

Title	Demonstrate and apply knowledge of electronic test equipment		
Level	3	Credits	6

Purpose	<p>This unit standard covers the use of test equipment widely employed in the electronics industry and laboratories to measure electronic circuits.</p> <p>People credited with this unit standard are able to:</p> <ul style="list-style-type: none"> – demonstrate and apply knowledge of electrical measuring instruments; – demonstrate knowledge of measurement accuracy and calibration when testing electronic equipment; – demonstrate and apply knowledge of digital and analogue multimeters; – demonstrate and apply knowledge of a bench power supply; – demonstrate and apply knowledge of a function generator; – demonstrate and apply knowledge of an oscilloscope; and – demonstrate and apply knowledge of logic probes.
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Classification	Electronic Engineering > Core Electronics
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Available grade	Achieved
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Guidance Information

- 1 References
 - Electricity Act 1992;
 - Electricity (Safety) Regulations 2010;
 - Electrical Workers Registration Board (EWRB) Rules of the Board and Teaching Guidelines available at www.ewrb.govt.nz;
 - Health and Safety at Work Act 2015 and associated regulations; and all subsequent amendments and replacements.
- 2 Definitions
 - a.c.* – alternating current.
 - d.c.* – direct current.
 - FSD* – full scale deflection.
 - Industry practice* – those practices that competent practitioners within the Electronic Engineering industry recognise as current industry best practice.
 - RMS* – root mean square.
- 3 Range
 - a Electrical, radiation, and workshop or laboratory safety practices are to be observed at all times.

- b All measurements are to be expressed in Système Internationale (SI) units and multipliers.
- c All activities and evidence presented for all outcomes and performance criteria in this unit standard must be in accordance with:
 - i legislation;
 - ii policies and procedures;
 - iii ethical codes;
 - iv Standards – may include but are not limited to those listed in Schedule 2 of the Electricity (Safety) Regulations 2010;
 - v applicable site, company, and industry practice;
 - vi where appropriate, manufacturer instructions, specifications, and data sheets.

Outcomes and performance criteria

Outcome 1

Demonstrate and apply knowledge of electrical measuring instruments.

Range a.c. and d.c. voltage, a.c. and d.c. current, resistance, continuity, insulation resistance.

Performance criteria

1.1 Describe analogue and digital electrical measuring instruments in terms of their principles of operation and their applications.

Range instruments – multimeter, clip-on ammeter, insulation tester, d.c. ammeter, d.c. voltmeter, ohmmeter;
applications – a.c. and d.c. voltage and current, resistance, insulation, continuity, diode testing, use of series and parallel shunts, battery, potentiometer, other specialised functions.

1.2 Select instruments to match the type of measurement and inspect to ensure safety before testing.

1.3 Set and connect instruments in accordance with manufacturers' specifications and in a manner that causes no danger to persons, instruments, or the equipment under test.

1.4 Take and record measurements in accordance with safe industry practice to ensure that components under test and test equipment are not damaged and personnel are not injured.

1.5 Identify the approximate tolerance for each measurement.

Outcome 2

Demonstrate knowledge of measurement accuracy and calibration when testing electronic equipment.

Performance criteria

2.1 Explain sources of measurement error.

Range parallax, interpolation, analogue instrument accuracy as % of FSD, digital meter error as sum of % of reading plus digit error, meter loading of circuit measured, effect of waveform, calibration hierarchy, input levels.

2.2 Explain differences between instruments reading true RMS and a.c. rectified average with reference to measurements of sine and square waves.

2.3 Describe the principle and use of voltage probes in measurement of electronic circuits.

2.4 Identify sources for regular calibration of instruments.

Outcome 3

Demonstrate and apply knowledge of digital and analogue multimeters.

Range measurements of – a.c. and d.c. voltage and current, resistance.

Performance criteria

3.1 Explain measurement accuracy variance when using meters in high impedance low currents circuits.

3.2 Take a.c. and d.c. measurements and calculate and record percentage errors.

Range analogue error as a percentage of FSD; digital error as a percentage of reading plus digit error over a frequency range of d.c to 100kHz.

3.3 Explain safety classification rating of meters.

Outcome 4

Demonstrate and apply knowledge of a bench power supply.

Performance criteria

4.1 Explain the purpose of all controls and safety features.

4.2 Use power supply to energise electronic circuits to specified levels.

Outcome 5

Demonstrate and apply knowledge of a function generator.

Performance criteria

- 5.1 Explain the purpose of all controls and safety features.
- 5.2 Inject sine, square, and sawtooth signals at specified levels into electronic circuits in a manner that does not affect the circuit operation.

Outcome 6

Demonstrate and apply knowledge of an oscilloscope.

Range waveforms – sine, square, sawtooth, more complex with spikes;
measurements – wave shape, d.c. voltage, peak-to-peak voltage, spike voltage,
frequency, phase.

Performance criteria

- 6.1 Describe the principle of operation of a basic oscilloscope and its use for measurement purposes.
- 6.2 Describe limitations and safety precautions to be observed in the use of an oscilloscope.
- 6.3 Use internal calibration procedure to calibrate voltage and frequency in accordance with instrument manual.

Range calibration includes high impedance or high voltage probe.
- 6.4 Confirm suitability of oscilloscope for the type of measurement with reference to input voltage limitation, frequency, impedance, and earthing.
- 6.5 Check connection of oscilloscope to circuit does not affect circuit operation or measurement accuracy.
- 6.6 Adjust frequency and trigger points to produce steady display of waveforms.
- 6.7 Make and record measurements together with an indication of the expected degree of accuracy.

Outcome 7

Demonstrate and apply knowledge of logic probes.

Performance criteria

- 7.1 Describe the principles of operation of logic probes to display bus and logic gate states.
- 7.2 Examine logic states of bus and gates in accordance with instrument instructions.

Replacement information	This unit standard replaced unit standard 8199.
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Planned review date	31 December 2025
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Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	24 November 2003	31 December 2011
Rollover and Revision	2	22 August 2008	31 December 2012
Review	3	21 July 2011	31 December 2022
Review	4	24 June 2021	N/A

Consent and Moderation Requirements (CMR) reference	0003
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

Comments on this unit standard

Please contact The Skills Organisation reviewcomments@skills.org.nz if you wish to suggest changes to the content of this unit standard.