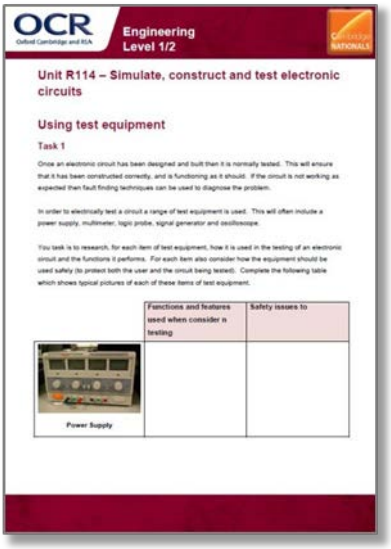
Unit R114 – Simulate, construct and test electronic circuits

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.*



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

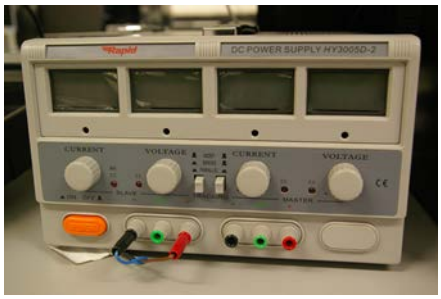
Task 1

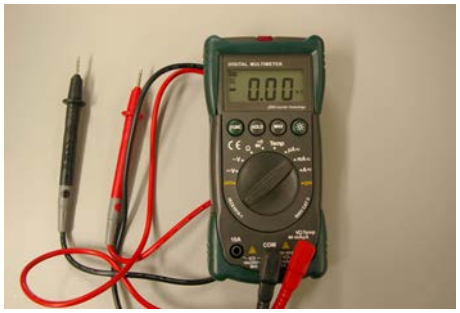
For this activity learners have the opportunity to research a range of test equipment commonly used for testing electronic circuits. This includes a power supply, multimeter, logic probe, signal generator and oscilloscope. The teacher may wish to add or remove items from this list as appropriate.

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:**
 **Power Supply**	• 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	• 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:
 **Multimeter**	• 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	• 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
 **Logic Probe**	• 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	• 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
 **Signal or Function Generator**	• 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	• 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:
 **Oscilloscope**	• 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	• 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