Australian Government

AURETR1003 Apply automotive electrical system fundamentals

Release 1

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

AURETR1003 Apply automotive electrical system fundamentals

Modification History

Release	Comment
Release 1	New unit of competency

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes required to apply basic knowledge, skills and understanding of electricity as it relates to the electrical systems, components and technologies found in modern motor vehicles. The unit involves the development of skills and knowledge that relate to the fundamental operating principles of electrical systems, including electrical controls; vehicle electrical systems, such as lighting, charging or control systems for engine management; and body management, including electrical accessories. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.

Application of the Unit

Application of the unit	Work applies to light vehicles (cars, light commercial vehicles) and is based on knowledge of elements of electricity and basic circuit theory as well as the function, location and operation of vehicle electrical circuits, systems and components.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

Employability skills	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 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.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify and apply electrical fundamentals	1.1 Suitable and relevant ***sources of information*** are located to assist with electrical fundamentals research 1.2 ***Elements of electricity*** are identified 1.3 Elements of electricity are applied to common terminology for automotive electrical circuits, systems and components 1.4 Elements of electricity are applied to common electrical calculations for automotive electrical circuits, systems and components
2. Research and identify systems and components	2.1 Component or system to be researched is identified 2.2 Suitable and relevant sources of information are located to assist with identification of systems and components 2.3 Reference information is researched to ensure sufficient understanding of component or system to assist with identifying how the circuit functions 2.4 Potential for unsafe conditions or ***safety hazards*** is identified 2.5 ***Workplace health and safety (WHS) requirements*** are applied
3. Locate systems and components	3.1 Suitable ***automotive systems or components*** are sourced to assist with task 3.2 Location of system or component is confirmed in relation to modern vehicle configuration 3.3 Alternative methods of system or component location are identified in relation to possible light vehicle configuration (where applicable)
4. Determine method of system or component operation	4.1 Appropriate ***electrical test equipment*** is identified and applied for the purpose of testing circuit, system or component 4.2 System or component is examined and sub-assembly components are identified 4.3 Operational principles of circuit, component and system functions are determined and analysed 4.4 System or component relationship to light vehicle operation is determined 4.5 Potential for unsafe conditions or associated risk factors with system or component operation or testing is identified 4.6 Potential ***common faults*** with system or component are identified

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

- communication skills to:
  - follow written and verbal instructions
  - communicate ideas and information relating to electrical terminology and procedures verbally and in writing
  - apply questioning and active listening skills, e.g. when obtaining factual information from sources
- initiative and enterprise skills to recognise a workplace problem or potential problem and take action
- learning skills to:
  - identify sources of information, assistance and expert knowledge to expand skills, knowledge and understanding
  - participate in self-improvement activities
- literacy skills to:
  - understand workplace safety procedures
  - read and follow information in written instructions, specifications and other applicable reference documents
- planning and organising skills to:
  - identify risk factors and take action to minimise them
  - plan and organise activities that implement and follow standard procedures
- problem-solving skills to:
  - refer problems outside area of responsibility to appropriate person
  - use and communicate basic mathematical ideas and techniques that relate to automotive electrical systems and components
- self-management skills to:
  - recognise limitations and seek timely advice
  - follow workplace documentation, such as workplace safe operating procedures
- technical skills to:
  - collect, organise and research technical information relating to:
    - recognising and reporting unsafe situations
    - automotive electrical components and systems identification, location and function
  - collect, organise and apply electrical fundamentals information and concepts
- technology skills to use information technology equipment to assist with research

Required knowledge

- basic electrical theory and principles of electricity, including:

REQUIRED SKILLS AND KNOWLEDGE

- voltage
- amperage
- circuit resistance
- alternating current (AC)
- direct current (DC)

- range of sources of information available to assist with understanding fundamental elements of electricity as they relate to automotive applications
- range of sources of information available to service, maintain and repair light vehicle electrical systems and components
- industry and workplace practice in relation to working safely in an automotive workplace
- identification, location and function of major components of common automotive:
  - engine electrical systems, including:
  - ignition systems
  - charging systems
  - starting systems
  - engine management systems
- vehicle lighting systems
- vehicle body electrical systems, including:
  - electric door locking systems
  - boot release systems
  - car stereo and sound systems
- wiring harness assembly

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	The evidence required to demonstrate competency in this unit must be relevant to workplace operations and satisfy all of the requirements of the performance criteria and required skills and knowledge. A person who demonstrates competency in this unit must be able to: • identify and apply basic electrical terminology and circuit theory • identify automotive electrical circuits, systems and components • source relevant technical information • locate electrical systems and components on modern motor vehicles • explain the function of at least three major electrical systems of a modern motor vehicle • demonstrate basic troubleshooting techniques to determine possible causes of electrical faults or problems • communicate effectively using technical information and terms with others involved in or affected by the work.
Context of and specific resources for assessment	Competency is to be assessed in the workplace or a simulated workplace environment that accurately reflects performance in a real workplace setting. Assessment is to occur: • using standard workplace practices and procedures • following safety requirements • applying environmental constraints. Assessment is to comply with relevant: • regulatory requirements • Australian standards • industry codes of practice. The following resources must be made available for the assessment of this unit: • a workplace or simulated workplace • technical reference information

EVIDENCE GUIDE	
	• a range of functioning automotive systems and components • functioning light vehicle or vehicles • automotive tools and equipment • electrical test equipment • workplace safety equipment, including personal protective equipment.
Method of assessment	Assessment must satisfy the endorsed Assessment Guidelines of this Training Package. Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with the application of required skills and knowledge. Assessment methods must be by direct observation of tasks and include questioning on required skills and knowledge to ensure correct interpretation and application. Competence in this unit may be assessed in conjunction with other units which together form part of a holistic work role. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate the needs of diverse clients. Assessment processes and techniques must be culturally sensitive and appropriate to the language, literacy and numeracy capacity of the candidate and the work being performed.

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.	
Sources of information may include:	• automotive electrical texts • vehicle workshop manuals • service bulletins • magazine technical articles • written instructions • documented workplace procedures.
Elements of electricity may include:	• voltage • current • resistance • Ohm's law • conventional circuit theory or circuit types.
Safety hazards may include:	• electricity and water • electric shock • broken or damaged equipment • flammable materials and fire hazards • lifting practices.
Workplace health and safety requirements may include:	• personal protective equipment (PPE) • safe manual handling and lifting • safe use of tools and equipment • industry codes of practice • worksite documentation for WHS.

Automotive systems and components may include:	• engine electrical systems, including:
	  • ignition systems:
	  • distributors
	  • coils
	  • spark plugs
	  • high tension leads
	• charging systems:
	  • alternators
	  • generators
	  • voltage regulators
	• starting systems:

RANGE STATEMENT	
	• starter motors • drives • relays • switches • engine management systems: • electronic control unit (ECU) • engine immobilisers • crank angle sensors • mass air flow (MAF) sensors • throttle position sensors (TPS) • knock sensors • oxygen sensors • temperature sensors • variable valve timing (VVT) componentry (electrical) • vehicle lighting systems: • headlight assemblies • globes and bulbs • LEDs • control and tell-tale systems • auxiliary lighting • vehicle body electrical systems: • electric door and central locking systems • boot release systems • car stereo and sound systems • power windows • electric mirrors • electronic seat adjustment with memory • security systems • wiring harness assembly • batteries • fuses and circuit breakers.
Electrical test equipment may include:	• multimeters • test lamp • AC/DC current clamp • battery diagnostic equipment • digital scanner • computer with vehicle interface software • insulated hand tools

RANGE STATEMENT	
	• oscilloscope • thermal imaging equipment or non-contact thermometer.
Common faults may include:	• failure to achieve ignition or power • failure to achieve fuel flow • flat batteries • loss of engine power • system or component malfunction.

Unit Sector(s)

Competency field	Electrical
Unit sector	Technical – Electrical and Electronic

Custom Content Section

Not applicable.