



Australian Government

ICTOPN402 Use advanced optical test equipment

Release: 1

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Modification History

Release	Comments
Release 1	This version first released with ICT Information and Communications Technology Training Package Version 2.0.

Application

This unit describes the skills and knowledge required to test optical communication 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 individuals 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, legislative or certification requirements apply to this unit at the time of publication.

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 instruments	1.1 Obtain relevant legislation, codes, regulations and standards for compliance when conducting work 1.2 Notify customer for site access, security arrangements and location details of optical system and test purpose 1.3 Identify site hazards and notify appropriate personnel to make site safe 1.4 Devise and implement risk control measures of hazards with

	handling of optical fibres and lasers in consultation with appropriate personnel 1.5 Prepare a testing plan indicating the type of measurement, procedures and nominated wavelength, and seek approval from customer 1.6 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's instructions and work health and safety (WHS) and environmental requirements 2.2 Perform measurement using knowledge of appropriate testing techniques and advanced test equipment 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's and enterprise guidelines 2.4 Perform end-to-end measurements on an optical link to a customer and record test results and test points 2.5 Calculate optical losses for a link budget figure of an optical link to determine if within operational margins as specified in manufacturer's manual 2.6 Evaluate test results and report on functionality of the optical component or equipment and performance of the optical link
3. Document measurement results	3.1 Document test results for future reference and make recommendations on optimising component and system performance 3.2 Clean worksite and make safe according to enterprise requirements and to customer satisfaction 3.3 Notify appropriate personnel of job completion for sign off and present test documentations

Foundation Skills

This section describes language, literacy, numeracy and employment skills incorporated in the performance criteria that are required for competent performance.

Skill	Performance Criteria	Description
Reading	1.1, 1.6, 2.1, 2.3, 2.5, 2.6	Interprets textual information from relevant sources to plan, identify all job requirements and adhere to procedures and standards

Writing	1.2-1.5, 2.3, 2.6, 3.1, 3.3	Accurately completes relevant reports and documentation using clear and technically specific language and numerical data
Oral Communication	1.2-1.5, 2.6, 3.3	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
Numeracy	1.5, 1.6, 2.2, 2.4, 2.5	Uses mathematical formulae to gather and record technical measurements
Navigate the world of	1.1, 1.3, 1.4, 2.1, 2.2, 3.2	- 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	3.3	Actively identifies requirements of important communication exchanges, selecting appropriate channels, format, tone and content to suit purpose and audience
Get the work done	1.1, 1.3, 1.5, 1.6, 2.2, 2.6	- 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

This field allows for different work environments and conditions that may affect performance. 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) should be included.

Test equipment that must be used includes:	• optical time domain reflectometer (OTDR) • optical spectrum analyser (OSA) • optical return loss (ORL)
Measurements that must be performed include:	• optical power level • insertion loss of optical network • end-to-end fibre loss (bi-directional)

Unit Mapping Information

Code and title current version	Code and title previous version	Comments	Equivalence status
ICTOPN402 Use advanced optical test equipment	ICTOPN4116A Use advanced optical test equipment	Updated to meet standards for Training Packages	Equivalent unit

Links

Companion Volume implementation guides are found in VETNet -

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

Assessment Requirements for ICTOPN402 Use advanced optical test equipment

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Performance Evidence

Evidence of ability to:

- obtain operation documentation for advanced optical test instruments
- plan and prepare a schedule of tests to be performed
- conduct optical tests
- record measurements for a range of parameters
- test, calculate and document optical link budget
- comply with all related work health and safety (WHS) requirements and work practices.

Note: If a specific volume or frequency is not stated, then evidence must be provided at least once.

Knowledge Evidence

To complete the unit requirements safely and effectively, the individual must:

- describe an optical system and its main components
- identify hazards and risks for health and safety associated with optical systems
- identify and describe common tests, measurements and testing plans used for optical systems
- identify common wavelengths involved with optical systems
- list and describe use of tools and test equipment for optical systems
- explain consequences of mating contaminated optical connectors
- perform calculations using decibels, dBm
- discuss downstream and upstream signals
- outline dense wavelength division multiplexing (DWDM) metro and long haul system architecture
- summarise measurement of DWDM signals
- explain measurement of gain and gain flatness of optical amplifier

- discuss measurement of laser spectral stability, drift and unexpected variation in spectral transmission characteristics
- explain non-linear effects, four-wave mixing
- identify optical connector types
- outline optical signal to noise ratio (OSNR)
- summarise optical spectrum limits, wavelengths used in various applications and International Telecommunications Union (ITU) grid
- identify optical transmitters and receivers
- describe optical return loss (ORL)
- discuss OTDR dead zones, dynamic range and launch cable reflectance
- outline safe handling procedures with optical fibres
- describe transmission system line rates:
 - optical ethernet
 - optical transport network (OTN)
 - synchronous digital hierarchy (SDH)
- explain wavelength division multiplexing (WDM), coarse wavelength division multiplexing (CWDM) and DWDM principles and optical multiplexers
- identify and explain influence of legislation, regulations, standards and codes of practice relevant to advanced optical work.

Assessment Conditions

Gather evidence to demonstrate consistent performance in conditions that are safe and replicate the workplace. Noise levels, production flow, interruptions and time variances must be typical of those experienced in the Telecommunications – Optical Networks field of work and include access to:

- tools and equipment required for measurements
- manufacturer's 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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