

**1. Module details****Module name****Television RF Stages****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**

NUE107

**Discipline code**

0703230

**2. Module purpose**

This module provides the knowledge and skills to enable students to locate and rectify faults in the small signal stages of tuner, IF, detector and AGC in a typical TV 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****The Television Tuner**

tuner functions  
the RF amplifier  
the mixer  
the Oscillator  
AFT  
tuner types  
antenna isolating circuits

**Tuning Systems**

simple tuning  
voltage synthesis tuning (VST)  
frequency synthesis tuning (FST)

**Vision I.F. Amplifiers**

IF amplifier operation  
IF response  
vestigial sideband compensation  
SAW. filter

**Vision Detectors**

simple square law detector  
square law detector and colour transmission  
synchronous demodulators

**AGC**  
 AGC operation  
 peak level AGC  
 gated AGC  
 synctip AGC  
 forward/reverse AGC  
 delayed AGC

**6. Assessment strategy**

**Assessment methods**

Assessment should be progressive reflecting an 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 the operation of tuners found in typical TV receivers.**

**Assessment criteria**

- 1.1 State the functions of the tuner in a typical TV receiver.
- 1.2 Draw the block diagram of a tuner.
- 1.3 Draw the block diagram of an AFT system and describe how tuning is maintained.
- 1.4 State why colour receivers require AFT.
- 1.5 Describe the operational differences between turret, incremental and electronic type tuners.
- 1.6 Draw the tuner frequency response showing relevant frequencies and levels.
- 1.7 Describe why aerial isolation circuits are required in some receivers.

<b>Learning outcome 2</b>	<b>Locate and repair faulty components in VST and FST tuning systems in typical TV receivers or VCRs.</b>
<b>Assessment criteria</b>	<p>2.1 Draw the block diagram and describe the operation of a VST tuning system.</p> <p>2.2 Draw the block diagram and describe the operation of a FST tuning system.</p> <p>2.3 State the expected voltages on each pin of an electronic tuner when it is tuned to the UHF band given the receiver/VCR schematic diagram.</p> <p>2.4 Measure and record voltages at each pin of an electronic tuner under no fault and fault conditions.</p> <p>2.5 Tune a modern receiver or VCR fitted with VST or FST to provide specified channels in specified tuning locations.</p> <p>2.6 Adjust any preset controls correctly in VST and FST tuning systems.</p> <p>2.7 Locate and repair faulty components in typical VST and FST tuning systems.</p> <p>2.8 Test the repaired receiver/VCR to confirm it is operating within manufacturer's specifications.</p> <p>2.9 Repair typical faults.</p>
<b>Learning outcome 3</b>	<b>Locate and repair faults in typical vision IF circuits.</b>
<b>Assessment criteria</b>	<p>3.1 Draw the vision IF amplifier frequency response showing all relevant frequencies and signal levels.</p> <p>3.2 Describe why the vision IF frequency response is so critical to correct receiver operation.</p> <p>3.3 Describe the operation of a SAW filter.</p> <p>3.4 Describe how luminance signal delay is incorporated within the SAW filter.</p> <p>3.5 Measure and record voltages at relevant points in a typical vision IF circuit under fault and no fault conditions.</p> <p>3.6 Adjust any preset controls correctly.</p> <p>3.7 Locate and repair a faulty component in a typical vision IF circuit.</p>

**Learning outcome 4**

3.8 Test the receiver to confirm if IF circuitry is operating within manufacturer's parameters.

**Describe the operation of and fault find a typical TV synchronous demodulator circuit.**

**Assessment criteria**

4.1 Draw the circuit of synchronous demodulator and describe the operation of the circuit.

4.2 Draw the circuit of simple envelope detector and describe its limitations.

4.3 Calculate the interfering beat frequency produced if a simple envelope detector is used as the vision detector.

4.4 Measure and record voltages and waveforms in a synchronous demodulator at relevant points under fault and no fault conditions.

4.5 Adjust any preset controls, traps etc. correctly.

4.6 Locate and repair faulty components in a typical synchronous demodulator circuit.

**Learning outcome 5**

**Describe the operation of and fault find AGC circuits in typical TV receivers.**

**Assessment criteria**

5.1 Draw the simplified circuit of a gated AGC system and describe the operation of the circuit.

5.2 Describe the operating principles of forward and reverse AGC.

5.3 Describe the advantages and disadvantages of peak level AGC, gated AGC and synctip AGC.

5.4 Describe why delayed AGC is used for tuner AGC systems.

5.5 Measure and record voltages and waveforms under fault and no fault conditions in typical AGC circuits.

5.6 Adjust any preset controls correctly.

5.7 Locate and repair a faulty component in a typical AGC circuit.

5.8 Test the receiver to confirm the AGC system is operating within manufacturer's specifications.

5.9 Measure the tuner AGC voltage with a varying RF input and state if forward/reverse AGC is used.

## 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 an holistic manner which may require a learning outcome sequence other than that indicated in the module.

### Resource requirements

Resources should be sufficient for students to carry out experiments on an individual basis. This will require a range of experimental circuit devices and measuring instruments.

Useful references include:

Ibrahim KF 1994, *Television Receivers*  
Longman Essex, England  
ISBN 0-582-086175

Liff A et al 1993, *Colour and Black and White Television*  
Prentice Hall, Englewood Cliffs  
ISBN 0-13-150012-0

Zarach et al 1985, *Television: Principles and Practice*  
MacMillan, Hampshire  
Trundle E 1996, *Newnes Guide to TV and Video Technology*  
Butterworth-Weinermann Oxford  
ISBN 07506 23748

Botto D 1992, *A Basic Guide to Colour TV and VCRs*  
Electronics Australia, Federal Publishing, Alexandria

### Occupational health and safety requirements

A safe and healthy environment will be provided for students and teachers as well as safe procedures with regard to learning / teaching activities.