

-SQA-SCOTTISH QUALIFICATIONS AUTHORITY

HIGHER NATIONAL UNIT SPECIFICATION

GENERAL INFORMATION

-Unit Number- **8413007**
-Superclass- **CA**
-Title- **COMPUTER PERIPHERALS**

-DESCRIPTION-

GENERAL COMPETENCE FOR UNIT: Explaining the principles of operation of computer peripherals and maintaining computer system hardware.

OUTCOMES

1. explain computer system busses and interfaces;
2. explain and maintain printers;
3. explain and maintain input devices;
4. explain and maintain visual display units;
5. explain and maintain disk storage systems;
6. explain and maintain modems.

CREDIT VALUE: 2 HN Credits

ACCESS STATEMENT: Access to this unit is at the discretion of the centre. However, it would be beneficial if the candidate had a knowledge of microprocessor based systems and fault finding techniques. This may be evidenced by possession of HN units:

2451767 Electronic Fault Finding
2451847 Microprocessor System Fundamentals

or similar qualifications or experience.

For further information contact: Committee and Administration Unit, SQA, Hanover House, 24 Douglas Street, Glasgow G2 7NQ.

Additional copies of this unit may be purchased from SQA (Sales and Despatch section). At the time of publication, the cost is £1.50 (minimum order £5.00).

HIGHER NATIONAL UNIT SPECIFICATION

STATEMENT OF STANDARDS

UNIT NUMBER: 8413007

UNIT TITLE: COMPUTER PERIPHERALS

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

OUTCOME

1. EXPLAIN COMPUTER SYSTEM BUSES AND INTERFACES

PERFORMANCE CRITERIA

- (a) Explanation of the roles of standard busses and local busses is correct.
- (b) Identification of the standard and local busses is correct with regard to connectors and signals.
- (c) Explanation of the roles of the computer interfaces is correct.
- (d) Identification of computer interfaces is correct in terms of connector size and type and signal names.

RANGE STATEMENT

Standard busses: ISA; EISA; MCA.

Local busses: PCI; VESA.

Interfaces: RS232C; centronics; bi-directional printer port; IDE; EIDE; SCSI; PCMCIA.

EVIDENCE REQUIREMENTS

Graphical and written evidence of the candidate's ability to differentiate between the system busses, interfaces and uses as detailed in performance criteria (a) - (c).

Performance evidence of the candidate's ability to identify different bus connectors and interfaces as detailed in performance criterion (d).

OUTCOME

2. EXPLAIN AND MAINTAIN PRINTERS

PERFORMANCE CRITERIA

- (a) Explanation of printer subsystems is correct.
- (b) Comparison of the principles of printing on paper by different printer types is correct.
- (c) Explanation of the principles of operation of a laser printer is correct.
- (d) Maintenance of a laser printer is carried out correctly in accordance with manufacturers' procedures.
- (e) Identification and correction of hardware and software faults in printers are correct.

RANGE STATEMENT

Subsystems: paper-feed; print-head; carriage movement mechanism; interface circuitry; power supply.

Printer types: dot matrix; continuous stream ink-jet; piezoelectric ink-jet; heat-type ink-jet.

Laser printer: removable cartridge; toner powder; photo sensitive drum; developing cylinder; OPC; printing corona wire; grid.

EVIDENCE REQUIREMENTS

Written evidence of candidate's ability to explain the principles of operation of printers as detailed in performance criteria (a) - (c). Performance evidence of the candidate's ability to carry out maintenance on a laser printer as detailed in performance criterion (d). Performance evidence as detailed in performance criterion (e).

OUTCOME

3. EXPLAIN AND MAINTAIN INPUT DEVICES

PERFORMANCE CRITERIA

- (a) Explanation of the principles of operation of an encoded keyboard is correct.
- (b) Description of the construction, organisation and operating characteristics of a typical personal computer keyboard is correct.
- (c) Explanations of the principles of operation of optical input devices are correct.
- (d) Identification and correction of hardware and software faults in input devices are correct.

RANGE STATEMENT

Input devices: optical mouse; bar-code reader; optical scanner; touch pad; mouse.

Faults: stuck keys; broken keys; faulty encoder; dirty mouse mechanism.

EVIDENCE REQUIREMENTS

Written evidence of the candidate's ability to explain the principles and construction of the input devices as detailed in performance criteria (a) - (c).

Performance evidence of fixing faults in keyboards and mice as detailed in performance criterion (d).

OUTCOME

4. EXPLAIN AND MAINTAIN VISUAL DISPLAY UNITS

PERFORMANCE CRITERIA

- (a) Explanations of the principles of operation of visual display units are correct.
- (b) Explanation of the operation of a CRT-based display generator, using a CRTIC, is correct.
- (c) Explanations of the components within a SVGA card are correct.
- (d) Identification and correction of faults in a VDU are correct.
- (e) Identification and correction of software faults in VDU drivers are correct.

RANGE STATEMENT

Visual display unit: CRT-based; LCD based; gas plasma displays; touch sensitive screens.

Display generator: CRTIC; video RAM; character ROM; PISO shift register; dot clock; video RAM address multiplexer; video combiner.

SVGA card: clock oscillator; VGA ASIC chip; (memory management, emulation, host interface, timing sequencer, CRTIC); display memory.

Faults: raster but no image; shrinking picture.

EVIDENCE REQUIREMENTS

Written evidence of the candidate's ability to explain a VDU system and a graphics card as detailed in performance criteria (a) - (c).

Performance evidence of fixing a VDU system as detailed in performance criteria (d) and (e).

OUTCOME

5. EXPLAIN AND MAINTAIN DISK STORAGE SYSTEMS

PERFORMANCE CRITERIA

- (a) Explanation of the principles of magnetic surface recording is correct.
- (b) Explanation of the principles of modern tape storage is correct.
- (c) Explanation of the organisation of data on a floppy disk is correct.
- (d) Explanation of the operation of a floppy disk drive unit is correct.
- (e) Explanation of the operation of a floppy disk controller (FDC) is correct.
- (f) Description of the operation of a hard disk drive is correct.
- (g) Description of the principles of operation of optical drives (CD-ROM, WORM, MO) are correct.
- (h) Identification and correction of faults in floppy and hard disk systems are correct.
- (i) Identification and correction of faults in software drivers are correct.

RANGE STATEMENT

Recording: FM; MFM; RLL.

Hard disk drive: platter; barometric filter; cylinder; head; sector; interleaving; head parking.

CD-ROM: spiral track; constant linear velocity; laser beam; land; pit; double speed; quad speed; eight speed.

EVIDENCE REQUIREMENTS

Written evidence of the candidate's ability to explain and maintain storage systems.

OUTCOME

6. EXPLAIN AND MAINTAIN MODEMS

PERFORMANCE CRITERIA

- (a) Descriptions of modem transmission methods are clear.
- (b) Drawing of the block diagram of a simple modem is correct.
- (c) Explanations of the components of the block diagram of a modem are correct.
- (d) Explanation of the operation of a UART is correct.
- (e) Demonstration of the connections between a computer (DTE) and modem (DCE) is effective.
- (f) Identification of software and hardware faults in a modem connection is correct.

RANGE STATEMENT

Transmission methods: FSK; PSK; QAM.

Block diagram: scrambler; descrambler; modulators; demodulators; TX filter; Rx filter; matching transformer.

Connections: GND; TXD; RXD; RTS; CTS; DCD; DSR; DTR; RI; (RS232) BABT Regulations.

EVIDENCE REQUIREMENTS

Written evidence of the candidate's ability to explain modems, as specified in performance criteria (a) to (d).

Performance evidence of maintaining modems, as specified in performance criteria (e) and (f).

MERIT To gain a pass in this unit, a candidate must meet the standards set out in the outcomes, performance criteria, range statements and evidence requirements.

To achieve a merit in this unit, a candidate must demonstrate a superior or more sophisticated level of performance. This may be demonstrated by:

- (i) additional research outwith the course materials;
- (ii) working independently with minimum supervision on practical exercises.

ASSESSMENT

In order to achieve this unit, candidates are required to present sufficient evidence that they have met all the performance criteria for each outcome within the range specified. Details of these requirements are given for each outcome. The assessment instruments used should follow the general guidance offered by the SQA assessment model and an integrative approach to assessment is encouraged. (See references at the end of support notes).

Accurate records should be made of the assessment instruments used showing how evidence is generated for each outcome and giving marking schemes and/or checklists, etc. Records of candidates' achievements should be kept. These records will be available for external verification.

SPECIAL NEEDS

Proposals to modify outcomes, range statements or agreed assessment arrangements should be discussed in the first place with the external verifier.

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HIGHER NATIONAL UNIT SPECIFICATION

SUPPORT NOTES

UNIT NUMBER: 8413007

UNIT TITLE: COMPUTER PERIPHERALS

SUPPORT NOTES: This part of the unit specification is offered as guidance. None of the sections of the support notes is mandatory.

NOTIONAL DESIGN LENGTH: SQA allocates a notional design length to a unit on the basis of time estimated for achievement of the stated standards by a candidate whose starting point is as described in the access statement. The notional design length for this unit is 80 hours. The use of notional design length for programme design and timetabling is advisory only.

PURPOSE This unit aims to develop the skills and knowledge necessary to enable the candidate to work as a field service engineer or as a debug technician.

CONTENT/CONTEXT The following information gives further clarification regarding the context in which the outcomes and performance criteria are to be achieved. Formal lectures should be reduced to a minimum, progress through the unit should be via discussions and handling of computer components. **A set text should be used.** Candidate should have access to a MPC (multi-media personal computer).

Outcome 1

Centre discussions around MPC base unit, motherboard connectors and parts. Off prints of magazine articles and bus data sheets should be used. Candidate should practice insertion and extraction of expansion or interface cards, in particular, ISA cards into EISA connectors.

Outcome 2

Access to a range of printers (dot.matrix, inkjet including colour, laser) is desirable. Candidate should practice routine maintenance on the range of printers ie self-test, change ribbon, lubrication, mechanism tensions. Difference between standard and bi-directional printer cable.

Outcome 3

Keyboards: non-encoded hex keypad, encoded ascii type keyboard.

Operation (keyboard): key press detection, key identification bounce elimination, rollover, lockout, output code.

Construction: mechanical keys, capacitive keys, membrane switches.

Operating characteristics: TTL - level output, parallel output code, serial RS232c output.

Candidates should use all input devices listed with appropriate software. Candidates should be encouraged to “look inside or take apart” devices where possible.

Outcome 4

Explanation of the functions carried out by a CRTC - line count, character count, row count, HSYNC, VSYNC.

Safety considerations: tube discharge, high voltage capacitor discharge, x-rays, CRT handling (implosion), hot chassis.

SVGA adaptor: memory size, memory banks, display planes and colour DACs.

Outcome 5

- (a) An introduction to magnetic recording techniques and the principle of reading/writing data from/to a magnetic surface. To include techniques for FM and MFM recording.
- (b) To include layout of track and sector maps and the significance of identifying data field information, eg. marks, CRC-bytes, etc, the function of track zero, storage capacity. Reference should be made to both 5¼” and 3½” discs. Standard format should be considered, eg. IBM-3740 and contrasted with any other format.
- (c) To include drive motor, head control mechanism and optoelectronic sensors for index and write protect. Control signals. Control functions eg. track seeking, record search, read/write record. Timing considerations eg. definition of seek-time, latency time and access time.
- (d)
 - (i) analysis of floppy disc interface in terms of functional circuit elements required to handle control signals and data transfer;
 - (ii) the functional elements of an FDC chip to include registers, control logic, serial interface and drive interface controllers. Features provided to include seek operations, sector read/write, formatting and CRC;
 - (iii) data transfer methods eg. programme controlled I/O and DMA;
 - (iv) the need for a disc operating system (DOS) to provide a command structure for disc drive access eg. format, save, load, etc.

CD-ROM standards: red book, yellow book, ISO 9096 (High Sierra).
CD ROM data packet format.

Write Once Read Many (WORM): real time recording (until worm disk is full), organic dyes, high power laser for writing, low power for reading, tellurium coating.

Magneto-Optical (MO); Heating of alloy (Tellurium iron cobalt, Te Fe Co) to Curie point, alignment of metallic crystals to 'O' or 'I' using magnetic flux. Reading using low power laser and photodiodes. Kerr Effect.

Hard disk faults: drive operates, but will not read; drive operates, but will not write.

Floppy disk faults: drive will not operate, motor dead; drive will not format disk; disk will not slide in or out of drive.

Outcome 6

Candidate should be encouraged to carry out:

- (a) self test on a modem;
- (b) an RS-232C loopback test;
- (c) use a breakout box to monitor the signals between a computer and modem. Functions of a 'null modem' connector and light indicators on a modem should be considered.

Faults: no ready indicator, intermittent characters.

V standards eg: V24, V34.

A checklist for testing/fault-finding for each peripheral should be produced by the candidates.

Some useful books are listed below:

Programmers Guide to EGA and VGA Cards
Richard F Ferraro
Addison-Wesley
ISBN 0-201-57025-4

How Computers Work
Ron White
Ziff-Doris Press
ISBN 1-56276-344-X

Microcomputer Trouble Shooting and Repair
JG Stephenson, Bob Cahill
Howard W Sams and Company
ISBN 0-672-22629-4

Computer Peripherals
BM Cook and NH White
Edward Arnold
ISBN 0-340-60658-4

The PC Support Handbook
David Dick
Dumbreck Publishing
ISBN 0-9521 484-2-0

The Principle of Computer Hardware
Alan Clements
Oxford Science Publications
ISBN 0-19-853764-6

CD-ROM Fundamentals
Robert Starrett, Dana J Parker
Boyd and Fraser Publishing Company
ISBN 0-87709-168-4

Turbo C Programming for the PC
Robert Lafore
SAMS
ISBN 0-672-22 660-X

PCI Local Bus Specification

Servicing Personal Computers
Michael Tooley
NEWES
ISBN 0-7606-1757-8

The Indispensable PC Hardware Book
Hans-Peter Messmer
Addison Wesley
ISBN 0-201-87697-3

APPROACHES TO GENERATING EVIDENCE This unit should be taught in a computer laboratory with access to appropriate test equipment. The various procedures should be explained and demonstrated to the candidate before he/she is allowed access to the equipment to be used. The candidate must be informed of any tasks which contribute to summative assessment. Any safety procedures should be highlighted.

ASSESSMENT PROCEDURES

All outcomes 1 to 6

All outcomes should be assessed by means of an assignment incorporating a structured practice exercise.

REFERENCES

1. Guide to unit writing.
2. For a fuller discussion on assessment issues, please refer to SQA's Guide to Assessment.
3. Information for centres on SQA's operating procedures is contained in SQA's Guide to Procedures.
4. For details of other SQA publications, please consult SQA's publications list.

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