

# Model Assignment

## Issued September 2008

OCR Level 2 Principal Learning in Engineering

Unit F552: Construct electronic and electrical systems

**Please note:**

This OCR model assignment may be used to provide evidence for the unit above. Alternatively, centres may 'tailor' the assignment within permitted parameters (see 'Notes for Tutors'). It is the centre's responsibility to ensure that any adaptations made to this assignment allow learners to meet all the assessment objectives and provide sufficient opportunity for learners to demonstrate achievement across the full range of marks.

**The scheme codes for these qualifications are:**

OCR Level 2 Principal Learning in Engineering                      500/2399/8

**The QCA Accreditation Number for this unit is:**

Unit F552: Construct electronic and electrical systems                      F/501/1888

This OCR model assignment remains live for the life of these qualifications.

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# Contents

	Page Number(s)
<b>LEARNER INFORMATION</b>	<b>3</b>
<b>Model Assignment</b> This section contains the assignment background which learners will need to be familiar with in order to complete the tasks.	<b>4</b>
<b>Tasks</b> This section contains all the tasks learners must complete before submission for assessment.	<b>5 - 9</b>
<b>TUTOR INFORMATION</b>	<b>10</b>
<b>Guidance for centres</b> This section provides general guidance to centre staff on the preparation and completion of the assignment.	<b>11 - 13</b>
<b>Notes for tutors</b> This section provides additional guidance and support to centre staff for each task. It is not intended for use by learners.	<b>14 - 16</b>

# Model Assignment: Learner Information

OCR Level 2 Principal Learning in Engineering

Unit F552: Construct electronic and electrical systems

# Model Assignment

## Description of model assignment.

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This is a practical based unit providing you with the opportunity to learn and apply the basic principles and techniques used in the construction of electronic and electrical systems.

The tasks for this unit will be in the form of a timed 'Design Challenge' activity.

It will take place in three 2-hour sessions lasting for 6 hours in total and be based in a design studio or workshop.

You will use your knowledge of electrical and electronic components to develop a prototype system in order to solve a design problem, given to you by your presenter.

This design problem will be linked to one of the sector skill areas.

All of your evidence will be presented in a 'workbook' which will be provided by OCR.

**Read through all of the following tasks carefully, so that you know what you will need to do to complete this assignment.**

# Tasks

Prior to completion of the 'Design Challenge' you will undertake a number of teaching and learning activities designed to develop your knowledge and understanding of electronic and electrical principles. The assessment task will take place at the end of the unit and will be a 6-hour design challenge activity, undertaken in three, 2-hour sessions.

All of your evidence from the 'Design Challenge' will be presented in a 'workbook' which will be provided by OCR.

Photographs will be taken at set times during the 'Design Challenge' to record your progress. Additional photographs can be taken and stuck into your workbook to allow you to explain aspects of your designing and making. These must be annotated by you to gain credit.

The 'Design Challenge' activity and the workbook are divided up into numbered sections and for each section you will have a set time to undertake the work required and record details in the workbook.

Your presenter will read to you detailed instructions of what to do in each section which are provided in a 'script'. The detailed instructions will also include details of the time allowed for each of the sections.

The 'Design Challenge' is based on a theme or scenario similar to the examples given below:

## Example Design Challenge 1

Landrover vehicles are often used in 'off road' environments.

A warning system is required to alert drivers if the vehicle is tilting at an angle that may result in the vehicle rolling.

You are to design a system that would give a clear indication to the driver of the potential rolling hazard using either visual and/or audible indication.

## Example Design Challenge 2

Public transport systems such as buses can often become overcrowded during rush hour.

A system to count the number of passengers boarding and leaving a bus is required to ensure that all passengers are able to travel safely.

You are to design a system that would give a clear indication to the driver of the overcrowding hazard using either visual and/or audible indication.

You will record your responses using a range of techniques including text, digital photography, screen dumps, freehand sketches and/or CAD drawing in the appropriate sections of the workbook.

Photographs will be taken and fixed to your workbook at set times during the 'Design Challenge'. The workbooks are there to support you and also to assist in the assessment of your work.

It is not your responsibility to take the photographs or fix them in you workbook it is the responsibility of your presenter.

You may wish to take additional photographs and fix them in your workbook yourself during the 'Design Challenge'. This is acceptable and you may find this method a good way of communicating your experiences to the assessor. You should note that it is your **annotation** which will be rewarded and not the photographs.

During the 'Design Challenge' activity you will be expected to demonstrate knowledge and understanding of electronic and electrical principles and will be assessed against the following tasks and assessment criteria.

## Task 1: Electronic and electrical principles

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### Assessment Criteria 1.1, 1.2

In response to the context given within the 'Design Challenge' you will apply your knowledge of electronic and electrical principles and demonstrate your safe working procedures.

You will describe and apply basic electronic and electrical principles.

Your descriptions will be of proposed circuit(s) operation and may include details of:

- current
- electro motive force (emf)
- potential difference
- resistance
- power
- energy

Describe, apply and justify the need for safe working procedures.

You will give details of your justified selection of the:

- tools
- equipment
- manufacturing processes

which are appropriate to your selected circuit design(s).

Your descriptions might include your consideration of:

- visual inspection of equipment
- Portable Appliance Testing (PAT) compliance
- selection of test equipment

You will work in a safe and appropriate manner that considers the needs of others giving specific details in your workbook.

You will indicate the safe use of manually operated tools which may include:

- soldering iron
- wire cutters
- wire strippers
- pliers
- screwdrivers
- de-soldering tools
- manual drills
- pcb drills

## Task 2: Operating principles of electronic and electrical components

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### Assessment Criteria 2.1, 2.2, 2.3

In response to the context given within the 'Design Challenge' you will demonstrate knowledge and understanding of the operating principles of a range of electronic and electrical components.

You will identify and describe the properties of a range of electronic and electrical components.

You will be able to justify the selection of appropriate components based upon their properties required to manufacture your circuit(s) which may include some of the following:

- resistors - types (fixed, variable, thermistor, light dependent), tolerances, colour code
- capacitors - types, values, colour code
- semi-conductors - diodes, transistors, Integrated Circuits
- operational amplifiers, timers, logic gates, counters, PICs
- audio/Visual Indicators- lamps, LEDs, buzzers
- cells and batteries
- copper wire
- plugs and sockets
- switches

You will use calculations to independently identify and select component values and to justify your selection of component values and component types.

## Task 3: Circuit construction

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### Assessment Criterion 3.1

In response to the context given within the 'Design Challenge' you will need to be able to demonstrate knowledge and understanding of various methods of circuit construction.

You will be able to identify, design and construct circuit(s) using suitable methods of circuit construction for prototype activity.

You will demonstrate knowledge and application in the construction of circuits which may include:

- soldering techniques
- stripboards
- protoboards
- breadboards
- PCB

You will construct an appropriate circuit for the given context which might include:

- audio
- optical
- transistor (sensors and switches)
- alarm
- logic
- counting

## Task 4: Testing and fault finding

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### Assessment Criterion 4.1

In response to the context given within the 'Design Challenge' you will need to identify and justify the selection of appropriate testing, test equipment and fault finding methods. Use them and act upon the outcome.

You will make simple calculations to modify a circuit to enable correct operation.

You will select and use appropriate test equipment and test methods which may include:

- power supplies
- multi-meters
- logic probes

You will undertake appropriate circuit testing which may include:

- checking construction against circuit diagrams
- continuity
- visual inspection
- expected values



# Model Assignment: Tutor Information

OCR Level 2 Principal Learning in Engineering

Unit F552: Construct electronic and electrical systems

# Guidance for Centres

## 1 General

1.1 OCR model assignments are issued free to participating centres and are also available to download from our website: [www.ocr.org.uk](http://www.ocr.org.uk).

1.2 Centres may choose to:

- use OCR model assignments for formal summative assessment of learners
- tailor OCR model assignments for formal summative assessment of learners

It is intended that this model assignment can be used by centres without modification. However, in order provide appropriate contextualisation, improve access or increase local relevance, centres may 'tailor' the model assignments within set parameters. Details of the scope of adaptation are provided in the 'Notes for Tutors' section of this document.

1.3 This assignment has been designed to meet the full assessment requirements of the unit. Learners will need to take part in a planned learning programme that covers the underpinning knowledge and skills of the unit.

## 2 Before carrying out the assignment

2.1 Learners should be provided with a copy of the *Learner Information* section of this assignment or the centre adapted model assignment.

2.2 Learners may carry out preparations prior to undertaking the tasks; there is no time limit for this subject to the overall guided learning hours for this unit.

2.3 Learners should be aware of the format of the 'Design Challenge', the timings, restrictions involved and the content and layout of the workbook and the use of photographic evidence.

## 3 Before and during the assignment

3.1. Centres are responsible for ensuring they are in receipt of workbooks and the presenter script prior to the commencement of the 'Design Challenge'.

3.2. The focus of the activity should be set by the presenter in conjunction with the learner and engineering sector. **The details of the focus of activity should not under any circumstances be made know to any learners prior to the commencement of the 1<sup>st</sup> session of the 'Design Challenge'.**

3.3. Each centre is required to provide appropriate means of digitally capturing learner achievements at set points during the 'Design Challenge'. Prompt printing and a method of securely attaching the digital images into the learner's workbook should be provided. This is a centre responsibility and not that of the learner.

- 3.4. Security of the workbooks before, between sessions and afterwards and also prior and during marking is essential to secure the validity and reliability of the assessment, provide good manageability for all involved and allow the presenter to confidently authenticate the work.
- 3.5. Once marked by the centre the 'Design Challenge' will be moderated externally by OCR in accordance with QCA's Code of Practice.

#### 4 When completing the assignment

- 4.1. All assessment evidence must be produced under **controlled conditions** so that the overall level of permit control secures validity and reliability, provides good manageability for all involved and allows teachers to authenticate the work confidently. Further guidance on **controlled conditions** is provided within the OCR Principal Learning Handbook.
- 4.2. In this unit it is recommended that learners spend 24glh on the acquisition of knowledge, skills and understanding. The remaining 6glh will take the form of controlled assessment where learners produce the appropriate evidence.
- 4.3. Each learner must produce individual and authentic evidence. Centre staff may give support and guidance to learners during the initial 24glh. This support and guidance should focus on checking that learners understand what is expected of them. It is not acceptable for presenters to provide model answers or to work through answers in detail.
- 4.4. During the 'Design Challenge' the centre staff must adopt the role of script reader and supervisor, including that of monitoring with regard to Health and Safety. It is essential that all staff ensure they do not undertake any 'teaching' activity.
- 4.5. Learners may use information from any relevant source to help them with producing evidence for the tasks.
- 4.6. Learners will need to be given free access to all appropriate tools, equipment and facilities to enable them to fully demonstrate their individual capabilities.

#### 5 After completing the assignments

- 5.1 It is the responsibility of the centre to ensure that the learner's work is marked by a competent person. This person must apply the marking criteria clearly outlined in this unit.
- 5.2 Learners evidence is assessed by the centre's assessor against the qualification specification contained in the Principal Learning Handbook. When marking learners' work, centres **must** use the descriptors provided within the unit. For further information about assessment please refer to the section on Assessment and Moderation in the Principal Learning Handbook.
- 5.3 Assessors' decisions should be quality assured across the centre through internal moderation. For further information about internal moderation please refer to the section on Assessment and Moderation in the Principal Learning Handbook.

## **6 Presentation of work**

- 6.1 Learners will present the evidence within a 'workbook' which will be provided by OCR, using a range of techniques including text, digital photography, screen dumps, freehand sketches and CAD drawing.
- 6.2 Photographic record of proceedings at various scripted points during the 'Design Challenge' is the centre's responsibility. This serves as stimulus for the learner during the 'Design Challenge' and a detailed visual record of learner achievement.
- 6.3 No additional materials will be required for the presentation of learner evidence.

## **7 Acceptable evidence**

- 7.1 For guidance on generation and collection of evidence please refer to the section on Assessment and Moderation in the Principal Learning Handbook.

## **8 Plagiarism and unauthorised collaboration**

- 7.1 Centres should have adequate procedures in place to ensure that plagiarism and unauthorised collaboration are identified and responded to.
- 7.2 When supervising tasks, teachers are expected to:
- offer learners advice about how best to approach such tasks
  - inform learners of the ramifications of unfair practice
  - exercise continuing supervision of work in order to monitor progress and to prevent plagiarism
  - ensure all copied materials is suitably acknowledged
  - ensure copied material is not given credit in the assessment process
- 7.3 As with all controlled assessments, the presenter must be satisfied that the work submitted for assessment is the learner's own work.

# Notes for Tutors

## Introduction to the Tasks

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**These guidance notes must be used in conjunction with the unit specification and Principal Learning Handbook, OCR Design Challenge workbook and presenters script.**

The workbook and the script have been designed to enable learners to demonstrate and record their knowledge, understanding and application of the principles and techniques used in the construction of electronic and electrical systems.

The tasks have been designed so that all of the assessment criteria in Unit F552 are fully addressed.

## Scope of permitted Model Assignment modification

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The model assignment takes the form of an exemplar 'Design Challenge' activity. Two examples of suitable 'Design Challenges' are given below:

### Example Design Challenge 1

Landrover vehicles are often used in 'off road' environments.

A warning system is required to alert drivers if the vehicle is tilting at an angle that may result in the vehicle rolling.

You are to design a system that would give a clear indication to the driver of the potential rolling hazard using either visual and/or audible indication.

### Example Design Challenge 2

Public transport systems such as buses can often become overcrowded during rush hour.

A system to count the number of passengers boarding and leaving a bus is required to ensure that all passengers are able to travel safely.

You are to design a system that would give a clear indication to the driver of the overcrowding hazard using either visual and / or audible indication.

Either design challenge may be used in its entirety, modified or a different scenario substituted.

This model assignment is in no way prescriptive and centres are encouraged to construct scenarios more appropriate to their individual circumstances.

If Centres write their own assignments to suit the learners and a specific engineering sector, choose different or adapt other assignments (e.g. Landrover TrackNAv Challenge) they **must** ensure there is sufficient scope and challenge in the scenario set to enable learners full access to all of the assessment criteria.

When creating assignment scenarios for the 'Design Challenge' it is advisable to do so in conjunction with the script and the learner workbook to ensure full matching of the 'Design Challenge' to the assessment criteria.

When completing this model assignment it may be possible to generate evidence for completing a task in a variety of formats. This list is not exhaustive and will depend on the approach taken to complete the task or model assignment. In some cases the task or model assignment will require a specific format for the outcome and this will be clearly marked in the table.

Depending on the approach taken to the model assignments it may also be possible to demonstrate additional PLTS coverage and some additional opportunities have been listed below.

Task activity	Nature of evidence generated	Potential Assessment Criteria coverage
<p><b>Task 1</b></p> <p>Electronic and electrical principles</p>	<p><b>Initial thoughts</b> Learners' carry out an analysis of a design problem which identifies possible concepts for solution. Generation of a design brief, consideration of user and environment. Generation of a product design specification.</p> <p><b>Initial ideas</b> Learners use a 'systems approach' to identify possible Input, Process/Control, and Output components for the design of the circuit. Evaluation of identified components.</p>	<p><b>Assessment Criteria</b></p> <ul style="list-style-type: none"> <li>• 1.1, 1.2</li> </ul> <p><b>PLTS</b></p> <ul style="list-style-type: none"> <li>• None</li> </ul>
<p><b>Task 2</b></p> <p>Operating principles of electronic and electrical components</p>	<p><b>Design Development</b> Circuit developed using identified components. Calculations used to select suitable component values and anticipate circuit test data. Initial circuit diagram produced. Component selection justified.</p>	<p><b>Assessment Criteria</b></p> <ul style="list-style-type: none"> <li>• 2.1, 2.2, 2.3</li> </ul> <p><b>PLTS</b></p> <ul style="list-style-type: none"> <li>• None</li> </ul>
<p><b>Task 3</b></p> <p>Circuit construction</p>	<p><b>Circuit Prototype Assembly and Testing</b> Action Plan – learners plan for the construction of the prototype circuit including risk assessment.  Circuits constructed using a suitable circuit prototyping method justified by the learner.</p>	<p><b>Assessment Criterion</b></p> <ul style="list-style-type: none"> <li>• 3.1</li> </ul> <p><b>PLTS</b></p> <ul style="list-style-type: none"> <li>• IE4</li> </ul>

<b>Task 4</b>  Testing and fault finding	<b>Circuit testing</b> Appropriate test equipment and test methods identified by learner. Operation of circuit checked against expected values. Possible modifications to circuit identified and final circuit diagram produced. Expected values for circuit testing given. Circuit operation evaluated against specification and initial design problem.	<b>Assessment Criterion</b>  • 4.1  <b>PLTS</b>  • IE1 • IE4 • IE6
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