



Australian Government

AURMTF4002 Analyse and repair performance fuel injection systems

Release 1

AURMTF4002 Analyse and repair performance fuel injection systems

Modification History

Release	Comment
Release 1	Replaces AURM441395A Analyse and repair performance fuel injection systems Unit code updated to meet policy requirements Reference to OHS legislation replaced with new WHS legislation

Unit Descriptor

Unit descriptor	<p>This unit of competency describes the skills and knowledge required to inspect, analyse and repair fuel injection systems, associated components and refuelling equipment.</p> <p>It requires the technical ability to conduct and interpret tests, determine repair and/or performance improvement strategies and conduct repairs, adjustments and post-repair checks.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.</p>
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Application of the Unit

Application of the unit	<p>This unit applies to individuals who analyse faults and implement performance improvement strategies in fuel injection systems, associated components and refuelling equipment in the motorsport and performance enhancement environment.</p>
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	
AURTTF2001	Service petrol fuel systems
AURETR3023	Diagnose and repair electronic spark ignition engine management systems

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. Assessment of performance is to be consistent with the evidence guide.
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify and confirm faults	1.1. Use controlling body rules, category rules, supplementary regulations and team requirements to specify task requirements, including configuration, equipment, quality and quantities 1.2. Access and interpret benchmark specifications for a correctly functioning fuel system 1.3. Observe workplace health and safety (WHS) requirements, including regulatory requirements, equipment and system isolation requirements, and personal protection needs, throughout the work 1.4. Examine the details of the fault and document available preliminary information 1.5. Identify the effects of the fault and confirm from direct and/or indirect evidence 1.6. Respond to possible safety impacts of the fault in accordance with regulatory and team obligations and practices
2. Prepare for fault analysis	2.1. Identify possible causes of the fault, including intermittent faults from an analysis of technical support information and available onboard diagnostic systems 2.2. Develop the most appropriate analysis process, including sequence, tests and testing equipment, and select from the range of available options 2.3. Obtain test equipment and prepare for the application in accordance with regulatory, manufacturer and team requirements 2.4. Select and prepare tooling and materials required to support the diagnostic process
3. Analyse faults and determine repair/performance enhancement strategies	3.1. Follow the selected analysis process in accordance with technical specifications and directions and/or the locally authorised method 3.2. Conduct test using testing equipment in accordance with regulatory requirements and manufacturer/component supplier specifications 3.3. Verify test results and other diagnostic findings, if necessary, and use reliable alternative or optional processes 3.4. Obtain authority to partly dismantle components, to permit an accurate inspection of analysed faults, if required

ELEMENT	PERFORMANCE CRITERIA
	<p>3.5. Draw valid conclusions about the cause, and draw the direct and indirect consequences of the fault from available evidence and document to team requirements</p> <p>3.6. Research technical support information to identify options for rectifying the fault or enhancing performance</p> <p>3.7. Select the most appropriate option from an analysis of the options, the prevailing circumstances, regulatory requirements and team policies</p> <p>3.8. Document and communicate the selected repairs/modifications or adaptation of equipment to appropriate persons, including the analysis outcome and repair requirements</p>
4. Conduct repairs/implement performance improvement strategies	<p>4.1. Carry out repairs and adjustments to components/sub-assemblies in accordance with manufacturer/component supplier specifications for methods, equipment used and tolerances relative to the system</p> <p>4.2. Conduct post-repair checks and vehicle start-up</p>
5. Clean up work area and finalise documentation	<p>5.1. Clean, maintain and prepare equipment and tooling for future use and store in accordance with manufacturer/component supplier specifications and team requirements</p> <p>5.2. Remove surplus and unserviceable components in accordance with team procedures</p> <p>5.3. Report problems with the work area or the operation of the equipment to appropriate persons</p> <p>5.4. Record work/vehicle documentation</p>

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

Required skills include:

- technical skills to the level required to use workplace technology related to fuel injection systems, including tooling equipment, calculators and measuring devices
- communication skills to the level required to communicate ideas and information to enable confirmation of work requirements, coordination of work with technical supervisors, other technicians and workers, and reporting of work outcomes and problems
- literacy skills to the level required to collect, organise and understand information related to the analysis and repair of fuel injection system analysis, including technical, regulatory, environmental and safety requirements
- numeracy skills to the level required to use mathematical ideas and techniques to correctly interpret test results in order to determine required action for the maintenance of fuel systems
- problem-solving skills to the level required to use pre-checking and inspection techniques to anticipate maintenance and repair problems, avoid reworking and avoid wastage
- team skills to the level required to work with others and in a team by recognising dependencies and using cooperative approaches to optimise workflow and productivity
- planning skills to the level required to plan and organise activities, including the preparation and layout of the work area, and obtaining equipment and material, to avoid backtracking, workflow interruptions or wastage

Required knowledge

Required knowledge includes:

- types, function, operations and limitations of fuel injection systems and components
- properties of fuels used in the motorsport industry, including compatibility with fuel injection system components
- fuel injection systems layouts
- diagnosis and testing procedures, and test instrument application
- symptom and cause differentiation
- repair and/or performance improvement strategies
- removal, replacement and repair, adjustment and post-repair check procedures
- diagnosis theory, including concept, design and planning
- record keeping procedures, including procedures for reporting equipment faults and component defects

REQUIRED SKILLS AND KNOWLEDGE

- team guidelines regarding acceptable quality and tolerance levels
- equipment safety requirements
- WHS policies and procedures
- applicable commonwealth, state or territory legislation, regulations, standards and codes of practice, including WHS, personal safety and environment, relevant to fuel injection systems

Evidence Guide

EVIDENCE GUIDE	
<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>	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	<p>Assessors must be satisfied that the candidate can competently and consistently:</p> <ul style="list-style-type: none"> • interpret and apply team requirements, controlling body and category rules and supplementary regulations • apply safety requirements, including the isolation of equipment and the use of personal protective equipment • follow task instructions, operating procedures and inspection processes to: <ul style="list-style-type: none"> • minimise the risk of injury to self or others • prevent damage to competition vehicle or equipment • achieve required outcomes within team time and quality standards • correctly analyse, repair and conduct post-repair checks on a minimum of three (3) fuel injection system faults involving: <ul style="list-style-type: none"> • rough running, under/over fuelling, misfiring, poor performance, contamination or leaks, with: <ul style="list-style-type: none"> • at least one fault having a possible combination causes involved in the sub-systems (e.g. fuel cells, pumps, pressure and/or flow regulation, management/control system and injection • the scope of the faults necessitates the use of a range of testing equipment • work effectively with others.
Context of, and specific resources for assessment	<ul style="list-style-type: none"> • The application of competency is to be assessed in the workplace or a simulated environment that reflects as far as possible the actual working environment. • Assessment is to occur using standard and authorised work practices, safety requirements and environmental constraints. • Assessment is to comply with relevant regulatory requirements, including specified Australian standards. • Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and

EVIDENCE GUIDE	
	<p>disability.</p> <ul style="list-style-type: none"> • The following resources should be made available: <ul style="list-style-type: none"> • access to competition vehicles fuel injection systems and associated test instruments • material and equipment • information on work specifications • team requirements • organisational procedures • safety procedures, regulations and quality standards.
Method of assessment	<ul style="list-style-type: none"> • 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 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 its correct interpretation and application. • Assessment may be applied under project-related conditions (real or simulated) and require evidence of process. • Assessment must confirm a reasonable inference that competency is able not only to be satisfied under the particular circumstance, but is able to be transferred to other circumstances. • Competence in this unit may be assessed in conjunction with other functional units which together form part of the holistic work role.
Guidance information for assessment	<p>Assessment processes and techniques must be culturally sensitive and appropriate to the language and literacy capacity of the candidate and the work being performed.</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

RANGE STATEMENT	
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.	
Fuel injected system	<p>A performance fuel injection system is defined as a specialised motorsport/performance system incorporating a configurable management/control system, and may include:</p> <ul style="list-style-type: none"> • a duplicate/backup supply system and injection
Fuel systems	<p>Fuel systems, including sub-systems and components, may include:</p> <ul style="list-style-type: none"> • fuel cells • pumps • pressure and/or flow regulation • management/control system and injection
Diagnosis	<p>Diagnosis includes covering:</p> <ul style="list-style-type: none"> • module and parts replacement in related electrical, electronic and pneumatic control systems
Fuel system faults	<p>Fuel system faults may include:</p> <ul style="list-style-type: none"> • rough running • under/over fuelling • misfiring • poor performance • contamination • leakage • indirect faults caused by the influence of external systems which may or may not be faulty in their primary operation
WHS requirements	<p>WHS requirements are to be in accordance with applicable commonwealth, state or territory legislation and regulations, and organisational safety policies and procedures, and may include:</p> <ul style="list-style-type: none"> • personal protective equipment and clothing • safety equipment • first aid equipment • hazard and risk control • elimination of hazardous materials and substances

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	<ul style="list-style-type: none"> • manual handling, including shifting, lifting and carrying • emergency procedures • team insurance requirements • material safety management systems • controlling body requirements • manufacturer/component supplier specifications • local safe operating procedures
Legislative requirements	<p>Legislative requirements are to be in accordance with applicable commonwealth, state or territory legislation, regulations, certification requirements and codes of practice, and may include:</p> <ul style="list-style-type: none"> • award and enterprise agreements • industrial relations • Australian standards • Australian Design Rules • confidentiality and privacy • WHS • the environment • equal opportunity • anti-discrimination • duty of care • health regulations
Tooling and equipment	<p>Tooling and equipment may include:</p> <ul style="list-style-type: none"> • hand and power tooling • vacuum/pressure gauges • flow meters • exhaust analysers • multimeters • engine diagnostic computer hardware and software
Components	<p>Components may include:</p> <ul style="list-style-type: none"> • rollover valves • fuel cells • fuel lines • breathers • pickup pumps • main pumps

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	<ul style="list-style-type: none"> • filters • fuel pots/surge tanks/collector tanks • pressure and temperature sensors • injectors • hoses and fittings • refuelling equipment, including churns/rigs, dry break valves, hoses and fittings
Information and procedures	<p>Information and procedures may include:</p> <ul style="list-style-type: none"> • controlling body rules, category rules and supplementary regulations • event scheduling and location details • team procedures and standards related to: <ul style="list-style-type: none"> • diagnosing and maintaining fuel systems • reporting and communication • use of tooling and equipment • emergency service contacts and team persons emergency contacts • team emergency and event procedures for accidents or injury • work instructions, including worksheets, material safety data sheets (MSDS), assembly procedures, plans, drawings, designs and checklists • manufacturer/component supplier specifications and application procedures for test equipment and material • Australian Design Rules (where applicable) • safety body publications • environmental, hazardous chemicals and dangerous goods legislation and local requirements relating to the disposal and use of fuels, lubricants, coolants and cleaning agents

Unit Sector(s)

Unit sector	Motorsport
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Co-requisite units

Not applicable.

Competency field

Competency field	Technical - Fuel Systems
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