



**Australian Government**

# **ICTBWN3082B Perform tests on optical communication system and components**

**Release 1**

# ICTBWN3082B Perform tests on optical communication system and components

## Modification History

Release	Comments
Release 2	This version first released with <i>ICT10 Integrated Telecommunications Training Package Version 3.0</i> .  References to other units updated.  Outcomes deemed equivalent.
Release 1	This version first released with <i>ICT10 Integrated Telecommunications Training Package Version 1.0</i> .

## Unit Descriptor

This unit describes the performance outcomes, skills and knowledge required to test optical communication systems and components in the field using portable test instruments.

It covers testing of point-to-point networks as well as next generation optical fibre networks which use passive optical network (PON) technologies in fibre to the home (FTTH) deployment.

## Application of the Unit

Installation contractors, technical staff and field officers from telecommunications service providers or other private and public organisations or regulatory authorities apply the skills and knowledge in this unit.

They combine technical skills with organisational and administrative skills to perform tests on broadband passive optical networks (PON), fibre to the x (FTTx) networks, hybrid fibre coaxial (HFC) networks and dense wavelength division multiplexing (DWDM) systems during installation, maintenance, commissioning and troubleshooting phases.

## Licensing/Regulatory Information

Licensing, legislative, regulatory and certification requirements apply to working at heights. If an elevated work platform (EWP) is required, verify state or territory law requirements for a licence to operate an EWP. Users should confirm requirements with the relevant federal, state or territory authority.

If working at heights, achievement of the unit 'CPCPCM2015A Work safely on roofs' from the CPC08 Construction and Plumbing Services Integrated framework training Package fulfils this requirement.

## Pre-Requisites

Not applicable.

## Employability Skills Information

This unit contains employability skills.

## Elements and Performance Criteria Pre-Content

Element	Performance Criteria
<i>Elements describe the essential outcomes of a unit of competency.</i>	<i>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.</i>

## Elements and Performance Criteria

<p>1. Prepare to use optical measuring instruments</p>	<p>1.1 Obtain <b>relevant legislation, codes, regulations and standards</b> and prepare for the given work</p> <p>1.2 Notify <b>customer</b> for site access, security arrangements and location details of <b>optical system</b> and test purpose</p> <p>1.3 Identify site <b>hazards</b> and notify appropriate personnel to make site safe</p> <p>1.4 Devise and implement risk control measures of hazards with handling optical fibres and lasers in consultation with appropriate personnel</p> <p>1.5 Prepare a <b>testing plan</b> indicating the <b>type of measurement</b> at the nominated <b>wavelength</b> and seek approval from customer</p> <p>1.6 Select the appropriate <b>tools</b> and <b>test instruments</b> according to the required measurement and enterprise practice</p>
<p>2. Conduct optical measurements</p>	<p>2.1 Set up test instrument according to manufacturer's instructions according to occupational health and safety (<b>OHS</b>) <b>and environmental requirements</b></p> <p>2.2 Perform measurement using knowledge of appropriate testing techniques and in a safe manner to assess the performance of optical system and component</p> <p>2.3 Record test results and compare with standard test specifications from manufacturer and enterprise guidelines</p> <p>2.4 Evaluate the test results and report on the functionality of the optical component or equipment and the performance of the optical system</p>
<p>3. Document measurement results</p>	<p>3.1 Document test results for future reference and make recommendations on optimising component and system performance</p> <p>3.2 Clean work site and make safe according to the enterprise requirements and to customer satisfaction</p> <p>3.3 Notify appropriate personnel of job completion for sign off and present test documentations</p>

## Required Skills and Knowledge

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

### Required skills

- communication skills to liaise with customers and enterprise staff
- literacy skills to read and interpret work instructions and document work
- numeracy skills to gather and record data from measurements
- planning and organisational skills to plan, prioritise and manage own work
- safety awareness skills to:
  - apply precautions and required action to minimise, control or eliminate hazards that may exist during work activities
  - select and use required personal protective equipment conforming to industry and OHS standards
  - work systematically with required attention to detail without injury to self or others, or damage to goods or equipment
- technical skills to:
  - clean an optical connector to an acceptable industry standard
  - safely inspect an optical connector for contamination and determine if cleaning is necessary
  - safely operate:
    - optical loss test set (OLTS)
    - optical time domain reflectometer (OTDR)
    - PON power meter.
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### Required knowledge

- consequences of mating contaminated optical connectors
- downstream and upstream signals
- DWDM metro and long haul system architecture
- HFC architecture (optical section)
- logarithmic power levels (decibels, dBm)
- optical connector types
- optical fibre safety, practices, handling and theory
- optical spectrum limits, wavelengths used in various applications and International Telecommunications Union (ITU) grid
- optical transmitters and receivers
- PON architecture
- safe handling procedures with optical fibres
- transmission system line rates:
  - optical Ethernet
  - synchronous digital hierarchy (SDH)
- wavelength division multiplexing (WDM), coarse wavelength division multiplexing (CWDM) and DWDM principles and optical multiplexers.

## 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.*

<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>• measure optical power level</li> <li>• measure insertion loss of a passive device</li> <li>• measure end-to-end fibre loss (bi-directional)</li> <li>• measure splice loss</li> <li>• measure distance to fault, event, end of fibre using OTDR</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>• sites on which optical measurements can be conducted</li> <li>• tools and equipment required for measurements</li> <li>• manufacturer's documentation for test instruments and equipment under test.</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 optical measurements</li> <li>• review of a written reports and test results completed by the candidate</li> <li>• oral or written questioning to assess required knowledge.</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>• ICTBWN3100B Work safely with live fibre to test and commission a fibre to the x installation</li> <li>• ICTBWN3205B Use optical and radio frequency measuring instruments.</li> </ul>

	<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

*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.*

<p><b><i>Relevant legislation, codes, regulations and standards</i></b> may include:</p>	<ul style="list-style-type: none"> <li>• appropriate licences:             <ul style="list-style-type: none"> <li>• crane</li> <li>• EWP</li> <li>• forklift</li> <li>• winch</li> </ul> </li> <li>• Australian Construction Industry Forum (ACIF) standards and codes</li> <li>• AS Communications Cabling Manual (CCM) Volume 1</li> <li>• AS/NZS 3000:2007</li> <li>• AS/NZS 3080:2003</li> <li>• AS/NZS 3084:2003</li> <li>• AS/NZS 3085.1:2004</li> <li>• AS/NZS IEC 61935.1:2006</li> <li>• AS/NZS IEC 61935.2:2006</li> <li>• AS/NZS ISO/IEC 14763.3:2007</li> <li>• AS/NZS ISO/IEC 15018:2005</li> <li>• AS/NZS ISO/IEC 24702:2007</li> <li>• cabling security codes and regulations</li> <li>• Environmental Protection Acts</li> <li>• OHS</li> <li>• technical standards AS/ACIF S008:2006 and AS/ACIF S009:2006.</li> </ul>
<p><b><i>Customer</i></b> may be:</p>	<ul style="list-style-type: none"> <li>• asset manager</li> <li>• installation manager</li> <li>• maintenance manager</li> <li>• nominated customer representative</li> <li>• outage manager</li> <li>• project manager.</li> </ul>
<p><b><i>Optical system</i></b> may contain:</p>	<ul style="list-style-type: none"> <li>• add-drop multiplexer</li> <li>• DWDM system</li> <li>• fibre hub</li> <li>• HFC network</li> <li>• optical line termination (OLT)</li> <li>• optical network termination (ONT)</li> </ul>



	<ul style="list-style-type: none"> <li>• optical amplifier</li> <li>• optical splitter.</li> </ul>
<b>Hazards</b> may include:	<ul style="list-style-type: none"> <li>• building debris</li> <li>• earth potential rise</li> <li>• glass fibre</li> <li>• live power lines</li> <li>• manual handling</li> <li>• mud and water</li> <li>• natural gas and other gas build up</li> <li>• optical fibre cable may contain hazardous light</li> <li>• radio frequency (RF) equipment emitting radiation</li> <li>• remote power feeding services which operate at above telecommunications network voltage</li> <li>• vermin.</li> </ul>
<b>Testing plan</b> may include:	<ul style="list-style-type: none"> <li>• correct test set-up</li> <li>• recording and evaluation of measurements</li> <li>• test layout</li> <li>• test procedures</li> <li>• test purpose</li> <li>• test sites and location</li> <li>• type of measurements</li> <li>• use of appropriate test equipment.</li> </ul>
<b>Type of measurement</b> may include:	<ul style="list-style-type: none"> <li>• end-to-end continuity using visual fault locator</li> <li>• fibre loss (bi-directional)</li> <li>• insertion loss: <ul style="list-style-type: none"> <li>• coupler</li> <li>• filter</li> <li>• optical splitter</li> <li>• WDM</li> </ul> </li> <li>• optical power level at: <ul style="list-style-type: none"> <li>• drop terminal</li> <li>• OLT</li> <li>• ONT</li> <li>• optical transmitter</li> <li>• patch panel</li> </ul> </li> <li>• optical return loss (ORL)</li> <li>• splice loss</li> <li>• total end-to-end loss, including splices and connectors.</li> </ul>
<b>Wavelengths</b> may include:	<ul style="list-style-type: none"> <li>• 850 nm</li> <li>• 1310 nm</li> <li>• 1490 nm</li> </ul>

	<ul style="list-style-type: none"> <li>• 1550 nm.</li> </ul>
<b>Tools</b> may include:	<ul style="list-style-type: none"> <li>• alcohol swabs</li> <li>• dry type cleaning cassette for optical connectors</li> <li>• hand tools</li> <li>• lint-free dry wipes</li> <li>• microscope for examining optical connector with: <ul style="list-style-type: none"> <li>• integral safety infra-red filter</li> <li>• video microscope display</li> </ul> </li> <li>• optical connector adaptors <ul style="list-style-type: none"> <li>• FC to LC</li> <li>• FC to SC</li> <li>• FC to ST</li> <li>• SC to ST</li> </ul> </li> <li>• optical reference cable</li> <li>• optical termination.</li> </ul>
<b>Test instruments</b> may include:	<ul style="list-style-type: none"> <li>• bi-directional automated optical loss test set</li> <li>• hand-held optical power meter</li> <li>• hand-held optical source</li> <li>• launch cable for OTDR</li> <li>• OFI-FTTx active ONT detector</li> <li>• OLTS</li> <li>• ORL test set</li> <li>• OTDR multimode</li> <li>• OTDR single mode</li> <li>• PON – OTDR</li> <li>• PON meter</li> <li>• visual fault locator (VFL).</li> </ul>
<b>OHS and environmental requirements</b> may include:	<ul style="list-style-type: none"> <li>• decommissioning and isolating worksite and lines prior to commencement</li> <li>• identifying other services, including power and gas</li> <li>• personal protective equipment: <ul style="list-style-type: none"> <li>• earmuffs</li> <li>• gloves</li> <li>• head protection</li> <li>• masks</li> <li>• protective suits</li> <li>• safety boots</li> <li>• safety glasses</li> </ul> </li> <li>• safe working practices, such as the safe use and handling of: <ul style="list-style-type: none"> <li>• chemicals</li> </ul> </li> </ul>

	<ul style="list-style-type: none"><li>• materials</li><li>• tools and equipment</li><li>• work platforms</li><li>• safety equipment:<ul style="list-style-type: none"><li>• flashing lights</li><li>• safety barriers</li><li>• warning signs and tapes</li><li>• warden hats</li></ul></li><li>• special access requirements</li><li>• environmental considerations:<ul style="list-style-type: none"><li>• clean-up protection</li><li>• stormwater protection</li><li>• waste management.</li></ul></li></ul>
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## Unit Sector(s)

Telecommunications - Broadband and wireless networks