



National Unit Specification: general information

UNIT Alarm and Communication Systems (SCQF level 6)

CODE F5GY 12

SUMMARY

This Unit is intended for candidates with little or no prior knowledge of Alarm and Communication Systems.

The aim of this Unit is to develop the candidate's knowledge and understanding of the various types of system and the requirements of the Wiring Regulations BS7671 in relation to the installation of such systems. This Unit will introduce candidates to the design requirements of these systems and the circuit conditions necessary to produce them. Candidates will be able to draw up circuit and wiring diagrams and, from these, install wiring systems for simple intruder or fire alarm and hard-wired local area network (LAN) data communication systems. Candidates will also be able to test their wiring systems to ensure safe and reliable operation.

This Unit may form part of a National Qualification Group Award or may be offered on a free-standing basis.

OUTCOMES

- 1 Investigate the design requirements of alarm and data communication systems.
- 2 Draw circuit and wiring diagrams for alarm and hard-wired data-communication systems from basic design requirements.
- 3 Install simple alarm and hard-wired LAN communication systems.
- 4 Test simple alarm and hard-wired LAN communication systems.

Administrative Information

Superclass: TH

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RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following Standard Grades, or equivalent:

- ◆ Standard Grade Mathematics — Credit Level
- ◆ Standard Grade Technological Studies — Credit Level
- ◆ Standard Grade Physics — Credit Level
- ◆ NQ Unit *Security, Alarm and Communications Systems* (SCQF level 5)

CREDIT VALUE

1 credit at SCQF level 6 (6 SCQF credit points at SCQF level 6*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

CORE SKILLS

This Unit provides opportunities for candidates to develop aspects of the following Core Skills:

- ◆ Problem Solving (SCQF level 6)
- ◆ Numeracy (SCQF level 6)

These opportunities are highlighted in the Support Notes of this Unit Specification.

National Unit Specification: statement of standards

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Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit Specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

OUTCOME 1

Investigate the design requirements of alarm and data communication systems.

Performance Criteria

- (a) Describe clearly the purposes of alarm and data-communication systems.
- (b) Identify correctly the components and accessories of a given intruder or fire alarm system and a data-communication system.
- (c) Explain clearly the principles of open and closed security systems.
- (d) Explain clearly the principles of hard-wired and wireless local area network (LAN) data communication systems.
- (e) Explain correctly the design requirements of a given intruder or fire alarm system and a data-communication system from simple specifications.

OUTCOME 2

Draw circuit and wiring diagrams for alarm and hard-wired data-communication systems from basic design requirements.

Performance Criteria

- (a) Outline clearly the requirements of BS7671 for alarm and data-communication systems.
- (b) Draw correctly the circuit diagrams for a given intruder or fire alarm system and a data-communication system from simple specifications.
- (c) Draw correctly the wiring diagrams for a given intruder or fire alarm system and a data-communication system from simple specifications.

OUTCOME 3

Install simple alarm and hard-wired LAN communication systems.

Performance Criteria

- (a) Produce appropriate installation details from the design requirements of a given intruder or fire alarm system and a data-communication system.
- (b) Identify accurately the required materials and components for the specific system installations.
- (c) Install correctly the basic intruder or fire alarm system and the hard-wired LAN data communication systems having regard to the BS7671 requirements.

National Unit Specification: statement of standards (cont)

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OUTCOME 4

Test simple alarm and hard-wired LAN communication systems.

Performance Criteria

- (a) Identify correctly the instruments used for testing intruder or fire alarm and hard-wired LAN data-communication circuits.
- (b) Demonstrate correctly the appropriate testing techniques for the alarm and data-communication circuits.
- (c) Interpret correctly the results of the tests in relation to the appropriate system specification.

EVIDENCE REQUIREMENTS FOR THIS UNIT

Evidence is required to demonstrate that candidates have achieved all Outcomes and Performance Criteria.

Performance evidence supplemented with an assessor observation checklist and written and/or recorded oral evidence should be produced to demonstrate that the candidate has achieved all the Outcomes and Performance Criteria.

The evidence should be produced by means of a single holistic practical assessment under supervised, controlled conditions in a practical environment throughout the duration of the Unit.

Candidates are presented with plans and constructional information for a simple building requiring the installation of a basic intruder security or fire alarm and a hard-wired LAN data-communication installation.

Drawings, documentation and information regarding the systems and the operation of the equipment should be included with this information.

The necessary component parts accessories for the systems should be made available and provided to candidates on request.

A range of diagnostic test instruments including, insulation resistance testers, continuity testers, voltmeters, ammeters should also be made available and provided on request.

From information provided, the candidate should:

- ◆ produce installation details for the intruder or fire alarm and data-communication systems
- ◆ identify the materials and components required for the specific system installations
- ◆ install the basic intruder or fire alarm and hard-wired LAN data communication systems having regard to the BS7671 requirements
- ◆ identify the instruments used for testing alarm and hard-wired LAN data-communication circuits
- ◆ demonstrate the appropriate testing techniques for the alarm and data-communication circuits
- ◆ interpret the results of the tests in relation to the appropriate system specification

National Unit Specification: statement of standards (cont)

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This exercise should be accompanied by a written or recorded oral report in which the candidates:

- ◆ describe the purposes of alarm and data-communication systems
- ◆ identify the components and accessories of the given intruder or fire alarm and data-communication systems
- ◆ explain the principles of open and closed security systems
- ◆ explain the principles of hard-wired and wireless local area network (LAN) data communications systems
- ◆ explain the design requirements of the given intruder or fire alarm and data-communication systems
- ◆ outline THREE requirements of BS7671 with regard to alarm systems and THREE requirements of BS7671 with regard to data-communication systems
- ◆ draw circuit diagrams from the design requirements of the given alarm and data-communication systems
- ◆ draw wiring diagrams from the circuit requirements of the given alarm and data-communication systems

Note: Assessors **MUST** ensure that any connection of the installation or equipment to the supply, for the purpose of diagnostic and/or functional testing, is carried out in a safe manner and that no danger will arise due to such connection. Assessors must also ensure that a safe low voltage supply is used for such purposes. A high level of candidate supervision is required during this Unit.

National Unit Specification: support notes

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This part of the Unit Specification is offered as guidance. The support notes are not mandatory. While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

This is an Optional Unit within the National Qualification Group Award in Electrical Engineering at SCQF level 6 but may also be offered on a free-standing basis.

The aim of this Unit is to develop the candidate's knowledge and understanding of alarm and data-communications systems and to install and test simple systems.

The Unit will enable candidates to interpret the basic design requirements of intruder or fire alarm systems and hard-wired local area network data communications systems, and to design simple systems to meet the requirements of a given building layout and purpose.

Candidates should be provided with practical examples of intruder or fire alarm systems and hard-wired and wireless LAN data communications systems and the need for and operation of such systems should be discussed.

Candidates should know the difference between normally open and closed circuits for security and alarm circuits and be able to compare their relative advantages and disadvantages. They should also be introduced to the terminology of alarm and communications systems and be able to discuss their operation.

Given the particular function for which a building is to be used, and a simple layout of its rooms and common areas, the candidate should be able to design simple systems to meet the requirements of the building and relevant legislation.

The candidate should be able to install and test intruder or fire alarm and communications systems.

Terms including the following should be described and examples given: visual warning devices, audible warning devices, LED, bell, buzzer, motorised siren, electronic sounder, actuating devices, key switch, glass point, smoke detector, heat detector, presence detector, magnetic reed switch, relay, supply sources, transformer, rectifier, primary and secondary batteries protected wiring systems MI cable, FP200 cable, LV multi-core cable, pc terminal, visual display screen, pc networking, wireless router.

This content and context of this Unit should provide candidates with an overview of intruder or fire alarm and hard-wired and wireless LAN systems.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

This Unit should be delivered in a practical environment and should encourage candidates to become familiar with the techniques and terminology of the systems being considered.

Candidates should be presented with practical arrangements for the installation of intruder or fire alarm and hard-wired LAN communication systems.

National Unit Specification: support notes (cont)

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The relative features of open and closed-loop alarm systems should be discussed and candidates should be encouraged to participate fully in these discussions.

Case studies and discussion groups are some of the methods which could be used to engage with candidates to emphasise the importance of the topics included in this Unit.

A practical approach should be used to provide a learning bias which candidates will relate to. This should be through the presentation of typical practical systems showing clearly the features and operating principles of each system chosen. The installation and testing of various systems should be carried out in a workshop environment using actual components and accessories.

Lecturers must always ensure that candidates work in a safe manner and, the Health and Safety workshop procedures of the Centre should be continually emphasized and implemented.

Lecturers must also satisfy themselves that ALL circuit wiring produced by candidates has been inspected and tested in accordance with the requirements of BS7671 and that NO circuit is connected to the supply voltage until these requirements have been fully met.

It is recommended that the supply voltage used to energise candidate circuits is of a suitable safe value.

It is recommended that the Outcomes should be delivered in the sequence given in the ‘statement of standards’.

Candidates should be encouraged to discuss and debate the various issues raised by the subject content in order that this interaction might stimulate their thought processes and reinforce the learning.

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

Elements of the Core Skill of *Problem Solving*, including critical thinking, planning and organising, will be naturally developed as candidates investigate design requirements, produce working diagrams and install alarm and communication systems. Successful completion of practical work will involve identifying and taking account of a complex range of factors including safety regulations. As wiring systems are tested, safety and reliability of operation will be evaluated. Feedback from assessors should be routine and will enhance analytical approaches to Problem Solving.

Candidates must draw up and interpret circuit and wiring diagrams. Skills in using graphic data will be naturally enhanced, with a focus on the practical application of information.

Formative practical activities should be designed to develop Numeracy skills in electrical engineering contexts.

National Unit Specification: support notes (cont)

UNIT Alarm and Communication Systems (SCQF level 6)

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by information and communications technology (ICT), such as e-testing or the use of e-portfolios or e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003)*, *SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

The assessment of this Unit could take the form of a 'Practical Assignment' which extends over the duration of the Unit.

This assignment could contain the four elements specified in the Unit Outcomes ie:

- ◆ interpret the design requirements of intruder or fire alarm and data communications systems
- ◆ draw circuit and wiring diagrams for intruder or fire alarm and hard-wired data-communication systems from basic design requirements
- ◆ install simple intruder or fire alarm and hard-wired LAN communication systems
- ◆ test the operation of simple intruder or fire alarm and hard-wired LAN communication systems

These four elements could be integrated into one practical assignment with the achievements of each element being clearly recorded for each candidate.

It is recommended that the practical assignment is conducted in a workshop environment under supervised and controlled conditions.

Note: Assessors **must** ensure that any connection of the installation or equipment to the supply is carried out in a safe manner and that no danger will arise due to such connection. Assessors must also ensure that a safe low voltage supply is used for such purposes.

The Health and Safety of candidates must be paramount at all times and the lecturer must be responsible for ensuring that all wiring carried out for assessment purposes is of a sufficiently high standard that it meets all the necessary BS7671 requirement prior to connection of the supply voltage.

Candidates should be allowed access to the Wiring Regulations BS7671 for reference purposes.

CANDIDATES WITH DISABILITIES AND/OR ADDITIONAL SUPPORT NEEDS

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering alternative Outcomes for Units. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs (www.sqa.org.uk)*.