

Training Package	Automotive Industry Retail, Service and Repair (AUR05)	HSC Requirements and Advice
Unit title	Carry out repairs to single electrical circuits	
Unit code	Unit descriptor	HSC Indicative Hours 25
AURE218708A	<p>This unit covers the competence to test electrical circuits and carry out repairs in an automotive retail, service and/or repair context, including replacement of fuses, bulbs and terminals, wiring repairs, i.e. open circuits/short circuits/earthing.</p> <p>The unit includes identification and confirmation of work requirement, preparation for work, testing of circuits and identification of faults/causes, repair and replacement of circuit components and completion of work finalisation processes, including clean up and documentation.</p>	

Evidence Guide		HSC Requirements and Advice
The evidence guide identifies critical aspects, knowledge and skills to be demonstrated to confirm competence for this unit. This is an integral part of the assessment of competence and should be read in conjunction with the Range Statement.		
Critical aspects of evidence	Underpinning knowledge	Key Terms and Concepts
<p>It is <u>essential</u> that competence is fully observed and there is ability to transfer competence to changing circumstances and to respond to unusual situations in the critical aspects of:</p> <ul style="list-style-type: none"> • observing safety procedures and requirements • communicating effectively with others involved in or affected by the work • selecting methods and techniques appropriate to the circumstances • completing preparatory activity in a systematic manner • carry out repairs to electrical circuits covering open and short circuits and earthing, ensuring: <ul style="list-style-type: none"> - safe and correct use of tooling and equipment - isolating power supply to components - testing and identification of faults - electrical connections, including crimping and soldering to specification - electrical repairs to specification. 	<p>A working knowledge of:</p> <ul style="list-style-type: none"> • OH&S and environmental regulations/requirements, equipment, material and personal safety requirements • electrical principles (including current, voltage, resistance, conductors, insulators) • circuit types, diagrams, symbols and faults • electrical measuring and testing procedures • repair procedures • procedures to avoid damage to electronic systems/components • enterprise quality procedures • work organisation and planning processes. 	

Evidence Guide cont/d			HSC Requirements and Advice
Context of assessment	Method of assessment	Specific resource requirements for this unit	Key Terms and Concepts
<p>Application of competence <u>is to</u> be assessed in the workplace or simulated worksite.</p> <p>Assessment <u>is to</u> occur using standard and authorised work practices, safety requirements and environmental constraints.</p> <p>Assessment <u>is to</u> comply with regulatory requirements, including Australian Standards.</p>	<p>Assessment <u>must</u> satisfy the endorsed assessment guidelines of the automotive industry's RS&R [Retail, Service and Repair] Training Package.</p> <p>Assessment methods <u>must</u> confirm consistency and accuracy of performance together with application of underpinning knowledge.</p> <p>Assessment <u>must</u> be by direct observation of tasks, with questioning on underpinning knowledge and must reinforce the integration of key competencies.</p> <p>Assessment <i>may</i> be applied under project related conditions and require evidence of process.</p> <p>Assessment <u>must</u> confirm a reasonable inference that competence is able to be under the particular circumstance, and is able to be transferred to other circumstances.</p> <p>It is <i>preferable</i> that assessment reflects a process rather than an event and occurs over a period of time to cover varying quality circumstances. Evidence of performance <i>may</i> be provided by customers, team leaders/ members or other persons subject to agreed authentication arrangements.</p>	<p>The following <u>should</u> be made available:</p> <ul style="list-style-type: none"> workplace location or simulated workplace material relevant to repairing electrical circuits equipment, hand and power tooling appropriate to repairing electrical circuits activities covering mandatory task requirements specifications and work instructions. 	
		Relationship to other units	

- Key Terms and Concepts**
- workplace/organisation procedures/policies
 - environmental impact
 - fault identification
 - hazards
 - industry regulations/guidelines
 - interpretation and analysis of test results
 - job specifications
 - manufacturer's specifications
 - maintenance/servicing schedules
 - occupational health and safety requirements (OHS)
 - Ohm's Law
 - personal protective equipment (PPE)
 - planning and preparation
 - problem-solving skills
 - quality assurance
 - recording and reporting
 - regulations
 - repair action
 - risk management
 - safety/lockout tagging
 - safe working practices/procedures
 - soldering
 - sources of information
 - sources of work instructions
 - team environment
 - tools and equipment
 - troubleshooting
 - verbal, non-verbal and written communication
 - waste disposal/management
 - work records/documentation.

Specific key competencies, underpinning and employability skills required to achieve the performance criteria

These include a number of processes learned throughout work and life, which are required in most jobs. Some of these are covered by the national key competencies, although others may be added. The details below highlight how these competencies are applied in the attainment of this unit.

Application of the key competencies in this unit are to satisfy the nominated level in which:

Level 1 – relates to working effectively within set conditions and processes;

Level 2 – relates to management or facilitation of conditions or processes; and

Level 3 – relates to design, development and evaluation of conditions or process.

How will the candidate apply the following key competency in this unit? The candidate will need to:

Collect, analyse and organise information	<p>Collect, organise and understand information related to work orders, plans and safety procedures for circuit and component testing, and repair/component replacement.</p> <p>Technical literacy and communication skills sufficient to interpret and apply common industry terminology, and interpret technical information and specifications.</p> <p>Research and interpretive skills to locate, interpret and apply operational and safety information.</p>	Level 1
Communicate ideas and information	<p>Communicate ideas and information to enable confirmation of work requirements and specifications, coordination of work with site supervisor, other workers and customers, and the reporting of work outcomes and problems.</p> <p>Plain English literacy and communication skills in relation to dealing with others involved in the work.</p> <p>Questioning and active listening skills, for example when obtaining information on electrical repairs/ replacement procedures.</p>	Level 1
Plan and organise activities	<p>Plan and organise activities, including preparation and layout of worksite and obtaining of equipment and material to avoid backtracking or workflow interruptions.</p>	Level 1
Work with others and in a team	<p>Work with others and in a team by recognising dependencies and using cooperative approaches to optimise workflow and productivity.</p>	Level 1
Use mathematical ideas and techniques	<p>Use mathematical ideas and techniques to correctly complete tests and measurements to determine electrical circuit/ component repair/replacement requirements.</p>	Level 1
Solve problems	<p>Use pre checking and inspection techniques to anticipate planning and scheduling problems and avoid wastage of time and material.</p> <p>Manipulative and dexterity skills to perform electrical testing and repair/replacement procedures.</p> <p>Problem-solving skills for a range of procedural issues.</p>	Level 1
Use technology	<p>Use workplace technology related to repairing electrical circuits, including use of specialist tooling, measuring equipment, computerised technology and communication devices and the reporting/ documenting of results.</p>	Level 1

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1 Prepare for work	1.1 Work instructions are used to determine job requirements, including method, process and equipment.	<p>The Range Statement provides advice to interpret the scope and context of this unit of competence, allowing for differences between enterprises and workplaces. It relates to the unit as a whole and facilitates holistic assessment. The following variables may be present for this particular unit:</p> <p>Unit context</p> <ul style="list-style-type: none"> work <u>requires</u> individuals to demonstrate judgement and problem-solving skills in managing own work activities and contributing to a productive team environment within the scope of this unit. This <u>includes</u> an understanding of the level of work to be performed work <u>is</u> carried out in accordance with award provisions. <p>Communications</p> <ul style="list-style-type: none"> communications <u>are to</u> include, but are not limited to verbal and visual instructions and fault reporting and <i>may include</i> site specific instructions, written instructions, sketches, diagrams or instructions related to job/task, telephones and pagers. <p>Quality requirements</p> <ul style="list-style-type: none"> quality requirements <u>are to</u> include, but are not limited to regulations, including Australian Standards, internal company quality policy and standards and enterprise operations and procedures. 	<p>Learning experiences for the HSC must address:</p> <p>A range of sources for work instructions and procedures including:</p> <ul style="list-style-type: none"> work schedules/plans/specifications job card role/duty statement roster standard operating procedures (SOP) Material Safety Data Sheets (MSDS) diagrams/sketches manuals <ul style="list-style-type: none"> - workshop - product regulations/legislation/codes of practice workplace/organisation guidelines, specifications, requirements, policies and procedures Australian Standards workplace/organisation bulletins/memos engineer's design specifications/instructions. <p>An awareness of various modes of communication to receive work instructions including:</p> <ul style="list-style-type: none"> verbal <ul style="list-style-type: none"> - face-to-face (supervisor to employee) - telephone/mobile phone/pager - PA system - two-way radio workplace meetings written communication <ul style="list-style-type: none"> - work plans/job cards - memos/messages - job description/statement - workplace forms - roster - facsimile - email - intranet non-verbal <ul style="list-style-type: none"> - gestures - signals - signage - diagrams.

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			<p>Strategies for obtaining, understanding and clarifying instructions/procedures including:</p> <ul style="list-style-type: none"> • correct sourcing and selection of information • consult appropriate personnel • active listening • open and closed questions. <p>A range of opportunities to read, interpret and follow information/instructions for a range of work tasks of varying degrees of difficulty.</p> <p>Planning and preparation for a range of tasks/ activities applicable to repairing electrical circuits.</p> <p>A basic overview of the role of employees in quality assurance.</p>
	<p>1.2 Job specifications are read and interpreted.</p>		<p>Learning experiences for the HSC must address:</p> <p>Define:</p> <ul style="list-style-type: none"> • job specification(s). <p>An understanding of the nature of electricity and electron flow.</p> <p>Understanding and application of Ohm's Law including:</p> <ul style="list-style-type: none"> • current (amps) • resistance (ohms) • power (watts) • voltage (volts). <p>Knowledge and understanding of electrical measurements.</p> <p>An understanding of the characteristics of different types of circuits including:</p> <ul style="list-style-type: none"> • basic/simple • series • parallel. <p>Knowledge of the elements of a circuit and their purpose including:</p>

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			<ul style="list-style-type: none"> • power supply • fuse • switch • load • conductor. <p>Understanding of circuit and wiring diagrams including:</p> <ul style="list-style-type: none"> • reading circuit diagrams <ul style="list-style-type: none"> - individual components (basic circuits) - complete vehicle circuit • symbols <ul style="list-style-type: none"> - components - Ohm's law • Australian Standards.
	<p>1.3 OH&S requirements, including personal safety needs, are observed throughout the work.</p>	<p>Safety (OH&S)</p> <ul style="list-style-type: none"> • OH&S requirements <u>are to</u> be in accordance with legislation/regulations/codes of practice and enterprise safety policies and procedures. This <i>may</i> include protective clothing and equipment, use of tooling and equipment, workplace environment and safety, handling of material, use of fire fighting equipment, enterprise first aid, hazard control and hazardous materials and substances • personal protective equipment <u>is to</u> include that prescribed under legislation/regulations/codes of practice and workplace policies and practices • safe operating procedures <u>are to</u> include, but are not limited to the conduct of operational risk assessment and treatments associated with vehicular movement, electrical safety, manual lifting and shifting and working in proximity to others and site visitors • emergency procedures related to this unit <u>are to</u> include but may not be limited to operating safely in the event of fires, enterprise first aid requirements and site evacuation. 	<p>Learning experiences for the HSC must address:</p> <p>An awareness of safe work practices and procedures when working with electrical circuits.</p> <p>Selection, use and application of a range of personal protective equipment (PPE) for working with electrical circuits.</p> <p>Importance of correctly fitting PPE.</p> <p>Awareness of a range of hazards associated with electrical circuits including:</p> <ul style="list-style-type: none"> • electric shock • electrical flashes • heat • burns • working in proximity to others. <p>A basic understanding of risk management.</p> <p>Procedures to follow in the event of an emergency.</p>

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	<p>1.4 Equipment and tooling are identified and checked for safe and effective operation.</p>	<p>Tooling and equipment</p> <ul style="list-style-type: none"> • tooling and equipment <i>may</i> include hand tooling, test lamp, multimeter, power/air tooling, specialist tooling for removal/replacement, special testing equipment and soldering equipment. 	<p>Learning experiences for the HSC must address:</p> <p>General features, purpose, maintenance and working knowledge of a range of tools and equipment for electrical testing and circuit repair including:</p> <ul style="list-style-type: none"> • test lights <ul style="list-style-type: none"> - standard - light-emitting diode (LED) • meters <ul style="list-style-type: none"> - automatic voltage regulator (AVR) - multimeter • soldering iron • wire strippers • electrical pliers • side cutters • terminal crimping tool. <p>Knowledge of the meaning of colours used in electrical tape and heat-shrink tubing.</p> <p>Knowledge of the purpose, function and use of a range of basic electrical components including:</p> <ul style="list-style-type: none"> • conductors • insulators • resistors • switches • semi-conductors <ul style="list-style-type: none"> - transistors - diodes • bulbs • connectors • capacitors • circuit protectors <ul style="list-style-type: none"> - fuses - fuseable links - relays • DC power source <ul style="list-style-type: none"> - lead/acid battery • loads <ul style="list-style-type: none"> - lights - radio - clock - electric windows/mirrors

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	1.5 Procedures are determined to minimise task time.		<ul style="list-style-type: none"> - air-conditioner - ignition system/engine management system. <p>Learning experiences for the HSC must address:</p> <p>A basic understanding of electrical test procedures including:</p> <ul style="list-style-type: none"> • correct order of test procedures • use of visual and test equipment methods • access to manufacturers' specifications and test results • use of troubleshooting guides • pre-testing and post-testing of repairs/components.
2 Test circuits/components and identify faults	2.1 Correct information is accessed and interpreted from manufacturer/ component supplier specifications.	<p>Information</p> <ul style="list-style-type: none"> • information sources <i>may include</i>, but are not limited to: <ul style="list-style-type: none"> - verbal or written and graphical instructions, signage, work schedules/ plans/specifications, work bulletins, memos, material safety data sheets, diagrams or sketches - safe work procedures related to repairing electrical circuits - regulatory/legislative requirements pertaining to automotive industry, including Australian Design Rules - engineer's design specifications and instructions - organisation work specifications and requirements - instructions issued by authorised enterprise or external persons - Australian Standards. 	<p>Learning experiences for the HSC must address:</p> <p>Knowledge of a range of sources of information for testing and repair of electrical circuits including:</p> <ul style="list-style-type: none"> • workshop manuals <ul style="list-style-type: none"> - factory - general/generic - electronic • manufacturers' specifications <ul style="list-style-type: none"> - specification charts - manufacturers' websites • trade and technical journals • dealer job/service card.
	2.2 Tests are carried out to determine faults using tooling and techniques.		<p>Learning experiences for the HSC must address:</p> <p>Knowledge of a range of common electrical circuit faults including:</p> <ul style="list-style-type: none"> • damage • corrosion • wear

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			<ul style="list-style-type: none"> • electrical defects <ul style="list-style-type: none"> - open circuit - short circuit - grounded circuit - continuity. <p>Knowledge of procedures for identifying faults including:</p> <ul style="list-style-type: none"> • aural assessment • visual assessment • functional assessment. <p>Knowledge and understanding of a range of procedures for electrical testing including:</p> <ul style="list-style-type: none"> • measuring <ul style="list-style-type: none"> - voltage - current - resistance • test for open and/or short circuit • test individual components • testing for continuity. <p>Use of a range of electrical test equipment in accordance with manufacturers' specifications and workplace/organisation practices including standard operating procedures for:</p> <ul style="list-style-type: none"> • zero and calibration • selection of correct mode and range • diagnostic code extraction.
	2.3 Circuits/components are tested without causing damage to component or system.		<p>Learning experiences for the HSC must address:</p> <p>An awareness of the damage that can be caused while testing electrical circuits and methods of preventing this damage.</p>
	2.4 Faults are identified and preferred repair action determined.	<p>Unit Scope</p> <ul style="list-style-type: none"> • repairing electrical circuits <i>may</i> include replacement of fuses, bulbs and terminals, wiring repairs i.e. open circuits/short circuits/earthing • repair methods <u>are to</u> include: <ul style="list-style-type: none"> - electrical measurements 	<p>Learning experiences for the HSC must address:</p> <p>An ability to interpret, analyse and compare results to manufacturer's specifications and identify appropriate repair actions.</p> <p>Consultation with customer regarding faults and preferred repair action including:</p>

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		<ul style="list-style-type: none"> - fault finding using aural, visual and functional assessments for damage, corrosion, wear and electrical defects - reading circuit diagrams - pre- and post-repair testing - testing and identifying faults - repairs and adjustments - soldering • critical precautions <u>include</u> manufacturer/ component supplier procedures which must be applied as poor working practices are likely to damage electronic system ECUs and/or other components. 	<ul style="list-style-type: none"> • outline of fault and its cause/consequences • repair options • time/cost. <p>Appropriate actions including:</p> <ul style="list-style-type: none"> • adjust/repair individual components • overhaul entire unit • replace component/unit.
	2.5 Tests are carried out according to industry regulations/guidelines, OH&S, legislation and enterprise procedures/ policies.	<p>Statutory/regulatory authorities</p> <ul style="list-style-type: none"> • statutory/regulatory authorities <i>may</i> include Federal, State and local authorities administering acts, regulations and codes of practice. 	
3 Complete repairs to circuit wiring	3.1 Correct information is accessed and interpreted from manufacturer/ component supplier specifications.		<p>Learning experiences for the HSC must address:</p> <p>Understanding of the importance of correctly identifying component information including:</p> <ul style="list-style-type: none"> • name • type • serial number • manufacturer.
	3.2 Repairs, component replacement and adjustments are carried out using tooling, techniques and materials.	<p>Materials</p> <ul style="list-style-type: none"> • materials <i>may include</i> spare parts, soldering consumables and cleaning material. 	<p>Learning experiences for the HSC must address:</p> <p>Repairs including:</p> <ul style="list-style-type: none"> • replacement of components <ul style="list-style-type: none"> - fuses - bulbs - terminals • wiring repairs. <p>Knowledge of safe operating procedures for:</p> <ul style="list-style-type: none"> • soldering • crimping.
	3.3 Repairs to circuit wiring are completed without causing damage to component or system.		

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	3.4 Repairs are carried out according to industry regulations/guidelines OH&S, statutory and enterprise procedures/policies.		<p>Awareness of the consequences of not following manufacturer's recommendations when repairing or replacing components.</p> <p>Knowledge of procedures and devices used to protect electrical circuits during repair including:</p> <ul style="list-style-type: none"> • heat sinks • anti-static mats and straps.
4 Clean up work area and maintain equipment	4.1 Material that can be reused is collected and stored.	<p>Environmental requirements</p> <ul style="list-style-type: none"> • environmental requirements <u>are to</u> include but are not limited to waste management, noise, dust and clean up management. 	<p>Learning experiences for the HSC must address:</p> <p>Awareness of government incentives/initiatives/policies to encourage environmentally sound workplace practices.</p>
	4.2 Waste and scrap is removed following workplace procedures.		<p>Learning experiences for the HSC must address:</p> <p>An awareness of procedures for minimisation of impact on the environment including:</p> <ul style="list-style-type: none"> • efficient use of energy and resources • containment of loose materials on site (such as litter and waste material) • removal and disposal of non-reusable materials in a responsible manner <ul style="list-style-type: none"> - hazardous material - non-hazardous material • recycling <ul style="list-style-type: none"> - paper-based products - plastic - packaging materials - worn components - metal components - other circuit materials/components • safe storage of reusable materials in accordance with workplace/organisation policy. <p>Knowledge of workplace/organisation policy and procedures for waste disposal.</p>

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	4.3 Equipment and work area are cleaned and inspected for serviceable condition in accordance with workplace procedures.		<p>Learning experiences for the HSC must address:</p> <p>Clean-up procedures with proper consideration of the environment and OHS.</p> <p>A range of cleaning techniques including:</p> <ul style="list-style-type: none"> • wiping • washing • brushing • sweeping • scraping • use of cleaning agents (chemicals, solvents and detergents).
	4.4 Unserviceable equipment is tagged and faults identified in accordance with workplace requirements..		<p>Learning experiences for the HSC must address:</p> <p>Reporting of serious faults including:</p> <ul style="list-style-type: none"> • verbal notification to appropriate personnel • recording on job card/maintenance log • safety/lockout tagging where appropriate. <p>Personnel to whom problems should be reported:</p> <ul style="list-style-type: none"> • supervisor/manager • supplier/manufacturer. <p>Reasons for safety/lockout tagging including:</p> <ul style="list-style-type: none"> • ease of identification • evidence of serviceability • preventing use until repaired • prevent injury. <p>Procedures for marking and reporting unsafe or faulty tools for repair.</p>
	4.5 Operator maintenance is completed in accordance with manufacturer/ component supplier specifications and site procedures		<p>Learning experiences for the HSC must address:</p> <p>Knowledge of maintenance schedules.</p> <p>Awareness of routine operational maintenance for a range of tools and equipment including:</p> <ul style="list-style-type: none"> • lubrication • safety checks • cleaning and decontamination
	4.6 Tooling and equipment is maintained in accordance with workplace procedures		

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			<ul style="list-style-type: none"> • tightening and adjustment • replacement of consumable components • repair/replacement of worn, malfunctioning or damaged components/parts. <p>The importance of routine maintenance and servicing of equipment including:</p> <ul style="list-style-type: none"> • safety • productivity • warranty of item • costs associated with down time/lost production and capital expenditure • legal requirements. <p>An understanding of:</p> <ul style="list-style-type: none"> • the purpose of work records • workplace/organisation expectations for the maintenance of work records • types of work records <ul style="list-style-type: none"> - used in an automotive work environment - required by industry regulation(s) • methods for work records <ul style="list-style-type: none"> - manual - electronic. <p>The importance of recording information that is:</p> <ul style="list-style-type: none"> • clear • legible • accurate • concise • appropriate in terms of industry terminology and abbreviations.