SQA Advanced Unit Specification

General information for centres

Unit title: Electronic Fault Finding

Unit code: HP3L 48

Unit purpose: This Unit is designed to enable candidates to understand the concept of electronic fault finding and enable them to be proficient in designing and implementing a fault location strategy. This Unit is particularly suited for candidates who expect to work as electronic technicians (especially in a maintenance role) but is also relevant to all those on an electronic study programme who require a practical understanding of electronic fault finding.

On completion of this Unit, the candidate should be able to:

1   Explain the techniques of fault diagnosis in electronic circuits and systems
2   Implement a fault location strategy in an electronic system
3   Locate faults to component level in digital and analogue circuits.

Credit value: 1 SQA Credit at SCQF level 8: (8 SCQF credit points at SCQF level 8*)

*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 National 1 to Doctorates.

Recommended prior knowledge and skills: It is recommended that candidates have basic electronic construction and testing skills such as reading circuit diagrams, identifying components, simulating, constructing and testing circuits. This may be evidenced by possession of the SQA Advanced Unit Electronic Testing Skills or a similar Unit.

Core skills: There may be opportunities to gather evidence towards Core Skills in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery: This Unit was developed for the SQA Advanced Diploma in Electronics award. If this Unit is delivered as part of another group award, it is recommended that group award to which it contributes.

Assessment: Assessment for this Unit should take the following form:

Outcome 1 — Short written test lasting 30 minutes
Outcome 2 — Practical Exercise on an electronic system
Outcome 3 — One practical exercise on an analogue system,
        — One Practical exercise on a digital system.

The written test for Outcome 1 could be composed of a suitable balance of short answer, restricted response and structured questions. Outcomes 2 and 3 are practical and it is recommended that candidates be assessed by use of checklists and a report written by the candidate which includes a fault finding log. Assessment for both the written test and the practical exercises should be conducted under controlled, supervised conditions.

Unit specification: statement of standards

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The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Explain the techniques of fault diagnosis in electronic circuits and systems.

Knowledge and/or skills

♦ Sequential and non sequential fault location methods
♦ Systematic fault location methods eg input to output, output to input, half-split
♦ Fault location methods in complex systems eg divergence, convergence, alternative path
♦ Exceptional faults eg manufacturing faults, multiple faults, catastrophic failure

Evidence requirements

Candidates will need evidence to demonstrate their knowledge and/or skills by showing that they can:

Evidence for the knowledge in this Outcome may be provided on a sample basis. The evidence may be presented in responses to specific questions. Each candidate will need to demonstrate that she/he can answer correctly questions based on a sample of the items shown above. In any assessment of this Outcome, one item from each of the four knowledge and/or skills items should be sampled.

In order to ensure that candidates will not be able to foresee what items they will be questioned on, a different sample from each of the four knowledge and/or skills items is required each time the Outcome is assessed. Candidates must provide a satisfactory response to all four items.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing that the candidate is able to:

Group 1
♦ explain the difference between sequential and non sequential fault location methods
♦ explain the use of input to output and output to input methods
♦ explain the use of half-split methods

Group 2
♦ explain the significance of diverging paths in fault finding
♦ explain the significance of converging paths in fault finding
♦ explain the significance of alternative paths in fault finding

Group 3
♦ describe typical manufacturing faults
♦ explain the added difficulties involved when trying to locate multiple faults
♦ explain the significance of catastrophic failure

Sampling should be one item from each of the three groups above.

Evidence should be generated through an assessment paper lasting 30 minutes undertaken in supervised conditions. Candidates may not bring to the assessment any notes, textbooks, handouts or other material.

Outcome 2

Implement a fault location strategy in an electronic system

Knowledge and/or skills

♦ Identify risks and use safe working practices
♦ Identify fault symptoms in terms of system operation
♦ Interpret fault symptoms using test equipment and/or diagnostic aids
♦ Locate faulty circuit using system documentation and test equipment.

Evidence requirements

Candidates will submit evidence to satisfy this Outcome in the form of a report which documents a practical fault finding activity. The report should include:

♦ the identification of risks
♦ appropriate safe working practices used
♦ a description of the fault location strategy implemented
♦ details of tests carried out and the test equipment and/or diagnostic aids used
♦ sketches of appropriate block diagrams
♦ a reference to the documentation used
♦ a contemporaneous log of the fault finding activities

Assessment guidelines

Centres are recommended to develop and use appropriate checklists to monitor the candidates fault finding activities and provide a check on the authenticity of the report.

Outcome 3

Locate faults to component level in digital and analogue circuits

Knowledge and/or skills

All knowledge and skills items should be assessed for this Outcome
♦ Identify risks and use safe working practices
♦ Identify fault symptoms in terms of system operation
♦ Select a suitable fault location method
♦ Locate a fault to component level on an analogue system
♦ Locate a fault to component level on a digital system
♦ Use appropriate test equipment
♦ Correct use of a circuit diagram

Evidence requirements

Candidates will submit evidence to satisfy this Outcome in the form of two reports, one for fault finding on an analogue circuit and one on a digital circuit. The reports should include:

♦ the identification of risks
♦ appropriate safe working practices used
♦ a description of the fault location strategy implemented
♦ details of tests carried out and the test equipment used
♦ circuit diagrams used
♦ a reference to the documentation used
♦ a contemporaneous log of the fault finding activities

Assessment guidelines

Centres are recommended to develop and use appropriate checklists to monitor the candidates fault finding activities and provide a check on the authenticity of the report.

Administrative information

Unit code: HP3L 48

Unit title: Electronic Fault Finding

Superclass category: XL

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FURTHER INFORMATION: Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our Centre Feedback Form.

Unit specification: support notes

Unit title: Electronic Fault Finding

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 is at SCQF level 8 and is an optional Unit of the SQA Advanced Diploma in Electronics award.
It has been written in order to increase candidates knowledge of fault finding at a system level and a component level in both analogue and digital circuits. It builds on the basic fault finding skills contained in the SCQF level 7 Unit, Electronic Testing Skills.

Outcome 1 (5 hours)
Explain the techniques of fault diagnosis in electronic circuits and systems.
It is recommended that sequential methods are covered briefly with an explanation of their suitability for simple circuits. Work on non sequential fault finding methods is likely to take up the greater share of time for this Outcome though some time must be reserved to introduce candidates to the different types of exceptional faults.

Outcome 2 (10 hours)
Implement a fault location strategy in an electronic system.
Various electronic systems may be used for fault finding. A commercial/industrial electronic system would be particularly appropriate but it is recognised that this will not always be possible. Other suitable systems could include:

♦ PLC controlling external equipment
♦ a desk top computer driving a multi-applications board
♦ a microprocessor driving a multi-applications board
♦ an alarm system
♦ a multi stage AF or RF amplifier
♦ a static inverter

It is not necessary to find faults to component level since the emphasis for this Outcome should be on a block diagram or system approach. It is acceptable to use the same fault for Outcome 2 and one part of Outcome 3 (either the digital or the analogue part), the fault being located to a particular block or stage for Outcome 2 and then located to component level for Outcome 3.

Outcome 3 (25 hours)
Locate faults to component level in digital and analogue circuits.
The notes for Outcome 2 also apply to Outcome 3. It is recommended that the bulk of the time available for this Unit be allocated to Outcome 3 in order to give candidates the opportunity to locate many different faults to component level prior to proceeding to assessment.

Guidance on the delivery and assessment of this Unit

This Unit has been designed for SQA Advanced Diploma in Electronics candidates. It should provide candidates with sufficient knowledge, understanding and practical skills in fault finding to enable them to locate faults in a wide range of electronic and electrical circuits and equipment. In order to become fluent in applying these skills it is important that candidates are given repeated opportunities to locate different faults, firstly to block level and then to component level. Whilst computer packages for simulating fault finding are available and would be a good introduction, it is important that candidates are given the opportunity to work on real circuits. Simulations are not recommended for the practical assessments.

Open learning

Given the practical nature of this Unit it is unlikely that it will be suitable for distance learning.

For information on normal open learning arrangements, please refer to the SQA guide *Assessment and Quality of Open and Distance Learning,* (SQA 2000).

Equality and inclusion

This unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

General information for candidates

Unit title: Electronic Fault Finding

This Unit has been designed to allow you to develop your knowledge, understanding and practical skills in locating faults in electronic circuits. It is at SCQF level 8 and is an optional Unit of the SQA Advanced Diploma in Electronics award. It builds on the basic fault finding skills from the level 7 Unit, Electronic Testing Skills.

Outcome 1 is concerned with gaining knowledge and understanding for various types of faults and fault finding methods. It will be assessed by a short written test.

Outcome 2 requires you to correctly locate a fault in an electronic or electrical circuit to a block or stage level. You will be required to keep a log of your fault finding activities and produce a written report detailing the fault finding strategy employed, the tests undertaken to locate the fault and how the fault was isolated to a particular block or stage.

Outcome 3 requires you to correctly locate faults to component level, one for a digital circuit and one for an analogue circuit. A log and report, similar to those required for Outcome 2, are required.

The type of equipment used for fault finding will vary from centre to centre. It is possible that the fault located to a block or stage in Outcome 2, will be used for fault finding to component level in Outcome 3.

Assessment will take place under controlled and supervised conditions. You will be expected to carry out the practical fault finding assessments within a given time limit.