

Achievement Standard

Subject Reference	Digital Technologies 3.48		
Title	Implement complex interfacing procedures in a specified electronic environment		
Level	3	Credits	4
		Assessment	Internal
Subfield	Technology		
Domain	Digital Technologies		
Status	Registered	Status date	4 December 2012
Planned review date	31 December 2019	Date version published	17 November 2016

This achievement standard involves implementing complex interfacing procedures in a specified electronic environment.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
<ul style="list-style-type: none"> Implement complex interfacing procedures in a specified electronic environment. 	<ul style="list-style-type: none"> Skilfully implement complex interfacing procedures in a specified electronic environment. 	<ul style="list-style-type: none"> Efficiently implement complex interfacing procedures in a specified electronic environment.

Explanatory Notes

- This achievement standard is derived from Level 8 of the Technology learning area in *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007; and is related to the material in the *Teaching and Learning Guide for Technology*, Ministry of Education at <http://seniorsecondary.tki.org.nz>.

Further information can be found at <http://www.technology.tki.org.nz/>.

Appropriate reference information is available in *Safety and Technology Education: A Guidance Manual for New Zealand Schools*, Ministry of Education at <http://technology.tki.org.nz/Curriculum-support/Safety-and-Technology-Education>, and the Health and Safety at Work Act 2015.

This standard is also derived from *Te Marautanga o Aotearoa*. For details of *Te Marautanga o Aotearoa* achievement objectives to which this standard relates, see the [Papa Whakaako](#) for the relevant learning area.

2 *Implement complex interfacing procedures in a specified electronic environment* involves:

- devising and applying functional sensor subsystems that interact with the environment e.g. proximity sensors that identify train positions on a railway track
- devising and applying functional actuator subsystems to interact with the environment e.g. wind turbine blade and direction controls
- writing software that interfaces with the data provided by the sensors and with the actuators it controls e.g. analogue to digital conversion (ADC), data processing subroutines
- analysing, modifying, testing and debugging a functional model of the interface.

Skilfully implement complex interfacing procedures in a specified electronic environment involves:

- analysing and modifying sensor subsystems to improve the quality of the data delivered by the interface
- analysing and modifying actuator subsystems to improve the way they work
- writing annotated, readily understandable software that interfaces with the data provided by the sensors and with the actuators it controls
- analysing, modifying, testing and debugging a functional model of the interface to achieve and demonstrate improved operation.

Efficiently implement complex interfacing procedures in a specified electronic environment involves:

- analysing and modifying sensor subsystems to substantially improve the quality of the data delivered by the interface
- analysing and modifying actuator subsystems to substantially improve the way they work
- writing well-structured, clearly annotated, readily understandable software that interfaces effectively with the data provided by the sensors and with the actuators it controls
- analysing, modifying, testing and debugging a functional model of the interface to achieve and demonstrate substantially improved operation.

3 *A specified electronic environment* refers to a functional combination of hardware and embedded software with specifications that define the qualities required by the environment. The specifications must be of sufficient rigour to allow the student to meet the standard. These will be developed by the assessor in negotiation with the student. Specifications will include sensor and actuator requirements and relate to the development of hardware and software for purposes which may include but are not limited to:

- environmental monitoring and control with multiple sensors and outputs
- robotics
- complex elevator and traffic light scenarios
- railway control systems.

4 *Complex interfacing procedures* relate to the selection, modification, testing and debugging of the hardware and software that allow sensors and actuators to work together compatibly and effectively to meet the specifications for the specified electronic environment. The sensor and actuator subsystems to be used will be developed in conjunction with the teacher.

- 5 *Complex interfacing procedures* may include:
- selecting the best types of components and calculating their values for a particular application
 - setting up interface circuits to input and output peripherals e.g. actuators, displays, keypads, input sensors
 - implementing protocols for the transmission of data e.g. infrared, wireless, chip to chip
 - input and output impedance matching
 - noise reduction and filtering
 - analysing and modifying hardware input and/or output parameters
 - analysing and modifying software routines and parameters
 - using suitable test equipment e.g. multimeter, oscilloscope etc. to measure and report signal parameters e.g. voltage, current, frequency etc. at indicated points.
- 6 Conditions of Assessment related to this achievement standard can be found at <http://ncea.tki.org.nz/Resources-for-aligned-standards/Technology/Level-3-Technology>.
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Replacement Information

This achievement standard replaced AS90681.

Quality Assurance

- 1 Providers and Industry Training Organisations must have been granted consent to assess by NZQA before they can register credits from assessment against achievement standards.
- 2 Organisations with consent to assess and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards.

Consent and Moderation Requirements (CMR) reference

0233