National Unit Specification: General Information

UNIT Automotive: Introduction to Vehicle Electrical/Electronic Systems (Intermediate 2)

NUMBER 2210248

COURSE

SUMMARY

A unit designed to develop a knowledge of the main electrical/electronic components fitted to a vehicle, how they operate within a certain circuit, the areas of potential failure, the methods used to identify circuit and operational safety of the components and the removal and replacement techniques.

OUTCOMES

1 Identify the main electrical/electronic components fitted to a vehicle.
2 Explain the operation of the electrical/electronic components in relation to the system.
3 Indicate the electrical/electronic components that are subject to problems.
4 Demonstrate the use of circuit diagrams to locate a component and its source of supply and earth.
5 Demonstrate the procedure for removal and fitting of an electrical/electronic component.

RECOMMENDED ENTRY

Access to this unit is at the discretion of the centre, however no entry prerequisites are envisaged.

CREDIT VALUE

0.5 Credit at Intermediate 2.

CORE SKILLS

Information on the automatic certification of the core skills in this unit is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999)

Administrative Information

Superclass: XS

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National unit specification: statement of standards

UNIT Automotive: Introduction to Vehicle Electrical/Electronic Systems (Intermediate 2)

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

OUTCOME 1
Identify the main electrical/electronic components fitted to a vehicle.

Performance Criteria
a) The main components of the lighting circuit are correctly identified.
b) The main components of the charging circuits are correctly identified.
c) The main components of the directional indicator circuit are correctly identified.
d) The main components of an electronic circuit are correctly identified.
e) The main components of a starting circuit are correctly identified.

Evidence Requirements
Written and/or oral evidence of the candidate's ability to correctly identify from diagrams or actual units, for:

PC (a) 12 lighting circuit components.
PC (b) 4 charging circuit components.
PC (c) 4 directional indicator circuit components.
PC (d) 4 electronic circuit components.
PC (e) 3 starter circuit components.

OUTCOME 2
Explain the operation of the electrical/electronic components in relation to the system.

Performance Criteria
a) The explanation of the operation of the lighting circuit components is correct.
b) The explanation of the operation of the charging circuit components is correct.
c) The explanation of the operation of the directional indicator circuit components is correct.
d) The explanation of the operation of the starting circuit components is correct.

Evidence Requirements
Written and/or oral evidence of the candidate's ability to correctly explain the operation of the components in relation to the electrical/electronic system for:

PC (a) correct explanation of the lighting circuit operation.
PC (b) correct explanation of the charging circuit operation.
PC (c) correct explanation of the directional indicator circuit operation.
PC (d) correct explanation of the starter circuit operation.

National unit specification: statement of standards (cont)

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OUTCOME 3
Indicate the electrical/electronic components that are subject to problems.

Performance Criteria
a) The components subject to problems in the lighting circuit are correctly indicated.
b) The components subject to problems in the charging circuits are correctly indicated.
c) The components subject to problems in the directional indicator circuit are correctly indicated.
d) The components subject to problems in the starting circuit are correctly indicated.

Evidence Requirements
Written and/or oral evidence of the candidate's ability to correctly identify from diagrams or actual units for:

PC (a) correct indication of 3 lighting circuit components subject to problems.
PC (b) correct indication of 4 charging circuit components subject to problems.
PC (c) correct indication of 3 directional indicator circuit components subject to problems.
PC (d) correct indication of 3 starter circuit components subject to problems.

OUTCOME 4
Demonstrate the use of circuit diagrams to locate a component and its source of supply and earth.

Performance Criteria
a) The location of a given component is correct.
b) The source of supply to the given component and earth is correct.
c) The cable coding/classification to the given component and earth is established accurately.

Evidence Requirements
Written and/or oral evidence for of the candidate's ability to correctly demonstrate for:

PC (a) correct location of the component on the circuit diagram.
PC (b) correct location of the source of supply and earth for the component on the circuit diagram.
PC (c) correct cable coding/classification on the circuit diagram.

National unit specification: statement of standards (cont)

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OUTCOME 5
Demonstrate the procedure for removal and fitting of an electrical/electronic component.

Performance Criteria
a) Tools/equipment are used in accordance with manufacturers' or companies' set procedures.
b) The procedures for removal and fitting are followed correctly.
c) The component disconnecting and connecting procedures are carried out correctly.
d) The relevant/set safety requirements for the given task are correctly followed.

Evidence Requirements
Evidence of actual performance of the candidate's ability to follow instructions (manufacturer's or company set procedures), use tools, observe relevant/set safety requirements for the given task and meet set timescales within defined criteria.

National unit specification: support notes

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

GUIDANCE ON CONTENT AND CONTEXT

This unit is designed to operate in conjunction with the SVQ Level II 'Vehicle Mechanical: Unit Replacement', building the underpinning theory which will assist in the attainment of the SVQ, The PDA Certificate in Motor Vehicle Systems and Intermediate level 2 of the Higher Still programme or as a freestanding unit.

The identification of the main electrical/electronic components fitted to a vehicle, how they operate within a certain circuit and the power flow through that circuit, the areas of potential failure, the methods used to identify circuit and operational safety of the components and the removal and replacement techniques.

Demonstrations of the methods used to check circuits, identify the areas of security codes and the problems caused or produced and the implication to the vehicle or unit of not identifying the code prior to the repair or test procedure.

Identification of problem sources within the circuits or the associated wiring, units which will have a life span dependent on the use, or if incorrectly fitted, how the life span could be dramatically reduced or affected.

Practical exercise which could be on bench mounted assembly or a vehicle where the candidate can, from a given task relating to the various electrical/electronic circuits carry out a removal and refitting task to set specifications/procedures.

GUIDANCE ON TEACHING AND LEARNING APPROACHES

Outcome 1

Candidates could be given the opportunity to examine, in a practical location, an electrical system, to identify the main components, layout, the principle of operation of components in that system.

The following sample of components could be used for both the identification and the assessment of the outcome:

battery, alternator, regulator, diode pack (rectifier), starter motor, solenoid, headlamp, headlamp bulb, fog lamp (rear), side lamp, indicator, flasher unit, number plate lamp, switch, lens, reflector, wire (conductor), lambda sensor, terminals/multi plugs, TDC sensor, engine management unit, air flow sensor, hazard switch, warning lamps.

National unit specification: support notes (cont)

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Outcome 2

The main components of the lighting circuit should be identified and how the components operate. The flow of current through the circuit for the side lamps, main and dip beams. Head lamp aim should be introduced here and reference to the C and U regulations, lighting regulations, with regard to aim, anti dazzle requirement, colour, type and number.

The main components of the charging circuit, using a black box treatment to show the flow of current into the alternator when it is stationary and out of the alternator when it is charging. Reference to the battery and its use when the engine is not running to supply the main electrical components.

The main components of the directional indicators and how the current flow through the circuit to operate the components. Identification of the effect of electrical load (one bulb not working) on the operation of the circuit could be identified here.

The main components of the pre-engaged starter circuit should be identified and the power flow through the circuit. The operation of the starter solenoid, the engagement of the pinion and what happens to the pinion when the engine starts.

Outcome 3

Candidates could be given the opportunity to examine, in a practical location, an electrical system, to identify the main components which could be subject to problems, items such as bulb failure, bulb alignment, multi plugs, alternator drive belt, flasher units/relays, diode packs, rectifiers, starter and alternator brushes, starter solenoids, starter pinions, battery terminals, cable chaffing, connections and repairs to wiring, sensors and ECU's.

Outcome 4

The use of wiring diagrams to locate components, identify the source of power to that component and the method of earthing for the component. Recognition of the codes used to classify the cables – trace colours – numbers and types of connectors used.

National unit specification: support notes (cont)

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Outcome 5

Practical exercise could be on a bench mounted assembly or a vehicle where the candidate can, from a given task relating to the various electrical/electronic circuits carry out a removal and fitting task. Circuit safety (method of disconnecting a battery) and the need for identifying any coded units such as radio, telephone, central locking, ignition, ECU's, vehicle immobilisation, that could be affected if the battery should be disconnected. Reference to sources of information including questions asked directly to the customer at the point of entry. The method used to connect the voltmeter/ammeter/ohmmeter/code reader or test lamp into the circuit, especially voltage/polarity conscious circuits. The principle of operation, the use of code savers and headlamp alignment equipment could be demonstrated in a practical situation/location with video and other demonstration aids used as reinforcement to the practical demonstration.

The ability of the candidate to follow instruction, select the correct information, select the correct tools and or equipment, check that the tools are in a safe condition to use or report that the tools are suspect, calibrate if required the tools before use to achieve a correct reading or setting, connect the equipment and or tools in accordance with laid down/set out instructions/procedures, and work in a manner that promotes safety to themselves, other and the vehicle.

Reference to "equipment/tools" within the PC's means that in some tasks specialist tools or equipment or both may be used.

Note: The criteria or the critical points, (what the candidate must do for each PC, to achieve that PC when doing the task – the Instruments or specifications for the task), relating to PC's (a) to (d), against which the candidate is measured in order to achieve the outcome should be clearly set out and recorded on a checklist.

GUIDANCE ON APPROACHES TO ASSESSMENT

All assessment packs should contain the following:

- Clear indication that the assessment and the Marking schedule have undergone internal verification.
- Main assessment (or first assessment) – A clear statement of what the candidate must do to achieve a pass.
- Marking schedule for the Main assessment, of all the required and acceptable responses against which the assessor will mark the candidate.

National unit specification: support notes (cont)

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- Reassessment (or second, third etc. assessment depending on centre policy), indicating clearly that it is re-assessment, again, with a clear statement of what the candidate must do to achieve a pass.

- Marking schedule of all the required and acceptable responses against which the assessor will mark the candidate.

Outcome 1

Written and/or oral evidence which may be in the form of multi choice type questions, a matching exercise, from diagrams, slides, video or actual units and or vehicles, which allows the candidate to identify the electrical/electronic components.

Outcome 2

Written and/or oral evidence which may be in the form of multi choice type questions, short answer or gapped responses could be used which allows the candidate to explain the critical points of circuit operation.

Outcome 3

Written and/or oral evidence which may be in the form of multi choice type questions, short answer or gapped responses could be used which allows the candidate to identify the critical points of wheel balancing.

Outcome 4

Written and/or oral evidence which may be in the form of multi choice questions, a matching exercise, from diagrams, slides, video or actual units/vehicles, which allows the candidate to explain the use of testers.

Outcome 5

A practical exercise either in the candidate's normal place of work, when being assessed during his/her SVQ, or in the centre on actual units or vehicles, with access to all the relevant tools, equipment, data and clean/safe work area.

Set tasks should have direct specifications against which he/she will be measured, directly related to the task that the candidate must achieve to pass.