



Australian Government

ICTOPN404 Test optical communications systems and components

Release: 1

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Modification History

Release	Comments
Release 1	This version released with ICT Information and Communications Technology Training Package Version 5.0.

Application

This unit describes the skills and knowledge required to test optical communications systems and components using advanced optical test equipment. It involves using the optical time domain reflectometer (OTDR), optical spectrum analyser (OSA) and optical return loss (ORL) test set for performance testing and link budget calculation.

It applies to cablers who combine technical skills with organisational and administrative skills. They may be installation contractors, technical staff and field officers from telecommunications carriers or other private and public organisations or regulatory authorities.

No licensing, registration, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

ICTBWN307 Use optical measuring instruments

Unit Sector

Telecommunications – Optical Networks

Elements and Performance Criteria

Element	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
1. Prepare to use advanced optical measuring	1.1 Notify customer for site access, security arrangements and location details of optical system and test purpose 1.2 Identify site hazards and notify appropriate personnel to make site safe

instruments	1.3 Devise and implement risk control measures for hazards and risks associated with handling optical fibres and lasers, in consultation with appropriate personnel 1.4 Prepare a testing plan indicating the type of measurement, procedures and nominated wavelength, and seek approval from customer 1.5 Select appropriate tools and test instruments according to required measurement and enterprise practice
2. Evaluate optical performance and link budget using advanced optical test equipment	2.1 Set-up test instrument according to manufacturer instructions, and work health and safety (WHS) and environmental requirements 2.2 Perform measurement and tests in a safe manner to evaluate performance of optical system and component 2.3 Record test results and compare with standard test specifications from manufacturer and enterprise guidelines 2.4 Perform end-to-end measurements on an optical link and record test results and test points 2.5 Calculate optical losses for a link budget figure of an optical link 2.6 Evaluate test results and report on functionality of optical component or equipment and performance of optical link
3. Document measurement results	3.1 Document test results for future reference and make recommendations for optimising component and system performance 3.2 Clean worksite and make safe according to enterprise requirements and customer satisfaction 3.3 Notify appropriate personnel of job completion for sign-off and present test documentation

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance, but not explicit in the performance criteria.

Skill	Description
Reading	Interprets textual information from relevant sources to plan, identify all job requirements and adhere to procedures and standards
Writing	Accurately completes relevant reports and documentation using clear and technically specific language and numerical data
Oral Communication	Uses listening and questioning skills to confirm understanding for requirements, participates in a verbal exchange of ideas and solutions, and uses appropriate, detailed and clear language to address key personnel and customers

Skill	Description
Numeracy	Uses mathematical formulae to gather and record technical measurements
Navigate the world of	- Takes personal responsibility for adherence to legal and regulatory responsibilities relevant to own work context with specific reference to workplace safety - Understands main tasks, responsibilities and boundaries of own work
Interact with others	Actively identifies requirements of important communication exchanges, selecting appropriate channels, format, tone and content to suit purpose and audience
Get the work done	- Takes responsibility for planning and organising own workload, identifying ways of sequencing and combining elements for greater efficiency - Takes responsibility for routine decision-making by selecting from a range of predetermined options in routine situations, identifying and taking some situational factors into account - Considers purpose, needs and limitations when selecting devices and applications for different tasks

Range of Conditions

Specifies different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included. Range is restricted to essential operating conditions and any other variables essential to the work environment.

Test equipment must include:	- optical time domain reflectometer (OTDR) - optical spectrum analyser (OSA) or equivalent optical spectrum analyser - optical return loss (ORL)
Measurements must include:	- optical power level - insertion loss of optical network - end-to-end fibre loss (bi-directional)
Optical performance must include:	- wavelength spectrum parameters - ODTR events

Unit Mapping Information

No equivalent unit. Supersedes and is not equivalent to ICTOPN402 Use advanced optical test equipment.

Links

Companion Volume Implementation Guides are available from VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=a53af4e4-b400-484e-b778-71c9e9d6aff2>

Assessment Requirements for ICTOPN404 Test optical communications systems and components

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Performance Evidence

The candidate must demonstrate the ability to perform the tasks outlined in the elements, performance criteria, and foundation skills on two occasions and to:

- obtain operation documentation for advanced optical test instruments
- plan and prepare a schedule of tests to be performed
- conduct at least one optical test
- record the following measurements for a range of parameters:
 - optical power level
 - insertion loss of optical network
 - end-to-end fibre loss (bi-directional)
- test, calculate and document optical link budget according to industry standards using the following test equipment:
 - optical time domain reflectometer (OTDR)
 - optical spectrum analyser (OSA) or equivalent optical spectrum analyser
 - optical return loss (ORL)
- comply with all related work health and safety (WHS) requirements and work practices
- evaluate optical performance using:
 - wavelength spectrum parameters
 - ODTR events.

Knowledge Evidence

The candidate must demonstrate the knowledge required to perform the tasks outlined in the elements, performance criteria, and foundation skills, which includes knowledge about:

- optical system and its main components
- hazards and risks associated with optical systems
- health and safety and environmental requirements associated with optical systems
- common tests, measurements and testing plans used for optical systems
- common wavelengths involved with optical systems

- use of tools and test equipment for optical systems
- consequences of mating contaminated optical connectors
- calculations using decibels, dBm
- downstream and upstream signals
- dense wavelength division multiplexing (DWDM) metro and long-haul system architecture
- measurement of:
 - DWDM signals
 - gain and gain flatness of optical amplifier
 - laser spectral stability, drift and unexpected variation in spectral transmission characteristics
- non-linear effects, four-wave mixing
- optical connector types
- optical signal to noise ratio (OSNR)
- optical spectrum limits, wavelengths used in various applications and International Telecommunication Union (ITU) grid
- optical transmitters and receivers
- optical return loss (ORL)
- OTDR dead zones, dynamic range and launch cable reflectance
- safe handling procedures with optical fibres
- transmission system line rates including:
 - optical ethernet
 - optical transport network (OTN)
 - synchronous digital hierarchy (SDH)
- wavelength division multiplexing (WDM), coarse wavelength division multiplexing (CWDM) and DWDM principles and optical multiplexers
- influence of legislation, regulations, codes and standards relevant to advanced optical work.

Assessment Conditions

Skills must be assessed in a workplace or simulated environment where conditions are typical of those in a telecommunications work environment or workplace.

Access is required to:

- tools and equipment required for measurements
- manufacturer documentation for test instruments and equipment under test.

Assessors of this unit must satisfy the requirements for assessors in applicable vocational education and training legislation, frameworks and/or standards.

Links

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