## Unit 158 Knowledge in diagnosis and rectification of light vehicle chassis faults

<table>
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<tr>
<th>UAN:</th>
<th>L/601/3735</th>
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<tr>
<td>Level:</td>
<td>3</td>
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<td>Credit value:</td>
<td>6</td>
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<td>GLH:</td>
<td>45</td>
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<td>Relationship to NOS:</td>
<td>This unit is linked to LV08 Diagnose and Rectify Light Vehicle Chassis System Faults.</td>
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<td>Assessment requirements specified by a sector or regulatory body:</td>
<td>This unit was developed by the IMI, the sector skills council for the automotive retail industry. All assessments have been developed in accordance with the IMI Assessment Requirements for VRQs.</td>
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### Aim:
This unit enables the learner to develop an understanding of diagnosis and rectification of braking steering and suspension systems. It also covers light vehicle chassis systems and the evaluation of their performance.

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<th>Learning outcome</th>
<th>The learner will:</th>
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<td>1.</td>
<td>understand how the light vehicle chassis systems operate</td>
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### Assessment criteria
The learner can:

1.1 explain the construction and operation of light vehicle chassis systems to include:
1.2 electronic braking
1.3 front and rear wheel geometry
1.4 four wheel steer
1.5 hydraulic power steering
1.6 electronic power steering
1.7 self levelling suspension
1.8 ride control system
1.9 explain the interaction between electrical, electronic and mechanical components within light vehicle chassis systems
1.10 explain how light vehicle chassis electrical systems interlink and interact, including multiplexing
1.11 compare light vehicle chassis system components and assemblies against alternatives to identify differences in construction and operation
1.12 identify the engineering principles that are related to light vehicle chassis systems
1.13 inertia force, mass and acceleration
1.14 laws of friction
1.15 statics (springs and torsion bars)
1.16 hydraulic machines.

### Learning outcome

<table>
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<th>The learner will:</th>
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<tr>
<td>2. understand how to diagnose and rectify faults in light vehicle chassis systems</td>
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### Assessment criteria

The learner can:

2.1 explain symptoms and causes of faults found in light vehicle chassis systems
2.2 explain systematic diagnostic techniques used in identifying chassis system faults
2.3 explain how to examine, measure and make suitable adjustments to the components
2.4 explain how to carry out the diagnosis and rectification activities in order to correct the faults in the light vehicle chassis systems
2.5 explain how to select, prepare and use diagnostic and rectification equipment for light vehicle chassis systems
2.6 explain how to evaluate and interpret test results found in diagnosing light vehicle chassis system faults against vehicle manufacturer specifications and settings
2.7 explain how to evaluate the operation of components and systems following diagnosis and repair to confirm system performance.
Unit 158  Knowledge in diagnosis and rectification of light vehicle chassis faults

Supporting information

Candidates will be assessed on the assessment criteria as specified within the unit. The following information has been provided by IMI SSC and is included to support centres in terms of teaching and delivery.

Electronic and electronic principles of light vehicle chassis systems
a. The operation of electrical and electronic systems and components related to light vehicle chassis systems including:
   i. ECU
   ii. sensors and actuators
   iii. electrical inputs
   iv. voltages
   v. oscilloscope patterns
   vi. digital and fibre optic principles.
b. The interaction between the electrical/electronic system and mechanical components of chassis systems.
c. Electronic and electrical safety procedures.

Operation of electronic ABS and EBD braking systems
a. Layout of:
   i. ABS and EBD braking systems
   ii. anti-lock braking
   iii. anti-skid control systems
   iv. warning systems.
b. Operation of:
   i. hydraulic and electronic control units
   ii. wheel speed sensors
   iii. load sensors
   iv. hoses
   v. cables and connectors.
c. Advantage of ABS and EBD braking systems over conventional braking systems.
d. The relationship and interaction of ABS braking with and other vehicle systems – traction control.

Steering geometry for light vehicle applications
a. Non-steered wheel geometry settings.
b. Front/rear wheel geometry:
   i. castor
   ii. camber
   iii. kingpin or swivel pin inclination
   iv. negative offset
   v. wheel alignment (tracking)
   vi. toe in and toe out
   vii. toe out on turns and steered wheel geometry
viii. Ackerman principle
ix. slip angles
x. self-aligning torque
xi. oversteer and understeer
xii. neutral steer.
c. The operation and layout of rear and four wheel steering.
d. The construction and operation of power assisted steering systems:
   i. hydraulic system
   ii. power cylinders
   iii. drive belts and pumps
   iv. hydraulic valve (rotary, spool and flapper type).
e. The operation of:
   i. electronic power steering systems (EPS)
   ii. electrical and electronic components.

Components and operation of self-levelling suspension
a. The components, construction and operation of a self levelling suspension system.
b. The operation of self-levelling suspension system under various conditions:
   i. self-energising
   ii. pump operated self-levelling suspension.

Operation of fitting ride-controlled systems
a. The reasons for fitting ride controlled systems.
b. The operation of driver controlled and ride controlled systems.

Symptoms and faults in braking systems
a. Symptoms and faults associated with conventional braking systems, ABS, and EBD systems:
   i. mechanical
   ii. hydraulic
   iii. electrical and electronic systems
   iv. fluid leaks
   v. warning light operation
   vi. poor brake efficiency
   vii. wheel locking under braking.

Diagnosis and faults in braking systems
a. Locate and interpret information for:
   i. diagnostic tests
   ii. vehicle and equipment specifications
   iii. use of equipment
   iv. testing procedures
   v. test plans
   vi. fault codes
   vii. legal requirements.
b. Prepare equipment for use in diagnostic testing.
c. Conduct systematic testing and inspection of:
   i. braking system
   ii. ABS
   iii. EBD
   iv. mechanical
   v. hydraulic
   vi. electrical and electronic systems.
d. Using appropriate tools and equipment including:
Symptoms and faults associated with steering systems

a. Symptoms and faults associated with steering systems:
   i. mechanical
   ii. hydraulic
   iii. electrical and electronic
   iv. steering boxes (rack and pinion, worm and re-circulating ball)
   v. steering arms and linkages
   vi. steering joints and bushes
   vii. idler gears
   viii. bearings
   ix. steering columns (collapsible and absorbing)
   x. power steering system.

Diagnosis and faults in steering systems

a. Locate and interpret information for:
   i. diagnostic tests
   ii. vehicle and equipment specifications
   iii. use of equipment
   iv. testing procedures
   v. test plans
   vi. fault codes
   vii. legal requirements.

b. How to prepare equipment for use in diagnostic testing.

c. Conduct systematic testing and inspection of:
   i. steering systems
   ii. mechanical
   iii. hydraulic
   iv. electrical and electronic systems
   v. power steering system.

d. Using appropriate tools and equipment including:
   i. multi-meters
   ii. oscilloscope
   iii. pressure gauges
   iv. wheel alignment equipment
   v. steering geometry equipment.

e. Evaluate and interpret test results from diagnostic testing.

f. Compare test result and values with vehicle manufacturer’s specifications and settings.

h. Assess, examine and evaluate the:
   i. operation
Symptoms and faults associated with suspension systems

a. Symptoms and faults associated with suspension systems:
   i. mechanical
   ii. hydraulic
   iii. electrical and electronic
   iv. conventional
   v. self-levelling and ride controlled suspension systems
   vi. ride height (unequal and low)
   vii. wear
   viii. noises under operation
   ix. fluid leakage
   x. excessive leakage
   xi. excessive tyre wear.

Diagnosis and faults in suspension systems

a. Locate and interpret information for:
   i. diagnostic tests
   ii. vehicle and equipment specifications
   iii. use of equipment
   iv. testing procedures
   v. test plans
   vi. fault codes
   vii. legal requirements.

b. How to prepare equipment for use in diagnostic testing.

c. How to conduct systematic testing and inspection of:
   i. suspension systems
   ii. mechanical
   iii. hydraulic
   iv. electrical and electronic systems
   v. conventional
   vi. self-levelling and ride controlled suspension systems.

d. Using appropriate tools and equipment including:
   i. multi-meters
   ii. oscilloscope
   iii. pressure gauges
   iv. alignment equipment
   v. geometry equipment.

e. Evaluate and interpret test results from diagnostic testing.

f. Compare test result and values with vehicle manufacturer’s specifications and settings.

g. How to dismantle, components and systems using appropriate equipment and procedures.

h. Assess, examine and evaluate the operation, settings, values, condition and performance of components and systems.

i. Probable faults, malfunctions and incorrect settings.

j. Rectification or replacement procedures.

k. Operation of systems following diagnosis and repair to confirm operation and performance.
Measurements on components to include:

a. settings
b. input and output values
c. voltages
d. current consumption
e. resistance
f. output patterns with oscilloscope
g. pressures
h. condition
i. wear and performance.