



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **ICTOPN5121A Test and commission a dense wavelength division multiplexing transmission system**

**Release: 1**

## ICTOPN5121A Test and commission a dense wavelength division multiplexing transmission system

### Modification History

Not Applicable

### Unit Descriptor

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| <b>Unit descriptor</b> | <p>This unit describes the performance outcomes, skills and knowledge required to test and commission optical transmission systems using dense wavelength division multiplexing (DWDM) technology.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit at the time of endorsement but users should confirm requirements with the relevant federal, state or territory authority.</p> |
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### Application of the Unit

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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| <b>Application of the unit</b> | <p>Technical staff working with telecommunications carriers, service providers, public utilities and broadcasting companies apply the skills and knowledge in this unit. They combine technical optical communications skills with broader organisational and administrative skills to test and commission DWDM systems in a range of commercial contexts and environments.</p> <p>This unit applies to high capacity telecommunications transmission undertaken by carriers and utility companies for long haul communications as well as metropolitan area networks.</p> |
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### Licensing/Regulatory Information

Refer to Unit Descriptor

## Pre-Requisites

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| <b>Prerequisite units</b> |  |  |
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## Employability Skills Information

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| <b>Employability skills</b> | This unit contains employability skills. |
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## Elements and Performance Criteria Pre-Content

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| 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

| ELEMENT                                           | PERFORMANCE CRITERIA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Prepare to commission DWDM transmission system | 1.1. Implement hazard risk control measures<br>1.2. Review system specifications and technical data by identifying system operating parameters<br>1.3. Obtain and check tools and test equipment needed for the work<br>1.4. Verify all necessary equipment is installed, and circuit cards and filler cards are correctly located and seated<br>1.5. Check that interconnecting fibres to optical multiplexers and shelves are intact and correctly routed<br>1.6. Establish communication between computer and <b>DWDM shelf</b><br>1.7. Upload latest software release to each DWDM shelf in the network                                                                                                              |
| 2. Commission DWDM transmission system            | 2.1. Connect an <b>optical test set</b> and a physical <b>optical loopback</b> to the system, and select <b>protocol</b> compatible with the DWDM hardware<br>2.2. Check the status of the connection and that test set data is passing correctly<br>2.3. Monitor quality of received signal by setting <b>performance monitoring (PM) features</b> and retrieve PM counts<br>2.4. Verify that no errors are counted by the test set during a <b>long term stability test</b> while customer input signal is set to the worst case (minimum) power level<br>2.5. Verify that no alarms are generated during the long term stability test period<br>2.6. Dispose of antistatic packaging to minimise environmental impact |
| 3. Complete test and commissioning documentation  | 3.1. Finalise documentation on commissioning test results<br>3.2. Present results to <b>appropriate person</b> according to established procedures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

## **REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit.

### **Required skills**

- communication skills to:
  - liaise with internal and external personnel on technical and operational matters
  - relate to work associates, supervisors, team members and clients
- literacy skills to:
  - interpret technical documentation, such as equipment manuals, specifications and service orders
  - write reports using standard formats
- numeracy skills to interpret results and evaluate different types of technical data
- planning and organisational skills to plan, prioritise and monitor own work and that of others
- problem solving and contingency management skills to:
  - adapt testing procedures to requirements of particular situations
  - modify activities depending on operational contingencies, risk situations and environments
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities especially when dealing with infra-red laser light
  - select and use required personal protective equipment conforming to industry and occupational health and safety (OHS) standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - backup and restore
  - clean optical fibre connector
  - examine optical fibre connector for contamination and assess whether cleaning is required
  - install software
  - measure optical power using handheld optical power meter
  - measurement of DC and AC voltages
  - select and use appropriate test equipment
  - setup internet protocol (IP) addresses and subnet masks

### **Required knowledge**

- alarms
- DWDM principles of operation
- electrostatic discharge precaution

## **REQUIRED SKILLS AND KNOWLEDGE**

- features and operating requirements of test equipment including:
  - hand-held optical power meter
  - transmission test set
  - optical spectrum analyser
- functions of optical add drop multiplexer
- IP addressing, subnet mask, dynamic host configuration protocol (DHCP) and default gateway
- International Telecommunications Union (ITU) wavelength grid for DWDM
- optical fibre connector types and characteristics
- optical fibre types and characteristics
- path protection and protection switching
- physical optical loopbacks and software loopbacks
- protocols used on optical DWDM systems
- ring topologies and linear network topologies
- specific OHS requirements that impact on the safe inspection of optical connectors and the safe measurement of optical power from laser transmission systems

## Evidence Guide

| <b>EVIDENCE GUIDE</b>                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| 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. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Overview of assessment</b>                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Critical aspects for assessment and evidence required to demonstrate competency in this unit</b>                                                                                                                    | <p>Evidence of the ability to:</p> <ul style="list-style-type: none"> <li>• plan and coordinate commissioning</li> <li>• test and commission DWDM transmission system</li> <li>• complete test and commissioning documentation</li> <li>• comply with all related OHS requirements and work practices.</li> </ul>                                                                                                                                                                                                                                                                                 |
| <b>Context of and specific resources for assessment</b>                                                                                                                                                                | <p>Assessment must ensure:</p> <ul style="list-style-type: none"> <li>• access to sites on which testing and commissioning a DWDM transmission system may be conducted</li> <li>• use of test equipment currently used in industry</li> <li>• manufacturer's technical documentation.</li> </ul>                                                                                                                                                                                                                                                                                                  |
| <b>Method of assessment</b>                                                                                                                                                                                            | <p>A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:</p> <ul style="list-style-type: none"> <li>• direct observation of the candidate performing test and commissioning</li> <li>• review of test and commissioning documentation completed by the candidate</li> <li>• oral or written questioning to assess knowledge of test and commissioning procedures.</li> </ul>                                                                                                                               |
| <b>Guidance information for assessment</b>                                                                                                                                                                             | <p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example:</p> <ul style="list-style-type: none"> <li>• ICTOPN5118A Plan and configure dense wavelength division multiplexing systems</li> <li>• ICTOPN5119A Perform acceptance and commissioning test on optical network</li> <li>• ICTOPN5120A Plan for an optical system upgrade and cut over</li> <li>• ICTOPN5122A Test the performance of specialised optical devices</li> <li>• ICTOPN5123A Analyse and integrate specialised optical devices in the network.</li> </ul> |

## EVIDENCE GUIDE

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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|  | <p>Aboriginal people and other people from a non-English speaking background may have second language issues.</p> <p>Access must be provided to appropriate learning and assessment support when required.</p> <p>Assessment processes and techniques must be culturally appropriate, and appropriate to the oral communication skill level, and language and literacy capacity of the candidate and the work being performed.</p> <p>In all cases where practical assessment is used it will be combined with targeted questioning to assess required knowledge. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.</p> <p>Where applicable, physical resources should include equipment modified for people with special needs.</p> |
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## Range Statement

### 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.

|                                             |                                                                                                                                                                                                                                                                                              |
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| <b><i>DWDM shelf</i></b> maybe part of:     | <ul style="list-style-type: none"> <li>• long haul system</li> <li>• metropolitan area (metro) system.</li> </ul>                                                                                                                                                                            |
| <b><i>Optical test set</i></b> may include: | <ul style="list-style-type: none"> <li>• Acterna/JDSU ANT-20 advanced network tester</li> <li>• synchronous digital hierarchy (SDH)/synchronous optical network (SONET) analyser</li> <li>• SDH/SONET STM-1/4/16 or OC-3/12/48 transmission test set - bit error rate test (BERT)</li> </ul> |

| <b>RANGE STATEMENT</b>                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>Optical loopback</i></b> may include:                | <ul style="list-style-type: none"> <li>• fibre optic patchcord connecting transmit and receive ports via inline variable optical attenuator (VOA)</li> <li>• short fibre optic patchcord connecting transmit and receive ports with fixed attenuator at receive port input if required.</li> </ul>                                                                                                                                                                                                                                                                                                     |
| <b><i>Protocol</i></b> may include:                        | <ul style="list-style-type: none"> <li>• D1 video 270 Mbps</li> <li>• ESCON 200 Mbps.</li> <li>• fast Ethernet</li> <li>• fibre channel</li> <li>• gigabit Ethernet</li> <li>• SDH: <ul style="list-style-type: none"> <li>• STM-1</li> <li>• STM-4</li> <li>• STM-16</li> <li>• STM-64</li> </ul> </li> <li>• SONET: <ul style="list-style-type: none"> <li>• OC-3</li> <li>• OC-12</li> <li>• OC-48</li> <li>• OC-192.</li> </ul> </li> </ul>                                                                                                                                                        |
| <b><i>Performance monitoring features</i></b> may include: | <ul style="list-style-type: none"> <li>• equipment performance monitoring: <ul style="list-style-type: none"> <li>• threshold crossing alerts</li> </ul> </li> <li>• SDH: <ul style="list-style-type: none"> <li>• errored bytes (EB)</li> <li>• errored seconds (ES)</li> <li>• severely errored seconds (SES)</li> <li>• out-of-frame seconds (OFS)</li> </ul> </li> <li>• SONET: <ul style="list-style-type: none"> <li>• coding violation (CV)</li> <li>• errored seconds (ES)</li> <li>• severely errored seconds (SES)</li> <li>• severely errored framed seconds (SEFS).</li> </ul> </li> </ul> |
| <b><i>Long term stability test</i></b> may refer to:       | <ul style="list-style-type: none"> <li>• 24 hour period</li> <li>• 48 hour period</li> <li>• 72 hour period.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b><i>Appropriate person</i></b> may include:              | <ul style="list-style-type: none"> <li>• customer</li> <li>• network administrator</li> <li>• network planner</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

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| <b>RANGE STATEMENT</b> |                                                                                         |
|                        | <ul style="list-style-type: none"><li>• project manager</li><li>• supervisor.</li></ul> |



## Unit Sector(s)

|                    |                    |
|--------------------|--------------------|
| <b>Unit sector</b> | Telecommunications |
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## Co-requisite units

| Co-requisite units |  |  |
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|                    |  |  |

## Competency field

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| <b>Competency field</b> | Optical networks |
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