

Unit R114 – Simulate, construct and test electronic circuits

Using test equipment

Instructions and answers for teachers

These instructions should accompany the OCR resource ‘Using test equipment’ activity which supports OCR Cambridge Nationals in Engineering.

OCR Engineering Level 1/2 Cambridge Nationals

Unit R114 – Simulate, construct and test electronic circuits

Using test equipment

Task 1

Once an electronic circuit has been designed and built then it is normally tested. This will ensure that it has been constructed correctly, and is functioning as it should. If the circuit is not working as expected then fault finding techniques can be used to diagnose the problem.

In order to electrically test a circuit a range of test equipment is used. This will often include a power supply, multimeter, logic probe, signal generator and oscilloscope.

You task is to research, for each item of test equipment, how it is used in the testing of an electronic circuit and the functions it performs. For each item also consider how the equipment should be used safely to protect both the user and the circuit being tested. Complete the following table which shows typical pictures of each of these items of test equipment.

	Functions and features used when considered in testing	Safety issues to consider
 Power Supply		

The Activity:

This resource comprises of 1 task.



This activity offers an opportunity for maths skills development.

Associated materials:

‘Using test equipment’ activity sheet

Suggested timings:

Tasks 1: 1 hour

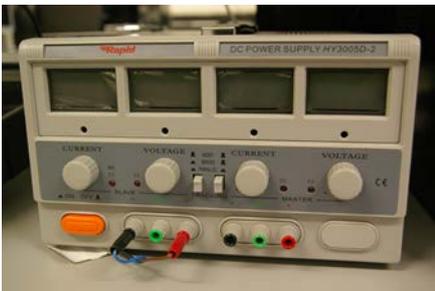
Task 1

For this activity learners have the opportunity to research a range of test equipment commonly used for testing electronic circuits. This includes a power supply, multimeter, logic probe, signal generator and oscilloscope. The teacher may wish to add or remove items from this list as appropriate.

Learners may use whatever means they wish to explore: the functions and features of these devices and, safety issues to consider for both the user and the circuit under test.

The activity may be undertaken individually, in pairs or as part of a group activity at the teacher's discretion. The teacher might also wish to demonstrate real equipment in operation if available.

It is anticipated that learners will, at some point, be given the opportunity to practice using real test equipment to check the operation of their own completed circuit and PCB, and the intention of this activity is as preparation.

	Functions and features used when considering testing:	Safety issues to consider:
 <p style="text-align: center;">Power Supply</p>	<ul style="list-style-type: none"> • Provides a variable d.c. voltage supply to power circuit being tested • Converts mains electricity to d.c. supply • Power supplies that provide an a.c. supply are also available • Some power supplies allow the output current to be limited for safety 	<ul style="list-style-type: none"> • Check that power supply has been PAT tested and visually is safe to use (ie case not broken, cable and plug not damaged) • Make sure that power supply is set to correct voltage to avoid damage to circuit • Make sure power supply can provide sufficient current for circuit • Make sure positive and negative are connected correct way round to circuit being tested

	Functions and features used when considering testing:	Safety issues to consider:
 <p style="text-align: center;">Multimeter</p>	<ul style="list-style-type: none"> • Measures resistance, voltage and current • Some multimeters also measure temperature and have a component tester (such as a diode tester) • Some require range to be selected and some are automatic 	<ul style="list-style-type: none"> • Check that multimeter and test leads are not damaged before use • Check that correct type of measurement has been selected • Be careful not to create a short circuit when connecting probes to circuit to take a measurement
 <p style="text-align: center;">Logic Probe</p>	<ul style="list-style-type: none"> • Used in digital circuits where there are 1 and 0 or high and low voltage conditions • Tests for 0 and 1 or high and low voltages • May have a buzzer to indicate a high or 1 condition 	<ul style="list-style-type: none"> • Might need to be powered – make sure power supply is connected correctly to the logic probe • Be careful not to create a short circuit when taking measurements with the logic probe
 <p style="text-align: center;">Signal or Function Generator</p>	<ul style="list-style-type: none"> • Generates a test signal to input into circuit being tested • Signal often a sine, square or triangular wave • Amplitude and frequency of signal generator output can be changed • Typical application could be to provide a test input to an amplifier 	<ul style="list-style-type: none"> • If mains powered, check that signal generator has been PAT tested and make visual checks (ie case not damaged, cable and plug not damaged) • Make sure that output of signal generator is connected to correct part of circuit • Make sure that output voltage is not set too high to avoid damage to circuit being tested

	Functions and features used when considering testing:	Safety issues to consider:
 <p>Oscilloscope</p>	<ul style="list-style-type: none"> • Measures and displays electrical waveforms • Can be used to display a.c. and d.c. waveforms • Has switches to adjust the size and position of the signal being displayed • Can measure amplitude and frequency of the waveform • Often two waveforms can be displayed at once • Typical application could be measuring input and output signals of an amplifier, or an a.c. supply 	<ul style="list-style-type: none"> • If mains powered, check that oscilloscope has been PAT tested and make visual checks (ie case not damaged, cable and plug not damaged) • Make sure input of oscilloscope is connected to correct part of circuit • Be careful not to create a short circuit when connecting probes to circuit being tested

To give us feedback on, or ideas about the OCR resources you have used, email resourcesfeedback@ocr.org.uk

OCR Resources: the small print

OCR's resources are provided to support the teaching of OCR specifications, but in no way constitute an endorsed teaching method that is required by the Board, and the decision to use them lies with the individual teacher. Whilst every effort is made to ensure the accuracy of the content, OCR cannot be held responsible for any errors or omissions within these resources.

© OCR 2014 - This resource may be freely copied and distributed, as long as the OCR logo and this message remain intact and OCR is acknowledged as the originator of this work.

OCR acknowledges the use of the following content: Maths and English icons: Air0ne/Shutterstock.com,