

# **Video Security Systems Technician**

# NICET

## **Level III Certification**

### **Content Outline**

National  
Institute for  
Certification in  
Engineering  
Technologies



# Introduction

The purpose of this certification program is to recognize the professionalism of qualified technicians and provide a way for others to distinguish those technicians who have demonstrated job knowledge and work experience. NICET will do this by defining and testing relevant knowledge and evaluating experience.

This document presents the content that is covered in the examination and other criteria for certification as a Video Security Systems Technician at Level III. This program is based on an analysis of the tasks that are performed by a competent technician. The content outline is a listing of tasks that should be performed well by a Level III certified Technician. Also included are knowledge and skills needed to succeed at each task. These tasks are the focus of the test questions that make up the Level III exam.

The tasks are grouped into larger areas of responsibilities, or “domains”. The domains are:

- Project Planning
- System Installation
- System Testing and Commissioning
- Troubleshooting
- Planning and Conducting User Training (No tasks at Level III)
- Documentation
- Project Management

A general description or profile of a Level III Technician includes the following characteristics:

**Education:** Minimum expected for Level II, with coursework or other experiences that develop a broad knowledge of current video technologies, computer operation, and RS wiring standards.

**Work Experience:** Minimum experience required for Level II plus a minimum of two years of related work, one year of which must be full time installation, maintenance, and troubleshooting of video systems, and the balance may be installation, maintenance, and troubleshooting of other low voltage systems. One year of the work experience as a VSS Technician must have been acquired within the three-year period prior to the date the certification at this level is awarded. (An Electronics Associates Degree from an ABET accredited program may be substituted for 18 months of work experience.)

**Responsibility:** Install and troubleshoot type B systems without technical supervision. May provide daily supervision for one or more Level I or II technicians.

**Acquired Competencies:** In addition to Level II competencies, perform installation and testing of type B systems. Troubleshoot problems. Report deficiencies in devices and systems and recommend corrective actions. Train users in system operation.

# **Tasks Performed by the Level III Technician**

*(Installs Type B Systems, in addition to A)*

## **3.1 “Project Planning” Tasks**

### **3.1.1 Perform site assessment and determine interfacing requirements for Type B systems.**

Knowledge:

Functions of other electronic building systems

Points and methods of interface with other electronic building systems, including HVAC control, access control, fire alarm, and burglar alarm

Electromagnetic or RF interference sources

Skills:

Identify points of physical or electrical interface or interference with other systems.

Identify alternate locations to correct mounting constraints and achieve desired field of view.

### **3.1.2 Prepare work plans, timetables, and equipment needs for installation of types A and B systems.**

Knowledge:

Relevant manufacturers’ information

Procedures and considerations for estimating man-hour requirements for system assembly and installation

Appropriate applications for hand tools, test equipment, and lifts and ladders

Skills:

Assemble a task sequence and a time-driven critical path schedule for a Type A or B project.

Review the time required for each task and the total labor hours required for the project and possible alternative procedures.

Determine equipment needs for each phase of the project.

Determine inspection requirements and schedules.

Record, adjust as needed, and communicate the timeline.

### **3.1.3 Recommend value-added engineering changes for type A and B systems.**

Knowledge:

System purposes and the system elements needed to achieve them

Skills:

Read and interpret change orders and specifications.

Identify opportunities for improved system function or value.

### **3.1.4 Prepare, assemble, and coordinate set-up and programming requirements.**

#### Knowledge:

Memory partitioning and security setup under DOS<sup>®</sup>, Windows<sup>®</sup> 98, 2000, XP, NT, and Linux

Programming requirements of type B systems

#### Skills:

Plan memory partitioning and users' permissions.

Translate operational requirements into a set-up for matrix switches.

## **3.2 “System Installation” Tasks**

### **3.2.1 Install, connect, and verify operation of camera positioning equipment.**

#### Knowledge:

PTZ communications requirements for hardwire, coax, RS232, RS422, and RS485 connections

Appropriate mounting hardware for heavy loads, given various combinations of structure and materials

Location and mounting requirements of positioning systems

#### Skills:

Read and interpret site plans.

### **3.2.2 Install, connect, and verify operation of matrix switchers.**

#### Knowledge:

Matrix switcher features and application

Configuration of input, output, alarm and relay modules

Camera phasing

RS-232, RS-422, and RS485 serial communications wiring requirements

Meaning of the terms “sequence,” “macro,” and “preset (shot)”

#### Skills:

Read and understand manufacturer's set-up instructions.

Use PCs to perform basic macro programming per manufacturer's instructions.

### **3.2.3 Install, connect, and verify operation of dedicated point-to-point fiber systems.**

#### Knowledge:

Types of connectors and their applications

Types of fiber

Differences between single mode and multimode fiber

Loss measurement

EIA/TIA 455 and 526-14

Skills:

Identify different types of fiber connectors.

Identify different types of fiber.

Make proper fiber connections

Place fiber for proper operation.

**3.2.4 Install, connect, and/or test operation of shared fiber systems.**

Knowledge:

Meanings and applications of the following terms and concepts:

- Single Mode
- Wavelength
- Bandwidth
- Modulator
- Demodulator
- Optical Loss Budget

EIA/TIA 455, 526-14, and 568A

Skills:

Operate an OTDR and oscilloscope.

Calculate losses and develop a loss budget.

Properly configure and install a multi-channel shared fiber system.

**3.2.5 Install, connect, and verify operation of low light and day/night cameras.**

Knowledge:

Meanings and applications of the following terms and concepts:

- |                          |                          |
|--------------------------|--------------------------|
| • Lux                    | • Image intensifier      |
| • Lumens                 | • Infrared Cut Filter    |
| • Signal to Noise Ratio  | • IRE                    |
| • Backlight compensation | • Faceplate illumination |
| • AGC                    | • Scene reflectance      |
| • Digital Slow Shutter   | • Dynamic range          |
| • Auto Iris              | • Neutral density filter |

Differences between the various types of light sources and their significance to different camera technologies

Skills:

Install and set up a low light camera and properly adjust for optimal operation in both day and night lighting.

Install and properly adjust an auto-iris lens.

### **3.2.6 Install, connect, and check operating parameters of long video cable runs.**

Knowledge:

Meanings and applications of the following terms:

- Attenuation
- dB
- Roll-off
- Cable tilt
- Wire capacitance
- Bandwidth
- Balun (passive v. active)

Skills:

Read and interpret cable specifications.

Calculate losses.

Select appropriate type of cable for the application.

Specify and apply active and passive transmitters and/or receivers (UTP)

Specify and apply equalizing amplifiers.

### **3.2.7 Install, connect, and verify operation of RF modulated systems.**

Knowledge:

Meanings and applications of the following terms and concepts:

- Frequency
- AM/FM modulation
- Insertion Loss
- Adjacent Channel
- Channel Elimination Filter
- Bandpass Filter
- High and Low band, UHF, VHF
- Intermodulation distortion

Basic MATV system design and construction

TV channel plans

Functions and proper applications of splitters, combiners and taps

Skills:

Combine an RF modulated signal with off-air or other sources properly.

Operate a field strength meter.

### **3.2.8 Install, connect, and verify operation of contact interfaced equipment.**

Knowledge:

Relay functions and operation

System interaction requirements

Skills:

Read and interpret manufacturer's instructions for installation and operation of contact interfaced equipment.

### **3.2.9 Install and initialize stand-alone PC based products.**

Knowledge:

Functions of PC related hardware and their connections

The following basic operations/commands in DOS<sup>®</sup>, Windows<sup>®</sup> 98, 2000, XP, NT, and Linux:

- Directory Navigation
- File manipulation
- Automatic Start Up
- Software installation

Skills:

Navigate directories, manage files, configure hardware, and install software.

### **3.2.10 Perform preliminary programming/setup required for minimal initial system operation.**

Knowledge:

Characteristics of system components that affect compatibility

Skills:

Set minimum program requirements needed to test individual components in order to insure compatibility.

## ***3.3 “System Testing and Commissioning” Tasks***

### **3.3.1 Optimize video, focus, and view quality for lowlight, infrared, and day/night cameras.**

#### Knowledge:

Lens function and operation as it relates to low light applications and infrared lighting

Relationships among video, focus, iris settings, camera positioning, and view quality, and how they impact the particular application

Functions and applications of digital slow shutter (DSS), image intensifiers, and infrared cut filter removal

Types of lighting, including incandescent, florescent, mercury vapor, low-pressure sodium, and infrared illuminators, and the impact each has on CCTV cameras

#### Skills:

Use a portable monitor; a hand-held video meter, and filters to optimize lowlight and infrared video, focus, and view quality.

### **3.3.2 Verify proper terminations, interconnections, and markings for fiber and data rated cables.**

#### Knowledge:

Appropriate terminations and interconnections for particular applications

EIA/TIA 587

#### Skills:

Read and interpret system plans and cable markings.

Use power meters, OTDRs, field strength meters, VOMs, and/or fiber optics testers for verifying proper terminations and interconnections.

### **3.3.3 Optimize Type B head-end and field equipment, including communications.**

#### Knowledge:

Indicators of proper and improper functioning of type B head-end and field equipment

Advanced video theory

Know the principles of RF signal generation, transmission, and reception

Know the principles of fiber optic transmitters, receivers, transceivers, and fiber cable that can be used to send video, RS232, RS422, RS485, and Ethernet data

#### Skills:

Use Ohm's Law to calculate voltage, current, and resistance in Type B system circuits.

Calculate impedance and capacitance in a Type B circuit.

Use a power meter and a field strength meter for optimizing Type B head-end and field equipment.



### **3.3.4 Optimize digital recording devices.**

#### Knowledge:

Indicators of proper and of improper functioning of digital recording devices

Appropriate functioning of digital recording devices for particular video applications, as well as their interface with other CCTV products and the methods to back up, recover, print, and copy digital video segments

#### Skills:

Read and interpret manufacturers' instructions.

Operate digital recording devices.

### **3.3.5 Program type B head-end and field equipment.**

#### Knowledge:

Generic set-up and programming requirements for the following:

- Pan/Tilt/Zoom systems
- DVRs
- Multiple keyboard systems
- Matrix switchers using alarm interfaces

#### Skills:

Read and interpret system plans.

Determine how to program various field devices.

Read and interpret manufacturers' instructions.

### **3.3.6 Optimize interfaced operation with other systems.**

#### Knowledge:

Proper operation of various interfaces with such other systems as HVAC control, access control, fire alarm, and burglar alarm, and the indicators of improper operation

Principles of fiber technology relevant to transmission of signals between CCTV and other systems

Requirements of the following data transmission standards:

- RS-232
- RS-422
- RS-485
- 10/100 BaseT (Ethernet)

Meanings and applications of the following basic network terms:

- IP Address/subnet mask
- Category 5 cable and connectors
- Server
- Bandwidth
- Client
- Gateways
- Router
- PING
- Bridge
- TRACE

#### Skills:

Use a laptop computer and the CCTV manufacturer's documentation and/or software for verifying correct interfaced operation.

Use HyperTerminal or other method to ping an address on a network and interpret the meaning of the results.

Use TRACERT to determine whether the communication path is acceptable for the application.

### **3.3.7 Optimize signal strength and pictures on RF modulated cameras.**

#### Knowledge:

Basic principles of video imaging and transmission

Principles of RF signal generation, transmission, and reception, as well as environmental and regulatory considerations

#### Skills:

Use portable monitors and field strength meters to verify proper signal strength and pictures.

## **3.4 “Troubleshooting” Tasks**

### **3.4.1 Troubleshoot cameras: remote zoom, iris, and focus adjustments; DSP adjustments; lighting conditions; infrared illumination.**

#### Knowledge:

Communication requirements for remote control of camera

Function of each component of the remote control system, particularly as it affects the controlled accessory

Types of lighting and how each affects the camera, as well as camera adjustments to compensate for poor lighting

Infrared testing procedures and practices

#### Skills:

Use test equipment such as the VOM/DVM, oscilloscope, vectorscope, portable monitor, and hand-held video meter to test and setup remote controlled cameras and lenses.

### **3.4.2 Troubleshoot remote positioning devices: scanners, pan/tilt, domes, limit switches, presets, cables, cable fatigue, drip loops.**

#### Knowledge:

Cable types, applications, installation procedures and connections

Remote positioning communication techniques, programming of devices, the operation of limit switches, presets, and motors

#### Skills:

Use test equipment VOM/ DVM, portable monitor, breakout box, and visual inspection to test and locate problems with cabling and mechanical positioning devices.

### **3.4.3 Troubleshoot type B communications: presence of signal, signal strength, protocol, addressing, fiber dB loss, RS232/422/485 coax data, UTP, RF broadband.**

#### Knowledge:

Communication paths, language, transmission media, and signal strength associated with various system components

Affect of low color burst on digital video recording

Programming requirements and methods for each part of a system (including computers for computer based products), and for amplification and attenuation

#### Skills:

Use OTDR, field strength meter, laptop, and power meters to detect and interrupt the data signals.

Measure fiber dB losses.

Measure color burst level using an oscilloscope or a color burst meter.

Calculate necessary amplification or attenuation for the system.

Check and test for proper addressing.

### **3.4.4 Troubleshoot programming: matrices, relays, alarm functions (dry contact).**

#### Knowledge:

Programming requirements and methods

Relay and alarm functions

Relationships between sensing devices (output) and receiving devices (input) that cause an action

#### Skills:

Use a VOM/DVM and laptop computer to check for proper system function with alarm inputs, and for proper relay output with selected alarm inputs.

## ***3.5 “Planning and Conducting User Training” Tasks***

No tasks at this level

## **3.6 “Documentation” Tasks**

*Note: The letters following some tasks indicate for whom the documentation is required:*

*S = Shop, C = Customer, G = Government*

### **3.6.1 Provide certification documentation for fiber and data cables. (SC)**

Knowledge:

Standards set for various cable certifications and the types of documentation required to satisfy those standards

Jim will email standards for reference

Skills:

Prepare cable documentation in an appropriate format.

### **3.6.2 Label patch panels. (SC)**

Knowledge:

Wiring symbols

Patch panel layout

Skills:

Use wiring legends and shop drawings to properly identify patch panel terminations.

### **3.6.3 Label head-end equipment.**

Knowledge:

Wiring symbols

Equipment identification schemes

Skills:

Use wiring legends and shop drawings to properly identify head-end equipment.

### **3.6.4 Record the inputs to head-end equipment. (SC)**

Knowledge:

Functions of head-end terminals

Skills:

Identify and accurately record the inputs to head-end equipment.

### **3.6.5 Document head-end and field device programs.**

Knowledge:

What devices are programmable

Purposes for which programming is recorded

Skills:

Determine which devices have been programmed.

Clearly and understandably record programming information.

### **3.6.6 Record the cables in shared fiber, data, telecommunications, and power systems. (SC)**

#### Knowledge:

Concept of shared cables and how it applies to video systems

#### Skills:

Clearly and accurately document the shared resources.

### **3.6.7 Collect and assemble all documents and make as-built drawings. (SC)**

#### Knowledge:

Information required to create as-built drawings

Architectural and video symbols required to create as-built drawings

#### Skills:

Properly locate, draw, letter, and/or label installation facts on as-built drawings.

### **3.6.8 Prepare a sequence of operations (also known as an “I/O schedule” or “event/action list”).**

#### Knowledge:

Purpose and intended users of the “sequence of operations”

Information required to create a “sequence of operations”

#### Skills:

Record the information in a clearly understandable and well-formatted document.

## ***3.7 “Project Management” Tasks***

### **3.7.1 Procure and schedule materials.**

#### Knowledge:

How to obtain ordering information for all components needed for the project

Shipping and storage considerations

#### Skills:

Retrieve relevant information from Gantt charts.

List the materials in a logical order on the project schedule.

Determine and record material suppliers and delivery dates and reconcile differences with project schedule.

Arrange for delivery receiving and storage of materials.

### **3.7.2 Select and supervise the project team.**

#### Knowledge:

Types A and B systems and the skills required for their installation

#### Skills:

- Determine the skill requirements of the project.
- Determine the schedules and labor requirements of other project managers.
- Determine the skills available in the local company, as well as in subcontractors.
- Negotiate effectively with workers and other managers to secure the needed labor force.
- Properly communicate with supervisors and subordinates to coordinate installation.

#### **3.7.3 Supervise and coordinate subcontract agreements.**

##### Knowledge:

- Legal implications of contract administration activities
- Contents, organization, and language of contracts

##### Skills:

- Determine the work expected of all parties under contract.
- Determine what subcontractors can do the work required.
- Identify any labor restrictions that might affect the choice of, or agreement with, a subcontractor.
- Negotiate agreements and on-going activities with subcontractors.
- Monitor progress on the project and by the subcontractor and inform the subcontractor of any shortfalls or changes in expectations.

#### **3.7.4 Coordinate with other trades on project.**

##### Knowledge:

- Types of work typically performed by various trades

##### Skills:

- Determine what other trades, such as electrical, plumbing, HVAC, painting, drywall, etc., will be working on the project, their expected roles and schedules, and the chain of command among trades/subcontractors/general contractor/owner.
- Monitor progress by other trades and determine any impact on your company's work.
- Determine and record progress, using clear written and verbal communication.

#### **3.7.5 Organize and attend project meetings.**

##### Knowledge:

- Purposes of project meetings
- Symbols typically used by the various trades, including electrical, plumbing, HVAC, painting, drywall, etc., that work alongside CCTV projects

##### Skills:

- Read and interpret the blueprints used by the various trades that work alongside CCTV projects.
- Communicate clearly the role of the project manager to other trades.
- Assemble a mail list of all who should be notified of project meetings or receive progress reports.

### **3.7.6 Monitor budget.**

#### Knowledge:

Source materials from which project budget information may be obtained

Addition, subtraction, multiplication, division, and calculation of percentages

Bookkeeping significance of income and expenses, beginning and current balances, labor hours, material purchased, funds available and funds expended

#### Skills:

Determine expended labor, materials, and other costs, as well as the expenses remaining for the project.

Determine the budgetary impact and technical feasibility of possible substitutions.

Read and interpret a budget in spreadsheet format.

# **NICET Video Security Systems Classification**

*The following are some of the types of equipment and system characteristics that delineate “Type A,” “Type B,” and “Type C” systems, as referred to in this content outline.*

## **Type A Systems**

*These are basic systems with standard components, low bandwidth transmission, and menu-driven setup, such as:*

Multiplexer/VCR

Quad/VCR

Digital video recorders with time/date, play/record, and anti-tamper functions

Sequential switch

Single keyboard

Indoor/outdoor

Standard cable runs not requiring repeaters or amplifiers (less than 800 ft. for coaxial; less than 1500 ft. for twisted pair)

## **Type B Systems**

*These systems can include specialized components, programmable controls, and high-bandwidth transmission, such as:*

PTZ

Multiple keyboards

Matrix interfaced with alarms, A/C, or intercom (GPI or dry contact)

Digital video recorders with programmable, alarm-based resolution and frame rate

Fiber transmission systems

Low light

Long cable runs

Covert or portable systems

RF modulators

## **Type C Systems**

*These systems can include PCs, serial communication, and wireless transmission, such as:*

Integrated systems/serial communications/GUIs

LANs/WANs

Remote systems

Microwave and IR transmission

Digital video recorders with remote interface