



Australian Government

Department of Education, Employment and Workplace Relations

MSL977005A Integrate data acquisition and interfacing systems

Revision Number: 1

MSL977005A Integrate data acquisition and interfacing systems

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to automate experimental processes for instrument control and the acquisition and communication of data, particularly the integration of laboratory processes with computer systems.
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Application of the Unit

Application of the unit	This unit of competency is applicable to senior technical officers, laboratory supervisors and technical specialists working in all industry sectors. This unit of competency covers only the interconnection, not the design and construction, of scientific equipment or laboratory computer systems. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL924002A	Use laboratory application

Prerequisite units		
		<i>software</i>

Employability Skills Information

Employability skills	This unit contains employability skills.
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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 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. Transform physical data into an electronic form	1.1. Determine operational constraints 1.2. Select suitable transducer or sensor for electronic data 1.3. Transform physical phenomena into electronic data stream
2. Convert electronic data for acceptance by computerised system	2.1. Determine digitisation requirements 2.2. Condition electronic signals for digital data transformation 2.3. Configure computer systems for acquisition of experimental data 2.4. Transform electronic data stream to digital domain
3. Communicate data to, and between, computerised systems	3.1. Determine operational considerations 3.2. Prepare communication hardware 3.3. Configure hardware 3.4. Implement software to automate laboratory and/or field systems
4. Document procedures and constraints	4.1. Prepare standard operating procedures (SOPs) for interfaced systems 4.2. Assist management in the specification of automated laboratory and/or field systems 4.3. Manage the implementation of automated laboratory and/or field systems

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

Required skills include:

- implementing and troubleshooting the interconnection of laboratory and field equipment
- collecting relevant information from manuals, specification sheets, diagnostic equipment and software
- constructing and correctly routing interconnections
- implementing successful data transfer
- managing data transfer
- documenting operational procedures and implementation details
- troubleshooting exiting data collection and communication between laboratory processes and computer systems
- capturing data from non-automated laboratory processes
- interconnecting laboratory and/or field equipment with computers using both serial and parallel digital communication
- integrating laboratory workstations into networked laboratory computer systems
- programming and interrogating stand alone monitoring equipment

Required knowledge

Required knowledge includes:

- appropriate technical terminology to communicate effectively with others
- relevant numbering systems (binary, decimal and hexadecimal)
- basic computer hardware and software concepts
- integration of enterprise wide information systems
- data types used in laboratory and field sciences
- scientific concepts relevant to the application
- relevant health, safety and environment requirements

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

Assessors should ensure that candidates can:

- collect relevant information from manuals, specification sheets, diagnostic equipment and software
- construct and correctly route interconnections
- implement successful data transfer
- manage data transfer
- document operational procedures and implementation details
- troubleshoot exiting data collection and communication between laboratory processes and computer systems
- capture data from non-automated laboratory processes
- interconnect laboratory and/or field equipment with computers using both serial and parallel digital communication
- integrate laboratory workstations into networked laboratory computer systems
- program and interrogate stand alone monitoring equipment.

Context of and specific resources for assessment

This unit of competency is to be assessed in the workplace or simulated workplace environment.

This unit of competency may be assessed with:

- *MSL977004A Develop or adapt analyses and procedures.*

Resources may include:

- workplace documents, such as manuals, specification sheets, laboratory notebooks and SOPs
- relevant equipment and components, including computer network, suitable instruments and equipment, specimens and samples
- equipment generated data.

EVIDENCE GUIDE	
Method of assessment	The following assessment methods are suggested: • integrated assessment based on a real or stimulated case study, for example: • establish successful data acquisition (sensor selection, acquisition module installation and configuration, suitable signal conditioning and representative analog to digital conversion) • troubleshooting defective data capture (covering problems, such as resolution and noise) • establish successful two-way communication between laboratory or field equipment and a laboratory computer network • troubleshoot defective digital communications (incorrect protocol parameters, incorrect hardware configuration) • oral and written questions associated with electronic data capture, digital communications and associated documentation and standards • feedback from peers and/or supervisors to confirm that workplace practices and procedures are consistently followed and that the results meet workplace requirements. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. Manufacturing

EVIDENCE GUIDE

A manufacturing plant was monitoring wastewater before discharging it from its treatment plant. A multi-probe capable of monitoring up to fifteen parameters, such as temperature, dissolved oxygen, pH, conductivity and redox potential was purchased to streamline the monitoring process. The technical specialist checked the documentation accompanying the probe. The documentation indicated that it was compatible with a variety of RS-232, RS-485, RS-422 and SDI-12 data-handling devices. After attaching the probe to the computer system using HyperTerminal in Windows, the 'Connect' and 'Direct to COM port' commands were selected to connect the multi-probe to the computer. The test data was received by the computer and saved and analysed using appropriate data analysis programs.

Biomedical

A senior technical officer works for a pathology laboratory that has just installed a new laboratory information management system (LIMS). As part of the purchase contract the LIMS vendor interfaced all currently operational automated equipment. The laboratory has an older electrolyte analyser, which it uses as a back-up unit. It has had frequent use lately. Because of the unit's age, the technical manuals have been misplaced. The officer has been asked to see if the old unit can be interfaced to the new LIMS to save on manual transcription. The analyser uses a serial interface, which appears to comply with RS-232. By inspection of the connectors and from knowledge of the RS-232 standard, the officer determines the analyser should be configured as for data terminal equipment (DTE). The officer then constructs a suitable cable and physically connects the analyser to a PC workstation. Using a simple terminal emulation program, the officer determines the correct communication parameters and basic commands to upload the results to the PC. Using the LIMS open database connectivity capability and a graphical programming language, such as Labview, the officer semi-automates data transfer from the analyser to the PC then to the LIMS. The report on the success of the interconnect prompts management to contract a professional programmer to fully automate the interface in liaison with the officer.

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.

Codes of practice

Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Information sources

Information sources may include:

- Australian and international standards, such as:
- AS/NZS ISO 9000 Set:2008 Quality management systems set
- data format and management standards (e.g. National Pathology Accreditation Advisory Council's Laboratory Assessment Checklist: Computer Services Section and Analytical Data Interchange Protocols)
- environment, safety and emergency procedures
- hardware interface standards (e.g. EIA RS232, IEEE 488 or IEEE 1394)
- maintenance agreements with suppliers
- national and international standards covering hardware and software
- National Association of Testing Authorities (NATA) Accreditation programs requirements
- operation manuals for computer ware, laboratory instruments and field equipment
- safe operation requirements for computers and equipment used
- specifications of laboratory instruments and field equipment
- specifications of laboratory instruments and field equipment

Equipment, materials and systems

Equipment, materials and systems may include:

- suitable scientific equipment and instruments
- array of sensors and transducers
- data acquisition and digital communication interfacing modules

RANGE STATEMENT	
	• simple troubleshooting equipment (multimeter and breakout boxes) • protocol analysis tools (software or hardware) • turnkey and programmable data acquisition and control software • temperature, pressure, light displacement and stress sensors • representative laboratory and field equipment (e.g. pH meters, balances, spectrometers or data loggers)
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing
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Competency field

Competency field	
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Co-requisite units

Co-requisite units		