Title	**Demonstrate knowledge of specialist equipment used in electronic repairs**		
Level	**3**	**Credits**	**5**

Purpose	This unit standard is for electronics and service technicians, who have to test, diagnose, and handle electronic components and equipment, and select appropriate batteries and chargers. People credited with this unit standard are able to demonstrate knowledge of: – static electricity, and the damage it can do to semiconductors; – the techniques to minimise electrostatic discharge; – battery testing for electronic applications; – selection of batteries and appropriate chargers for given applications; – electrical measuring and test instruments; and – oscilloscope use and application.

Classification	Electronic Engineering > Core Electronics

Available grade	Achieved

Guidance Information

1 Reference
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 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.
PCB – printed circuit board.
Specialist equipment – may include but is not limited to – signal generator, function generator, oscilloscope, battery tester for batteries used in electronic equipment, electrostatic field tester, logic probe.

3 Range
- a Electrical, radiation, and workshop or laboratory safety practices must be observed at all times.
- b 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 knowledge of static electricity, and the damage it can do to semiconductors.

Performance criteria

1.1 Explain generation of a static charge in terms of separation of electrons.

1.2 Identify factors contributing to the generation of static electricity in the electronics workplace and outline means of prevention.

Range poor air conditioning, low humidity, choice of carpet, clothing, aerosol sprays, solder suckers, packaging materials.

1.3 Describe the type of damage to semiconductor devices.

Range effect – permanent damage, latent defects, intermittent faults.

1.4 Describe how a significant static electric charge may be present without the person being aware of it.

Outcome 2

Demonstrate knowledge of the techniques to minimise electrostatic discharge.

Performance criteria

2.1 Describe the failure of mechanisms that cause damage to semiconductors, and how such damage can be prevented.

Range prevention – reduce generation of electrostatics, discharge to earth.

2.2 Identify the basic requirements for handling, storage and transport of components and PCBs.

2.3 Explain how the selection of clothing, tools, personal grounding, furnishings, floor coverings, and use of antistatic sprays may be used to prevent or reduce electrostatic generation.

2.4 Describe when ionising air blowers should be used.

2.5 Describe the minimum requirements for a static safe workstation.

2.6 Describe precautions suitable for temporary work situations to prevent electrostatic discharge.

2.7 Describe the requirement to test wrist and ankle straps in accordance with manufacturer recommendations.

Outcome 3

Demonstrate knowledge of battery testing for electronic applications.

Performance criteria

3.1 Describe battery load and capacity testing procedures.

Range manufacturer guidelines, electrical safety practice.

3.2 Explain how testing would establish the state of battery charge.

Range evidence of three different types of batteries is required.

3.3 Explain how testing would identify faulty rechargeable batteries.

Range memory effect, high resistance cell, leaky cell.

Outcome 4

Demonstrate knowledge of selection of batteries and appropriate chargers for given applications.

Performance criteria

4.1 Select batteries for given electronic applications and give reasons for the selection.

Range typical application requirements may include but are not limited to – voltage, current, physical size, capacity, cost, absence of memory effect;
evidence of three applications using primary batteries, and two applications using secondary batteries is required.

4.2 Select battery chargers for given batteries.

Range battery charging requirements – voltage, current, charge time; evidence for two rechargeable batteries from a range of charger specifications is required.

Outcome 5

Demonstrate knowledge of electrical measuring and test instruments.

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

Performance criteria

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

Range instruments – multimeter, clamp meter, insulation tester, d.c. ammeter, d.c. voltmeter, ohmmeter;
applications may include but are not limited to – a.c. and d.c. voltage and current, resistance, insulation, continuity, diode testing, use of series and parallel shunts, battery, potentiometer, other specialised functions.

5.2 Select instruments to match given type of measurement and identify inspection requirements to ensure safety before testing.

5.3 Identify the factors affecting accuracy of electrical measuring instruments.

Range may include but is not limited to – parallax, range, non-standard wave shape, sample rate, digit resolution, tolerance, sensitivity, analogue error as a percentage of FSD, input impedance, burden, calibration hierarchy, input levels;
evidence of six is required.

5.4 Explain the difference between a true RMS instrument and an averaging instrument.

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

5.6 Describe the use of logic probes to display bus and logic gate states.

5.7 Explain safety classification rating of meters.

5.8 Identify the requirement for regular verification or calibration of instruments.

Range may include but is not limited to – verification methods, self-calibration against known instruments and/or standards, calibration by accredited organisations.

Outcome 6

Demonstrate knowledge of oscilloscope use and application.

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 the limitations and safety precautions to be observed in the use of an oscilloscope.

6.3 Confirm suitability, or otherwise, of an oscilloscope for the given measurements with reference to input voltage limitation, frequency, impedance and earthing.

6.4 Describe the use of the internal calibration procedure for voltage, frequency and high impedance or high voltage probe.

6.5 Describe triggering options and levels to ensure steady display of waveforms.

Planned review date	31 December 2025

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	14 December 2017	31 December 2022
Review	2	24 June 2021	N/A

Consent and Moderation Requirements (CMR) reference	0003

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.