



Australian Government

MEA263B Modify/repair aircraft component multi-layer printed circuit boards

Revision Number: 2

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Modification History

Minor formatting and editorial changes made. Missing knowledge requirements reinstated.

Unit Descriptor

This unit of competency is part of the Avionic Certificate IV training pathways. It covers the competencies required to modify or repair multi-layer printed circuit boards. The unit is used in workplaces that operate under the airworthiness regulatory systems of the ADF and CASA.

Application of the Unit

This unit requires application of hand skills (including those required to gain access to inner layers and repair outer layers after track repair), including high reliability hand soldering and knowledge of standard practices and techniques in the repair of multi-layer printed circuit boards.

Applications include circuit boards from aircraft avionic components that are repaired in aviation workshops.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

MEA260B	Use electrical test equipment
MEA261C	Use electronic test equipment

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.
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Elements and Performance Criteria

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| 1. Inspect multi-layer printed circuit cards and associated components | 1.1.Relevant maintenance documentation, including component defect reports where applicable, is interpreted and matched by part and serial number
1.2.Preparation of work area and circuit card assemblies is appropriate to allow for effective detailed inspection of all substrate, circuit tracks, edge connectors and attached components , taking into account any static discharge procedures
1.3.Circuit card assemblies are visually or physically inspected for physical integrity of substrate, circuit tracks, edge connectors and attached components
1.4.Modification status is established to assist in determining repair requirements
1.5.Defects are correctly identified and reported |
| 2. Test multi-layer printed circuit cards and associated components | 2.1.Circuit card assemblies are correctly prepared and connected to the appropriate test facility in accordance with approved procedures, or circuit card assemblies are correctly prepared and connected in situ to allow required test procedures to be performed
2.2.Circuit card assemblies are functionally tested in accordance with normal trade practice and approved maintenance documentation for evidence of serviceability or malfunction
2.3.Circuit card assemblies, attached hardware and electronic components are electronically and/or physically adjusted/aligned in accordance with maintenance manuals or other prescribed procedures |
| 3. Troubleshoot multi-layer printed circuit cards and associated components | 3.1.Maintenance documentation, physical inspection and test results are used, where applicable, to assist in fault determination
3.2.Maintenance manual fault diagnosis guides, logical processes and test equipment are used appropriately to ensure efficient and accurate troubleshooting
3.3.Component faults are located and the causes of the faults are clearly identified and recorded in maintenance documentation, where required
3.4.Rectification requirements are determined |
| 4. Dismantle multi-layer printed circuit cards and associated components | 4.1.Conformal/protective coatings are removed from the circuit card assembly to the extent required to effect necessary repairs and in accordance with maintenance manuals, industry or enterprise standards as applicable
4.2.Appropriate OHS precautions are observed at all times during maintenance procedure |

- 4.3.Circuit card assembly is dismantled to the extent necessary to allow repair of all identified faults
 - 4.4.Parts for processing are correctly tagged and despatched
 - 4.5.Parts for retention and re-fitment are correctly packaged and stored in accordance with approved procedures to avoid physical and electrostatic damage
 - 4.6.Parts for disposal are correctly packaged and processed to accord with statutory requirements pertaining to dangerous goods
5. Assemble multi-layer printed circuit cards and associated components
- 5.1.Parts removed for access, and replacement parts, are collected ensuring appropriate modification status, component tolerances and assembly configuration is maintained
 - 5.2.Any conformal/protective coatings removed are replaced to the approved standard of the equipment manufacturer, or industry standard, as appropriate
 - 5.3.Rework techniques are in accordance with industry approval procedures and relevant OHS requirements are observed
 - 5.4.Printed circuit card and associated components are assembled in accordance with maintenance manuals, and all electrical joints meet the approved standard of the equipment manufacturer, or industry standard, as appropriate
 - 5.5.Circuit substrate material, circuit tracks, edge connectors and through-hole eyelets are reworked, as necessary, to restore printed circuit card to a serviceable condition

Required Skills and Knowledge

Required skills

Look for evidence that confirms skills in:

- applying relevant OHS practices
- using approved repair procedures and processes relating to multi-layer circuit cards
- recognising unacceptable soldered connections, damage circuit card components, circuit tracks integrity, substrate damage and edge connector condition
- applying static-safe work area practices
- reworking unacceptable PCB soldered connections, via acceptable de-soldering and soldering techniques
- disassembling and assembling PCB cards to approved industry standards and prescribed specifications
- performing PCB tests using relevant test equipment and processes to isolate PCB track faults and assess serviceability state post repair
- correctly disassembling, preparing repair area, reworking the card to industry standards, replacing faulted components and assembling card for post-repair inspection and testing

Required knowledge

Look for evidence that confirms knowledge of:

- component operation
- basic principles/functions relating to electrical and electronic components on PCBs
- substrate materials
- types of conformal coating
- types of soldering equipment and solders used in track repair and component assembly
- de-soldering techniques
- optical equipment and tools used in multi-layer PCB repair
- how to obtain MSDS
- OHS procedures
- relevant maintenance manuals
- relevant regulatory requirements and standard procedures

Evidence Guide

The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment

A person who demonstrates competency in this unit must be able to repair multi-layer circuit boards in accordance with procedures and standards while applying all relevant safety precautions.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

It is essential that substrate abrasion and rebuilding techniques, and precautions associated with handling and assembly of electrostatic and temperature sensitive devices are fully observed, understood and complied with. A high level of awareness of safety precautions associated with beryllium materials and use of fluxes and solvents is to be demonstrated.

Evidence of transferability of skills and knowledge related to single layer printed circuit card assembly and repair is essential before undertaking any action. This may be demonstrated through application of the techniques involved across a representative range of circuit card substrate materials and attached components. The work plan should take account of applicable safety and quality requirements in accordance with the industry and regulatory standards. Use of high precision, high reliability soldering techniques and handling of components, including application of anti-static equipment, must be demonstrated.

A person cannot be assessed as competent until it can be demonstrated to the satisfaction of the workplace assessor that the relevant elements of the unit of competency are being achieved under routine supervision on a representative range of cards with various substrate materials and components. This shall be established via the records in the Log of Industrial Experience and Achievement or, where appropriate, an equivalent Industry Evidence Guide.

Context of and specific resources for assessment

Competency should be assessed in the work environment or simulated work environment, using tools and equipment specified in maintenance manuals. It is also expected that general and special purpose test equipment found in most routine situations would be used where appropriate.

Method of assessment	
Guidance information for assessment	

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Circuit card components	Attached components include: capacitors, resistors, wires, semiconductors, inductors, transformers, switches, connectors, multi-pin ICs, terminal posts and heat-sink materials and will include electrostatic sensitive devices
Application	Application of this unit may relate to: - scheduled or unscheduled maintenance activities - individual or team-related activities - multi-layer printed circuit card assemblies with substrates made from fibreglass, phenolic, composite fibre and epoxy resins and coatings that are from a wide range of aircraft systems
Procedures and standards	Procedures and standards for repair of printed circuit card assemblies include: - a range of general engineering hand skills in addition to specific high reliability soldering skills and hand skills relating to gaining access to inner layers and progressive rebuilding of outer layers after track repair - standards applicable in a given situation will be defined by equipment manufacturers and/or regulatory authorities and the enterprise

Unit Sector(s)

Aviation maintenance

Competency field

Co-requisite units

Not applicable