

ENGINEERING PROGRAMMABLE SYSTEMS

Moderators' report

INCLUDED ON THE
KS4 PERFORMANCE TABLES

OCR Level 1/Level 2

Cambridge National in Engineering Programmable Systems

J824

For first teaching in 2022 | Version 1

R048-R049 Summer 2025 series

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Introduction

Our Moderators' reports are produced to offer constructive feedback on centres' assessment of moderated work, based on what has been observed by the moderation team. These reports include a general commentary of accuracy of internal assessment judgements, identify good practice in relation to evidence collation and presentation, and comment on the quality of centre assessment decisions against individual Learning Objectives. The report also highlights areas where requirements have been misinterpreted and provides guidance to centre assessors on requirements for accessing higher mark bands. Where appropriate, the report will also signpost other sources of information that centre assessors will find helpful.

OCR completes moderation of centre-assessed work in order to quality assure the internal assessment judgements made by assessors within a centre. Where OCR cannot confirm the centre's marks, we may adjust them in order to align them to the national standard. Any adjustments to centre marks are detailed on the Moderation Adjustments report, which can be downloaded from Interchange when results are issued. Centres should also refer to their individual centre report provided after moderation has been completed. In combination, these centre-specific documents and this overall report should help to support centres' internal assessment and moderation practice for future series.

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We have created online courses to build your confidence in delivering, marking and administering internal assessment for our qualifications. Courses are available for Cambridge Nationals, GCSE, A Level and Cambridge Technicals (2016).

Cambridge Nationals

All teachers delivering our Cambridge Nationals suite are asked to complete the Essentials for the NEA course, which describes how to guide and support your students. You'll receive a certificate which you should retain.

Following this you can also complete a subject-specific Focus on Internal Assessment course for your individual Cambridge Nationals qualification, covering marking and delivery.

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These self-paced online courses are intended for any teachers. During the course, you will engage with interactive content on subjects such as guidance on unit content, structure and administrative processes.

If you have any queries, please contact our Customer Support Centre on 01223 553998 or email support@ocr.org.uk.

General overview

Moderators need to receive candidate work from centres by the deadline. If samples are submitted late, it delays the moderation process and makes it harder to resolve any issues that arise.

Centres should carefully check which sample work is needed for moderation and make sure the correct candidates' samples are sent to the moderator.

Each candidate in the requested sample must have a completed Unit Recording Sheet (URS). Without a properly completed URS for each candidate, moderation cannot happen and will be delayed.

Centres are strongly encouraged to make sure all candidates are correctly identified on their paperwork with the correct candidate number. This also applies to the naming of electronic files, which should include the centre number, unit number and candidate number.

Clerical errors

Please carefully check the addition of marks on the URS and their transcription to Interchange. If they are incorrectly totalled or transcribed, we will need to reconfirm them with centres at moderation. This introduces delay to the moderation process.

A copy of the IMS1 mark sheet generated by Interchange is no longer required to be sent to your moderator and can be retained in centre.

Marker comments on the URS

Marker commentary on the URS, along with clear indication of how the mark given is derived, helps greatly with the moderation process. Page numbers of where evidence can be found in the candidate work is also extremely useful. Candidate work can also be directly annotated showing where each task and mark band is being addressed.

Centres are reminded that work cannot be double counted, and if used as evidence for one task should not be used for others. This is also the case for work that overlaps more than one task or Unit within the qualification. Work that is double counted might be discounted if found during moderation, thereby disadvantaging the candidate.

Internal standardisation

If more than one internal assessor is marking a cohort of work, it is crucial to standardise marking across those involved. Internal standardisation ensures that the marks presented are accurate and consistent, and that the rank order of marks is maintained. Rank order errors are often referred to the centre by the moderator and often require the centre to remark work, thereby delaying the moderation process.

Photographic evidence should be annotated by the candidate to explain what is being presented. It should also clearly identify the candidate, for example, using a card with their candidate number.

Authentication

It is essential that candidate work is authentic. This means that it is individual, and that sources of information are referenced. This is not only good practice but avoids the risk of penalties being applied. Moderators check for authenticity during moderation, referring any suspected cases to OCR for further investigation. This will delay moderation and may have serious consequences for the centre and candidate. Copies of Candidate and Unit Authentication Statements are required to be completed and should be kept in centre in case they are requested. They do not need to be sent to the moderator and do not form part of the moderation process.

Centres must use the Teacher Observation Records (TORs) included with the Set Assessments to support and corroborate candidate-generated evidence where independence is part of the marking criteria. Where a TOR is not included, and the task requires the corroboration of independence then this should be noted on the URS. This qualification does not use 'Witness Statements' which were included with the legacy qualification, and so these should not be used here.

Teacher Observation Records (TORs)

TORs are used to support and corroborate evidence produced by candidates and are useful where this evidence is difficult to show directly. Examples include working independently, working safely, and producing high quality finished items. They cannot be used as a direct source of evidence when the candidate is able to produce evidence themselves. Moderation will impose penalties where a TOR is used incorrectly. TORs should be individualised for each candidate, and not all be identical.

Full guidance on how to use the TOR correctly can be found alongside the supplied TOR within each Set Assessment brief, with further guidance on the OCR website.

Unit R048 General overview

Within this unit, candidates successfully demonstrated their use of software to create and simulate an electronic circuit, and to produce a PCB layout. However, the step-by-step evidence of safely making and populating the PCB was sometimes lacking, as was the evidence of testing and evaluation. For more details, please see the comments under each task below.

Comments by Task

Task 1 – Drawing and simulating electronic circuits

For Task 1 there was often good evidence of candidates being able to use software to create a circuit schematic diagram, and the circuit being simulated. In some cases, there was limited evidence of simulation, or of any circuit corrections based on the outcomes of testing as is required for this task. Simulation can involve using the virtual instrumentation within the software to record voltages or currents at points within the circuit. These can then be used later to compare against values measured physically. Testing refers to making adjustments to circuit parameters (e.g. simulated light level, values of variable resistors etc.), and observing that correct circuit operation is achieved. Actions or corrections should then be made as a result of virtual testing to make sure correct circuit operation.

The Task also requires candidates to demonstrate how they can use software to produce a PCB layout – which should include both track and component views. Annotated screenshots are an effective way to illustrate simulation and show PCB layout production. Please remember that both track and component side views are required. It is permitted to use auto-routing to help in the production of the PCB layout, however, higher achieving candidates often then manually adjusted their design to make it more logical and optimised.

Task 2 – Constructing electronic circuits

This task requires candidates to safely manufacture a blank PCB and to populate the PCB using suitable components. While it was often clear that candidates had done this, their submission often lacked evidence of safely manufacturing the PCB (e.g. by (photo) etching or engraving methods).

Candidates need to clearly show step-by-step evidence of making the blank PCB and then populating the PCB with components. Health and safety is an essential requirement of this task and could be addressed using risk assessments, and with the use of suitable PPE being shown in any photos. Candidates should show how they have planned for and worked safely in this task.

It is the intention of this task that candidates use the PCB they have produced themselves to populate and test and not be supplied with a pre-manufactured board for populating components to. There was evidence in isolated cases of candidates being supplied with a blank PCB by the centre. This is acceptable should the candidate fail to produce a PCB so that they can proceed with the assignment, although it should be clearly noted in the work presented.

Annotated photographs are an excellent way for candidates to show step-by-step evidence of circuit construction. This task relies both on direct evidence from the candidate, and additional supporting evidence of independent working using a TOR. Evidence of independent working can be corroborated using the TOR supplied with the Set Assignment brief.

Please try and avoid the over-use of stock photos that do not actually show the candidate undertaking the PCB making and construction activities. Where it is not acceptable to show the candidate's face in the images, a card with the candidate number in the image will suffice. Alternatively, you could show their hands undertaking the activity.

Assessment for learning



A blank TOR template along with full guidance on its use for Task 2 can be found in the Set Assessment brief.

It is important to remember that they cannot be used as a substitute for direct evidence that the candidate can produce. They should only be used to support and corroborate things like independent and safe working, or the quality of a finished product.

Task 3 - Testing electronic circuits

This task requires clearly presented evidence of testing, which should include both visual inspection and functional testing. Functional testing includes confirming correct operation of the circuit and taking of measurements using suitable instrumentation (e.g. multimeter, oscilloscope, logic probe).

In quite a few cases, there was limited evidence of functional testing and little or no measurements recorded.

To effectively produce evidence for this task, candidates should include annotated photos showing the testing process, such as a visual inspections of the circuit, followed by creating a table comparing actual readings with the expected values from the simulation in Task 1.

Candidates need to identify any faults in their own circuit. If there are no faults, teachers should provide circuits with known faults for candidates to practice identifying issues and complete this part of the task.

This is noted in the Assessment Guidance in the Specification which states:

'You should ensure that students have access to suitable test equipment to test the functionality of their completed circuit. Should their circuit function as expected i.e. 'work first time' then you should provide students with further circuits with known faults. This will enable students to identify these faults using common fault-finding techniques.'

Finally, an evaluation of the construction and operation of the circuit is required to secure marks in the higher mark bands. This part of the task was often overlooked or not attempted.

Assessment for learning



Candidates could be provided with a template on which to record expected test values, and on which to record and compare actual test readings for the circuit.

Assessment for learning



Task 3 provides an excellent opportunity to develop skills of evaluation by evaluating how well the circuit was constructed, and how well it operates.

Unit R049 General overview

In this unit, candidates often showed solid evidence of creating a block diagram for the system in the scenario, choosing a suitable programmable system with the necessary input and output devices, and programming the system. They used various methods to present simulations and also provided evidence of testing the system to make sure it worked correctly.

Comments by Task

Task 1 – Planning the development of programmable systems

In this task it was clear from the evidence presented that most candidates were able to draw a relevant and accurate block diagram of the proposed system. There was also evidence of being able to select appropriate hardware and software to develop the system with. Sometimes the block diagrams included input and output devices that were incorrect, or that were not required. Also, candidates sometimes went into unnecessary level of detail about the chosen programmable system hardware and software, or the input and output device selected.

What is required for this task is an accurate block diagram showing the layout of the programmable system, its associated programmable device/system and input and output devices. Candidates should then investigate suitable programmable systems, input and output devices for the system specification in the Set Assignment brief and make a justification for the hardware and software selected.

Task 2 – Develop programmable systems

For Task 2, most candidates were able to provide some evidence of different connection methods and showed how they proposed to connect input and output devices to their own system. Sometimes these were a little generic where candidates had described a range of connection techniques (e.g. crocodile clips, screw terminals, using a breadboard etc.), and it was unclear which method had been selected by the candidate and how this had been implemented.

How the system is connected up needs a little more detail and needs to be shown clearly (e.g. the method for connecting the input and output devices selected). This could be done with simple annotated photos showing the connection methods used.

There was evidence of screenshots showing program creation and simulation. One method used by candidates to show simulation was by highlighting program operation on a flow chart. An alternative method to show the simulation taking place is to use a short video showing the program sequencing through the flow chart. There was also evidence of how to download the program to the programmable device, which is an essential requirement of this task.

This task relies both on direct evidence from the candidate, and additional supporting evidence of independent working using a TOR. Evidence of independent working can be corroborated using the TOR supplied with the Set Assignment brief.

Please try and avoid the over-use of stock photos that do not actually show the candidate undertaking the system connection. Where it is not acceptable to show the candidate's face in the images, a card with the candidate number in the image will suffice. Alternatively, you could show their hands undertaking the activity.

OCR support



A blank TOR template along with full guidance on its use for Task 2 can be found in the Set Assessment brief.

It is important to remember that they cannot be used as a substitute for direct evidence that the candidate can produce. They should only be used to support and corroborate things like independent and safe working, or the quality of a finished product.

Task 3 – Test programmable systems

In this task, most candidates were able to show evidence of both visual and functional testing based on a performance against a test plan, as well as an evaluation of the system's operation. Short videos demonstrating the system's operation are an effective way to show functional testing. Remember, this task requires both visual and functional testing of the system, against a test plan created by the candidate. The results of the testing should be clearly recorded against the test plan.

Finally, candidates are required to evaluate the performance of their system based on the outcomes of testing and suggest improvements. These could be to the hardware, or the operation of the program itself. Most candidates were able to provide some evaluation of performance, albeit this was perhaps again the weakest part of the assignment. Note that it is not required for them to undertake these improvements to the system.

Assessment for learning



Candidates should use the test plan template provided with the Set Assignment, or one provided by the centre to specify the visual and functional tests to be undertaken and to record the outcomes of testing.

Assessment for learning



Task 3 provides an excellent opportunity to develop skills of evaluation by evaluating how well the programmable system operated, making suggestions for improvements.

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Why should you use our online courses?

With these online courses you will:

- learn about the key principles and processes of internal assessment and standardisation
- gain a deeper understanding of the marking criteria and how to apply them consistently and accurately
- see examples of student work with commentary and feedback from OCR moderators
- have the opportunity to practise marking and compare your judgements with those of OCR moderators
- receive instant feedback and guidance on your marking and standardisation skills
- be able to track your progress and achievements through the courses.

How can you access our online courses?

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If you already have a Teach Cambridge account, you'll find the link to the **Online courses** under the **Assessment** or **Training** tab – hover over **Assessment** or **Training** on the horizontal menu and select **Online courses** from the dropdown.

If you don't have a Teach Cambridge account yet, ask your exams officer to set you up – just send them this [link](#) and ask them to add you as a Teacher.

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