Unit 19: Application of data logging (LEVEL 2)

Learning outcomes

By completing this unit candidates will develop knowledge and understanding of how data logging can be used in a variety of situations.

Candidates will be able to:

- investigate an application of data logging
- investigate the hardware used in data logging
- set up and carry out an investigation(s) using data logging
- evaluate data logging activities.

It is anticipated that a candidate will require 30 guided learning hours to complete this unit.

Assessment objectives	Knowledge, understanding and skills
1 Investigate an application of data logging	Candidates will investigate **one** data logging application eg: • environmental monitoring • logistics tracking • sports training • security monitoring • medical applications Investigation to cover: • purpose of the application • hardware and software used • description of the application in use • data logging carried out eg: how sensors are used, what data is collected, how data is collected, storage of data, analysis of data • advantages and disadvantages of the application
2 Investigate the hardware and software used in data logging	Types of data logging systems: • dedicated data loggers • sensors attached to PCs through interfaces Description of types of data logging systems to include eg: • main differences between two types identified • advantages and disadvantages of two types Identify **at least four** different sensors and for each describe eg: • how the sensor works • one application • whether the user needs to calibrate the sensor • reason for calibration (**for one sensor only**) • how to calibrate (**for one sensor only**) Sensors may include, eg: • angular position • digital sensors eg switches/gates • dissolved oxygen • humidity (continued)

Assessment objectives	Knowledge, understanding and skills
2 Cont. Investigate the hardware and software used in data logging	• light • magnetic field strength (Hall probe) • pH • pressure • sound • temperature
Assessment objectives 3 and 4 are based on practical investigations using data logging carried out by the candidate	
3 Set up and carry out an investigation (or investigations) using data logging	Conduct one or more investigations. Choose appropriate hardware: • data logger or computer with interface • appropriate sensors Set up equipment: • connect equipment • calibrate sensors where necessary • set period and interval of logging Obtain and store results: • carry out data logging • store results Analyse the results: • use specialist software or transfer to generic application • summarise the results of the investigation Produce a report: • purpose of investigation • describe the methods used • describe the results eg charts/graphs and tables, list of raw data
4 Evaluate data logging activities	Evaluation to include eg: • advantages and disadvantages of using data logging to carry out the practical investigation(s) • accuracy and reliability of findings • health and safety issues

Assessment

This unit is centre assessed and externally moderated.

In order to achieve this unit, candidates must produce a portfolio of evidence showing that they have met all of the assessment objectives.

Portfolios of work must be produced independently. They will need to be made available, together with witness statements and any other supporting documentation, to the OCR Visiting Moderator when required.

Centres must confirm to OCR that the evidence produced by candidates is authentic. An OCR Centre Authentication Form is provided in the Centre Handbook and includes a declaration for assessors to sign. It is a requirement of the QCA Common Criteria for all Qualifications that proof of authentication is received.

Guidance on assessment and evidence requirements

Candidates may provide portfolio evidence for this unit using a range of suitable and appropriate techniques. These may include written data, photographs and video. Where centre assessors have witnessed experiments or displays for which evidence cannot be easily included within the portfolio, testimony/witness statements must be included, signed by the assessor(s), and supported by appropriate evidence (handouts, slides, photographs etc).

For Assessment Objective 1 candidates must carry out a study of data logging used in an organisation and produce a report, which might either be written or given as an illustrated talk. Candidate portfolios should include either the written report or printouts of slides used, with speaker notes. If the speaker notes do not fully evidence the information given in the talk the centre must include a witness statement.

The investigation may be done using visits, interviews etc or may be a more academic exercise with information gained from published material, in print or on the internet. The focus of the study should be data logging, rather than control. Their report/talk must include the: purpose, hardware and software used, description of the application in use, data logging carried out eg: how sensors are used, what data is collected, how data is collected, storage of data, analysis of data, and the advantages and disadvantages of the application compared to alternative methods.

It is expected that candidates will find some information for Assessment Objective 2 from their Assessment Objective 1 study. However, it is likely that this will need to be supplemented by research from catalogues and websites to cover both types of data logging systems and a wider range of sensors. They will find specific commercial examples of different types of hardware. For sensors to be counted as 'different' for the purpose of assessment they must each measure a different external quantity. For example, a light sensor and a temperature sensor count as two different types of sensor, but two different models of light sensor do not. Candidates must describe at least four different types of sensors and provide the following information for each identified sensor:

- brief overview of how the sensor works, and
- one application of the sensor, clearly stating the purpose and data being monitored.

For higher grades candidates will need to be able to describe what is meant by calibration and how one of their identified sensors could be calibrated. There is no requirement for circuit diagrams and detailed technical explanations only descriptions showing an understanding of the general method used by the sensor to capture the relevant data. Such descriptions might commonly be found in catalogues and technical dictionaries.

For Assessment Objective 3 and Assessment Objective 4 candidates will carry out one or more practical data logging activities. It is anticipated that candidates working in schools or colleges may complete these activities in a subject such as Science or Geography rather than totally in specialist ICT lessons. They will need to be given a problem to investigate and must have a choice of a number of different types of sensor. Merit and distinction candidates need to use more than one different type of sensor so that they can monitor more than one physical variable, eg temperature, light, acidity. This may be done in one complex experiment or as a number of smaller, discrete experiments. Candidates must show throughout an awareness of the need to carry out procedures with care to ensure precision and reliability of results. This will include checking the calibration of sensors and consideration of accuracy when handling and positioning sensors and when deciding when to take readings.

All candidates will need to produce some evidence of the results obtained. Candidates must analyse their results and produce a report. The report must describe: the purpose of the investigation, methods employed and the results which may be a list of raw data. For higher grades candidates will present their results using charts/graphs and tables, explain how they analysed their results and provide detailed explanations.

Assessment Objective 4 requires an evaluation of the usefulness of data logging in the practical investigation(s) carried out by the candidate in Assessment Objective 3. They should include advantages and disadvantages of using data logging equipment. Candidates should also consider accuracy of their results. High level candidates they should also consider issues of reliability. All candidates must describe at least one health and safety measure they had to take when carrying out their investigation(s).

Signposting to Key Skills

✓ The unit contains opportunities for developing the Key Skill, and possibly for generating portfolio evidence, if teaching and learning is focused on that aim.

Key Skill reference		**Key Skill reference**		**Key Skill reference**	
C2.1a	✓	ICT2.1	✓	N2.1	✓
C2.1b	✓	ICT2.2	✓	N2.2	✓
C2.2	✓	ICT2.3	✓	N2.3	✓
C2.3	✓				

Mapping to National Occupational Standards

National Occupational Standards	**Reference ID**	**Title**
IT Users (e-skills UK)	EI2	Evaluate the impact of IT Level 2
Contact Centres (e-skills UK)	CCIWC	Interpersonal and written communication
IT Users (e-skills UK)	MSU2	Make selective use of IT Level 2
IT Users (e-skills UK)	OPU2	Operate a computer Level 2
IT Users (e-skills UK)	PS2	Presentation software Level 2

Resources

This section provides suggestions of suitable resources. The list is neither prescriptive nor exhaustive, and candidates should be encouraged to gather information from a variety of sources. Some suggested resources are intended for Tutor use. The resources in this section were correct at the time of production.

Books

Roger Frost Data logging & Control
ISBN 0 9520257 1 X

Websites

http://www.onsetcomp.com
A site providing data loggers and controllers.

http://science.uniserve.edu.au/school/addres/datalog.html
Teacher resources and data logging information.

http://www.rogerfrost.com
Provides training days for schools and education authorities and also writes and reviews teaching materials.

http://www.weatherstations.co.uk
A sales and information website for automatic weather stations.

http://www.geminidataloggers.com

Grading

Assessment Objective	Pass	Merit	Distinction
AO1 Investigate an application of data logging	Candidates will identify the purpose of a data logging application and list the main hardware and software used. They will describe briefly how the data logging is carried out and state what data is collected. They will list some of the advantages of data logging in this situation.	Candidates will describe the purpose of a data logging application and the hardware and software used. They will describe how the data logging is carried out, including: • what data is collected • how data is collected • where data is stored • how it is analysed. They will describe advantages and disadvantages of data logging in this situation.	Candidates will describe fully the purpose of a data logging application and the hardware and software used. They will describe how the data logging is carried out, including: • how sensors are used • what data is collected • how data is collected • where data is stored • how it is analysed They explain the advantages, disadvantages and limitations of using data logging to meet the needs of this situation, making clear comparisons with alternative methods.
AO2 Investigate the hardware and software used in data logging	Candidates will identify the main differences between dedicated data loggers and sensors attached to PCs through interfaces. They will describe one example of each. They will describe examples of at least four different types of sensor and give an example of an application where each might be used, stating clearly the purpose of the application and the data being monitored.	Candidates will describe the main differences between dedicated data loggers and sensors attached to PCs through interfaces. They will describe one example of each giving an appropriate use for each. They will describe examples of at least five different types of sensor and for each: • give a brief overview of how the sensor works • describe one application where the sensor might be used, stating clearly the purpose of the application and the data being monitored (continued)	Candidates will explain the main differences between dedicated data loggers and sensors attached to PCs through interfaces. They will describe one example of each giving an appropriate use for each, with reasons. They will compare the advantages and disadvantages of the two types of system. They will describe examples of at least six different types of sensor and for each: • give a description of how the sensor works • describe one application where the (continued)

Assessment Objective	Pass	Merit	Distinction
AO2 Cont. Investigate the hardware and software used in data logging		• state whether or not the sensor needs to be calibrated by the user	sensor might be used, stating clearly the purpose of the application and the data being monitored • state whether or not the sensor needs to be calibrated by the user They explain the purpose and processes of calibration and describe how at least one type of sensor can be calibrated.
AO3 Set up and carry out an investigation (or investigations) using data logging	Candidates choose at least one appropriate sensor to carry out a simple investigation. They connect the equipment. They set the period and interval of logging and obtain some results. They state the purpose of the investigation, write about the method they used and comment on the results they find. The results are displayed as a list of raw data.	Candidates choose appropriate sensors to carry out an investigation or investigations monitoring at least two different physical variables. They connect the equipment. They set the period and interval of logging and obtain some results. They save their results and carry out some analysis to summarise their findings. They describe the purpose of the investigation(s), how the investigation(s) was carried out, how they analysed the results and describe their results.	Candidates choose appropriate sensors to carry out an investigation or investigations monitoring at least three different physical variables. They connect the equipment, and check the calibration of at least one sensor to ensure accuracy. They set the period and interval of logging and obtain some results. They save their results and carry out a detailed analysis to summarise their findings. They describe in detail the purpose of the investigation(s), how the investigation(s) was carried out and how they analysed the results. Their description of how the investigation(s) was carried out includes details of procedures followed to ensure precision and reliability of results. They produce a report, illustrated with charts/graphs and tables, detailing their findings.

Assessment Objective	Pass	Merit	Distinction
AO4 Evaluate data logging activities	Candidates give at least one advantage and one disadvantage of using data logging equipment in their investigation. They describe at least one measure they had to take to ensure health and safety. They comment briefly on the accuracy of their findings.	Candidates describe several advantages and disadvantages of using data logging equipment in their investigation(s). They explain any advantages, disadvantages and limitations of some of the equipment they used. They comment on the accuracy and reliability of their findings. They describe clearly any health and safety issues they had to consider whilst carrying out the investigation(s) and any measures they took in response to these issues.	Candidates give a comprehensive evaluation of using data logging equipment in their investigation(s), considering the purpose of each investigation and alternative methods that could have been used. They explain any advantages, disadvantages and limitations of the particular equipment they used. They give an evaluation of the accuracy and reliability of their findings. They explain any health and safety issues they had to consider whilst carrying out the investigation and any measures they took in response to these issues.