

Live Assessment

Assessment Material

OCR Level 1/2 Cambridge National Award in Systems Control in Engineering
OCR Level 1/2 Cambridge National Certificate in Systems Control in Engineering

Unit R114: Simulate, construct and test electronic circuits

Please note:

This OCR model assignment is to be used to provide evidence for the unit identified above. Alternatively, centres may 'tailor' or modify the assignment within permitted parameters (see Information for Teachers). It is the centre's responsibility to ensure that any modifications made to this assignment allow learners to show that they can meet all of the learning outcomes and provide sufficient opportunity for learners to demonstrate achievement across the full range of marks.

INSTRUCTIONS TO TEACHERS

The OCR administrative codes associated with this unit are:

- unit entry code R114
- certification codes Award J833 / Certificate J843

The accreditation numbers associated with this unit are:

- unit reference number [F/505/3543]
- qualification reference(s) Award [601/1406/X] / Certificate [601/1407/1]
- **Duration: Approximately 10-12 hours**

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Contents

	Page Number(s)
INFORMATION FOR LEARNERS	3
Scenario for the assignment	4
This section contains the assignment background which learners will need to be familiar with in order to complete the tasks.	
Your Tasks	5
This section contains all the tasks learners must complete before work can be submitted for assessment.	
INFORMATION FOR TEACHERS	7
Guidance on using this assignment	8 - 14
This section provides guidance to centre staff on the preparation and completion of the assignment.	

Live Assessment: Information for Learners

OCR Level 1/2 Cambridge National Award in Systems Control in Engineering
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Unit R114: Simulate, construct and test electronic circuits

Scenario for the Assignment

A torch manufacturer has been given feedback regarding their rechargeable torch. Customers have commented that it would be useful to be able to locate the torch charging station in the dark. You have been asked to produce a modification to the charging unit to support this.

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

Your Tasks

Task 1: Circuit Simulation and Test

Learning Outcome 1, Be able to use Computer Aided Design (CAD) for circuit simulation and design, is assessed in this task.

The circuit design provided (Fig.1) has been produced in response to the design problem. You are to use appropriate Computer Aided Design (CAD) software to produce a circuit schematic diagram and test the operation of the circuit 'on-screen' to prove that it functions correctly.

Once the circuit operation has been proved you are to use the CAD package to produce a Printed Circuit Board (PCB) layout design to include track and component views. Review PCB layout to ensure correct functionality.

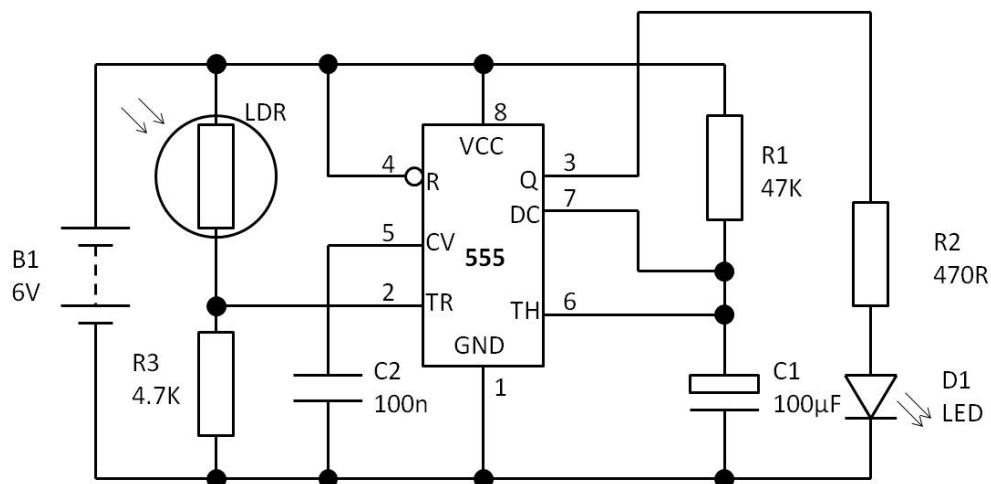


Fig.1

Task 2: Circuit Construction

Learning Outcome 2, Be able to construct circuits, is assessed in this task.

You are to use your PCB layout design to manufacture a PCB using an appropriate method. You are then to assemble components to the PCB using appropriate techniques.

Task 3: Circuit Testing

Learning Outcome 3, Be able to test electronic circuits, is assessed in this task.

On completion of the PCB and circuit construction you must undertake testing and evaluation of the final constructed circuit using appropriate test equipment and test methods.

Information for Teachers

OCR Level 1/2 Cambridge National Award in Systems Control in Engineering
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Unit R114: Simulate, construct and test electronic circuits

Guidance on using this assignment

1 General guidance

- 1.1 OCR assignments are available to download free of charge from our website:
www.ocr.org.uk
- 1.2 OCR assignments are intended to be used for summative assessment of learners. The OCR specification gives more information on the arrangements for assessing internally assessed units.
- 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, understanding and skills of the unit.

2 Before carrying out the assignment

- 2.1 Learners should be provided with a copy of the *Information for Learners* section of this assignment.
- 2.2 Learners will not need to carry out any preparations prior to undertaking the assessment tasks, such as collating resources to use in the assessment
- 2.3 We have estimated that it will take approximately 10-12 hours to complete all tasks. Learners would need approximately 2-3 hours to complete Task 1 and approximately 6-7 hours to complete Task 2 and 2 hours to complete Task 3. These timings are for guidance only but should be used by the teacher to give learners an indication of how long to spend on each task. Centres can decide how the time can be allocated between each part or individual task. Centres are also permitted to spread the tasks across several sessions and therefore it is permissible for evidence to be produced over several sessions.

3 When completing the assignment and producing evidence

- 3.1 Each learner must produce individual and authentic evidence for each task within the assignment.
- 3.2 Centre staff may give support and guidance to learners. This support and guidance should focus on checking that learners understand what is expected of them and giving general feedback that enables the learner to take the initiative in making improvements, rather than detailing what amendments should be made. It is not acceptable for teachers/deliverers to provide answers, to work through answers in detail or to detail specifically what amendments should be made.
- 3.3 Learners may use information from any relevant source to help them with producing evidence for the tasks.
- 3.4 Learners must be guided on the use of information from other sources to ensure that confidentiality is maintained at all times.

- 3.5 Usually, the type of evidence required may be modified, with the exception of certain types of evidence listed below under '*Permitted changes*'. It is important to note that it is possible to generate the evidence in a variety of formats. Centres must advise learners as to the most appropriate format of evidence. The nature of this assessment means that learners are free to use the format that they feel is most appropriate for the purpose and target audience for each individual task (see Section 6).

4 Presentation of work for marking and moderation

- 4.1 Centres wishing to produce digital evidence in the form of an e-portfolio should refer to the appendix in the specification on guidance for the production of electronic assessment.
- 4.2 Centres may wish to discourage learners from excessive use of plastic wallets for presentation of their evidence as this may hinder the assessment process. Instead centres may wish to encourage learners to present their work so that it is easily accessible, e.g. spiral bound, stapled booklet, treasury tag.
- 4.3 All work must be marked against the marking criteria for the unit. Marks are allocated to learning outcomes rather than tasks. Please see Appendix B Marking criteria for centre assessment and Section 4 The centre assessed units in the specification for this qualification for more information on marking, moderation and submission of work.

5 Scope of permitted model assignment modification

The model assignment is self-contained in its present form. The set of tasks form a coherent whole addressing all the learning outcomes and allowing access to the full range of marks.

You must not change the following:

- the learning outcomes
- the marking criteria
- the requirements for supervision and authentication as described in the specification (Section 4 *The centre assessed units*)
- the maximum duration for completion of the assignment.

Permitted changes:

The model assignment can be modified in terms of the areas described below but centres must be sure that learners still have the opportunity to cover all of the learning outcomes and to access the full range of marks:

- the scenario, which can be contextualised or amended to suit local needs
- each specific task may be appropriately contextualised to match with any permitted changes you have made to the scenario.

Should the centre change the context of the assignment they must make sure that the circuit to be constructed and tested is of equal complexity to that given in this model assignment. The circuit design must be fully tested to ensure its correct operation prior to learners undertaking the task.

OCR has ensured that in the language used and the tasks and scenario provided we have avoided discrimination, bias and stereotyping and support equality and diversity. In the development of qualifications and assessments we use the guidance given in the Ofqual publication *Fair access by design*, notably this includes:

- using language and layout in assessment materials that does not present barriers to learners
- using stimulus and source materials in assessment materials (where appropriate) that do not present barriers to learners.

If centres wish to modify the model assignment we strongly advise that staff responsible for modifying the model assignment and the quality assurance of it refer to the publication *Fair access by design*.

If modifications are made to the model assignment, whether to just the scenario or to both the scenario and individual tasks, it is up to the centre to ensure that all learning outcomes can still be met and that learners can access the full range of marks.

6 Specific guidance on the task

Task 1

Learners will be required to use CAD software that has been specifically designed for circuit simulation, testing and PCB design. Examples of software include PCB Wizard, Livewire and Designspark. For the circuit given (555 timer in monostable mode) light level is detected by the LDR. When light falls to a given level, the 555 is triggered and the LED activated. The LED illumination time is determined by $T = R1 \times C1$ (seconds) – and the effect of altering these values might be also investigated. Screen shots should be taken to evidence each learner's use of the software. Learners should compare the final PCB layout with the circuit schematic diagram to ensure correct functionality.

Task 2

Learners will need to use their PCB layout design to construct a printed circuit board for the circuit. They will need to select an appropriate manufacturing method such as CNC engraving or photo-resist. Appropriate risk assessment and safe working procedures must be followed.

Learners will require access to circuit construction equipment and components in order to complete the task. Evidence of circuit construction detailing quality of joining methods must be provided in the portfolio by digital photographs, supported by signed witness statement. High quality refers only to fully operational circuits. Appropriate pre-testing of the constructed PCB should cover correct component placement, quality of construction, bridge tracks etc.

Task 3

Learners are required to use test equipment to prove the operation of their constructed circuit. All details of testing should be recorded including any details of modifications required in order to achieve a functioning circuit.

Evidence of circuit testing and evaluation will be provided in the portfolio supported by a signed witness statement.

Learners must provide evidence in the form of text, photographs or video and screenshots.

Total marks for assignment: 60

Witness Statement – Task 2

LEARNER NAME	
Date	
Unit	R114 – Simulate, construct and test electronic circuits
LO2	Be able to construct circuits

Independent working to manufacture, appropriate safety precautions and testing

Witness observations	
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Name of witness: _____

Relationship to learner: _____

Assessor comments: How the observations demonstrate achievement against the marking criteria

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RECORD OF QUESTIONS/ANSWERS (if applicable)

ASSESSOR QUESTION 1	
LEARNER RESPONSE 1	
ASSESSOR QUESTION 2	
LEARNER RESPONSE 2	
ASSESSOR QUESTION 3	
LEARNER RESPONSE 3	

ASSESSOR SIGNATURE:		DATE:	
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LEARNER SIGNATURE:		DATE:	
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Witness Statement – Task 3

LEARNER NAME	
Date	
Unit	R114 – Simulate, construct and test electronic circuits
LO3	Be able to test electronic circuits

Independent working to test, appropriate safety precautions and testing	
Witness observations	

Name of witness: _____

Relationship to learner: _____

Assessor comments: How the observations demonstrate achievement against the marking criteria

RECORD OF QUESTIONS/ANSWERS (if applicable)

ASSESSOR QUESTION 1	
LEARNER RESPONSE 1	
ASSESSOR QUESTION 2	
LEARNER RESPONSE 2	
ASSESSOR QUESTION 3	
LEARNER RESPONSE 3	

ASSESSOR SIGNATURE:		DATE:	
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LEARNER SIGNATURE:		DATE:	
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