

Title	Apply intermediate knowledge of electronic manufacturing		
Level	5	Credits	15

Purpose	<p>This unit standard covers the design and production process of electronic printed circuit board manufacturing processes and methods of testing for electronic products.</p> <p>People credited with this unit standard are able to:</p> <ul style="list-style-type: none"> –select circuit board, materials, and manufacturing technologies for a given electronic engineering application hardware solution; –produce circuit schematic diagrams and printed circuit board artwork for a given electronic engineering application; –assemble a printed circuit board based circuit; and –apply effective electronic product hardware testing and fault-finding techniques.
----------------	--

Classification	Electronic Engineering > Electronic Manufacturing
-----------------------	---

Available grade	Achieved
------------------------	----------

Guidance Information

- 1 This unit standard is intended for use in engineering courses at diploma level with assessment primarily against laboratory assignments.
- 2 This unit standard is one of two that cover knowledge of electronic manufacturing process engineering, the other being Unit 22733, *Demonstrate advanced knowledge of electronic manufacturing process engineering*, which builds on this unit standard. It is recommended that competency in this unit standard be achieved before assessment against unit standard 22733 is attempted.
- 3 Manufacturing plants in the candidate's local region should be used for site visits.
- 4 References
Health and Safety In Employment Act 1992;
Health and Safety in Employment Regulations 1995;
and all subsequent amendments and replacements.
- 5 Definitions
CAD – computer-aided design.
Industry practice – practice used and recommended by organisations involved in the electrotechnology industry.

Intermediate knowledge – means employing a broad knowledge base, with substantial depth in some areas of the subject matter, to analyse and interpret a wide range of information.

PCB – printed circuit board.

- 6 All measurements are to be expressed in Système International (SI) units, and, where required, converted from Imperial units into SI units.
- 7 All activities must comply with: any policies, procedures, and requirements of the organisations involved; the standards of relevant professional bodies; and any relevant legislative and/or regulatory requirements.
- 8 Range
 - a performance in relation to the outcomes of this unit standard must comply with the Health and Safety in Employment Act 1992;
 - b laboratory and workshop safety practices are to be observed at all times.

Outcomes and performance criteria

Outcome 1

Select circuit board, materials, and manufacturing technologies for a given electronic engineering application hardware solution.

Performance criteria

- 1.1 Suitable materials and method of manufacture for a given circuit are selected in accordance with a given specification.

Range may include but is not limited to – single, double and multi-layered PCBs; through-hole (leaded) and surface-mount components; manual and automated component placement and soldering.

Outcome 2

Produce circuit schematic diagrams and printed circuit board artwork for a given electronic engineering application.

Range may include but is not limited to – simple circuit, double-sided, earth plane, a simple micro with interface circuitry using surface-mount components.

Performance criteria

- 2.1 A schematic diagram and printed circuit board layout are prepared to given specifications using a CAD software package in accordance with industry practice.

Range evidence of two schematics and two artwork layouts is required.

Outcome 3

Assemble a printed circuit board based circuit.

Performance criteria

- 3.1 Component placement on a printed circuit board is performed in accordance with industry practice.

Range may include but is not limited to – component identification, lead forming, polarity, mix of leaded and surface-mount components.
- 3.2 Soldering techniques following safe industry practice are used to connect components.

Range may include but is not limited to – hand-soldering, automated soldering.
- 3.3 Operational tests conducted in accordance with industry practice confirm that product performs to specification.

Outcome 4

Apply electronic product hardware testing and fault-finding techniques.

Performance criteria

- 4.1 Systematic fault-finding techniques are demonstrated in accordance with industry practice.

Range hardware faults located in electronic circuits containing passive and active components.
Evidence of ten faults is required.
- 4.2 Common test equipment is used in accordance with manufacturer instructions ensure that components under test and test equipment are not damaged and personnel are not injured.

Range may include but is not limited to – multi-meter, oscilloscope, signal generator.

This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	18 December 2006	31 December 2021
Review	2	26 July 2018	31 December 2021

Consent and Moderation Requirements (CMR) reference	0003
--	------

This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.