

-SQA-SCOTTISH QUALIFICATIONS AUTHORITY

HIGHER NATIONAL UNIT SPECIFICATION

GENERAL INFORMATION

-Unit Number-	D3PL 04
-Unit Title-	DISTRIBUTED CONTROL SYSTEMS
-Superclass category-	VE
-Date of publication- (month and year)	
-Originating centre for unit-	Cleveland Open Learning Unit

-DESCRIPTION-

GENERAL COMPETENCE FOR UNIT: Analysing the principles and applications of Distributed Control Systems.

OUTCOMES:

1. explain the development of Distributed Control Systems (DCS);
2. analyse the construction and operation of controllers;
3. describe interfacing procedures;
4. analyse the operation of an Advanced Distributed Control System;
5. analyse advanced control strategies and applications.

CREDIT VALUE: 1.5 HN Credits

ACCESS STATEMENT: Access to this unit is at the discretion of the centre. However, it would be beneficial if the student had competence in basic control systems. This may be evidenced by possession of a National Certificate in Control or similar qualifications or by equivalent industrial experience.

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STATEMENT OF STANDARDS

Unit number:

Unit title: DISTRIBUTED CONTROL SYSTEMS

Additional copies of this unit can be obtained from:

The Administrative Services Unit, SQA, Hanover House, 24 Douglas Street,
Glasgow G2 7NQ, (Tel: 0141-242 2166).

At the time of publication, the cost is £2.50 (minimum order £5.00).

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 the standards are mandatory and cannot be altered without reference to SQA.

OUTCOME**1. EXPLAIN THE DEVELOPMENT OF DISTRIBUTED CONTROL SYSTEMS (DCS)****PERFORMANCE CRITERIA**

- (a) Outline description of stages in DCS is correct in terms of their function.
- (b) Description of DCS hardware layout is correct in terms of communication paths.
- (c) Description of data highway based control systems is correct in terms of communication requirements.
- (d) Analysis of direct digital system is correct in relation to its application to distributed control.

RANGE STATEMENT

Systems: computer data logging; computer supervisory control; direct digital control.

Hardware: data highway cables; process units; controllers; communications controller; operator interface.

Communications: command words; data words.

EVIDENCE REQUIREMENTS

Written or oral evidence to cover all items of the performance criteria and range statement.

OUTCOME**2. ANALYSE THE CONSTRUCTION AND OPERATION OF CONTROLLERS****PERFORMANCE CRITERIA**

- (a) Description of component parts is correct in terms of their respective functions.
- (b) Definitions of control modes are correct in terms of configuration requirements.
- (c) Analysis of digital and analogue techniques is appropriate to advanced controller capabilities.
- (d) Description of primary and reserve controllers is correct in relation to uninterrupted automatic control systems.

RANGE STATEMENT

Components: power regulator; RAM; battery backed RAM; MUX and ADC; CPU; ROM; data highway interface and output cards.

Control modes: manual; automatic; cascade; program.

EVIDENCE REQUIREMENTS

Written or oral evidence to cover all items of the performance criteria and range statement.

OUTCOME**3. DESCRIBE INTERFACING PROCEDURES****PERFORMANCE CRITERIA**

- (a) Identification of analogue and digital data processing is appropriate to DCS requirements.
- (b) Analysis of data reporting is appropriate to given conditions.
- (c) Description of the use of the operator interface and displays is appropriate to a given process.
- (d) Explanation of ergonomic requirements is appropriate to a stated operator environment.

RANGE STATEMENT

Displays: detail; group; schematic; configuration; trend.

EVIDENCE REQUIREMENTS

Written or oral evidence to cover all items of the performance criteria and range statement. With regard to PC (c) and PC (d), evidence is required for only one process and one environment.

OUTCOME**4. ANALYSE THE OPERATION OF AN ADVANCED DISTRIBUTED CONTROL SYSTEM****PERFORMANCE CRITERIA**

- (a) Identification of the disadvantages of data highway based systems is correct in relation to advanced distributed control.
- (b) Explanations of the use of local area network communications are accurate in terms of overcoming disadvantages of low level systems.
- (c) Analysis of the overall operation of an advanced DCS is accurate.
- (d) Description of system reporting operations is correct in relation to a distributed control system.
- (e) Description of methods of data configuration is appropriate to a distributed control system.
- (f) Identification of system security levels is appropriate to DCS configuration.

RANGE STATEMENT

Local area network modules: gateway; operator interface; minicomputer; mainframe computer; interface module; historical module.

Communications: speed; word length; number of addresses.

Security levels: view only; operator; supervisor; engineer.

EVIDENCE REQUIREMENTS

Written or oral evidence to cover all items of the performance criteria and range statement in relation to one Advanced Distributed Control System.

OUTCOME**5. ANALYSE ADVANCED CONTROL STRATEGIES AND APPLICATIONS****PERFORMANCE CRITERIA**

- (a) Analysis of program execution at controller level is accurate in terms of an advanced control strategy.
- (b) Description of the uses of minicomputers and mainframe computers is appropriate to advanced distributed control systems.
- (c) Identification of maintenance requirements of components at data highway level is appropriate to a distributed control system.
- (d) Description of recovery method from power outage is appropriate to distributed control systems.
- (e) Identification of the factors influencing the use of a distributed control system is accurately related to a given industrial environment.
- (f) Comparative analysis of proprietary distributed control systems is correct in terms of topography and communication protocols.

RANGE STATEMENT

Levels of control: data highway box; minicomputer; mainframe computer.

Data highway components: power supply regulator card; A/D converter card; analog output card.

EVIDENCE REQUIREMENTS

PCs (a) to (d) One item of written or oral evidence to cover all of the performance criteria and each of the items of the range statement.

PC (e) Written or written and oral evidence for two different industrial environments.

PC (f) Written or written and oral evidence to cover the comparison of three different types of proprietary system.

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. In this unit this might be shown in the following ways:

- (a) evidence of further reading or research
- (b) relating theory to practice.

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 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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SUPPORT NOTES

Unit Number:

Unit Title: DISTRIBUTED CONTROL SYSTEMS

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

NATIONAL 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 60 hours. The use of notional design length for programme design and timetabling is advisory only.

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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