

1. Module details

Module name Closed Circuit TV – Introduction

Suggested structured learning time 40 hours

Module code NUE 486

Discipline code 0703225 Electrotechnology

2. Module purpose

To provide students with knowledge and skills to enable them to select, install, and perform basic repairs to single camera and monitor, closed circuit television systems.

3. Prerequisite modules

NBB 002 Occupational Health and Safety.

4. Relationship to competency standards

This module provides some of the knowledge and skills underpinning competency in the following standards:

National Electrotechnology Industry Standards, Unit NES 209

5. Content

Safety

Purpose and function of CCTV systems

- Introduction to television principles
- Scanning
- Standards
- Video signals
- Colour
- Basic block diagram of system
- Definition of terms
- Explanation of blocks

Block diagram of cameras (basic)

- Explanation of blocks
- Types of cameras
- Chip sizes
- Resolution
- Sensitivity

Lens types and their various applications

- Types of lenses
- Field of view
- Depth of field

- Definition/Resolution versus broad view
- Focusing
- Set-up/back focusing

Monitors and VCRs

- Basic principles of operation
- Colour versus monochrome
- Monitor versus receiver monitor
- Selection applications
- Selection and adjustment
- Time lapse VCRs
- Tapes

Mounting and auxiliary equipment

- Location
- Sealed/unsealed housings
- Heated housing
- IP rating
- Ground loop connectors
- Lightning protection
- In line video amplifiers/equalisers
- Video distribution amplifiers

Connections, cables and transmission media

- Types of connectors
- Cable types and characteristics
- Length of run
- Joining

Legal, ethical and moral obligations of surveillance

- Overt
- Covert
- Regulations

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 items types, such as multiple choice, short answer and problem solving.

Conditions of assessment

Learning and assessment will take place in a classroom/laboratory environment and in a real or simulated security installation.

7 Learning outcome details

Learning outcome 1

Describe and practice safety procedures when working with CCTV systems.

Assessment criteria

- 1.1 Recall relevant sections of the Occupational Health and Safety Act.
- 1.2 Describe the various safety aspects when operating AC and portable powered tools used to install a CCTV system.
- 1.3 Identify the types of equipment used to install a CCTV cameras monitors at heights above normal reach for maximum efficiency.
- 1.4 List the safety procedures to be observed when connecting AC or DC power supplies to cameras.
- 1.5 Demonstrate how to run both coaxial and figure eight cable in and out of buildings.
- 1.6 Demonstrate with the use of a cable finder how to locate the hidden cables in walls.
- 1.7 Define the safety procedures when using a soldering iron for connecting cables to cameras.
- 1.8 Define the safety procedures when using a crimping tool for connecting cables to cameras.

Learning outcome 2

Describe the purpose and basic function of a CCTV system.

Assessment criteria

- 2.1 State the uses of a CCTV system.
- 2.2 Define the principles of a PAL video signal.
- 2.3 Define the different video standards used within the CCTV industry.
- 2.4 Describe how each of the different blocks of a TV system operates.
- 2.5 Describe the characteristics of the human eye.
- 2.6 State how the different levels of lighting affect the operation of a CCTV system.
- 2.7 Define the units of light.

Learning outcome 3

Assessment criteria

- 2.8 Evaluate the different readings taken by a 'Lux' meter under different lighting conditions and at different times of the day and night.
- 2.9 Define the terms used in the CCTV industry.
- 2.10 Observe the differences between monochrome and colour reception used in CCTV.
- 2.11 State the different types of transmission media.

Describe the purpose, basic function and types of cameras used in a CCTV system.

- 3.1 Define the standards world-wide and the standards used in Australia (PAL, CCIR, NTSC, SECAM and EIA).
- 3.2 Describe the operation of several different types of cameras using a block diagram.
- 3.3 List the specifications and advantages of the CCD cameras over the old types of cameras.
- 3.4 Define the terms; resolution, sensitivity, interlaced scanning, pixels penetration, IR cut filter, minimum illumination, S/N ratio, dynamic range.
- 3.5 Describe the difference between:
 - 'Linear' and 'Array' CCD cameras
 - 'Frame Transfer', 'Interline Transfer' 'Frame Interline Transfer' chip CCDs
 - Two, three and four phase shift pulses used in CCD cameras
 - Monochrome and colour CCD cameras (1 CCD, 3 CCD)
 - The different types (CCD, TUBE, C, and CS) of cameras used in the CCTV industry.
 - The two types of 'Array' CCD and list the differences (ensure the terminology for these two types is correct)
- 3.6 Compare the different techniques used to improve the resolution of CCD cameras.
- 3.7 State whether the CCD type camera output is an analogue or digital signal.
- 3.8 Provide a definition of the sampling frequency, which is twice the bandwidth.

Learning outcome 4

Assessment criteria

- 3.9 Describe the following:
- Where the optical split prism is used for the colour CCD camera.
 - The power supply and wire characteristics required when using both monochrome and colour cameras.
 - The reason for using AC cameras over DC cameras (V-phase adjustment)
- 3.10 Define the term 'white balance' when referring to colour cameras.
- Describe the purpose, basic function and types of lenses used in a CCTV system.**
- 4.1 Revision of basic optical theory (refraction, reflection, angle of incidence, concave and convex lenses, and prism theory).
- 4.2 Describe the following:
- How chromatic aberration can be minimised.
 - The factors that determine the lens design.
 - The factors that determine the lens elements.
 - The factors that determine the lens mechanical composition.
 - The factors that determine the lens electronics.
 - The geometrical construction of images.
 - The aspherical lens.
 - The contrast transfer function and modulation transfer function.
 - The F and T numbers.
 - 'Depth of field'.
 - 'Neutral density filters'.
- 4.3 Describe the difference between manual, auto, motorised, video and DC driven Iris lenses.
- 4.4 Describe how to adjust the auto iris lens for 'level' and 'ALC'.
- 4.5 Describe how to determine the angle of view.
- 4.6 Compare the different types of CCD lenses for horizontal angle of view.
- 4.7 Describe the difference between 'fixed focal length' and zoom lenses.
- 4.8 State the difference between C and CS mounts.

Learning outcome 5

Assessment criteria

4.9 State why back-focus adjustment is important.

Describe the purpose, basic function and types of monitors and VCRs used in a CCTV system.

5.1 Describe the purpose of using a monitor within a CCTV system.

5.2 Describe the operation of the CRT for both monochrome and colour monitors.

5.3 Define the terms: efficiency, persistency in monitors.

5.4 State how monitor sizes are defined.

5.5 Identify several different sizes of monitors.

5.6 State the four major adjustments available at the front of most monitors.

5.7 Define the following terms: Horizontal/vertical hold, contrast, brightness, linearity and picture height.

5.8 Describe the use of the impedance switch on a monitor.

5.9 State and give reasons for the recommended viewing distances.

5.10 Define gamma.

5.11 Describe the following:

- The difference between CRT and LCD monitors.
- The difference between monitors and receiver monitors.
- The use of a real time video cassette recorder (VCR) within a CCTV system.
- The difference between VHS and S-VHS when recording in both B/W and colour.
- The difference between real time VCR and time lapse VCR.
- The use of a time lapse video cassette recorder (VCR) within a CCTV system.
- How and where to store video tapes after being used.
- The difference between analogue and digital processed video signals.

Learning outcome 6

Assessment criteria

5.12 Define the recording shot intervals when using a 3hr video tape in time lapse mode.

Describe the purpose, basic function and types of auxiliary equipment used in a CCTV system

6.1 Describe what is the purpose for a Pan and Tilt head (PTZ) used in a CCTV system.

6.2 Describe the different types of housing (indoors, outdoors, sealed, unsealed, heated).

6.3 Describe the IP rating meanings.

6.4 State practical methods that can be used to overcome ground loops.

6.5 State practical and proven industry methods to protect against lightning.

6.6 Describe the use of in line video amplifiers/equalisers.

6.7 Describe the use of video distribution amplifiers (VDAs).

Learning outcome 7

Assessment criteria

Describe the purpose, basic function and types of cables and connectors and transmission media used in a CCTV system.

7.1 Identify the seven most commonly used media for the transmission of video, audio and data in a CCTV system.

7.2 Review the concept of the seven most commonly used media used in CCTV.

7.3 Identify any interference problems, their characteristic impedance, connectors used to connect each type of cables used in CCTV.

7.4 Demonstrate the techniques used to join all types of cables used in a CCTV system.

7.5 Describe the testing techniques used to test the different types of cables used in a CCTV system.

7.6 State the advantages and disadvantages between the seven types of the most commonly used media.

Learning outcome 8

Describe how a camera is used for covert or overt installation used in a CCTV.

Assessment criteria	<p>8.1 Describe the use of cameras when being used as a covert camera.</p> <p>8.2 Describe the use of cameras when being used as an overt camera.</p> <p>8.3 Demonstrate a working knowledge of legislation and regulations that must be considered when installing both covert and overt CCTV system.</p>
8 Delivery of the module	
Delivery strategy	<p>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 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 a learning outcome sequence other than that indicated in the module.</p>
Recommended resource requirements	<p>Minimum teacher qualifications:</p> <p>Certificate IV Assessment & Workplace Training</p> <p>Trade qualifications in the electrical/electronic discipline and a demonstrated high level of competency in CCTV. This could be achieved by relevant workplace experience in this field.</p> <p>Non human resources:</p> <p>Resources should be sufficient for students to carry out practical exercised on an individual basis. This will require access to a range of equipment associated with CCTV.</p>
	<p>User Guides</p> <p>Where this module is used in an approved Traineeship or Apprenticeship program students should be advised to obtain, where available, respective EEQSBA¹ <i>User Guides</i> (these outline in detail what training and work performance the student is required to undertake for the program).</p>
	<p>References</p> <p>Damjanovski Vlado.1999 <i>CCTV</i>. (3rd edition) Butterworth – Heinemann ISBN: 0-7506-7196-3</p>

¹ EEQSBA - ElectroComms and EnergyUtilities Qualifications Standards Body of Australia Ltd

Occupational health and safety requirements

or
Damjanovski Vlado.1996 *CCTV*. (2nd edition)
CCTV Labs, Minchinbury
ISBN: 0-646-24088-9

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