



National Unit specification: general information

Unit title: Copper Cabling: An Introduction (SCQF level 6)

Unit code: FX1P 12

Superclass: XJ

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Version: 01

Summary

The purpose of this Unit is to develop candidates' understanding of copper cabling in terms of procedures, industry standards, basic electrical theory, installation and testing of different standards of copper cabling.

This is an optional Unit in the NC Computing: Technical Support (SCQF level 6). It is also available as a freestanding Unit.

This Unit is suitable for candidates who are interested in a career in technical support.

Outcomes

- 1 Identify basic electrical theory and health and safety issues.
- 2 Identify categories of cabling, wiring standards, required equipment and common wiring issues.
- 3 Make, install and test copper cable.

Recommended entry

While entry is at the discretion of the centre, it would be beneficial if candidates have attained a SCQF level 5 computing related course.

Credit points and level

1 National Unit 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.*

National Unit specification: general information (cont)

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Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the Support Notes of this Unit specification.

There is no automatic certification of Core Skills or Core Skill components in this Unit.

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

Identify basic electrical theory and health and safety issues.

Performance Criteria

- (a) Identify electrical units of measurement.
- (b) Identify health and safety issues and equipment.

Outcome 2

Identify categories of cabling, wiring standards, required equipment and common wiring issues.

Performance Criteria

- (a) Identify categories of copper cabling.
- (b) Identify wiring standards of copper cabling and their uses within a network.
- (c) Identify common cable testing equipment.
- (d) Identify common wiring issues.

Outcome 3

Make, install and test copper cable.

Performance Criteria

- (a) Make a copper cable.
- (b) Incorporate copper cable into a small network.
- (c) Test copper cable.
- (d) Document practical tasks, all tests, results of tests and any corrective actions taken.

National Unit specification: statement of standards (cont)

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Evidence Requirements for this Unit

Evidence is required to demonstrate that candidates meet the requirements of all Outcomes and Performance Criteria.

Outcome 1 — written and/or oral recorded evidence is required which includes:

- ◆ accurate identification of electrical units of measurement including:
 - AC/DC
 - voltage
 - current
 - impedance/resistance
 - ohms
 - amps

- ◆ identification of health and safety issues and equipment including:
 - fire extinguishers
 - Electrical Static Discharge (ESD)
 - temperature
 - environment
 - working with electrical equipment (unplugging & switching off PC)

The evidence for this Outcome should be obtained under controlled, supervised conditions. The assessment will be closed-book.

Outcome 2 — written and/or oral recorded evidence is required including:

- ◆ identification of three categories of copper cabling
- ◆ identification of wiring standards of copper cabling including: TIA/EIA-568A and TIA/EIA-568B, crossover, straight through, rollover/console cables and their uses within a network
- ◆ accurate identification of equipment utilised in the use and testing of copper cabling
- ◆ correct identification of wiring issues including cross talk and attenuation

The evidence for this Outcome should be obtained under controlled, supervised conditions. The assessment will be closed-book.

Outcome 3 — product and performance evidence which includes:

- ◆ production of 2 copper cables, taking into consideration any rules or special precautions for terminating the cables
- ◆ incorporation of both copper cables into a network. The candidate must include the cables created in OC3 pc(a) in a small network
- testing the copper cables and solving any errors in the copper cables created in OC3 pc(a) and ensuring that cables meet appropriate wiring standards
- accurately documenting practical tasks, all tests, results of tests and any corrective actions taken

The evidence for this Outcome should be obtained under controlled, supervised conditions. The assessment will be open-book and candidates will have access to notes and reference books.

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 Unit aligns to the following National Occupational Standards (NOS) from e-skills UK:

4.8 IT/Technology infrastructure design and planning

A practical, hands-on approach to learning should be adopted. The emphasis should be on learning-by-doing. Terminology and underpinning knowledge should be introduced in a practical context.

The actual distribution of time between Outcomes is at the discretion of the centre. However, the following distribution is suggested:

Outcome 1: 15 hours

Outcome 2: 15 hours

Outcome 3: 10 hours

Throughout this Unit, candidate activities should relate to their personal or vocational interests. For example candidates could locate, process and communicate information relating to their academic work, hobbies and pastimes, recreational and entertainment preferences or other topics that can genuinely stimulate their interest.

Outcome 1

Identify basic electrical theory and health and safety issues.

Outcome 2

Identify wiring standards, categories of cabling and required equipment.

The candidate must be familiar with the categories of cabling including Classes CAT5, CAT5e, CAT6, CAT7 and any future categories.

National Unit specification: support notes (cont)

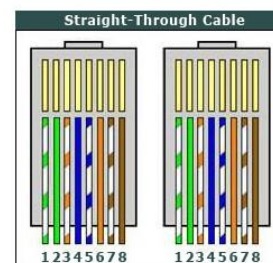
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Category	Bandwidth	Applications	Notes
Cat1	0.4 MHz	Telephone and modem lines	Not described in EIA/TIA recommendations. Unsuitable for modern systems.
Cat2	? MHz	Older terminal systems, e.g. IBM 3270	Not described in EIA/TIA recommendations. Unsuitable for modern systems.
Cat3	16MHz	10BASE-T and 100BASE-T4 Ethernet	Described in EIA/TIA-568. Unsuitable for speeds above 16 Mbit/s.
Cat4	20MHz	16 Mbit/s Token Ring	
Cat5	100MHz	100BASE-TX & 1000BASE-T Ethernet	
Cat5e	100MHz	100BASE-TX & 1000BASE-T Ethernet	Enhanced Cat5. Practically the same as Cat5, but with better testing standards so Gigabit Ethernet works reliably.
Cat6	250MHz	1000BASE-T Ethernet	Most commonly installed cable in Finland according to the 2002 standard. SFS-EN 50173-1
Cat6e	250MHz (500MHz according to some)	10GBASE-T (under development) Ethernet	Not a standard; a cable maker's own label.
Cat6a	500MHz	10GBASE-T (under development) Ethernet	Standard under development (ISO/IEC 11801:2002 Amendment 2).
Cat7	600MHz	No applications yet.	Four pairs, U/FTP (shielded pairs). Standard under development.
Cat7a	1000MHz	Telephone, CATV, 1000BASE-T in the same cable.	Four pairs, S/FTP (shielded pairs, braid-screened cable). Standard under development.
Cat8	1200MHz	Under development, no applications yet.	Four pairs, S/FTP (shielded pairs, braid-screened cable). Standard under development.

Candidates must identify wiring standards of copper cabling. The candidate must be familiar with the wiring standards TIA/EIA-568A and TIA/EIA -568B. The candidate must be familiar with crossover, straight through, rollover/console cables and their uses within a network.

Use a straight-through cable when:

- ◆ Connecting a router to a hub
- ◆ Connecting a computer to a switch
- ◆ Connecting a LAN port to a switch, hub, or computer

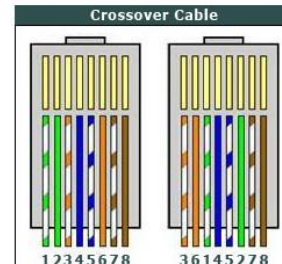


National Unit specification: support notes (cont)

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Use a crossover cable when:

- ◆ Connecting a computer to a router
- ◆ Connecting a switch to a hub
- ◆ Connecting a computer to a computer
- ◆ Connecting a router to a router
- ◆ Connecting a switch to a switch
- ◆ Connecting a hub to a hub



Console cable

In a rolled cable, the coloured wires at one end of the cable are in the reverse sequence of the coloured wires at the other end of the cable.

- ◆ Connecting a PC to a router

Candidates must identify equipment utilised in the use and testing of copper cabling such as Wire map testers and Multimeter, etc.

Candidates must identify wiring issues such as cross talk and attenuation.

Cross talk including:

- ◆ Near End Crosstalk (NEXT)
- ◆ Far end crosstalk (FEXT)

Outcome 3

Make, install and test copper cable

The evidence required for this Outcome will be practical tasks.

Candidates must create two copper cables, taking into consideration any rules or special precautions for terminating the cables. This may include the using the correct tools, ensuring the correct wire layout is incorporated and ensure the untwist length is considered.

Candidates must incorporate the copper cable into a network. The candidate must include the cables created in OC3 pc (a) in a small network.

Candidate must test copper cable. The candidate must be able to effectively test and solve errors in the copper cables created in OC3 pc (a) and ensure cables meet appropriate wiring standards. Errors include improper pin termination, shorts between any two or more wires, split pairs, crossed pairs, reversed pairs, and any other mis-wiring.

National Unit specification: support notes (cont)

Unit title: Copper Cabling: An Introduction (SCQF level 6)

Guidance on learning and teaching approaches for this Unit

A practical, hands-on approach to learning should be adopted. The emphasis should be on learning-by-doing. Terminology and underpinning knowledge should be introduced in a practical context.

Throughout this Unit, candidate activities should relate to their personal or vocational interests. For example candidates locate, process and communicate information relating to their academic work, hobbies and pastimes, recreational and entertainment preferences or other topics that can genuinely stimulate their interest.

Evidence of practical competence should be stored in a portfolio. At the completion of this Unit the portfolio should contain a range of evidence, drawn from the appropriate evidence requirements for each outcome.

Candidate evidence could be stored and submitted in an electronic portfolio (e-portfolio). Opportunities exist for integration between teaching and assessment, for example the process of setting up a smartgroup to use as a repository for an electronic portfolio could in itself be a source of assessment evidence.

Guidance on approaches to assessment for this Unit

Outcome 1 — A suitable format for this Outcome could be eight extended response questions. Four questions from each of the performance criteria sections.

The assessment will be supervised, controlled and under closed-book conditions. The assessment should be attempted on a single occasion. Where re-assessment is required a different instrument should be used.

Outcome 2 — The evidence required for this Outcome could be 20 multiple choice questions. five questions from each of the performance criteria sections.

The assessment will be supervised, controlled and under closed-book conditions. The assessment should be attempted on a single occasion. Where re-assessment is required a different instrument should be used.

Outcome 3 — Document practical tasks, all tests, results of tests and any corrective actions taken. An observation checklist and a portfolio would be appropriate to record achievement.

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 Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. 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)*.

National Unit specification: support notes (cont)

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Opportunities for developing Core Skills

In this Unit candidates will develop skills in making, installing and testing copper cables in small computer networks.

Candidates will:

- ◆ identify electrical units of measurement
- ◆ identify categories and wiring standards of copper cabling
- ◆ identify cable testing equipment and wiring issues
- ◆ make, install and test copper cables in a small network ensuring health and safety requirements are met
- ◆ maintain a record of all practical tasks, tests, results of tests and any corrective actions taken

As candidates are doing this Unit they will be developing aspects of the Core Skills of *Numeracy*, *Problem Solving* and *Communication*.

In addition, whilst completing this Unit, candidates may develop aspects of the following Core Skill where specific learning and teaching approaches are adopted:

- ◆ *ICT* — Candidates may use an e-portfolio to store a range of evidence.

Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website www.sqa.org.uk/assessmentarrangements

History of changes to Unit

Version	Description of change	Date

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