



**Australian Government**

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

# **ICTOPN5119A Perform acceptance and commissioning tests on optical network**

**Release: 1**

## **ICTOPN5119A Perform acceptance and commissioning tests on optical network**

### **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 conduct acceptance tests and commissioning tests on optical networks, including the optical portion of broadband hybrid fibre coaxial (HFC) networks, fibre to the x (FTTx) passive optical networks (PONs) and metropolitan and long haul dense wavelength division multiplexing (DWDM) networks.</p> <p>It ensures readiness of the new system through the application of appropriate inspections and tests to confirm compliance and specified performance.</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>Technicians who install and maintain optical network equipment in access networks apply the skills and knowledge in this unit to provide services in Next Generation Networks (NGN) using emerging technologies.</p> <p>This unit applies to experienced field officers, technicians or technical supervisors working for telecommunications carriers, contractors or other service providers.</p> <p>NGN services include internet protocol TV (IPTV), video on demand (VoD), interactive TV, mesh networks and cloud computing.</p> |
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## Licensing/Regulatory Information

Refer to Unit Descriptor

## Pre-Requisites

|                           |  |  |
|---------------------------|--|--|
| <b>Prerequisite units</b> |  |  |
|                           |  |  |
|                           |  |  |

## 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 conduct acceptance tests | 1.1. Obtain <b>installation and commissioning documents</b> and planning specifications from <b>appropriate personnel</b> to ensure the installed <b>optical network</b> is as planned and specified<br>1.2. Conduct visual inspection of new installation and verify compliance of the system against <b>relevant legislation, codes, regulations and standards</b> and accepted industry practice<br>1.3. Select and obtain required <b>test equipment</b> for suitability of acceptance testing<br>1.4. Prepare acceptance schedule and <b>test criteria</b> in consultation with appropriate personnel |
| 2. Conduct acceptance testing          | 2.1. Conduct and evaluate <b>performance tests</b> to ensure measurements meet with predetermined specifications and approved operating margins<br>2.2. Verify performance levels to be within tolerance specifications set in manufacturer's instructions<br>2.3. Test <b>protection mechanisms</b> to ensure performance criteria meets the specified standard<br>2.4. Test <b>alarms</b> for satisfactory operation and refer identified problems to appropriate personnel for remedial action<br>2.5. Record all acceptance test procedures and results                                                |
| 3. Complete administrative tasks       | 3.1. Complete acceptance documentation including recommendations<br>3.2. Notify appropriate personnel and obtain sign off                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

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

#### Required skills

- analytical skills to interpret test equipment settings and readings
- communication skills to:
  - liaise with customers and technical staff to ensure requirements are known and can be met within timeframes
  - prepare reports and technical documentation
- literacy skills to interpret technical specifications, standards documents and related

**REQUIRED SKILLS AND KNOWLEDGE**

documentation

- numeracy skills to make calculations and necessary calibration changes
- planning and organisation skills to develop activity plans to undertake inspections and tests in efficient manner
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to correctly handle, connect and calibrate test equipment

**Required knowledge**

- cabling, terminations and supporting structures that may be encountered in the system under inspection
- common performance levels and standards
- electrical and optical properties to be measured
- occupational health and safety (OHS) issues appropriate to the environment under inspection
- overview of typical network topologies, switching, routing and transmission techniques
- transmission type and signals that may be encountered
- various test equipment types suitable for tests to be made

## Evidence Guide

### 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

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

Evidence of the ability to:

- verify 'as built' installation against installation plans
- undertake acceptance and commissioning tests and analysis against specified performance criteria
- complete report, including acceptance test procedures, results and recommendations
- comply with all related OHS requirements and work practices.

#### Context of and specific resources for assessment

Assessment must ensure:

- sites on which acceptance tests may be conducted
- use of testing equipment currently used in industry
- relevant regulatory and equipment documentation.

#### Method of assessment

A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:

- direct observation of the candidate undertaking acceptance tests
- oral or written questioning to assess knowledge of tests and inspections types of systems and applications
- review of completed acceptance documentation for systems and equipment prepared by the candidate, including recommendations.

#### Guidance information for assessment

Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended, for example:

- ICTTEN5059A Commission telecommunications network equipment
- ICTTEN5092A Undertake outage management.

Aboriginal people and other people from a non-English speaking background may have second language issues.

**EVIDENCE GUIDE**

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <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.

|                                                                     |                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>Installation and commissioning documents</i></b> may include: | <ul style="list-style-type: none"> <li>• agreed modifications to original design plan</li> <li>• commissioning test results</li> <li>• preliminary test results</li> <li>• recommendations from commissioning procedures.</li> </ul>          |
| <b><i>Appropriate personnel</i></b> may include:                    | <ul style="list-style-type: none"> <li>• network manager</li> <li>• planning manager</li> <li>• project manager.</li> </ul>                                                                                                                   |
| <b><i>Optical network</i></b> may include:                          | <ul style="list-style-type: none"> <li>• 10 Gbps ethernet local area network (LAN) services over the emerging global standard called optical transport network (OTN)</li> <li>• DWDM long haul system</li> <li>• DWDM metro system</li> </ul> |

**RANGE STATEMENT**

- |  |                                                                                                              |
|--|--------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"><li>• gigabit Ethernet</li><li>• optical portion of HFC network.</li></ul> |
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| <b>RANGE STATEMENT</b>                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>Relevant legislation, codes, regulations and standards</i></b> include: | <ul style="list-style-type: none"> <li>• Australian Communications Industry Forum (ACIF) standards and codes</li> <li>• Australian Communications and Media Authority (ACMA) technical standards</li> <li>• International Standards ISO 9000 and 9001</li> <li>• ITU Standards</li> <li>• OHS</li> <li>• Privacy Act</li> <li>• private property law.</li> </ul>                                                                                                                                                                                 |
| <b><i>Test equipment</i></b> may include:                                     | <ul style="list-style-type: none"> <li>• advanced network tester - synchronous optical network (SONET)/synchronous digital hierarchy(SDH)</li> <li>• optical power meters</li> <li>• optical return loss test set</li> <li>• optical spectrum analyser</li> <li>• optical time domain reflectometer (OTDR)</li> <li>• protocol analyser.</li> </ul>                                                                                                                                                                                              |
| <b><i>Test criteria</i></b> may include:                                      | <ul style="list-style-type: none"> <li>• 24 - 72 hours test duration</li> <li>• live traffic tests</li> <li>• test environment</li> <li>• test margins and errors</li> <li>• testing at highest data rate: <ul style="list-style-type: none"> <li>• 10 Gbps</li> <li>• 40 Gbps</li> <li>• 100 GBps</li> </ul> </li> <li>• topology: <ul style="list-style-type: none"> <li>• point to point link</li> <li>• protected ring</li> </ul> </li> <li>• normal and extreme load tests</li> <li>• using installed optical fibre during test.</li> </ul> |
| <b><i>Performance tests</i></b> may include:                                  | <ul style="list-style-type: none"> <li>• end-to-end bit error rate (BER) test: <ul style="list-style-type: none"> <li>• stressful pseudo random binary sequence (PRBS) pattern</li> </ul> </li> <li>• forward error correction (FEC) testing</li> <li>• G.709 testing</li> <li>• receive interface specification: <ul style="list-style-type: none"> <li>• received optical power</li> </ul> </li> <li>• stability tests</li> <li>• transmit interface specification:</li> </ul>                                                                 |

| RANGE STATEMENT                           |                                                                                                                                                                                                |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                           | <ul style="list-style-type: none"><li>• optical output power.</li></ul>                                                                                                                        |
| <b>Protection mechanisms</b> may include: | <ul style="list-style-type: none"><li>• 1:1 protection</li><li>• 1+1 protection</li><li>• optical channel path protection</li><li>• path protection</li><li>• wavelength protection.</li></ul> |
| <b>Alarms</b> may include:                | <ul style="list-style-type: none"><li>• audible alarms</li><li>• on-screen display and monitoring systems</li><li>• visual indicators.</li></ul>                                               |

## Unit Sector(s)

|             |                    |
|-------------|--------------------|
| Unit sector | Telecommunications |
|-------------|--------------------|

## Co-requisite units

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| Co-requisite units |  |  |
|                    |  |  |
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## Competency field

|                  |                  |
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| Competency field | Optical networks |
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