



**Australian Government**

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

# **ICTRFN3175A Operate and maintain radio communications technical instruments and field equipment**

Release: 1

## ICTRFN3175A Operate and maintain radio communications technical instruments and field equipment

### Modification History

Not Applicable

### Unit Descriptor

<b>Unit descriptor</b>	<p>This unit describes the performance outcomes, skills and knowledge required to operate and maintain radio communications technical instruments and field equipment. It involves taking measurements, fault-finding, minor repair and commissioning new instruments and equipment.</p> <p>Individuals must comply with radio communications transmitter licensing requirements and operator certificates for maritime and aeronautical services and occupational health and safety (OHS) electromagnetic radiation (EMR) licensing requirements.</p>
------------------------	--

### Application of the Unit

<b>Application of the unit</b>	<p>Technical staff who work with radio communications equipment in radio communications apply the skills and knowledge in this unit. This may include field officers from regulatory authorities or other private and public organisations.</p>
--------------------------------	---

### Licensing/Regulatory Information

Refer to Unit Descriptor

### Pre-Requisites

<b>Prerequisite units</b>	

<b>Prerequisite units</b>	

## Employability Skills Information

<b>Employability skills</b>	This unit contains employability skills.
-----------------------------	--

## Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where <b><i>bold italicised</i></b> 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.
---	--

## Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
<p>1. Prepare for use of instruments and field equipment</p>	<p>1.1. Plan and prepare work according to site procedures, <i>operating environment</i> and relevant <i>legislation, codes, regulations and standards</i></p> <p>1.2. Select <i>measurements</i> required to meet performance outcomes</p> <p>1.3. Read, interpret and use equipment and system manuals, specifications and relevant organisation policy to determine work requirements</p> <p>1.4. Select and ensure <i>equipment</i> for work activities is ready for operation</p> <p>1.5. Determine, address and report <i>potential risks and hazards</i> and <i>environmental issues</i></p> <p>1.6. Adhere to relevant emergency procedures, policy guidelines and OHS procedures to ensure safety of personnel and plant</p>
<p>2. Test the instruments and field equipment</p>	<p>2.1. Perform safety checks according to instrument and equipment manual and organisational procedures</p> <p>2.2. Confirm equipment is calibrated and calibration label is within approved timeframes</p> <p>2.3. Select appropriate traceable calibrated equipment where measurements are required to be traceable to the National Measurements Act</p> <p>2.4. Label and report damaged or unsafe instruments and field equipment and send for service</p> <p>2.5. Update operational log books</p>
<p>3. Operate instruments and field equipment</p>	<p>3.1. Optimise instrument and equipment settings for the particular measurement or analysis</p> <p>3.2. Perform measurements with the optimum precision given field and technical constraints</p> <p>3.3. Assess data for accuracy and precision against quality control information, known standards and references within <i>measurement uncertainty</i></p>
<p>4. Maintain instruments and field equipment</p>	<p>4.1. Use fault finding techniques to verify and rectify faults</p> <p>4.2. Perform preventative <i>maintenance</i> within limits of authorisation and report equipment wear and faults</p> <p>4.3. Replace defective parts and make adjustments according to equipment specifications</p> <p>4.4. Seek expert help from appropriate colleagues where problems are encountered</p> <p>4.5. Update maintenance and calibration records according to organisation procedures</p>

ELEMENT	PERFORMANCE CRITERIA
5. Commission new instruments and equipment	5.1. Arrange commissioning procedures with manufacturer's agent 5.2. Unpack, check and assemble instruments and equipment according to manufacturer's warranty requirements 5.3. Check instrument and equipment performance against specifications prior to acceptance of item 5.4. Prepare operating instructions and make available to relevant personnel

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

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

#### Required skills

- analytical skills to analyse test results
- communication skills to liaise with internal and external personnel on technical, operational and legal site matters
- literacy skills to interpret technical documentation, such as equipment manuals and specifications
- numeracy skills to:
  - check that equipment is calibrated
  - evaluate technical data
  - interpret results
  - take radio frequency (RF) measurements
- planning and organisational skills to organise and maintain a range of instruments and equipment
- problem solving skills to find simple equipment and instrument faults
- task management skills to work systematically with required attention to detail and adherence to safety requirements
- technical skills to:
  - operate radio communications test and diagnostic equipment
  - perform diagnostic and fault-finding procedures
  - use hand and power tools

#### Required knowledge

- features and operating requirements of calibrated equipment and test equipment:

## **REQUIRED SKILLS AND KNOWLEDGE**

- digital radio communications measuring equipment
- RF termination
- spectrum analyser
- power meter
- modulation analyser
- features of instrument and equipment test methods and performance requirements
- legislation, codes of practice and other formal agreements that directly impact on operation and testing of radio communications instruments and equipment
- manufacturer's requirements for operation and testing of radio communications equipment and calibrated equipment
- measurements according to test specifications
- radio communications instruments and equipment
- specific OHS requirements that impact on the use and testing of radio communications instruments and equipment
- typical issues and challenges that occur with radio communications instruments and field equipment

## Evidence Guide

<b>EVIDENCE GUIDE</b>	
<p>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.</p>	
<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>• prepare, operate and maintain a range of instruments and field equipment appropriate to a radio communications environment</li> <li>• comply with site risk control, OHS, environmental, quality and communication requirements</li> <li>• apply knowledge of technical procedures and requirements for different types of equipment.</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 instruments and field equipment can be operated</li> <li>• use of field measurement equipment currently used in industry</li> <li>• relevant instrument and equipment manuals and other procedural 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 operating and maintaining radio communications equipment</li> <li>• evaluation of measurement results and reports produced by the candidate</li> <li>• evaluation of the candidate's oral or written reports on findings with recommendations.</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>• ICTRFN4095A Conduct radio frequency measurements.</li> </ul> <p>Aboriginal people and other people from a non-English speaking background may have second language issues.</p>

## 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>
--	---

## 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.

***Operating environment*** may include:

- day or night
- dry or wet
- field environment
- heights or on roof tops
- laboratory
- old underground workings and voids
- stable or broken ground
- various natural landscapes.

***Legislation, codes, regulations and standards*** may include:

- Australian Communications Industry Forum (ACIF) standards and codes
- Australian Communications and Media Authority (ACMA):
  - assignment guidelines



## **RANGE STATEMENT**

- Business Operating Procedures (BOPs)
- CIs
- Radiocommunications Assignment and Licensing Instruction (RALIs)
- spectrum planning reports
- technical standards
- WI's
- Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) EMR standard
- Australian building codes and regulations
- Australian standards
- enterprise standards
- environmental protection
- equipment standards
- fire regulations
- heritage legislation
- international standards
- intrinsically safe lightning protection
- local government
- OHS
- Radcoms Act
- site engineering standard
- Telecoms Act.

<b>RANGE STATEMENT</b>	
<p><b>Measurements</b> may include:</p>	<ul style="list-style-type: none"> <li>• bandwidth</li> <li>• blocking</li> <li>• carrier frequency</li> <li>• cross modulation</li> <li>• electric field strength (E field)</li> <li>• forward RF power</li> <li>• frequency deviation</li> <li>• harmonic and spurious levels</li> <li>• intermodulation distortion products (IMD)</li> <li>• intermodulation</li> <li>• magnetic field strength (H field)</li> <li>• 'mask'</li> <li>• modulation</li> <li>• noise level</li> <li>• occupied spectrum</li> <li>• receiver sensitivity</li> <li>• reflected RF power</li> <li>• return loss</li> <li>• RF power</li> <li>• VSWR.</li> </ul>
<p><b>Equipment</b> may include:</p>	<ul style="list-style-type: none"> <li>• bit error rate tester (BERT)</li> <li>• constellation analyser</li> <li>• data logger</li> <li>• field strength meter</li> <li>• generators</li> <li>• gravity meter</li> <li>• internet protocol (IP) transmitter and receiver</li> <li>• memory magnetometer</li> <li>• mobile communications</li> <li>• modulation analyser</li> <li>• motors</li> <li>• personal protective equipment for RF</li> <li>• portable PC with testing and diagnostic software</li> <li>• return loss measurement set</li> <li>• RF power meter</li> <li>• satellite navigation system</li> <li>• spectrum analyser</li> <li>• transient electromagnetic (TEM) transmitter and receiver</li> </ul>

<b>RANGE STATEMENT</b>	
	<ul style="list-style-type: none"> <li>• theodolite</li> <li>• two-way radios.</li> </ul>
<i>Potential risks and hazards</i> may include:	<ul style="list-style-type: none"> <li>• adverse weather conditions:                             <ul style="list-style-type: none"> <li>• electrical storms</li> <li>• extreme heat</li> <li>• fires</li> <li>• floods</li> </ul> </li> <li>• earth potential rise (EPR)</li> <li>• EMR</li> <li>• elevated plant</li> <li>• emissions</li> <li>• hazardous chemicals</li> <li>• hazardous gases</li> <li>• laser output</li> <li>• underground plant.</li> </ul>
<i>Environmental issues</i> may include:	<ul style="list-style-type: none"> <li>• dust</li> <li>• flora and fauna</li> <li>• materials</li> <li>• noise</li> <li>• run-off</li> <li>• spills</li> <li>• waste management and disposal</li> <li>• water quality.</li> </ul>
<i>Measurement uncertainty</i> may include:	<ul style="list-style-type: none"> <li>• intermittent faults</li> <li>• power supply fluctuations</li> <li>• temperature variations</li> <li>• uncalibrated equipment.</li> </ul>
<i>Maintenance</i> may include:	<ul style="list-style-type: none"> <li>• calibration of equipment</li> <li>• cleaning and storing</li> <li>• completing usage records</li> <li>• replacing 'remove and replace' components</li> <li>• working adjustments to tolerances.</li> </ul>

## Unit Sector(s)

<b>Unit sector</b>	Telecommunications
--------------------	--------------------

## Co-requisite units

<b>Co-requisite units</b>		

## Competency field

<b>Competency field</b>	Radio frequency networks
-------------------------	--------------------------