

<b>1 Module Details</b>	
<b>Module Name</b>	Printed Wiring Board Repair
<b>Nominal duration</b>	It is expected that students with the appropriate entry knowledge and skills will successfully complete this module in 18 –20 hours
<b>Module code</b>	NUE129
<b>Discipline code</b>	0703230
<b>2 Module purpose</b>	This module will provide students with the knowledge and skills to perform pad and track repairs to single and double sided printed circuit board assemblies.
<b>3 Prerequisites</b>	NUE128 Through Hole Soldering
<b>4 Relationship to competency standards</b>	This module provides some of the knowledge and skills underpinning competency in the following standards: National Electrotechnology Industry Standards, Units NES201, NES202, NES401, NES111
<b>5 Content</b>	<ol style="list-style-type: none"> <li>1. Printed wiring board substrate repair. <ul style="list-style-type: none"> <li>• Substrate Repair</li> <li>• Substrate Blister and Delamination Repair</li> <li>• PWB Warpage</li> </ul> </li> <li>2. Repair of PWB conductor patterns <ul style="list-style-type: none"> <li>• Pad repair</li> <li>• Pad replacement</li> <li>• Track repair</li> <li>• Track alteration</li> <li>• Track replacement</li> </ul> </li> <li>3. Conformal coatings <ul style="list-style-type: none"> <li>• Types</li> <li>• Removal and replacement</li> </ul> </li> </ol>
<b>6 Assessment strategy</b>	
<b>Assessment methods</b>	Assessment should be progressive reflecting a holistic approach to ensure the module purpose is met. In general, to assist in ensuring validity, reliability and fairness assessment instruments should include practical exercises, assignments and written tests consisting of a number of item types, such as multiple choice, short answer and problem solving. The assessment should focus on the practical skills emphasised in the module.
<b>Conditions of assessment</b>	Learning and assessment may take place in either a classroom/laboratory or an industrial workshop environment

## 7 Learning Outcome Details

### Learning Outcome 1

Repair a range of PWB substrates

#### Assessment criteria

List the typical methods used to repair PWB substrates.

1.2 Repair a PWB damaged with a substrate blister using:-

- Injection method
- Excavation method
- Complete replacement of Base Material Method.
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1.3 Repair a PWB with substrate edge delamination using the injection method.

1.4 Repair small cracks in a PWB.

1.5 Repair a warped PWB

### Learning Outcome 2

Repair a range of conductor patterns on a PWB

#### Assessment criteria

2.1 Repair a PWB with a partially lifted tracks using:

- adhesive under the track
- adhesive film under the track
- adhesive over the track

2.2 Repair partially lifted pads

2.3 Repair fully lifted and broken track using:-

- foil
- surface jumper wire
- through hole (in line) surface jumper wire
- through hole (offset) surface jumper wire
- surface to lead tinned copper wire

2.4 Repair fully lifted pad with broken track using:

- replacement track method
- surface jumper wire pad repair.

2.5 Repair of scratches and pin holes using:

- reflow soldering.
- selective plating.
- Lap soldering.

2.6 Repair edge connector damage

2.7. interfacial clinched jumper wire

- Fused eyelet (machine)
- Funnel-flange eyelet (hand)
- copperset through-hole plating system (CSS001)

2.8 Repair a PTH with a fully lifted pad and broken track.

### Learning Outcome 3

Identify, remove and replace a range of conformal coatings on a PWB.

<b>Assessment criteria</b>	<p>3.1 List the typical conformal coatings used on PWB's and state their relevant advantages and disadvantages.</p> <p>3.2 List commonly used methods to remove PWB conformal coatings.</p> <p>3.3 Demonstrate the correct method(s) used to remove typical conformal coatings on PWB.</p> <p>3.4 Demonstrate the correct method(s) used to re-coat PWBs with typical conformal coatings.</p>
<b>8 Delivery of the module</b>	<p><b>Delivery strategy</b></p> <p>Delivery strategies must be suitable for learning both theoretical and practical aspects described in the module purpose. It is considered that the most effective way to achieve this is by the integration of theory and practice where students learn by experimentation and through research and laboratory reports. It is recommended that learning and assessment be facilitated in a holistic manner, which may require a learning outcome sequence other than that indicated in the module.</p> <p>This module is designed to be taught in either a classroom, workshop or on industrial premises</p> <p>It is important that occupational health and safety issues, static discharge avoidance and workplace cleanliness are reinforced throughout the delivery of this module.</p>
<b>Resource requirements</b>	<p>Resources should be sufficient for students to carry out Practical exercises on an individual basis. This will require:</p> <ul style="list-style-type: none"> <li>Variable temperature, electronically controlled soldering stations.</li> <li>Vacuum type desoldering stations.</li> <li>Soldering tweezers</li> <li>Hot air/gas SMT rework stations.</li> <li>Paste dispensing stations.</li> <li>Visual inspection stations with times 10 and times 20 magnification.</li> <li>A range of examples of conformal coating and equipment suitable for their application</li> </ul> <p>Useful references include</p> <ul style="list-style-type: none"> <li>US National Standards: ANSI/J-STD-001: Requirements for Soldered Electrical and Electronic Assemblies.</li> <li>IPC-A-610: Acceptability of Electronic Assemblies.</li> <li>IPC 7711: Rework of Electronic Assemblies.</li> <li>US Dept of Defence: MIL-STD-2000: Standard Requirements</li> </ul>

for Soldered Electrical & Electronic Assemblies – cancelled 1995 but useful as a reference.

NEEITC, Electronic Soldering Techniques, Ambassador Press 1991.

IEC 61340-5-1: ELECTROSTATICICS – Part 5 Specification for the protection of electronic devices from electrostatic phenomena Section 1: General Requirements.

IEC 61340-5-2: ELECTROSTATICICS – Part 5 Specification for the protection of electronic devices from electrostatic phenomena – Section 2: User Guide.

IPC-HDBK-001. Handbook and Guide to requirements for Soldered Electrical and Electronic Assemblies.

**Occupational health and safety requirements**

A safe and healthy environment will be provided for students and teachers as well as safety procedures followed with regard to teaching/learning activities. In addition the following should be considered.

1. Fume extraction.
2. Storage and use of chemicals.
3. Use of equipment and components at elevated temperatures.
4. Eye protection from lead and wire offcuts.