finding techniques)

chroma signal processing (detailed block diagram, typical

waveforms, typical faults, fault finding techniques, controls and adjustments)
 final matrix/output (detailed block diagram, typical waveforms, typical faults, fault finding techniques, controls and adjustments, RGB and colour difference drive output stages typical circuits

Fault finding

Typical faults and fault finding in the complete chrominance and luminance signal processing circuitry

OH&S

Safe working techniques

6. Assessment strategy

Assessment methods

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.

Conditions of assessment

Normally learning and assessment will take place in a classroom / laboratory environment.

7. Learning outcome details

Learning outcome 1

Describe chrominance and luminance signal processing at the transmitter.

Assessment criteria

- 1.1 Draw a vector representation of the chroma signal.
- 1.2 Explain the principles of PAL encoding.
- 1.3 State the purpose and characteristics of the ‘colour burst’.
- 1.4 Draw a block diagram of a chroma encoder.
- 1.5 Draw the colour difference signals showing relative amplitudes for a standard colour test bar pattern.
- 1.6 State the need for gamma correction.

Learning outcome 2

Assessment criteria

- 1.7 Describe the need for weighting and state the relative factor.
- 1.8 Draw and state the composition of a standard colour bar test signal.
- 1.9 Sketch the composite video, U, V and chroma signals of a standard colour bar test signal.

Describe luminance signal processing in the receiver.

- 2.1 State the need for buffers, traps and filters in the luminance signal path and describe the various types.
- 2.2 State the bandwidth, gain and types of amplifier used in the video amplifier and output stages.
- 2.3 Fault find and adjust typical luminance circuitry.
- 2.4 State the need for black level clamping/DC restoration.
- 2.5 Repair typical faults in luminance signal circuitry.
- 2.6 Describe the need for luminance delay.

Learning outcome 3

Assessment criteria

Describe the operation of the chroma decoder in a receiver.

- 3.1 Draw a basic block diagram of a colour decoder.
- 3.2 Draw typical waveforms of chrominance and associated signals.
- 3.3 Describe the effects on the picture of typical problems with the chroma decoder.

Learning outcome 4

Assessment criteria

Describe the process of subcarrier regeneration.

- 4.1 Describe the function or purpose of each circuit block associated with subcarrier regeneration.
- 4.2 Sketch waveforms associated with subcarrier regeneration.
- 4.3 Identify components responsible for subcarrier regeneration in typical circuits and state their function.
- 4.4 In typical receivers adjust preset controls correctly as appropriate.
- 4.5 Describe the effect on the picture of typical sub-carrier regeneration problems with and without colour killer.

Learning outcome 5

Describe the processing of chrominance signals in a colour TV receiver.

Assessment criteria

- 5.1 Describe the function or purpose of each block associated with chrominance signal processing.
- 5.2 Sketch the waveforms associated with chrominance signal processing.
- 5.3 Identify components associated with chrominance signal processing in typical circuits and state their function.
- 5.4 In typical receivers adjust preset controls correctly as appropriate.
- 5.5 Describe the construction and characteristics of chrominance delay lines.
- 5.6 Describe U and V signal derivation.

Learning outcome 6

Describe the processing of colour signals.

Assessment criteria

- 6.1 Describe the method to recover the G-Y signal.
- 6.2 Describe the methods of producing the RGB signals.
- 6.3 Describe the operation of driver and/or output stages and sketch and label typical waveforms and DC voltages.
- 6.4 Identify components of the driver and output stages and state their function.
- 6.5 Describe the basic principles of colour difference drives.
- 6.6 In typical receivers adjust preset controls correctly as appropriate.
- 6.7 Fault find and repair to component level typical faults in driver and output stages.

| | |
|----------------------------------|---|
| Learning outcome 7 | Describe the operation of AV inputs. |
| Assessment criteria | <p>7.1 State appropriate signal levels for AV input and output signals.</p> <p>7.2 Identify components in typical AV input/output circuits.</p> <p>7.3 Fault find and repair to component level typical faults in AV input/output circuits.</p> |
| Learning outcome 8 | Implement correct Occupational Health and Safety procedures. |
| Assessment criteria | 8.1 Demonstrate safe working procedures. |
| 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 way to achieve this is by the integration of theory and practice where students learn by experimentation and through research and laboratory reports. It is recommended that learning and assessment be facilitated in a holistic manner which may require learning outcome sequence other than that indicated in the module. |
| Resource requirements | <p>Resources should be sufficient for students to carry out experiments on an individual basis. This will require a range of display devices and test equipment.</p> <p>Useful references include: Ibrahim KF 1994, <i>Television Receivers</i> Longman Essex, England ISBN 0-582-086175 Liff A et al 1993, <i>Colour and Black and White Television</i> Prentice Hall, Englewood Cliffs ISBN 0-13-150012-0 Zarach et al 1985, <i>Television: Principles and Practice</i> MacMillan, Hampshire Trundle E 1996, <i>Newnes Guide to TV and Video Technology</i> Butterworth-Weinermann Oxford ISBN 07506 23748 Botto D 1992, <i>A Basic Guide to Colour TV and VCRs</i> Electronics Australia, Federal Publishing, Alexandria</p> <p>Plant and equipment required: Isolating transformer Colour bar generators Oscilloscopes with suitable probes Various models of modern colour TV receivers</p> |

**Occupational health
and safety requirements**

Circuit diagrams for chosen TV receivers
EHT probes
Frequency counter
Degaussing wand
Digital and analogue multi meters
Distributed 'off air' TV signal
A supply of old tubes to demonstrate de-vacuuming and disposal according to environmental regulations

Because of the high voltages present, live/hot chassis, the risk of radiation and the size and weight of large screen television receivers suitable Occupation Health and Safety (OH&S) precautions and procedures should be emphasised at all times.