Higher National Unit Specification

General information for centres

Unit title: Advanced P.C. Faultfinding

Unit code: DC9H 35

Unit purpose: This Unit is designed to enable candidates to work effectively faultfinding and repairing Personal Computers in a professional practice/consultancy or installation/technical support role in manufacturing, commercial or domestic sectors of industry. Candidates will learn about the operation of modern Personal Computer components, common peripherals, test equipment and software as well as industrial practice and standards. Candidates will also gain experience of simplifying complex problems, analysing cost effectiveness and an appreciation of safe working practice. The Unit is primarily intended for candidates who expect to work in a PC faultfinding or support role, but is also relevant to all those on an IT course who require a deeper or more effective understanding of modern personal computers.

On completion of the unit, the candidate should be able to:

1. Perform Logical Faultfinding Techniques
2. Investigate and Faultfind Power Systems
3. Faultfind PC System Hardware
4. Investigate and Solve Software Problems
5. Specify and Commission Systems

Credit value: 2 HN Credits at SCQF level 8: (16 SCQF credit points at SCQF level 8)

SCQF (the Scottish Credit and Qualifications Framework) brings Scottish qualifications into a single framework of 12 levels ranging from SQA Access 1 to doctorates. The SCQF includes degrees; HNC/Ds; SQA National Qualifications; and SVQs. Each SQA Unit is allocated a number of SCQF credit points at a specific level. 1 SCQF point = 10 hours of learning. HN candidates are normally expected to input a further number of hours, matched to the credit value of the Unit, of non-contact time or candidate-led effort to consolidate and reinforce learning.

Recommended prior knowledge and skills:

Access to this Unit will be at the discretion of the Centre, however it is recommended that candidates should have a good working knowledge of building or maintaining personal computers and of operating systems such as MS-DOS and Windows. This can be evidenced by possession of the HN Unit *Computer Hardware: Installation and Maintenance* and also provides evidence that candidates are aware of the safe working practices when working with personal computers. Candidates who do not have the HN Unit *Computer Hardware: Installation and Maintenance* will be required to undertake a short written assessment after a lecture on safe working practice before commencing with this (faultfinding) unit. Candidates are then required to sign a document to acknowledge they have been made aware of the pertinent safety issues.

Higher National Unit Specification

General information for centres (cont.)

Unit title: Advanced P.C. Faultfinding

Recommended prior knowledge and skills (cont):

Candidates would also benefit from knowledge of basic electronics, basic computer architecture, computer operation, binary and hexadecimal number systems; some of this may be demonstrated by possession of the HN Units: *Computer Architecture and Computer Operating Systems.*

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 is included in the framework of HND Computing: Technical Support group award. It is recommended that it should be taught and assessed within the context of the particular group award to which it contributes. It is also recommended that this Unit be delivered subsequent to HN Units *Computer Architecture* and *Computer Hardware: Installation and Maintenance and Computer Operating Systems*. This faultfinding course builds on the hardware knowledge and basic faultfinding in the *Computer Hardware: Installation and Maintenance* course. Candidates should have a good working knowledge of PC components.

Assessment: It is suggested that the unit be assessed as follows:

Outcome 1.
Two instruments of assessments could assess this Outcome: a closed book assessment and one practical exercise submitting two fault reports demonstrating a logical approach to faultfinding peripheral equipment.

Outcome 2.
Two instruments of assessments could assess this Outcome: a closed book assessment and one practical exercise submitting two reports demonstrating the candidate's ability to calculate system power requirements and, identify and correct power faults using safe test methods

Outcome 3.
Three instruments of assessments could assess this Outcome: a closed book assessment, a system analysis flowchart and a fault report. The system analysis flowchart demonstrates the candidates' ability to create a flowchart to aid detailed faultfinding.

Outcome 4.
Two instruments of assessments could assess this Outcome: a closed book assessment and a fault report demonstrating the candidate's ability to solve software problems using diagnostic software aids.

Outcome 5.
Two instruments of assessment could assess this Outcome: an investigative report and a fault list. Using an example scenario, candidates will demonstrate their ability to perform the tasks required to specify and commission a computer system. The fault list will demonstrate the candidate's ability to identify commissioning faults.

Higher National Unit specification

General information for centres (cont.)

Unit title: Advanced P.C. Faultfinding

Assessment (Cont.)

To demonstrate knowledge and understanding it is recommended that a series of 10 questions would be appropriate for each closed book assessment.

Alternatively it is suggested that the closed book assessments for Outcomes 1, 2, 3 and 4 could be combined to form an Integrative Assessment for the unit. Candidates should correctly answer at least 70% of the questions set for each Outcome to provide a balanced response across the unit.

Guidelines on the Delivery and Assessment of the Unit have been produced to indicate the national standard of achievement required at SCQF level 8. This contains Specimen Report Pro-formas for use by candidates as well as specimen fault entries; this illustrates the style and quality of content required. All practical exercises should be signed by the assessor to endorse safe working practice.

Higher National Unit specification: statement of standards

Unit title: Advanced P.C. Faultfinding

Unit code:

The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence required 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

Perform Logical Faultfinding Techniques

Knowledge and/or skills

- Components involved in the input or output subsystem
- Interaction of components in terms of data flow
- Test methods
- Approaches to faultfinding
- Faultfind using logical techniques
- Potential hazards in the working environment
- Safe working practice

Evidence requirements

Candidates will provide evidence to demonstrate their knowledge and understanding by answering a representative series of questions on all of the following issues:

- Components involved in the input or output subsystem

  The software and hardware components involved in the peripheral subsystems are correctly identified.

- Interaction of components in terms of data flow.

  The relationship between the components of a peripheral subsystem must be described. The type of data passing from one component to the next and the direction of data flow must be described.

- Test methods.

  Candidates must choose an appropriate test method for each stage of the data flow through the subsystem.

- Approaches to faultfinding/

Higher National Unit specification: statement of standards (cont.)

Unit title: Advanced P.C. Faultfinding

Outcome 1 (cont.)

Evidence requirements (cont.)

- Approaches to faultfinding.

  A systematic and logical method of faultfinding the subsystem must be described. The description must include a justification for the choice of method.

A representative series of objective questions or restricted response/short answer questions must be set. Candidates must answer at least 70% of the questions correctly.

In order to ensure that candidates will not be able to foresee what they will be questioned about, a different representative series of questions is required each time this Outcome is assessed.

Evidence must be generated through assessment undertaken in supervised closed book conditions sufficient to ensure confidence in the authenticity of submissions. Candidates may not bring to the assessment any notes, textbooks, handouts or other material unless otherwise specified.

Candidates will provide evidence to demonstrate their knowledge and/or skills by submitting two fault reports to show that they can:

- Faultfind using logical techniques

  Candidates will carry out a practical exercise in faultfinding at least:

  - One input device. E.g. keyboard, mouse, graphics tablet, microphone.
  - One output device. E.g. printer, monitor, loudspeakers.

  The analysis of each fault and the logical steps taken in tracing each fault must be described.

- Identify potential hazards in the working environment

  Candidates must demonstrate knowledge of the hazards present during the faultfinding of a peripheral subsystem. This must include a list of hazards to equipment and to personnel and examples of how risks can be minimised through appropriate safe working practice.

- Demonstrate safe working practice.

  Candidates must demonstrate the correct use of tools, test equipment, anti-static precautions, suitable clothing and safety equipment during practical exercises.

Higher National Unit specification: statement of standards (cont.)

Unit title: Advanced P.C. Faultfinding

Outcome 1 (cont.)

Evidence requirements (cont.)

Evidence for the above knowledge and/or skills should be produced using pro-forma report sheets. Candidates should be provided with pro-forma report sheets.

Safe working practice can be evidenced over a period of time. The assessor must endorse the use of safe working practice by signing all fault reports.

Assessment guidelines

It is suggested two instruments of assessments could assess this Outcome: a closed book assessment and one practical exercise submitting two fault reports.

It is recommended that a series of 10 questions would be appropriate for the closed book assessment.

Alternatively it is suggested that the closed book assessments for Outcomes 1, 2, 3 and 4 be combined to form an Integrative Assessment for the unit. Candidates should correctly answer at least 70% of the questions set for each Outcome to provide a balanced response across the unit.

Safe working practice should extend to the equipment as well as the candidate and a record of the candidate's use of correct procedures should be logged.

Practical assessments should be carried out in an unhurried atmosphere with individual candidates closely supervised by the assessor.

Adequate preparation and practice time should be provided to allow all students to gain practical experience and confidence before embarking upon the assessments.

Higher National Unit specification: statement of standards (cont.)

Unit title: Advanced P.C. Faultfinding

Outcome 2

Investigate and Faultfind Power Systems

Knowledge and/or skills

- Mains electricity supply problems
- Power management features
- Power protection systems
- Power supply standards
- Recognize failure symptoms of CMOS battery
- PC power supply unit faultfinding strategy
- Calculate system power requirements
- Identify and correct power faults
- Use safe test methods

Evidence requirements

Candidates will provide evidence to demonstrate their knowledge and understanding by answering a representative series of questions on all of the following power supply issues:

- Mains electricity supply problems and solutions

  Describe power supply problems, e.g. power-up problems and symptoms, power line disturbances and causes, power outlet and grounding problems. Explain why the use of mains interference filters affects the ability to carry out electrical safety tests. The use of equipment to test electrical safety of portable equipment (PAT tester) must be described.

- Power management features

  Demonstrate knowledge of power management features of a modern computer system, including APM, ACPI and Hibernation. Describe wake-up events such as WOL & WOR.

- Power protection systems

  Describe power supply protection and monitoring circuit operation in particular as it affects fault conditions. E.g. crowbar protection. Explain the use of uninterruptible power supplies and their interaction with the operating system.

- Power supply standards

  Describe common P.C. power supply standards. E.g.: AT, ATX, and ATX2.03.

- Recognize failure symptoms of CMOS battery

  Describe the failure symptoms of a CMOS battery.

Higher National Unit specification: statement of standards (cont.)

Unit title: Advanced P.C. Faultfinding

Outcome 2 (cont.)

Evidence requirements (cont.)

- PC power supply unit faultfinding strategy

  Define a safe, logical and systematic method for faultfinding a PC power supply.

A representative series of objective questions or restricted response/short answer questions must be set. Candidates must answer at least 70% of the questions correctly.

In order to ensure that candidates will not be able to foresee what they will be questioned about, a different representative series of questions is required each time this Outcome is assessed.

Evidence must be generated through assessment undertaken in supervised closed book conditions sufficient to ensure confidence in the authenticity of submissions. Candidates may not bring to the assessment any notes, textbooks, handouts or other material unless otherwise specified.

Candidates will provide evidence to demonstrate their knowledge and/or skills by submitting two reports to show that they can:

- Calculate system power requirements

  The power requirements of example systems must be measured and matched to suitable supplies. Available output power must be correctly calculated. Candidates must carry out a practical exercise of measuring the actual power usage of different types of systems. Comparisons must be made of the actual power used against the available power and reasons for the difference must be correctly identified. Candidates must measure and record the accuracy of the voltages present within a working P.C. including power-good signal and battery voltage.

- Identify and correct power faults using safe test methods

  Candidates must carry out a practical exercise to identify and correct a power related fault. The correct faultfinding strategy and use of test equipment must be demonstrated. Hazards must be correctly identified and suitable precautions identified and followed. Hazards and their precautions must be recorded.

Evidence for the above knowledge and/or skills should be produced using pro-forma report sheets. Candidates should be provided with pro-forma report sheets.

Safe working practice must be observed throughout the exercise. The assessor must endorse the use of safe working practice by signing all fault reports.

Higher National Unit specification: statement of standards (cont.)

Unit title: Advanced P.C. Faultfinding

Outcome 2 (cont.)

Assessment guidelines

It is suggested two instruments of assessments could assess this Outcome: a closed book assessment and one practical exercises submitting two reports.

It is recommended that a series of 10 questions would be appropriate for the closed book assessment.

Alternatively it is suggested that the closed book assessments for Outcomes 1, 2, 3 and 4 be combined to form an Integrative Assessment for the unit. Candidates should correctly answer at least 70% of the questions set for each Outcome to provide a balanced response across the unit.

The power requirements assessment should be carried out once candidates have acquired adequate skill and practice in working safely. The potential hazards to the candidate and to the equipment should be identified and adequate precautions taken and recorded on the fault report.

Evidence for the power requirements (measurements and calculations) should be recorded into a table in the pro-forma report and then checked and signed by the assessor.

Evidence of completion of the faultfinding task should take the form of a fault report that includes a description of the candidate's method. The choices made by the candidate should be shown to be logical and systematic. The assessor should endorse each report to confirm that the candidate used safe working practices.

Assistance should be offered as necessary during the practice faultfinding exercises until the candidates are able to complete at least one exercise unassisted.

Higher National Unit specification: statement of standards (cont.)

Unit title: Advanced P.C. Faultfinding

Outcome 3

Faultfind PC System Hardware

Knowledge and/or skills

- BIOS functionality and reprogramming
- CMOS settings
- Establish component interaction during fault conditions
- Establish, apply and refine logical faultfinding methods
- Create a flowchart to aid detailed faultfinding
- Interpret error messages
- Analyse and interpret test results
- Faultfind system hardware

Evidence requirements

Candidates will provide evidence to demonstrate their knowledge and understanding by answering a representative series of questions on all of the following issues:

- BIOS functionality and reprogramming

  The functions and range of hardware compatibilities of the BIOS must be described. Explain the purpose and precautions relating to reprogramming the BIOS.

- CMOS settings

  The CMOS settings that relate to system configuration, performance and the boot process must be described.

- Establish component interaction during fault conditions

  Candidates must describe a computer system in terms of the components that may be included. The complex ways in which these components interact during fault conditions must be described.

- Establish, apply and refine logical faultfinding methods

  A method for simplifying the system to isolate the fault must be proposed. The minimum set of components able to provide a solution must be defined.

A representative series of objective questions or restricted response/short answer questions must be set. Candidates must answer at least 70% of the questions correctly.

In order to ensure that candidates will not be able to foresee what they will be questioned about, a different representative series of questions is required each time this Outcome is assessed.

Higher National Unit specification: statement of standards (cont.)

Unit title: Advanced P.C. Faultfinding

Outcome 3 (cont.)

Evidence requirements (cont.)

Evidence must be generated through assessment undertaken in supervised closed book conditions sufficient to ensure confidence in the authenticity of submissions. Candidates may not bring to the assessment any notes, textbooks, handouts or other material unless otherwise specified.

Candidates will provide evidence to demonstrate their knowledge and/or skills by submitting a systems analysis flowchart to show that they can:

- Create a flowchart to aid detailed faultfinding.

  A visual aid in the form of a detailed flowchart must be created to assist the faultfinding method. The flowchart must contain the POST error codes and visual error messages that would normally be received during the faultfinding process.

- Interpret error messages.

  Interpret POST error codes and visual error messages as they occur.

- Analyse and interpret test results

  The candidate's method must be tested during practical exercises and the results analysed to identify an improved method.

  All revisions of the flowchart must be submitted.

Candidates will provide evidence to demonstrate their knowledge and/or skills by submitting a fault report to show that they can:

- Faultfind System Hardware

  Candidates must demonstrate the ability to follow their previously defined method of faultfinding a system. At least one prepared fault within the "minimum system" must be correctly analysed. The example fault must be corrected using a systematic and logical method. The flowchart should be consulted to aid the faultfinding process.

Evidence for the above skill should be provided in the form of a completed pro-forma fault report. Candidates should be provided with pro-forma report sheets.

Safe working practice must be observed during the practical exercises. The assessor must endorse the use of safe working practice by signing all fault reports.

Higher National Unit specification: statement of standards (cont.)

Unit title: Advanced P.C. Faultfinding

Outcome 3 (cont.)

Assessment guidelines

It is suggested three instruments of assessments could assess this Outcome: a closed book assessment, a systems analysis flowchart and a fault report.

It is recommended that a series of 10 questions would be appropriate for the closed book assessment.

Alternatively it is suggested that the closed book assessments for Outcomes 1, 2, 3 and 4 be combined to form an Integrative Assessment for the unit. Candidates should correctly answer at least 70% of the questions set for each Outcome to provide a balanced response across the unit.

The system flowchart should include hardware faults from power-on to the completion of the boot-up process indicated by a removable media disk prompt. The flowchart should include sufficient annotation to illustrate a logical and systematic approach to faultfinding a P.C. system at boot-up. A flowchart is required to aid the method of faultfinding system hardware and should include the details of faultfinding down to, within and back from a minimum system.

Flowcharting aids should be made available to the candidate for computer generation of the flowchart. The candidate should be provided with the opportunity to gain practical experience through assisted and unassisted faultfinding examples on specially prepared systems and as the opportunity arises throughout the course when faults naturally occur.

As a guide, the flowchart is likely to contain 30 to 50 elements plus the necessary annotation.

Higher National Unit specification: statement of standards (cont.)

Unit title: Advanced P.C. Faultfinding

Outcome 4

Investigate and Solve Software Problems

Knowledge and/or skills

- Boot disk diagnostics and soak testing
- Boot-up error messages
- Hard-disk boot-up code
- Core operating system components
- Optional operating system components
- Software maintenance procedures
- Data recovery
- Solve software problems using diagnostic software aids

Evidence requirements

Candidates will provide evidence to demonstrate their knowledge and understanding by answering a representative series of questions on all of the following issues:

- Boot disk diagnostics and soak testing

  Use the facilities provided by software diagnostic aids for use in advanced testing of hardware, long-term soak testing and performance measurement.

- Boot-up error messages

  Interpret the error messages that may be generated during the hard disk boot-up process. Propose solutions for the faults.

- Hard-disk boot-up code.

  Describe how to create and/or repair the master boot record, partition table and DOS boot record on the hard disk

- Core operating system components.

  The means of identifying various operating system versions during a fault condition and the means of repairing these faults in a non-destructive way must be explained. The conditions that would require a destructive repair resulting in the loss of data must be stated.

- Optional operating system components.

  Describe methods of selectively disabling drivers and application software during the Boot process.

Higher National Unit specification: statement of standards (cont.)

Unit title: Advanced P.C. Faultfinding

Outcome 4 (cont.)

Evidence requirements (cont.)

- Software maintenance procedures

  Describe accepted software maintenance procedures including software updates, backups, anti-virus systems, filing system integrity testing and de-fragmentation. A description of the methods of correcting faults in applications and data must be provided.

- Data recovery

  Describe methods of recovering data after a disaster. Include methods that can be used when a backup is not present. Establish which repair procedures may result in the loss of data. Investigate the causes of data loss and describe preventative measures.

A representative series of objective questions or restricted response/short answer questions must be set. Candidates must answer at least 70% of the questions correctly.

In order to ensure that candidates will not be able to foresee what they will be questioned about, a different representative series of questions is required each time this Outcome is assessed.

Evidence must be generated through assessment undertaken in supervised closed book conditions sufficient to ensure confidence in the authenticity of submissions. Candidates may not bring to the assessment any notes, textbooks, handouts or other material unless otherwise specified.

Candidates will provide evidence to demonstrate their knowledge and/or skills by submitting a fault report showing that they can:

- Solve software problems using diagnostic software aids.

  Candidates must create a faultfinding aid to use during practical exercises in the form of a removable media boot disk on a bootable CDROM and/or a bootable floppy disk.
  A system software problem must be solved using an efficient and systematic method. This must be performed with the assistance of a software tool such as Microscope, Norton Utilities, Sci-Soft Sandra, the Boot floppy disk and/or Boot CD.

Candidates will provide evidence of solving a software problem by submitting a detailed pro-forma fault report. Candidates should be provided with pro-forma report sheets.

Safe working practice must be observed during the practical exercises. The assessor must endorse the use of safe working practice by signing all fault reports.

Higher National Unit specification: statement of standards (cont.)

Unit title: Advanced P.C. Faultfinding

Outcome 4 (cont.)

Assessment guidelines

It is suggested two instruments of assessments could assess this Outcome: a closed book assessment and a pro-forma report.

It is recommended that a series of 10 questions would be appropriate for the closed book assessment.

Alternatively it is suggested that the closed book assessments for Outcomes 1, 2, 3 and 4 be combined to form an Integrative Assessment for the unit. Candidates should correctly answer at least 70% of the questions set for each Outcome to provide a balanced response across the unit.

The candidate should be provided with the opportunity to gain practical experience through assisted and unassisted faultfinding examples on specially prepared systems and as the opportunity arises throughout the course when faults naturally occur.

A CD or floppy disk should be created for the bootable media. CD writing programs and disk-imaging programs should be investigated.

The system software boot-up problem could involve one or any combination of the following: hard-disk boot-up code, core operating system components, optional operating system components and data recovery.

Higher National Unit specification: statement of standards (cont.)

Unit title: Advanced P.C. Faultfinding

Outcome 5

Specify and Commission Systems

Knowledge and/or skills

- Collate information
- Specify a PC system
- Prepare for system installation
- Estimate cost
- Classify faults
- Examine intermittent faults
- Provide customer advice and support
- Keep records
- Identify commissioning faults

Evidence requirements

Candidates will provide evidence to demonstrate their knowledge and/or skills by submitting an investigative report showing that they can:

- Collate Information

  Candidates must detail the information that they would require to perform the new install (commission), e.g. customer, location, system requirements, existing resources.

- Specify a PC system

  Potential problems relating to system specification, where components can be incompatible, must be described. Integration of the new system with existing equipment must be investigated and any compatibility issues solved. Candidates must specify a system, which meets the requirements given by the customer.

- Prepare for system installation

  List the general tools and spares that should be available and any specific and/or high-valued tools and parts appropriate to the example installation scenario. Plan a route to the destination and provide a route map. Calculate appropriate departure and arrival times.

- Estimate cost

  Candidates must describe the factors contributing to the cost of the example installation scenario, e.g., consultancy, customisation, delivery, installation, training, hardware, software and support.

Higher National Unit specification: statement of standards (cont.)

Unit title: Advanced P.C. Faultfinding

Outcome 5 (cont.)

Evidence requirements (cont.)

- Classify faults

  Candidates must explain the differences between Commissioning, Faultfinding and Maintenance. The causes of a fault being classified as commissioning must be described.

- Examine Intermittent Faults

  Candidates must demonstrate knowledge of appropriate methods for dealing with intermittent faults. List the causes and effects of intermittent faults, which may occur in the example scenario. A minimum of three faults should be described.

- Provide customer advice and support

  Candidates must describe advice and support information to be provided to customers. Topics must include: data protection, Internet connectivity and security strategy, and system hardware and software maintenance. Describe the contributing factors, which influence the decision whether any work is carried out on-site or off-site. E.g. warranty, downtime, facilities, parts and costs.

- Keep records

  Information that should be retained relating to PC hardware, software and configuration settings must be listed. The security issues involved with keeping customer's data must be explained.

Candidates will be provided with details of an example commissioning-scenario for a fictitious remote customer. The candidate will use the example scenario as the basis for an investigative report containing detailed responses to all of the above knowledge and/or skills. A printed route map must be created as part of the evidence.

- Identify Commissioning Faults

  Candidates must perform at least one commissioning exercise on a specially prepared PC system and provide details of each fault discovered on the system. The faults should be of a general nature and have been covered in discussion throughout the year.

Candidates will provide evidence to demonstrate their ability to identify commissioning faults by submitting a list of at least 70% of the faults present. The problems that could be caused by these faults must be described. Candidates should be provided with a pro-forma list.

Higher National Unit specification: statement of standards (cont.)

Unit title: Advanced P.C. Faultfinding

Outcome 5 (cont.)

Assessment guidelines

It is suggested two instruments of assessment could assess this Outcome: An investigative report and a fault list.

It would be reasonable to expect a report of approximately 2000 words in addition to the exercise results and route map.

This outcome can be completed in the candidate's own time but access to mapping software should be provided when required.

Commissioning faults should be identified from a visual inspection on a dead system. The faults should be submitted on a pro-forma list

In order to ensure that candidates will not be able to foretell what faults they will be presented with, a different representative set of 10 faults should be randomly selected from a larger pool of faults each time this assessment is taken. It is suggested the pool should contain at least 20 faults.

Administrative Information

Unit code: DC9H 35

Unit title: Advanced P.C. Faultfinding

Superclass category: CA

Date of publication: August 2003

Source: SQA

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. The cost for each Unit specification is £2.50 (minimum order £5.00). Additional copies of the Assessment Exemplar and Guidelines on the Delivery of the Unit can also be purchased from the Scottish Qualifications Authority. The cost is £15.00.

Higher National Unit specification: support notes

Unit title: Advanced P.C. Faultfinding

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 80 hours.

Guidance on the content and context for this Unit

It is essential that candidates are made aware from the outset of the health and safety risks to themselves and others that can arise in working with electrical equipment. The risks to equipment from ESD should also be explained. Safe working practices, which balance these two problems, should then be explained and demonstrated. This is particularly important when candidates will be working in an anti-static environment or using anti-static equipment, which significantly increases health and safety risks if improperly used. It is recommended that candidates should not be permitted to work on live or exposed equipment until they have acknowledged in writing that they have received adequate safety training and have satisfied the requirements of the assessment instrument covering this topic. The importance of strict adherence to safe working practices should be stressed throughout the course.

Higher National Unit specification: support notes (cont.)

Unit title: Advanced P.C. Faultfinding

Guidance on the delivery and assessment of this Unit

This Unit is likely to form part of a group award that is primarily designed to provide candidates with technical or professional knowledge and skills related to a specific occupational area. It does require a significant level of prior competence from candidates, and so should be delivered towards the end of an award rather than as an initial Unit.

Wherever possible, this Unit is non-specific about the details of technologies and devices used by the computer systems being studied. This has been done to try to future-proof it, and avoid some of the more embarrassing examples of obsolescence found in previous Units in this rapidly evolving field. It is however important that candidates are exposed to a balanced range of both current and historical systems and components. Lack of specificity should not be taken as an excuse to re-deploy obsolete or 'scrap' equipment for these classes on the basis that it is more expendable without also providing a satisfactory range of modern components and devices to which candidates can progress once they are more proficient.

Resources

Candidates should be provided with access to the Internet through at least one permanently available resource PC. This will be used to gain information and download drivers from manufacturer's web sites, update virus definition files and access on-line technical resources.

There should be an available CD writer within a resource PC for distribution of downloaded software too large for floppy disks. The ability to create bootable CDs for system recovery purposes is also essential.

CDROM based technical resources should be installed kept up-to-date and made freely available. For example, Microsoft Developers Network, Microsoft Technet, Component distributor's catalogues, Mapping and route-planning software, Flowcharting software and a range of modern diagnostic and burn-in test programs

During practical exercises, each candidate should be provided with easy access to a working PC in addition to the subject PC. The working PC could be shared between two candidates if space or resources are restricted.

Workbenches should be roomy and uncluttered. Anti-static work surfaces should be provided. Adequate lighting is essential. Anglepoise-style directional lights at each workstation should supplement general room lighting.

Safety equipment should include ELCB or RCCB trips protecting all mains outlets. Safety glasses, disposable face masks and gloves should be made available. Anti-static earth bonding straps should be provided, tested and used.

Higher National Unit specification: support notes (cont.)

Unit title: Advanced P.C. Faultfinding

Guidance on the delivery and assessment of this Unit (cont.)

Resources (cont.)

Tools available to each candidate should include:
Anti-static wrist strap
No.1 and No.0 point pozidrive screwdrivers (not Philips)
Small and medium flat blade screwdrivers
Flat and serrated jaw long-nosed pliers
5mm AF (M2.5) Nutrunner / Box spanner
Small side cutters
Magnifying Glass
Tweezers
Torch

These tools should be of high quality, typically purchased as separate items and not part of a cheap "computer tool kit". It is important to introduce the candidates to the correct tools for the job and avoid low quality, poorly fitting tools, which wear quickly and damage equipment.

Test equipment available to each candidate should include:
Digital Multimeter
Hall effect clamp ammeter
Electrical safety portable appliance (PAT) tester
Network cable tester

A range of sample removable media appropriate for the subject computers should be provided.

Spare parts and consumable items:
A selection of hardware should include screws of the two common threads, brass and nylon stand-offs, blanking plates, cable ties and electrical jumpers of appropriate sizes. Spare fuses, cables and fans. Cleaning items should include isopropyl alcohol, anti-static cleaning spray, air duster (compressed air), lint-free cloths, small brushes, and paper towels. It may seem mundane but sometimes the fault is just down to a speck of dirt.

Component spares:
A comprehensive range of spare parts will be required. These should include replacements for all the individual components within the subject PCs. In some cases it may be difficult to provide exact replacements so suitable alternatives may be substituted. For example, a different make of video card or a different size of hard disk would be suitable.

Workbench equipment:
Each workbench should be provided with a working or spare Monitor, Keyboard, Mouse, Printer, Speakers, Power cable, a Telephone connection for modem testing and a Network connection. If the subject computers include older AT equipment, then an additional AT keyboard and Serial mouse will be required. Other services are optional and may be provided if available such as ISDN, ADSL, and WLAN. In addition, a common pool of other peripherals such as USB, Firewire and SCSI devices should be available for testing those interfaces.

Higher National Unit specification: support notes (cont.)

Unit title: Advanced P.C. Faultfinding

Guidance on the delivery and assessment of this unit (cont.)

This is a fast moving field and not only must candidates be encouraged to keep up with recent developments but also teaching staff should be confident with current and legacy PC components.

For candidates to be successful in this field they will have to be self-motivated to learn about new components and equipment on an on-going basis. This course provides a starting point and introduces the candidates to good practice and logical analysis. The hardware will change but the techniques and thought processes learned here should remain relevant.

Try to answer questions relating to PC hardware or software as they occur and encourage the questioning mind. There is no shame in being unable to answer all of the candidate's questions in this large and changing field but at least some pointers should be offered to lead the candidate to appropriate sources of up-to-date information.

Progress through the unit should not be rushed. The initial overview of the subject and of each new sub-system as it is introduced is very important to the candidates understanding.

The candidate should be encouraged to look upon a faulty computer as a chance to gain experience and to fill in a fault report sheet. In this way, the candidate will build up a portfolio of faults throughout the year.

Introduction

The introduction to the course should include an overview of the course and your expectations of the candidates. Check that all candidates have some relevant prior experience. Ensure that the assessment timetable is known and will be adhered to.

Outcome 1

Safe Working Practice
Prior to any practical work, it is necessary to cover Safe Working Practice guidelines including electrical safety, the correct use of tools and test equipment, suitable clothing and safety equipment and the appropriate use and checking of anti-static measures.
This information should be imparted through lecture and practical demonstration.

Perform Logical Faultfinding Techniques
We will start with faultfinding relatively simple linear or sequential systems.
Use a lecture to describe an example of an input or an output peripheral, the steps through which data will pass from source to destination and a method for efficiently discovering the point at which failure may have occurred. The lecturer should provide a practical demonstration of good practice. Feedback from the candidates should be encouraged and examined by group discussion.

An understanding of the systems and methods is essential to efficient faultfinding. Demonstrations and descriptive overviews should be provided early on and supplemented with more detailed information as the course progresses.

Higher National Unit specification: support notes (cont.)

Unit title: Advanced P.C. Faultfinding

Guidance on the delivery and assessment of this unit (cont.)

Outcome 1 (cont.)

The description of data flow could be simplified by the use of a short flow chart. Flow-chart elements may represent components in the system with links to show data flow.

Each link between components represents an opportunity to apply a test method. Usually at least two methods can be applied at each stage. For example, if the data passing from one component to another is suspect, then either the first or the second component could be substituted. However a third method may include introducing a piece of test equipment into the data path.

Candidates should describe an overall approach to testing the subsystem. References should be made to the order of testing to describe an efficient and logical faultfinding method.

At this point the candidates can start to do the practical exercises for faultfinding peripherals. Assistance may be offered as necessary until the students are able to complete at least two exercises unassisted.

When the practical exercises of Outcome 1 have been completed, the general ability of the candidates should be estimated and the delivery of the remainder of the course adjusted accordingly. That is, the amount of contemporary topics and examples may be increased to keep interest high in competent groups of candidates or reduced if time starts to become short.

Outcome 2

Investigate and Faultfind Power Systems
Candidates should be reminded of the dangers of the mains electrical supply and of stored charge in disconnected supplies.

Discuss the mains electricity supply, the power supply unit and the low voltage output to the system components and the possible problems associated with each.

Specify the variations and problems that can occur with the external power source - usually the mains electricity incoming supply e.g. brownouts, blackouts, spikes and surges. Describe the protection systems available such as generators, UPS units, ELCB and RCCB trips and mains filtering devices in addition to those included in the internal PSU.

Define and measure the low voltage load on the internal computer PSU. Use a practical exercise to measure voltage and current in different example systems. Calculate individual and total power used. Identify the power capabilities of the PSU and comment on spare capacity. Show that a power trade-off can occur between two outputs preventing them from supplying maximum output simultaneously. Describe the different specifications and outputs relating to PSUs including AT, ATX, and ATX2.03. Correctly explain the use of the power good signal and the relationship with the reset signal. Describe the operation of the crowbar circuit inside the PSU and show how it prevents damage to the load during fault conditions.

Higher National Unit specification: support notes (cont.)

Unit title: Advanced P.C. Faultfinding

Guidance on the delivery and assessment of this unit (cont.)

Outcome 2 (cont.)

Describe the failure symptoms of the CMOS battery such as inaccuracy of the RTC, failure to boot, loss of performance caused by fail-safe defaults and include this in measurements.

Define a method for faultfinding the PSU. For example, check the input voltages first by measurement or substitution. Secondly, check the output is not causing an overload by disconnecting the load in two stages to allow for zero load failure. Remind students that the design of some switching-mode power supply units as used in computer power supplies may cause the supply to fail to start if no load is applied, so a two-part test with half of the system load disconnected each time is recommended at this stage. Finally, replace the PSU. The simple rule here is: Check the input then check the output before replacing the PSU.

A range of systems should be provided to give an indication of typical power requirements for a variety of ages and configurations.

When measuring power usage, take into account the varying needs of the system at different times. For example, during start-up the motors and fans will require much more current than when running at normal speed. When running 3D applications the CPU and the graphics processor are working harder and will take more power. Try to measure the variations caused by these different tasks and consider the implications on PSU specification.

When specifying a PSU, also consider the expansion capabilities of the motherboard and the case. What CPU, memory and expansion cards may be fitted to the motherboard during the life of the system? How many drive bays are available and what are the likely power requirements of additional drives? Consider also the external devices that derive power from the internal PSU, such as USB, IEEE1394 (Firewire) and Serial port devices. Calculate the maximum power requirements of these devices and specify the PSU accordingly.

Outcome 3

Faultfind PC System Hardware
In preparation for this outcome, candidates should create a bootable floppy disk and/or a bootable compact disc. Demonstrate a method for creating a boot CD. A selection of DOS and third-party utility programs should be available for inclusion on the disks.

The basic functions of the BIOS should be described. Limitations of BIOS versions such as supported hard drive capacity and processor compatibility should be investigated. State the reasons for being cautious about upgrading the BIOS. If it goes wrong, will you have the ability to reboot and correct the problem? Show the sources of upgrades from manufacturers web sites, the purposes of different versions and demonstrate the method of applying an upgrade.

Investigate the settings available within the CMOS configuration utility. Explain the purpose of each setting that relates to hardware configuration, performance and boot sequence. State the purpose of optional settings such as port configuration and memory timing.

Higher National Unit specification: support notes (cont.)

Unit title: Advanced P.C. Faultfinding

Guidance on the delivery and assessment of this unit (cont.)

Outcome 3 (cont.)

This is probably the most demanding outcome. It requires that the candidate analyses a complex hardware system, full of interdependencies and define then refine a method for faultfinding the system. This is not easy so time should be taken to make sure that the system is adequately described.

For example, a faulty modem could stop a computer from booting up with exactly the same symptoms as a faulty CPU. How do you determine the cause of the fault without using inefficient guesswork? What if there are two faults? How would you protect a replacement part from the same fate?

Use group discussions to help the candidates define an initial method of tackling the system. Guide them to simplify the system and help to define a minimum system that is still able to respond. Introduce the concept of the minimum system and decide on the PSU, motherboard, CPU, speaker and one bank of memory. (Why 1 bank? - What's in a bank?) Discuss the method of faultfinding within the minimum system and why a substitution method is required. Decide on a logical sequence and justify it. (Damage limitation). Discuss the method of faultfinding out with the minimum system and how you have to respond to error signals and messages. Complete the faultfinding process up to booting to a boot disk.

Show that the minimum system method of getting to a working (even if restricted) system as quickly as possible and then building that system back up is more logical and efficient than pulling components out one-at-a-time from a full system and re-testing the system each time. This is because you are unable to test the removed components until a working system is achieved. To test the removed components, they have to be reinstalled into the working system.

A practical demonstration of faultfinding technique and method should be given. This should draw attention to the observation of symptoms, the correct handling of equipment, the use of safe working practice (remember ATX power is never off) and the use of a logical approach.

Candidates should practice first on a working system and make notes of the sequence of events during the normal boot process. The defined minimum system should then be tried and a note made of the necessary steps to change the symptoms during re-build.

At this point, the candidates should start to create a flowchart detailing the systematic approach that they will use during faultfinding. Flowcharting software should be available. This flowchart will then provide guidance during the practical exercises that follow. Improvements may be required to the flowchart in the light of experience gained from the practical exercises.

A number of practical exercises for faultfinding hardware boot problems should be carried out. Assistance at this stage should not be necessary as the candidates have now gained some confidence with the hardware but may be provided if required in the early stages. For assessment purposes, the candidate should complete at least one exercise unassisted.

Higher National Unit specification: support notes (cont.)

Unit title: Advanced P.C. Faultfinding

Guidance on the delivery and assessment of this unit (cont.)

Outcome 3 (cont.)

A test of the adequacy of the flowchart should include testing the candidate's method of faultfinding through the route defined by the flowchart. Do the conclusions match and are they correct? The practical exercises should include at least one minimum system component fault.

The use of a hardware faultfinding aid (e.g. P.O.S.T. card) to expedite the faultfinding process should be demonstrated.

Outcome 4

Investigate and Solve Software Problems
This outcome follows on directly from the end-point of outcome 3. At this stage there is a system that is capable of booting to a removable (and therefore known-good) disk. This outcome starts from that point and covers problems through to the successful completion of a GUI OS boot-up. Most basic hardware problems, except the HDD are covered in Outcome 3. Outcome 4 mainly concentrates on software problems.

Demonstrate the use of a boot disk, to access the hard drive and correct software problems. Candidates should practice using software which provides the facilities to perform more thorough diagnostic testing of hardware such as intensive memory tests, long-term soak tests and hard drive analysis programs.

List common boot-up error messages, explain their causes and demonstrate methods of correcting the errors. Allow candidates some time to practice on prepared faulty systems where they can use their previously created boot disk to gain access to otherwise non-bootable systems.

The start-up sequence of events should be defined and should include the CMOS set-up for the HDD and boot sequence, the MBR and partition table, the DOS boot record, the core operating system components (Give examples of DOS, Windows9x, NT/2000/XP, Linux, as available), the Windows kernel, Windows registry, drivers and auto-loading applications.

A range of operating systems should be provided and time given to practice faultfinding on at least two common operating systems.

Since the software boot process is sequential in nature, it may seem relatively simple to faultfind. The candidate should describe a method of discovering how far through the boot process a system has managed before failing and describe the methods available to correct errors at any stage. Methods that are both destructive and non-destructive to data should be mentioned and their appropriate use related to time and data recovery.

Candidates should be made aware of the causes, preventative and corrective measures of viruses. An active Internet connection should be used to demonstrate current anti-virus practice and provide access to program and driver updates.

Higher National Unit specification: support notes (cont.)

Unit title: Advanced P.C. Faultfinding

Guidance on the delivery and assessment of this unit (cont.)

Outcome 5

Specify and Commission Systems
In this outcome we will discuss the relevant background and topical information that the candidate would prepare before embarking on a remote job. An example scenario should be presented, detailing a remote PC system installation. This scenario can be worked through in class. Candidates should be shown how to derive the relevant information and make judgements on system specifications. An exemplar should be made available.

For assessment, a similar scenario should be presented that the candidates may work on in their own time. It is envisaged that the candidate will offer evidence in the form of an investigative report covering all of the evidence requirements. A planned and printed route to the example location should also be included. Access to mapping software should be provided when required. Four pages of text plus a route map would be a typical report size.

Information gathered may include customer details, equipment requirements, site facilities, location and availability, system integration, software licensing.

Candidates should specify an appropriate standard tool kit and list additional specific tools, test programs, test equipment, parts and software appropriate to the job. Job costing should be investigated and include labour and parts.

Explain the differences between commissioning and faultfinding. Why is commissioning much more difficult? Explain the circumstances, which cause a task to become a commissioning job, such as installation, upgrading, or failed repair. Cover specification problems where otherwise good components can be incompatible with each other. Choose adequate alternatives.

Intermittent faults are very difficult to adequately simulate in the restricted environment of an assessment. Evidence of ability will have to be obtained through the written report. Candidates will have to define the causes and effects of several intermittent faults, which could affect the type of installation presented. Support should be provided through notes and group discussion.

Discuss the advice and support information that should be given to customers. Include: protecting their data, Internet connectivity and security strategy, and system maintenance schedules and software updates. Describe the contributing factors, which influence the decision whether any work is carried out on-site or off-site. E.g. warranty, downtime, facilities, parts and costs.

List the information that should be retained relating to PC hardware, software and configuration settings. Consider through group discussion, the confidentiality and security issues involved with keeping customer's data.

A set of commissioning faults should be prepared on an example system. Ten visible faults should be of types that have been covered in discussion throughout the year. At least 70% of the faults present must be found.

Higher National Unit specification: support notes (cont.)

Unit title: Advanced P.C. Faultfinding

Guidance on the delivery and assessment of this unit (cont.)

Option - Network Faultfinding
Where circumstances allow, it may be appropriate to provide additional faultfinding theory and practice in the area of PC networks. Much of the above skills can be easily transferred to this new area with a small amount of extra work. Where candidates are involved in a theoretical or administrative networking unit, benefit can be gained by linking the skills here.

Faultfinding within a local area network involves the same logical approach as any other type of faultfinding. Observation is the key. Some of the basics are obvious. If you have three or more PCs on a network then the job of isolating the fault is much simpler. A useful faultfinding aid then, is a laptop computer that you can join onto a small network to prove which other computers you can communicate with. Another useful piece of kit is a long patch lead and a crossover adapter to allow you to directly link two PCs. Expensive network analysers can be hard to justify but simpler cable checkers can pick up the majority of faults and can be supplemented by analysis software.

Practical exercises could involve faulty and misconfigured network interface cards, IP address and subnet mask errors, logon faults, cable faults and protocol faults. All of which are common in real life.

Option - Performance Optimisation and Upgrading
As a continuation of commissioning skills, some additional time could be taken to look at performance issues. State a measurable goal such as a score obtainable in a software benchmark suite. Consider the upgrade possibilities to an example system. Measure the performance benefit and cost effectiveness of different upgrades.

Example upgrades could include the obvious choices of a faster processor, more memory, a better graphics card or a faster hard disk drive.

The real challenge here is to investigate the less obvious performance improvements such as, using multiple banks of memory and multiplexing between them, adding a pair of hard drives and creating a RAID array, changing partition sizes to gauge file system performance, measuring the effect of additional memory on a graphics card or comparing the performance of different operating systems on the same hardware. What comparisons can be made between processors manufactured by different companies? Is there a trade-off between stability and performance? Consider examples of overclocking and different types of RAID array. Does heat generation degrade longevity? Does a fast PC have to be noisy?

Investigating these and other developments of PC architecture will gain the candidate a better understanding of the hardware specifications available in the current market. Evidence may be through the instrument of a short written report.

Higher National Unit specification: support notes (cont.)

Unit title: Advanced P.C. Faultfinding

Glossary of Abbreviations

ACPI	Advanced Control and Power Interface - Power management protocols.
APM	Advanced Power Management - A legacy power management method.
AT, ATX, ATX2.03	Relating to power supplies, different form factors and specifications.
BIOS	Basic Input Output System - The motherboard's start-up program.
CD	Compact Disc - See CDROM
CDROM	Compact Disc Read Only Memory - A common type of removable media
CD-R	Compact Disc Recordable - A write-once version of a CDROM
CD-RW	Compact Disc Re-Writable - An erasable version of a CD-R
CMOS	Complementary Metal Oxide Semiconductor - Battery-powered configuration memory.
CPU	Central Processor Unit - The main calculating engine of the computer.
DOS	Disk Operating System - A simple early example of an operating system
ELCB	Earth Leakage Circuit Breaker - An electrical safety device.
FIREWIRE	See IEEE1394.
GUI	Graphical User Interface - Such as Windows
HDD	Hard Disk Drive - A mass storage device usually fixed into the system unit.
IEEE1394	Also known as Firewire or iLink - A fast serial interface for multiple independent devices.
ILINK	See IEEE1394.
MBR	Master Boot Record - The first area of information contained on the hard disk
OS	Operating System - A software program to control hardware and other software
OS/2	Operating System 2 - An obsolete operating system by IBM.
PAT	Portable Appliance Tester - Tests for electrical safety.
PC	Personal Computer.
POST	Power On Self-Test - A program contained within the BIOS chip.
PSU	Power Supply Unit - The Mains to low voltage converter inside a P.C.
PS/2	Personal System 2 or PS2 - A synchronous serial interface for mice and keyboards.
RCCB	Residual Current Circuit Breaker - An electrical safety device.
RS232	An asynchronous serial interface once used by mice and modems.
RTC	Real Time Clock - A battery-powered clock on the motherboard.
UPS	Uninterruptible Power Supply - A battery back-up power source.
USB	Universal Serial Bus - A fast serial interface for multiple devices.
USB2	Increases USB from 12Mb/s to 480Mb/s.
WOL	Wake on LAN - A remote start-up method used over a local area network.
WOR	Wake on Ring - A method of powering-up a system upon receiving an incoming phone call

Higher National Unit specification: support notes (cont.)

Unit title: Advanced P.C. Faultfinding

Pro-formas

Included on the following pages are examples of the Assessment Summary and the Assessment Pro-formas.

The fault report pro-forma is used for five assessments in outcomes 1, 2, 3 & 4.

Advanced P.C. Faultfinding

Summary of Assessments

Tutor: _____

Student Name:
Completion Date: / / 20
Result:

Outcome	Assessment	Completed
1. Perform Logical Faultfinding Techniques	1. Practical Fault Report: Peripheral Input & Output Faults	
2. Investigate & Faultfind Power Systems	2. Practical Fault Report: PSU Measurements and Faultfinding	
3. Faultfind Complex Hardware Systems	3. System Analysis Flowchart	
	4. Practical Fault Report: Minimum Hardware System Fault	
4. Investigate & Solve Software Problems	5. Practical Fault Report: Software Fault	
5. Specify & Commission Systems	6. Investigative Report	
	7. Practical Pro-forma Report: Commissioning Fault	
Integrated Assessment (Outcomes 1-4)	8. Closed Book – Objective Questions	

Additional / Optional Tasks	Non-Assessed	Completed
Preparatory	Safe Working Practice Acknowledgement	
Software Tools	Boot Disks Created (Floppy & CD)	
Practice Intermittent Faults	Soak Test Completed	
Network Faultfinding	Practical Exercises	
Performance Optimisation	Report	

Notes:

Advanced P.C. Faultfinding

Assessment - Fault Report

(Outcomes 1, 2, 3 & 4)

Student Name:	
Date: / /	Result:
Testing was performed in accordance with safe working practices.	Tutor:

FAULT REPORT

Use with outcomes 1a (Input), 1b (Output), 2 (Power), 3 (Hardware) & 4 (Software).

1. List the make, model and serial numbers of computer equipment:

2. Give a description of the initial fault symptoms:

3. Describe your actions & tests in the order you carried them out & record all results.

4. State a possible cause for this type of fault and list possible preventative measures:

5. List the potential hazards present during the faultfinding exercise and state the precautions you took to ensure safe working practice:

Advanced P.C. Faultfinding

Assessment - Power Measurement

(Outcome 2)

Student Name:	
Date: / /	Result:
Testing was performed in accordance with safe working practices.	Tutor:

Power Measurements

1. Fill in the following table from the listed ratings on the power supply and by measuring the actual values from an AT computer system in use.
State the computer type and serial number:_____

Rated Voltage	Rated Current	Rated Power (V x A)	Measured Voltage	Within +/-5%?	Measured Current	Measured Power Used
+12.0 V	A	W	V		A	W
+5.0 V	A	W	V		A	W
-5.0 V	A	W	V		A	W
-12.0 V	A	W	V		A	W
Total Rated Power:		W	Total Measured Power:			W

2. Fill in the following table from the listed ratings on the power supply and by measuring the actual values from an ATX computer system in use.
State the computer type and serial number:_____

Rated Voltage	Rated Current	Rated Power (V x A)	Measured Voltage	Within +/-5%?	Measured Current	Measured Power Used
+12.0 V	A	W	V		A	W
+5.0 V	A	W	V		A	W
SB+5.0 V	A	W	V		A	W
+3.3 V	A	W	V		A	W
-5.0 V	A	W	V		A	W
-12.0 V	A	W	V		A	W
Total Rated Power:		W	Total Measured Power:			W

3. Is the power required by the monitor included in the above ratings? Yes / No

4. What is the maximum combined power rating for the +5V and +3.3V?_____W

5. Fill in the following table from the listed ratings and by measuring the actual values from the computer system in use.

Description	Expected Voltage	Measured Voltage
Power Good	V	V
CMOS Battery	V	V

6. If the Power good signal goes low, what will the computer do? _____

Advanced P.C. Faultfinding

Assessment 3 - Flowchart

(Outcome 3)

Student Name:	
Date: / /	Result:

System Analysis Flowchart

Create a flowchart, which provides a detailed description of your faultfinding technique for a PC from power-on to removable media boot-up. Your flowchart must include notes as required and must answer the following points:

1) Create a visual aid in the form of a flowchart to assist with faultfinding a PC system from power-on to removable media boot-up.

2) Propose a method for simplifying the system to isolate the fault

3) Define the minimum set of components required to provide a measurable response and state the expected responses under normal and fault conditions.

4) Include in your flowchart, POST error codes and visual error messages that would be received during the faultfinding process.

5) Test your defined method in practical exercises and refine the flowchart to reflect experience gained.

6) Include all revisions of the flowchart with your submission.

As a guide, your flowchart should contain approximately 30 to 50 elements and may require up to one side of supplementary notes.

Advanced P.C. Faultfinding

Assessment 6 - Investigative Report

(Outcome 5)

Student Name:	
Date: / /	Result:

Specify and Commission Systems

Write an investigative report of approximately 2000 words covering all of the following points. A planned and printed route to the example location should also be included. Access to mapping software will be provided when required. Include your name and the date on each page. Base your report on the example scenario provided.

Collate Information
List the information that would be required to perform the new install e.g. customer details, equipment requirements, site facilities, location and availability, system integration, software licensing.

System specification
Describe potential problems relating to system specification, where components can be incompatible. Investigate the integration of the new system with existing equipment and solve any compatibility issues. Specify a system, which meets the requirements given by the customer.

Prepare for system installation
List the general tools and spares that should be available and any specific and/or high-valued tools, test programs, test equipment and parts appropriate to the example installation scenario. Plan a route to the destination and provide a route map. Calculate appropriate departure and arrival times.

Estimate cost
Describe the factors contributing to the cost of the example installation scenario. E.g.: consultancy, customisation, delivery, installation, training, hardware, software and support.

Fault classification
Explain the differences between commissioning, faultfinding and maintenance. Why is commissioning much more difficult? Explain the circumstances, which cause a task to become a commissioning job, such as installation, upgrading, or failed repair. Cover specification problems where otherwise good components can be incompatible with each other. Choose adequate alternatives.

Examine Intermittent Faults
List the causes and effects of intermittent faults, which may occur in the example scenario. A minimum of three faults should be described.

Customer advice and support
Describe advice and support information to be provided to customers. Topics must include: data protection, Internet connectivity and security strategy, and system hardware and software maintenance schedules and software updates. Describe the contributing factors, which influence the decision whether any work is carried out on-site or off-site. E.g. warranty, downtime, facilities, parts and costs.

Record keeping
List the information that should be retained relating to PC hardware, software and configuration settings. The security issues involved with keeping customer's data must be explained.

Advanced P.C. Faultfinding

Assessment 7 - Commissioning

(Outcome 5)

Student Name:	
Date: / /	Result:

Commissioning Faults

Examine the example computer system provided. List below the visible installation or commissioning faults present on the system. State the reason and circumstances in which the fault may cause a problem. A minimum of seven faults must be correctly identified and described.

1. Fault:
Description:

2. Fault:
Description:

3. Fault:
Description:

4. Fault:
Description:

5. Fault:
Description:

6. Fault:
Description:

7. Fault:
Description:

8. Fault:
Description:

9. Fault:
Description:

10. Fault:
Description:

Higher National Unit specification: support notes (cont.)

Unit title: Advanced P.C. Faultfinding

Open learning

If this Unit is delivered by open or distance learning methods, additional planning and resources may be required for candidate support, assessment and quality assurance.
A combination of new and traditional authentication tools may have to be devised for assessment and re-assessment purposes. For further information and advice, please see *Assessment and Quality Assurance for Open and Distance Learning* (SQA, February 2001 — publication code A1030).

Special needs

This Unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering special alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance on Special Assessment and Certification Arrangements for Candidates with Special Needs and Candidates for whom English is an additional language* (SQA, 2000).

General information for candidates

Unit title: Advanced P.C. Faultfinding

This Unit is designed to enable you to work effectively when faultfinding and repairing Personal Computers in a professional practice/consultancy or installation/technical support role in manufacturing, commercial or domestic sectors of industry. You will learn about the operation of modern Personal Computer components, common peripherals, test equipment and software as well as industrial practice and standards. You will also gain experience of simplifying complex problems, analysing cost effectiveness and an appreciation of safe working practice. The Unit is primarily intended for candidates who expect to work in a PC faultfinding or support role, but is also relevant to all those on an IT course who require a deeper or more effective understanding of modern personal computers.

On completion of the Unit candidates should be able to:

1. Perform Logical Faultfinding Techniques
2. Investigate and Faultfind Power Systems
3. Faultfind PC System Hardware
4. Investigate and Solve Software Problems
5. Specify and Commission Systems

The unit is preceded by written acknowledgement of safety issues as they relate to PC faultfinding. There are five outcomes, which are assessed through practical tasks and written evidence. Outcomes 1 to 4 are partly assessed by sets of objective questions. These may be presented in one integrative assessment.

The first outcome will be assessed by practical exercises and fault reports including a description of your logical faultfinding techniques.

The second outcome requires that you measure and test various aspects of power supplies and record the results. This is followed by a faultfinding exercise relating to power systems.

The third outcome requires you to produce a detailed flowchart to help you find a hardware fault that stops a PC from booting. This assessment will be carried out over several weeks and refined with feedback from practical experience gained within the classroom.

In the fourth outcome you will be expected to solve a software problem.

The fifth outcome presents you with an example scenario of a typical PC installation. You are expected to write an investigative report detailing the information and preparation needed to specify and commission the system. A practical commissioning exercise will also be undertaken.

You will produce evidence for your success in practical tasks by generating a portfolio of pro-forma fault report sheets. You will receive more detailed guidance on the content, style and quality required for your report entries during your progress though the Unit. Your assessor will observe you carrying out the assessment tasks, and will certify on each of your reports that it is your own work, whether it is satisfactory and whether you have carried out the work properly with regard to Health and Safety requirements.