

National Occupational Standards: Auto Electrical & Mobile Electrical Installation

NOS G1 – Contribute to Housekeeping in Motor Vehicle Environments

NOS Overview

This NOS is about the routine maintenance of the workplace, carrying out basic, non-specialist checks of work tools and equipment, cleaning the work area and using resources economically.

SCOPE OF THIS NOS:

1. **Equipment maintenance** covers
 - a. routine checks on work tools and equipment
 - b. cleaning work tools and equipment
 - c. replacing minor parts
 - d. visual inspection of electrical equipment
2. **Housekeeping activities** cover
 - a. day to day work area cleaning
 - b. clearing away
 - c. dealing with spillages
 - d. disposal of waste, used materials and debris
3. **Work tools and equipment** are
 - a. hand
 - b. electrical
 - c. mechanical
 - d. pneumatic
 - e. hydraulic

ESSENTIAL KNOWLEDGE

You need to understand:

Legislative and organisational requirements and procedures

1. the scope of your job responsibilities for the use and maintenance of hand tools, equipment and your work area.
2. workplace policies and schedules for **housekeeping activities** and **equipment maintenance**.

3. the manufacturer's requirements for the cleaning and general, non-specialist maintenance of the tools and equipment for which you are responsible.
4. the regulations and information sources applicable to workshop cleaning and maintenance activities for which you are responsible.
5. the importance of reporting faults quickly to the relevant person.
6. the importance of reporting anticipated delays to the relevant person(s) promptly.

Equipment maintenance

7. how to select and use equipment used for basic hand tool maintenance activities.
8. how to store hand tools safely and accessibly.
9. how to report faulty or damaged **work tools and equipment**.
10. how to work safely when cleaning and maintaining **work tools and equipment**.

General work area housekeeping

11. how to select and use cleaning equipment
12. how to use resources economically.
13. how to use work area cleaning materials and agents.
14. how to clean and maintain the **work tools and equipment** and work areas for which you are responsible.
15. how to dispose of unused cleaning agents, materials and debris.
16. the properties and hazards associated with the use of cleaning agents and materials.
17. the importance of wearing personal protective equipment.
18. the importance of using resources economically and for their intended purpose only.

PERFORMANCE OBJECTIVES

To be competent you must:

- a. wear suitable personal protective equipment throughout all **housekeeping and equipment maintenance activities**.
- b. select and use cleaning equipment which is:
 - of the right type
 - suitable for the task.

- c. use resources economically and for their intended purpose only, following manufacturers' instructions and workplace procedures.
- d. follow workplace policies, schedules and manufacturers' instructions when cleaning and maintaining hand tools and equipment.
- e. clean the work area(s), for which you are responsible, at the specified time and frequency.
- f. carry out **housekeeping activities** safely and in a way which minimises inconvenience to customers and staff.
- g. follow the manufacturer's instructions when using cleaning and sanitising agents.
- h. ensure your **housekeeping activities** keep your work area clean and free from debris and waste materials.
- i. ensure your **equipment maintenance** activities keep your **work tools and equipment** fit for purpose.
- j. dispose of used cleaning agents, materials and debris to comply with legal and workplace requirements.
- k. store your **work tools and equipment** in a safe manner which permits ease of access and identification for use.
- l. report any faulty or damaged tools and equipment to the relevant person(s) clearly and promptly.
- m. report any anticipated delays in completion to the relevant person(s) promptly.

NOS G2 – Reduce Risks to Health and Safety in the Motor Vehicle Environment

NOS OVERVIEW

This NOS covers the basic, legally required health and safety duties of everyone in the workplace. It describes the competence required to ensure that:

- our own actions do not create any health and safety risks
- you do not ignore significant risks in your workplace, and
- you take sensible action to put things right, including reporting situations which pose a danger to people in the workplace, and seeking advice from others

This NOS does **not** require you to undertake a full Risk Assessment. It is about having an appreciation of significant risks in the workplace and knowing how to identify them and deal with them.

When you have completed this NOS, you will have proved you can:

3. Identify hazards and evaluate risks in your workplace
4. Reduce the risks to health and safety in your workplace

SCOPE OF THIS NOS:

1. Risks resulting from

- a. the use and maintenance of machinery or equipment
- b. the use of materials or substances
- c. working practices which do not conform to laid down policies
- d. unsafe behaviour
- e. accidental breakages and spillages
- f. environmental factors
- g. working at height
- h. lifting operations and manual handling
- i. incorrect use of personal protective equipment

2. Workplace policies covering

- a. the use of safe working methods and equipment
- b. the safe use of hazardous substances
- c. smoking, eating, drinking and drugs
- d. what to do in the event of an emergency
- e. personal presentation
- f. personal protective equipment
- g. lifting operations and manual handling
- h. working at height
- i. mobile phones and personal stereo equipment

ESSENTIAL KNOWLEDGE

You need to understand:

Health and Safety Legislation and Workplace Policies

1. your legal duties for health and safety in the workplace as required by the Health and Safety at Work Act 1974, and any other policies or procedures that govern your working practices.
2. your duties for health and safety as defined by any specific legislation covering your job role.
3. **agreed workplace policies relating to controlling risks to health and safety.**
4. responsibilities for health and safety in your job description.
5. the responsible persons to whom you report health and safety matters.

Risks to Health and Safety

6. what hazards may exist in your workplace, (eg. Slips, trips and falls).
7. health and safety risks which may be present in your own job role and the precautions you must take.
8. the importance of remaining alert to the presence of hazards in the whole workplace.
9. how to deal with and report risks.
10. the importance of dealing with or promptly reporting risks.
11. the requirements and guidance on the precautions.
12. the specific workplace policies covering your job role.
13. suppliers' and manufacturers' instructions for the safe use of equipment, materials and products.
14. safe working practices for your own job role.
15. the importance of personal presentation in maintaining health and safety in the workplace.
16. the importance of personal conduct in maintaining the health and safety of yourself and others.
17. the importance of personal protective equipment, when and where it should be used and the importance of maintaining it correctly.
18. your scope and responsibility for rectifying risks.

19. workplace procedures for handling risks which you are unable to deal with.

PERFORMANCE OBJECTIVES

To be competent you must:

- a carry out your working practices in accordance with legal requirements.
- b identify the correct personal and vehicle protective equipment required to correctly carry out your workplace practices.
- c carry out your workplace practices using the correct personal protective equipment.
- d follow the most recent **workplace policies** for your job role.
- e rectify health and safety **risks** that are within your capability and scope of your job responsibilities.
- f pass on any suggestions for reducing **risks** to health and safety within your job role to the responsible persons.
- g ensure your personal conduct in the workplace does not endanger the health and safety of yourself or other persons.
- h follow the **workplace policies** and suppliers' or manufacturers' instructions for the safe use of equipment, materials and products.
- i report any differences between **workplace policies** and suppliers' or manufacturers' instructions as appropriate.
- j ensure your personal presentation at work:
 - ensures the health and safety of yourself and others,
 - meets any legal duties, and
 - is in accordance with workplace policies

NOS G3 – Maintain Working Relationships in the Motor Vehicle Environment

NOS OVERVIEW

This NOS is about maintaining good working relationships with all colleagues in the working environment by using effective communication and support skills.

SCOPE OF THIS NOS:

- 1. Colleagues** are
 - a. immediate work colleagues
 - b. supervisors and managers
- 2. Requests for assistance** covering
 - a. technical assistance
 - b. personal assistance

ESSENTIAL KNOWLEDGE

You need to understand:

Your responsibilities and constraints

1. your own and your colleague's job role and limits of responsibility for giving advice and support.
2. the operational constraints which may affect interaction with colleagues.
5. lines of communication within your workplace.

Communication skills and working relationships

4. how to use suitable and effective spoken communication skills when responding to and interacting with others.
5. how to adapt written and spoken communication methods to satisfy the needs of colleagues.
6. how to report problems using written and spoken methods of communication.
7. the importance of developing positive working relationships with colleagues – the effect on morale, productivity, and company image.
8. the importance of accepting other peoples' views and opinions.
9. the importance of making and honouring realistic commitments to colleagues.

PERFORMANCE OBJECTIVES

To be competent you must:

- a. contribute actively to team working by initiating ideas and co-operating with colleagues.
- b. respond promptly and willingly to requests for assistance from **colleagues** which fall within the limits of your own job responsibilities and capabilities.
- c. where requests fall outside your responsibility and capability, refer colleagues to the relevant person(s).
- d. give colleagues sufficient, accurate information and support to meet their work needs.
- e. make **requests for assistance** to **colleagues** clearly and courteously.
- f. use methods of communication which meet the needs of colleagues.
- g. treat colleagues in a way which shows respect for their views and opinions and promotes goodwill.
- h. make and keep achievable commitments to **colleagues**
- i.. inform colleagues promptly of any problems or information likely to affect their own work.

NOS G4 – Use of Hand Tools and Equipment in Motor Vehicle Engineering

NOS OVERVIEW

This NOS is about the basic use of tools, materials and fabrications relevant to the Automotive Sector.

This NOS is about:

- interpreting information
- adopting safe and healthy working practices
- selecting materials and equipment

This NOS is those working in technical support roles. It is also appropriate for workshop planners.

ESSENTIAL KNOWLEDGE

You must know and understand:

- a. The organisational procedures developed to report and rectify inappropriate information and unsuitable resources, and how they are implemented.
- b. The types of information, their source and how they are interpreted.
- c. The organisational procedures to solve problems with the information and why it is important they are followed.
- d. The level of understanding operatives must have of information for relevant, current legislation and official guidance and how it is applied.
- e. What the accident reporting procedures are and who is responsible for making the reports.
- f. Why and when personal protective equipment (PPE) should be used.
- g. Why disposal of waste should be carried out safely and how it is achieved
- h. Demonstrate an understanding of material properties
- i. Investigate the use of materials and fabrication
- j. how to file, fit, tap, thread, cut and drill plastics and metals
- k. how to select and use gaskets, sealants, seals, fittings and fasteners

PERFORMANCE OBJECTIVES

You must be able to:

1. Interpret the given information relating to the work and resources to confirm its relevance
2. Carry out pre-start preparation inspections on power tools and equipment in accordance with approved procedures
3. Carry out operations using power tools and equipment in accordance with safe working practices to achieve the work outcome
4. Identify problems associated with power tools and equipment which need to be referred to authorised personnel
5. Demonstrate work skills to:
 - measure, mark out, file, fit, tap, thread, cut, drill, finish, position and secure.
6. Use and maintain:
 - hand tools
 - ancillary equipment
 - safety aids
7. Disposal of waste in accordance with legislation to maintain a clean work space
8. Checks carried out in accordance with manufacturer's/operator's guidance, legislation and official guidance and organisational requirements
9. Demonstrate work skills to select correct materials and fabrication for project

NOS G6 – Enable Learning through Demonstrations and Instruction (Imported ENTO unit L11)

NOS OVERVIEW

This NOS is about demonstrating skills and methods to learners and instructing learners in procedures and processes.

These include; demonstrating how equipment is used, showing a learner how to do something, giving learners instructions on what to do or how to carry out a particular activity, deciding when you should use demonstration or instruction to encourage learning, reviewing the potential use of technology-based learning, checking on the progress of learners and giving feedback to learners.

ESSENTIAL KNOWLEDGE

You need to understand:

The nature and role of demonstrations and instruction

1. the separate areas of demonstrations which encourage learning.
2. which types of learning are best achieved and supported through demonstrations.
3. how to identify and use different learning opportunities.
4. how to structure demonstrations and instruction sessions.
6. how to choose from a range of demonstration techniques.

Principles and concepts

6. how to put learners at their ease and encourage them to take part.
7. how to choose between demonstration and instruction as learning methods.
8. how to identify individual learning needs.
9. which factors are likely to prevent learning and how to overcome them.
10. how to check learners' understanding and progress.
11. how to put information in order and decide whether the language you will be using is appropriate.
12. how to choose and prepare appropriate materials, including technology based materials.
13. the separate areas of instructional techniques which encourage learning.
14. which types of learning are best achieved and supported through instruction.

External factors influencing human resource development

15. how to make sure everybody acts in line with health, safety and environmental protection legislation and best practice.
16. how to analyse and use developments in learning and new ways of delivery, including technology-based learning.

PERFORMANCE OBJECTIVES

Demonstrate skills and methods to learners

To be competent you must:

- a. base the demonstration on an analysis of the skills needed and the order they must be learned in.
 - b. ensure that the demonstration is accurate and realistic.
 - c. structure the demonstration so the learner can get the most out of it.
 - d. encourage learners to ask questions and get explanation at appropriate stages in the demonstration.
 - e. give learners the opportunities to practise the skill being demonstrated and give them positive feedback.
 - f. give extra demonstrations of the skills being taught to reinforce learning.
 - g. ensure that demonstrations take place in a safe environment and allow learners to see the demonstration clearly.
 - h. respond to the needs of learners during the demonstration.
- a. reduce distractions and disruptions as much as possible.

Instruct learners

To be competent you must:

- a. match instruction to the needs of the learners.
- b. identify which learning outcomes will be achieved through instruction.
- c. ensure that the manner, level and speed of the instruction encourages learners to take part.
- d. regularly check that learners understand and adapt instruction as appropriate.
- e. give learners positive feedback on the learning experience and the outcomes achieved.
- f. identify anything that prevents learning and review this with the learners.

NOS G8 – Identify and Agree the Motor Vehicle Customer Needs

NOS OVERVIEW

This NOS is about: gaining information from customers on their perceived needs; giving advice and information and agreeing a course of action; contracting for the agreed work and completing all necessary records and instructions.

ESSENTIAL KNOWLEDGE

You need to understand:

Legislative and organisational requirements and procedures

1. the fundamental legal requirements of current consumer legislation and the consequences of your own actions in respect of this legislation.
2. the content and limitations of company and product warranties for the vehicles dealt with by your company.
3. the limits of your own authority for accepting vehicles.
4. the importance of keeping customers informed of progress.
5. your workplace requirements for the completion of records.
7. how to complete and process all the necessary documentation.

Customer communication and care

7. How to communicate effectively with, and listen to, customers.
8. how to adapt your language when explaining technical matters to non-technical customers.
9. how to use effective questioning techniques.
10. how to care for customers and achieve customer satisfaction.

Company products and services

11. the range of options available to resolve vehicle problems.
12. the range and type of services offered by your company.
13. the effect of resource availability upon the receipt of customer vehicles and the completion work.
14. how to access costing and work completion time information.

PERFORMANCE OBJECTIVES

To be competent you must:

- a. obtain sufficient, relevant information from the customer to make an assessment of their own and perceived vehicle needs.
- b. provide customers with accurate, current and relevant advice and information on:
 - suitable vehicle inspection, repair and/or service procedures
 - potential courses of action
 - the implications of courses of action
 - the estimated costs.
- c. provide advice and information clearly and in a form and manner which the customer will understand.
- d. actively encourage customers to ask questions and seek clarification during your conversation.
- e. support the accurate identification and clarification of customer and vehicle needs, by referring to:
 - vehicle data
 - operating procedures.
- f. before accepting the vehicle, agree with the customer and record:
 - the extent and nature of the work to be undertaken
 - the terms and conditions of acceptance
 - the cost
 - the timescale.
- g. confirm your customer's understanding of the agreement you have made.
- h. ensure your recording systems are complete, accurate, in the format required and signed by the customer where necessary.
- i. pass all completed records to the next person in the process promptly.
- j. gain further customer approval where the contracted agreement is likely to be exceeded.

NOS AE01 – Locate and Correct Motor Vehicle Electrical Faults

UNIT OVERVIEW

This unit is about conducting a range of routine electrical tests and identifying simple faults on a variety of basic electrical components and undertaking suitable correction activities.

KEY WORDS AND PHRASES

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Vehicles:

These can be any of the following – light vehicles, commercial vehicles, motorcycles, mopeds and scooters.

SCOPE OF THIS UNIT:

1. Examples of Electrical components are:
 - a. power storage devices
 - b. power generating devices
 - c. vehicle starting devices
 - d. vehicle lighting devices
 - e. wiring harness and connection devices
 - f. vehicle sensors and actuators
 - g. circuit protection devices
 - h. infotainment systems
 - i. telematic / tracking systems
 - j. security systems
 - k. communication systems

2. Electrical testing equipment covers:
 - a. volt meters
 - b. ammeters
 - c. ohmmeters
 - d. battery testing equipment
 - e. diagnostic equipment
 - f. oscilloscope

3. Tools and equipment:
 - a. hand tools
 - b. special purpose tools
 - c. general workshop equipment
 - d. specialist electrical testing equipment.

4. Electrical testing techniques are:
 - a. voltage measuring
 - b. current measuring
 - c. resistance measuring
 - d. visual
 - e. aural
 - f. functional

5. **Electrical fault location within systems:**

- As listed at 1 above.

6. Rectification activities are defined as:

A suitable repair or replacement that rectifies the fault(s) identified from the diagnostic activities carried out.

ESSENTIAL KNOWLEDGE

You need to understand:

Legislative and organisational requirements and procedures

1. the health and safety legislation and workplace procedures relevant to workshop practices and personal and vehicle protection when carrying out electrical fault location and correction activities
2. statutory legal requirements relating to the vehicle and the components fitted
3. your workplace procedures for
 - recording fault location and correction activities
 - reporting the results of tests.
 - the referral of problems
 - reporting delays to the completion of work
4. the importance of working to recognised diagnostic procedures and processes and obtaining the correct information for diagnostic activities to proceed.
5. the importance of working to agreed timescales and keeping others informed of progress.
6. the relationship between time and costs.
7. the importance of reporting any anticipated delays to the relevant person(s) promptly.

Electrical and electronic principles

8. vehicle earthing principles and earthing methods.
9. basic electrical and electronic principles, including Ohms Law, voltage, power, current (AC/DC), resistance, magnetism, electromagnetism and electromagnetic induction.

10. circuit protection.
12. how electrical / electronic systems within motor vehicles operate.
13. electrical / electronic symbols, units and terms.
14. how to interpret wiring diagrams.
15. hybrid and alternative fuel vehicles electrical and electronic systems operation

Use of electrical testing equipment and electrical testing techniques

16. when and where to use voltage, ohm, amp and specific gravity measurements and simple circuit testing techniques.
17. how to measure voltage, resistance, current and specific gravity and simple circuit testing techniques to determine the cause(s) of a fault.
18. how to use the electrical testing equipment required.
19. how to conduct tests following electrical safety and workplace procedures.
20. how to determine component condition based upon calculations using ohms law.
21. how to determine the suitability of a component based upon calculations using ohms law
22. how to interpret the results of your tests.
23. how to make recommendations based upon the results of your tests.
24. the importance of basing your recommendations upon the results of your tests.

Vehicle electrical equipment faults and their correction

25. how to identify faults and damage in vehicle electrical systems.
26. the common underlying causes of faults and damage within the electrical components.
27. the purpose and function of motors, capacitors, resistors, semi-conductors, transistors, actuators and sensors (including active or self-generating and passive or modulating).
28. how to dispose of any removed electrical components in line with legislation and organisational procedures.
29. how to perform safety and operational checks on the tools and equipment required to remove and replace electrical components.
30. how to check that any replaced electrical components are functioning correctly and the importance of doing so before release to the customer.

PERFORMANCE OBJECTIVES

To be competent you must:

- a. wear suitable personal protective equipment and use suitable vehicle protection when using electrical testing techniques and carrying out rectification activities.
- b. support the identification of electrical faults, by reviewing manufacturer:
 - technical data
 - diagnostic test procedures.
- c. confirm that all equipment is safe prior to use
- d. check the functionality of the electrical system(s) / component.
- e. carry out tests on those electrical system(s) / components relevant to the reported fault on the vehicle.
- f. use electrical testing techniques which are suitable for the electrical system(s) / components concerned.
- g. carry out all diagnostic & rectification activities following:
 - manufacturers' instructions
 - industry recognised repair methods
 - health and safety requirements.
- h. work in a way which minimises the risk of :
 - damage to other vehicle systems
 - damage to other components and units
 - contact with leakages
 - contact with hazardous substances.
- i. ensure your electrical testing techniques clearly identify the cause of identified fault and/or damage.
- j. report the results of your tests and any recommendations for further action to the relevant person(s) clearly and accurately in an appropriate format, when necessary.
- k. seek the assistance of the relevant person(s) promptly where the results of your testing are unclear.
- l. ensure all replaced and repaired electrical components are secure and function as specified by the manufacturer prior to release to the customer.
- m. dispose of any removed electrical components safely to comply with legal requirements and your workplace procedures
- n. complete all electrical fault location and correction activities within the agreed timescale.
- o. report any anticipated delays in completion to the relevant person(s) promptly.

NOS AE02 – Install Motor Vehicle Electrical System Enhancements

UNIT OVERVIEW

This unit is about fitting electrical features and components to enhance the original vehicle features and specification to meet customer requirements.

KEY WORDS AND PHRASES

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Vehicles:

These can be any of the following – light vehicles, commercial vehicles, motorcycles, mopeds and scooters.

SCOPE OF THIS UNIT:

1. Electrical enhancements are:
 - a. audio systems
 - b. visual systems
 - c. communication systems
 - d. safety systems
 - e. lamps
 - f. tow bar electrical systems
 - g. navigation systems
 - h. security systems
 - i. auxiliary power supplies
 - j. telematics / vehicle location systems

2. Tools and equipment are:
 - a. hand tools
 - b. specialist fitting tools
 - c. general workshop equipment
 - d. electrical and electronic testing equipment

ESSENTIAL KNOWLEDGE

You need to understand:

Legislative and organisational requirements and procedures

1. the health and safety legislation and workplace procedures relevant to workshop practices and personal and vehicle protection when fitting vehicle electrical enhancements.

2. the legal implications of the mechanical and electrical enhancement of vehicles.
3. your workplace procedures for
 - recording enhancement activities
 - recording functionality of enhancements
 - the referral of problems
 - reporting delays to the completion of work.
4. the importance of working to agreed timescales and keeping others informed of progress.
5. the relationship between time and costs.
6. the importance of reporting anticipated delays to the relevant person(s) promptly.

Tools and equipment

7. how to prepare, test and use general workshop, special tools and appropriate testing equipment.

Electrical and electronic principles

8. vehicle earthing principles and earthing methods.
9. basic electrical and electronic principles, including Ohms Law, voltage, power, current (AC/DC) resistance, magnetism, electromagnetism and electromagnetic induction.
10. circuit protection devices.
11. electrical safety procedures.
12. electric symbols, units and terms.
13. how charging, lighting and warning systems operate.

Fitting electrical enhancements

14. the function and purpose of the electrical components fitted within audio systems, visual systems, communications equipment, safety fitments, auxiliary lamps, tow bars, reversing aids, navigation systems, alarm systems and immobiliser systems and how they operate.
15. how to interpret and follow technical instructions and customer requirements.
16. how enhancement opportunities may be limited by the existing vehicle systems and fitments.
17. the advantages and disadvantages of electrical customisation.
18. manufacturers' requirements relating to the components which you fit.

19. how to fit audio systems, visual systems, communications equipment, safety fitments, auxiliary lamps, tow bar electrics, reversing aids, navigation systems, alarm systems and immobiliser systems.
20. how to fit tow bars if you are working on light vehicles or draw bars if you are working on heavy vehicles.
21. how to check that the components to be fitted are compatible with the vehicle specification and customer requirements.
22. how to check that newly fitted electrical enhancements are functioning correctly and the importance of doing so before release to the customer.
23. how to make adjustments to components and any surrounding systems to ensure effective working.
24. how to work safely avoiding damage injury to yourself and damage to vehicles.

PERFORMANCE OBJECTIVES

To be competent you must:

- a. wear suitable personal protective equipment and use vehicle coverings throughout all enhancement activities.
- b. support your enhancement activities, by reviewing:
 - fitting procedures
 - technical data
 - legal requirements.
- c. prepare and test all the tools and equipment required, following manufacturers' instructions, prior to use.
- d. fit components which are compatible with the vehicle specification and customer requirements.
- e. carry out all electrical enhancement activities following:
 - manufacturers' instructions
 - your workplace procedures
 - health and safety requirements
 - legal requirements.
- f. work in a way which minimises the risk of :
 - damage to other vehicle systems
 - damage to other components and units
 - contact with leakages
 - contact with hazardous substances.



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- g. when necessary, adjust the components fitted and vehicle systems correctly to ensure that they meet the manufacturer's specification for effective operation.
- h. ensure all enhancements function to specification prior to release to the customer.
- i. complete all enhancement activities within the agreed timescale.
- j. report any anticipated delays in completion to the relevant person(s) promptly.

NOS AE03 – Repair and Overhaul Motor Vehicle Electrical Units

UNIT OVERVIEW

This unit is about the off vehicle repair and overhauling of electrical units and components.

KEY WORDS AND PHRASES

Agreed timescales:

Examples include manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Generators:

These can be externally and internally regulated.

Starters:

Examples include pre-engaged; inertia; axial and co-axial.

SCOPE OF THIS UNIT:

1. Electrical equipment is
 - a. volt meters
 - b. ammeters
 - c. ohmmeters
 - d. electrical insulation testing equipment

2. Testing methods are
 - a. torque tests
 - b. resistance tests
 - c. insulation tests
 - d. visual
 - e. aural
 - f. measurement

3. Repair activities are
 - a. stripping
 - b. cleaning and evaluating the unit
 - c. soldering
 - d. replacing faulty parts
 - e. reassembly
 - f. testing

4. Electrical units are
 - a. generators
 - b. starters
 - c. motors
 - d. actuators

ESSENTIAL KNOWLEDGE

You need to understand:

Legislative and organisational requirements and procedures

1. the health and safety legislation and workplace procedures relevant to workshop practices and personal protection when undertaking electrical unit repair activities.
2. your workplace procedures for
 - recording fault location and repair / correction activities
 - reporting the results of tests.
 - the referral of problems
 - reporting delays to the completion of work.
3. the importance of documenting repair / correction information.
4. the importance of working to agreed timescales and keeping others informed of progress.
5. the cost-benefit relationship between the reconditioning, repair and replacement of components within electrical units and components.
7. the importance of reporting anticipated delays to the relevant person(s) promptly.

Electrical principles

7. the principles of electrical charging.
8. how starting, charging and electrical motor circuits work.
9. basic electrical and electronic principles, including Ohms Law, voltage, power, current (AC/DC) resistance, magnetism, electromagnetism and electromagnetic induction.
10. electrical symbols, units and terms.
11. the types of charging components, starting components and motors, and how they work.
12. how starter motor drive mechanisms work (including epicyclic gearing).
13. electrical safety procedures.

Use of electrical testing equipment and electrical testing techniques

14. how to prepare, assess and test the accuracy and operation of all the electrical repair and testing equipment required.

15. how to use all the electrical repair and testing equipment required.
16. how to interpret test results and perform electrical efficiency calculations.

Charging system components, starting system components and motors fault finding and repair

17. how to find, interpret and use sources of information on electrical repair procedures.
18. manufacturers specifications for the units being repaired, and where this information can be sourced.
19. suppression requirements applicable to electrical components and the type and causes of faults which can occur in charging, starting and motor systems.
20. the purpose of, and when to use torque, resistance, insulation and visual tests.
21. how to test the internal components of an alternator including: diode pack, rotor field and stator windings.
22. the relationship between test methodology and the faults repaired – the use of appropriate testing methods.
23. how to assess the condition of components within charging system components, starting system components and motors and locate electrical faults.
24. how to repair charging system components, starting system components and motors.
25. how to test and evaluate the performance of repaired electrical components against the operating specification required.
26. how to carry out wiring harness repairs including soldering and crimping of wires and terminals.
27. how to identify the types and causes of alternator and starter failure.
28. how to make suitable adjustments to the starter drive setting.

PERFORMANCE OBJECTIVES

To be competent you must:

- a. wear suitable personal protective equipment throughout all **repair activities**.
- b. use suitable sources of technical information to support your **repair activities**.
- c. assess and prepare all the **electrical equipment** required, following manufacturers' instructions, prior to use.

- d. use the **electrical equipment** required correctly and safely throughout all repairing activities.
- e. carry out all **repair activities** following:
 - manufacturers' instructions
 - recognised researched repair methods
 - health and safety requirements.
- f. work in a way which minimises the risk of :
 - damage to other vehicle systems
 - damage to other components and units
 - contact with leakages
 - contact with hazardous substances.
- g. ensure your initial assessment and **testing methods** of **electrical units** identifies accurately their condition and suitability for reconditioning, repair or replacement.
- h. inform the relevant person(s) promptly where a repair is uneconomic or unsatisfactory to perform.
- i. use electrical **testing methods** which are suitable for assessing the performance of the type of **electrical unit** repaired.
- j. when necessary, adjust electrical units and associated components to the specified settings correctly to ensure that they operate to requirements.
- k. ensure repaired alternators and starters conform to the electrical efficiency operating specification required and any legal requirements.
- l. ensure your repair records are accurate, complete and passed to the relevant person(s) promptly in the format required.
- m. complete all repair activities within the agreed timescale.
- n. report any anticipated delays in completion to the relevant person(s) promptly.

NOS AE04 – Diagnose and Rectify Motor Vehicle Engine Electrical Faults

UNIT OVERVIEW

This unit is about diagnosing and rectifying electrical faults occurring within the vehicle engine area.

KEY WORDS AND PHRASES

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Commercial Vehicles

These are medium and large goods vehicles of 3500kgs gross vehicle mass (GVM) and above.

Electrical faults:

These are faults that require a multi stage inspection and a series of test results to identify the cause.

Vehicles:

These can be any of the following – light vehicles, commercial vehicles, motorcycles, mopeds and scooters.

SCOPE OF THIS UNIT:

1. **Electrical faults** occurring within
 - a. starting and charging system
 - b. engine management systems (fuel and ignition)
 - c. electrical components of the cooling system
2. **Electrical and electronic testing equipment** covers:
 - a. volt meters
 - b. ammeters
 - c. ohmmeters
 - d. multimeters
 - e. battery testing equipment
 - f. dedicated and computer based diagnostic equipment
 - g. oscilloscopes
3. **Tools and equipment:**

- a. hand tools
- b. special purpose tools
- c. general workshop equipment

4. Diagnostic Testing is defined as:

- a. Verify the fault
- b. Collect further information
- c. Evaluate the evidence
- d. Carry out further tests in a logical sequence
- e. Rectify the problem
- f. Check all systems

5. Electrical and electronic testing techniques are:

- a. voltage, resistance and current measuring
- b. frequency measuring
- c. visual
- d. dedicated and computer based testing

6. Rectification activities are defined as:

A suitable repair or replacement that rectifies the fault(s) identified from the diagnostic activities carried out.

ESSENTIAL KNOWLEDGE

You need to understand:

Legislative and organisational requirements and procedures

1. the health and safety legislation and workplace procedures relevant to workshop practices and personal and vehicle protection when diagnosing and rectifying electrical faults.
2. legal requirements relating to the vehicle electrics (including road safety and refrigerant handling requirements).
3. your workplace procedures for
 - recording fault location and **correction activities**
 - reporting the results of tests.
 - the referral of problems
 - reporting delays to the completion of work
4. the importance of working to recognised diagnostic procedures and processes and obtaining the correct information for diagnostic activities to proceed
5. the importance of, documenting diagnostic and rectification information.
6. the importance of working to agreed timescales and keeping others informed of progress.
7. the relationship between time, costs and profitability.

8. the importance of reporting anticipated delays to the relevant person(s) promptly.

Electrical and electronic principles

9. electrical and electronic principles, including Ohms Law, voltage, power, current (AC/DC) resistance, magnetism, electromagnetism and electromagnetic induction, digital and fibre optics principles.
10. electrical symbols, units and terms.
11. electrical safety procedures.
12. how electrical and electronic units and components are constructed, dismantled and reassembled.
13. how electrical and electronic units and components operate, including electrical component function, electrical inputs, outputs, voltages and patterns.
14. the interaction between electrical, electronic and mechanical components within the systems defined.
15. how engine management system (both fuel and ignition) circuits work.
16. how electrical systems interlink and interact, including multiplexing.
17. the operation of the electrical and electronic systems for electric, hybrid and alternative fuel vehicles. (including regenerative braking systems).

Use of electrical testing equipment

18. how to prepare and test the accuracy of diagnostic testing equipment.
20. how to use **electrical and electronic testing equipment** to correctly and safely diagnose electrical faults

Auxiliary equipment electrical faults, their diagnosis and correction

20. the types and causes of electrical system, component and unit faults and failures.
21. electrical component and unit replacement procedures, the circumstances which will necessitate replacement and other possible courses of action.
22. how to find, interpret and use sources of information on electrical operating specifications, diagnostic test procedures, repair procedures and legal requirements.
23. how to carry out systematic diagnostic testing of electrical and electronic systems using **electrical testing techniques**.
24. how to select the most appropriate diagnostic testing method for the symptoms presented.
25. how to interpret test results and vehicle data in order to identify the location and cause of vehicle system faults.
26. how to rectify electrical and electronic faults.

27. how to make suitable adjustments to components and units.
28. how to make cost effective recommendations for rectification.

PERFORMANCE OBJECTIVES

To be competent you must:

- a. wear suitable personal protective equipment and use vehicle coverings when using **electrical testing techniques** and carrying out **rectification activities**.
- b. support the identification of **electrical faults**, by reviewing vehicle:
 - technical data
 - diagnostic test procedures.
- c. prepare, connect and test all the required **electrical and electronic testing equipment** following manufacturers' instructions prior to use.
- d. use **electrical and electronic testing techniques** which are relevant to the symptoms presented.
- e. collect sufficient diagnostic information in a systematic way to enable an accurate diagnosis of electrical system faults.
- f. identify and record any system deviation from acceptable limits accurately.
- g. make cost effective recommendations for rectification based upon your analysis of the diagnostic information gained.
- h. use all tools and equipment required for your diagnostic and rectification activities, correctly and safely throughout.
- i. carry out all diagnostic & rectification activities following:
 - manufacturers' instructions
 - recognised researched repair methods(see guidance document)
 - health and safety requirements.
- j. work in a way which minimises the risk of :
 - damage to other vehicle systems
 - damage to other components and units
 - contact with leakages
 - contact with hazardous substances.
- k. ensure all repaired and replaced electrical components and units conform to the vehicle operating specification and any legal requirements.



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- l. when necessary, adjust components and units correctly to ensure that they operate to meet system requirements.
- m. ensure the electrical system rectified performs to the vehicle operating specification and any legal requirements prior to return to the customer.
- n. ensure your records are accurate, complete and passed to the relevant person(s) promptly in the format required.
- o. complete all diagnostic and rectification activities within the agreed timescale.
- p. report any anticipated delays in completion to the relevant person(s) promptly.

NOS AE05 – Diagnose and Rectify Motor Vehicle Transmission and Chassis Electrical Faults

UNIT OVERVIEW

This unit is about identifying and rectifying electrical faults occurring within a variety of electrical systems within the vehicle transmission and chassis areas.

KEY WORDS AND PHRASES

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Commercial Vehicles

These are medium and large goods vehicles of 3500kgs gross vehicle mass (GVM) and above.

Transmission and chassis electrical faults:

These are faults that require a multi stage inspection and a series of test results to identify the cause.

Vehicles:

These can be any of the following – light vehicles, commercial vehicles, motorcycles, mopeds and scooters.

SCOPE OF THIS UNIT:

1. **Electrical faults** occurring within:
 - a. electronic clutch control system
 - b. electronic gearbox control system
 - c. electronic automatic gear box control system
 - d. electric retarder systems
 - e. electronically controlled slip differential system
 - f. electronic suspension control system
 - g. Antilock Braking System (ABS)
 - h. traction control system
 - i. electronic steering control systems
 - j. electronic stability control systems

2. **Electrical and electronic testing equipment** covers:
 - a. volt meters,
 - b. ammeters,
 - c. ohmmeters

- d. multimeters
- e. battery testing equipment
- f. dedicated and computer based diagnostic equipment
- g. oscilloscopes

3. Tools and equipment:

- a. hand tools
- b. special purpose tools
- c. general workshop equipment

4. Diagnostic Testing is defined as:

- k. Verify the fault
- l. Collect further information
- m. Evaluate the evidence
- n. Carry out further tests in a logical sequence
- o. Rectify the problem
- p. Check all systems

5. Electrical and electronic testing techniques are:

- a. voltage, resistance and current measuring
- b. frequency measuring
- c. visual
- d. dedicated and computer based testing

6. Rectification activities are defined as:

A suitable repair or replacement that rectifies the fault(s) identified from the diagnostic activities carried out.

ESSENTIAL KNOWLEDGE

You need to understand:

Legislative and organisational requirements and procedures

1. the health and safety legislation and workplace procedures relevant to workshop practices and personal and vehicle protection when diagnosing and rectifying complex electrical faults.
2. legal requirements relating to the vehicle electrics (including road safety and refrigerant handling requirements).
3. your workplace procedures for
 - recording fault location and **correction activities**
 - reporting the results of tests.
 - the referral of problems
 - reporting delays to the completion of work

4. the importance of working to recognised diagnostic procedures and processes and obtaining the correct information for diagnostic activities to proceed
5. the importance of, documenting diagnostic and rectification information.
6. the importance of working to agreed timescales and keeping others informed of progress.
7. the relationship between time, costs and profitability.
9. the importance of reporting anticipated delays to the relevant person(s) promptly.

Electrical and electronic principles

9. electrical and electronic principles, including Ohms Law, voltage, power, current (AC/DC) resistance, magnetism, electromagnetism and electromagnetic induction, digital and fibre optics principles.
10. electrical symbols, units and terms.
11. electrical safety procedures.
12. how electrical and electronic units and components are constructed, dismantled and reassembled.
13. how electrical and electronic units and components operate, including electrical component function, electrical inputs, outputs, voltages and patterns.
14. the interaction between electrical, electronic and mechanical components within the systems defined.
15. how electrical systems interlink and interact, including multiplexing.
16. the operation of the electrical and electronic systems for electric, hybrid and alternative fuel vehicles. (including regenerative braking systems).

Use of electrical testing equipment

17. how to prepare and test the accuracy of diagnostic testing equipment.
18. how to use **electrical and electronic testing equipment** to correctly and safely diagnose electrical faults.

Transmission and chassis electrical faults, their diagnosis and correction

19. the types and causes of transmission and chassis electrical system, component and unit faults and failures.
20. transmission and chassis electrical component and unit replacement procedures, the circumstances which will necessitate replacement and other possible courses of action.
21. how to find, interpret and use sources of information on transmission and chassis electrical operating specifications, diagnostic test procedures, repair procedures and legal requirements.

22. how to carry out systematic diagnostic testing of electrical and electronic systems using **electrical testing techniques**.
23. how to select the most appropriate diagnostic testing method for the symptoms presented.
24. how to interpret test results and vehicle data in order to identify the location and cause of vehicle system faults.
25. how to rectify electrical and electronic faults within the vehicle transmission and chassis area
26. how to make suitable adjustments to components and units.
27. how to make cost effective recommendations for rectification.

PERFORMANCE OBJECTIVES

To be competent you must:

- a. wear suitable personal protective equipment and use vehicle coverings when using **electrical testing techniques** and carrying out **rectification activities**.
- b. support the identification of **complex electrical faults**, by reviewing vehicle:
 - technical data
 - diagnostic test procedures.
- c. prepare, connect and test all the required **electrical and electronic testing equipment** following manufacturers' instructions prior to use.
- d. use **electrical and electronic testing techniques** which are relevant to the symptoms presented.
- e. collect sufficient diagnostic information in a systematic way to enable an accurate diagnosis of engine electrical system faults.
- f. identify and record any system deviation from acceptable limits accurately.
- g. make cost effective recommendations for rectification based upon your analysis of the diagnostic information gained.
- h. use the **tools and equipment** required, correctly and safely throughout all rectification activities.
- h. carry out all **rectification activities** following:
 - manufacturers' instructions
 - recognised researched repair methods
 - health and safety requirements.
- i. work in a way which minimises the risk of :

- damage to other vehicle systems
 - damage to other components and units
 - contact with leakages
 - contact with hazardous substances.
- k. ensure all repaired and replaced electrical components and units conform to the vehicle operating specification and any legal requirements.
- l. when necessary, adjust components and units correctly to ensure that they operate to meet system requirements.
- m. ensure the electrical system rectified performs to the vehicle operating specification and any legal requirements prior to return to the customer.
- n. ensure your records are accurate, complete and passed to the relevant person(s) promptly in the format required.
- o. complete all system diagnostic activities within the agreed timescale.
- p. report any anticipated delays in completion to the relevant person(s) promptly.

Unit AE06 – Diagnose and Rectify Motor Vehicle Electrical Unit and Component Faults

UNIT OVERVIEW

This unit is about identifying and rectifying electrical faults occurring within a variety of electrical systems.

SCOPE OF THIS UNIT:

1. **Electrical faults** occurring within the following systems:
 - a. Infotainment
 - b. Comfort and Convenience
 - c. Supplementary Restraint Systems (SRS)
 - d. Networking Systems
 - e. Body Electric Systems

2. **Electrical and electronic testing equipment** covers:
 - a. volt meters,
 - b. ammeters,
 - c. ohmmeters
 - d. multimeters
 - e. battery testing equipment
 - f. dedicated and computer based diagnostic equipment
 - g. oscilloscopes

3. **Tools and equipment:**
 - a. hand tools
 - b. special purpose tools
 - c. general workshop equipment

4. **Diagnostic Testing is defined as:**
 - a. Verify the fault
 - b. Collect further information
 - c. Evaluate the evidence
 - d. Carry out further tests in a logical sequence
 - e. Rectify the problem
 - f. Check all systems

5. **Electrical and electronic testing techniques** are:
 - a. voltage, resistance and current measuring
 - b. frequency measuring
 - c. visual
 - d. dedicated and computer based testing

6. **Rectification activities** are defined as:

- a. A suitable repair or replacement of a component(s) that rectifies the fault(s) identified from the diagnostic activities carried out.

ESSENTIAL KNOWLEDGE

You need to understand:

Legislative and organisational requirements and procedures

1. the health and safety legislation and workplace procedures relevant to workshop practices and personal and vehicle protection when diagnosing and rectifying complex electrical faults.
2. legal requirements relating to the vehicle electrics (including road safety and refrigerant handling requirements).
3. your workplace procedures for
 - recording fault location and **correction activities**
 - reporting the results of tests.
 - the referral of problems
 - reporting delays to the completion of work
4. the importance of working to recognised diagnostic procedures and processes and obtaining the correct information for diagnostic activities to proceed
5. the importance of, documenting diagnostic and rectification information.
6. the importance of working to agreed timescales and keeping others informed of progress.
7. the relationship between time, costs and profitability.
8. the importance of reporting anticipated delays to the relevant person(s) promptly.

Electrical and electronic principles

9. electrical and electronic principles, including Ohms Law, voltage, power, current (AC/DC) resistance, magnetism, electromagnetism and electromagnetic induction, digital and fibre optics principles.
10. electrical symbols, units and terms.
11. electrical safety procedures.
12. how electrical and electronic units and components are constructed, dismantled and reassembled.
13. how electrical and electronic units and components operate, including electrical component function, electrical inputs, outputs, voltage/current variation and patterns.

14. the interaction between electrical, electronic and mechanical components within the systems defined.
15. how electrical systems interlink and interact, including multiplexing.
16. the operation of the electrical and electronic systems for electric, hybrid and alternative fuel vehicles (including regenerative braking systems).

Use of electrical testing equipment

17. how to prepare and test the accuracy of diagnostic testing equipment.
18. how to use **electrical and electronic testing equipment** to correctly and safely diagnose electrical faults

Auxiliary equipment electrical faults, their diagnosis and correction

19. the types and causes of electrical system, component and unit faults and failures.
20. electrical component and unit replacement procedures, the circumstances which will necessitate replacement and other possible courses of action.
21. how to find, interpret and use sources of information on electrical operating specifications, diagnostic test procedures, repair procedures and legal requirements.
22. how to carry out systematic diagnostic testing of electrical and electronic systems using **electrical testing techniques**.
23. how to select the most appropriate diagnostic testing method for the symptoms presented.
24. how to interpret test results and vehicle data in order to identify the location and cause of vehicle system faults.
25. how to rectify electrical and electronic faults
26. how to make suitable adjustments to components and units.
27. how to make cost effective recommendations for rectification.

PERFORMANCE OBJECTIVES

To be competent you must:

- a. wear suitable personal protective equipment and use vehicle coverings when using **electrical testing techniques** and carrying out **rectification activities**.
- b. support the identification of **electrical faults**, by reviewing vehicle:
 - technical data
 - diagnostic test procedures.
- c. prepare, connect and test all the required **electrical and electronic testing equipment** following manufacturers' instructions prior to use.

- d. use **electrical and electronic testing techniques** which are relevant to the symptoms presented.
- e. collect sufficient diagnostic information in a systematic way to enable an accurate diagnosis of electrical system faults.
 - identify and record any system deviation from acceptable limits accurately.
 - make cost effective recommendations for rectification based upon your analysis of the diagnostic information gained.
- f. use all **tools and equipment** required for your diagnostic and rectification activities, correctly and safely throughout.
- g. carry out all **diagnostic & rectification activities** following:
 - manufacturers' instructions
 - recognised researched repair methods(see guidance document)
 - health and safety requirements.
- h. work in a way which minimises the risk of :
 - damage to other vehicle systems
 - damage to other components and units
 - contact with leakages
 - contact with hazardous substances.
- i. ensure all repaired and replaced electrical components and units conform to the vehicle operating specification and any legal requirements.
- j. when necessary, adjust components and units correctly to ensure that they operate to meet system requirements.
- k. ensure the electrical system rectified performs to the vehicle operating specification and any legal requirements prior to return to the customer.
- l. ensure your records are accurate, complete and passed to the relevant person(s) promptly in the format required.
- m. complete all diagnostic and rectification activities within the agreed timescale.
- n. report any anticipated delays in completion to the relevant person(s) promptly.

Unit AE07 – Motor Vehicle Auxiliary Locks and Security Devices

UNIT OVERVIEW

This unit is about identifying and fitting suitable auxiliary locking and security devices that are permanently fitted to vehicles to deter theft.

KEY WORDS AND PHRASES

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Commercial Vehicles

These are medium and large goods vehicles of 3500kgs gross vehicle mass (GVM) and above.

Vehicles:

These can be any of the following – light vehicles, commercial vehicles, motorcycles, mopeds and scooters.

SCOPE OF THIS UNIT:

All of the items listed below form part of this National Occupational Standard

1. Examples of auxiliary locks and security devices can be:

- a. electronic / electro mechanical lock mechanisms
- b. additional / auxiliary mechanical door locks using cylinder type locks
- c. additional / auxiliary mechanical door / aperture locks using external locking systems
- d. mechanical window protection devices (internal and external)
- e. replacement security windows / window security films
- f. pneumatic locking systems

2. Tools and equipment:

- a. hand tools
- b. special purpose tools
- c. general workshop equipment
- d. measuring equipment

ESSENTIAL KNOWLEDGE

You need to understand:

Legislative and organisational requirements and procedures

1. the health and safety legislation and workplace procedures relevant to workshop practices and personal and vehicle protection when fitting auxiliary locks and security devices.
2. legal requirements relating to the vehicle and fitment of auxiliary locks and security devices (including road safety, MOT, construction and use etc).
3. your workplace procedures for
 - fitting auxiliary locks and security devices
 - recording information.
 - the referral of problems
 - reporting delays to the completion of work
4. the importance of working to recognised procedures and processes and obtaining the correct information to enable fitting activities to proceed.
5. the importance of, documenting information.
6. the importance of working to agreed timescales and keeping others informed of progress.
7. the relationship between time, costs and profitability.
8. the importance of reporting anticipated delays to the relevant person(s) promptly.

Electrical and electronic principles

9. electrical and electronic principles, including Ohms Law, voltage, power, current (AC/DC) resistance, magnetism, electromagnetism and electromagnetic induction, digital and fibre optics principles.
10. electrical symbols, units and terms.
11. electrical safety procedures.
12. how electrical and electronic units and components are constructed, dismantled and reassembled.
13. how electrical and electronic units and components operate, including electrical component function, electrical inputs, outputs, voltages and patterns.
14. the interaction between electrical, electronic and mechanical components within the systems defined.
15. how vehicle electrical systems interlink and interact with auxiliary vehicle locks and additional security devices, including multiplexing.

Locking Device Principles and Operation.

16. the operating principle and construction of mechanical locking systems.
17. the operating principle and construction of pneumatic locking systems.
18. how locking systems (electrical, mechanical and pneumatic) can be integrated with standard vehicle systems.

Mechanical/Electrical Competencies and Fitting principles

19. how to identify suitable auxiliary locks and security devices for the type of vehicle being worked on.
20. how to prepare, test and use all the equipment required for the fitting of auxiliary locks and security devices.
21. how to use measuring devices in order to measure and mark out vehicles to enable the fitting of auxiliary locks and security devices.
22. how to file, fit, tap, thread, cut and drill plastics and metals.
23. how to integrate vehicle electrical systems with auxiliary locks and security devices (where applicable).
24. how to apply vehicle body anticorrosion to meet vehicle requirements.
25. how to make suitable adjustments to components and units.
26. how to make cost effective recommendations for rectification.
27. how to work safely avoiding damage to other vehicle systems, components and units and contact with leakage and hazardous substances.

PERFORMANCE OBJECTIVES

To be competent you must:

- a. wear suitable personal protective equipment and use vehicle coverings when fitting auxiliary locks and security devices
- b. support the fitting of auxiliary locks and security systems, by reviewing vehicle:
 - technical data
 - diagnostic test procedures.
- c. prepare, connect and test all the required **equipment** following manufacturers' instructions prior to use.
- d. use **fitting techniques** (both electrical and mechanical) which are relevant to the systems presented.

- e. collect sufficient information to enable an accurate fitting of auxiliary locking and security devices.
- f. measure and mark out where external locks are to be fitted .
- g. make cost effective recommendations for the fitting of relevant auxiliary locks and security devices according to the customers needs and vehicle type.
- h. use the tools and equipment required, correctly and safely throughout all fitting activities.
- i. carry out all fitting activities following:
 - manufacturers' instructions
 - recognised researched repair methods
 - health and safety requirements.
- j. work in a way which minimises the risk of :
 - damage to other vehicle systems
 - damage to other components and units
 - contact with leakages
 - contact with hazardous substances.
- k. ensure all components and units conform to the vehicle operating specification and any legal requirements.
- l. when necessary, adjust components and units correctly to ensure that they operate to meet system requirements.
- m. ensure the systems fitted performs to the vehicle operating specification and any legal requirements prior to return to the customer.
- n. ensure your records are accurate, complete and passed to the relevant person(s) promptly in the format required.
- o. complete all activities within the agreed timescale.
- p. report any anticipated delays in completion to the relevant person(s) promptly.

Unit AE08 – Inspect Motor Vehicle using Prescribed Inspection Methods

UNIT OVERVIEW

This unit is about carrying out a range of inspections on vehicles using a variety of prescribed testing and inspection methods.

KEY WORDS AND PHRASES

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

These can be any of the following – light vehicles, commercial vehicles

Sources of technical information:

Examples include pre-determined / pre-printed inspection schedules, manufacturers' manuals and Trade Association check lists, workplace procedures.

SCOPE OF THIS UNIT:

1. **Vehicle inspections** are
 - a. pre-work
 - b. installed system functional check
 - c. post work
 - d. vehicle handover inspection

2. **Test methods** are
 - a. visual
 - b. aural
 - c. functional
 - d. measurement

3. **Examples of Equipment Includes:**

Appropriate test equipment to correctly confirm the functionality of the system that you are inspecting; this may include measuring equipment, specialist diagnostic equipment or any type of tool required.

ESSENTIAL KNOWLEDGE

You need to understand:

Legislative and organisational requirements and procedures

1. the health and safety legislation and workplace procedures relevant to conducting **vehicle inspections** and personal and vehicle protection.
2. the legislation relevant to the **activities** described in the Scoping Statement for this unit.
3. your workplace procedures for
 - recording **vehicle inspections** and any variations from acceptable methods and procedures
 - the referral of problems
 - reporting delays to the completion of work
4. the importance of making accurate records of the results of your tests and inspections and interpreting them correctly.
5. the importance of working to agreed timescales and keeping others informed of progress.
6. the relationship between time and costs.
8. the importance of reporting anticipated delays to the relevant person(s) promptly.

Sources of information

8. how to find, interpret and use technical information .
9. the importance of using technical information to inform your inspection and testing of vehicles.

Testing methods and the conduct of Inspections

10. how vehicle systems operate and the operational tolerances for the vehicle(s) on which you are working.
11. how to follow procedures to carry out the systematic inspections described in the scoping statement above.
12. how to confirm the correct operation of vehicle systems and vehicle condition.
13. how to compare test and inspection results against vehicle specifications and legal requirements.
14. how to record test and inspection results in the format required.
15. how to make recommendations based upon the results of your inspections.
16. the implications of failing to carry out inspections activities correctly.
17. the implications of signing workplace documentation and vehicle records.

PERFORMANCE OBJECTIVES

To be competent you must:

- a. use suitable personal protective equipment throughout all vehicle inspection activities.
- b. use suitable sources of technical information to support your vehicle inspection activities.
- c. carry out systematic vehicle inspections following:
 - manufacturer's approved procedures
 - recognised researched repair methods
 - health and safety requirements.
 - prescribed documentation
- d. confirm all systems and components inspected, function correctly following the manufacturer's specifications.
- e. ensure your comparison of the vehicle against specification accurately identifies any:
 - differences from the vehicle specification
 - vehicle appearance and condition faults
- f. work in a way which minimises the risk of damage to the vehicle and its systems, other people and their property.
- g. make suitable recommendations for future action based upon the results of your tests and inspections.
- h. ensure your records are accurate, complete and passed to the relevant person(s) promptly in the format required. (This includes all vehicle related paperwork).
- i. complete all inspection activities within the agreed timescale and to specification.
- j. report any anticipated delays in completion to the relevant person(s) promptly.

Unit AE09 – Identify Suitability, Installation and Configuration of Vehicle Enhancements and Vehicle Security Systems

UNIT OVERVIEW

This unit is about identifying electronic enhancements, vehicle electronic security systems and vehicle tracking systems for vehicle types to ensure that the vehicle enhancement meets the specification and functionality of the vehicle and also correctly installing those products to ensure that the vehicle systems function correctly after installation.

KEY WORDS AND PHRASES

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Vehicles:

These can be any of the following – light vehicles, commercial vehicles, motorcycles, mopeds and scooters.

SCOPE OF THIS UNIT:

1. **Electronic enhancements may be within**
 - a. audio systems
 - b. visual systems
 - c. communication systems
 - d. networking systems
 - e. body electric systems
 - f. data logging
 - g. safety systems
 - h. lighting systems
 - i. tow bar electrical systems
 - j. auxiliary power supplies
 - k. telematics / vehicle location systems
 - l. electronic security systems

2. **Electronic Security Systems may be**
 - a. alarm systems
 - b. immobiliser systems
 - c. location / tracking systems
 - d. electronic deadlocking systems

3. **Electrical and electronic testing equipment** covers:
 - a. volt meters
 - b. ammeters
 - c. ohmmeters
 - d. multimeters
 - e. dedicated and computer based diagnostic equipment
 - f. oscilloscopes

4. **Tools and equipment:**
 - a. hand tools
 - b. special purpose tools
 - c. general workshop equipment

ESSENTIAL KNOWLEDGE

You need to understand:

Legislative and organisational requirements and procedures

1. the health and safety legislation and workplace procedures relevant to workshop practices and personal and vehicle protection when enhancing vehicle systems
2. legal requirements relating to the vehicle (including road safety requirements).
3. your workplace procedures for
 - recording fault location and **correction activities**
 - reporting the results of tests.
 - the referral of problems
 - reporting delays to the completion of work
4. the importance of working to recognised procedures and processes and obtaining the correct information for enhancement activities to proceed and how to formulate and construct procedures and processes in order for enhancement activities to proceed.
5. the importance of, documenting installation and enhancement information.
6. the importance of working to agreed timescales and keeping others informed of progress.
7. the relationship between time, costs and profitability.
8. the importance of reporting anticipated delays to the relevant person(s) promptly.

Electrical and electronic principles

9. electrical and electronic principles, including Ohms Law, voltage, power, current (AC/DC) resistance, magnetism, electromagnetism and electromagnetic induction, digital and fibre optics principles.

10. electrical symbols, units and terms.
11. electrical safety procedures.
12. how electrical and electronic units and components operate, including electrical component function, electrical inputs, outputs, voltages/current levels and their associated patterns/waveforms.
13. the interaction between electrical, electronic and mechanical components within the systems defined.
14. how electrical systems interlink and interact, including multiplexing.
15. the functionality of the electrical and electronic systems for electric, hybrid and alternative fuel vehicles.
16. how installed electronic enhancements interact with factory fit electronic components, including networking systems.

Use of electrical testing equipment

17. how to prepare and test the accuracy of diagnostic testing equipment.
18. how to use **electrical and electronic testing equipment** to correctly and safely test electrical and electronic systems.
19. how to find, interpret and use sources of information on electrical operating specifications and legal requirements.
20. how to use dedicated and computer based equipment to configure vehicle electronic controlled systems to operate correctly within legal requirements.
21. how to prepare and reconfigure electronically controlled vehicle enhancement systems to allow them to function correctly with factory fit vehicle systems.
22. how to rectify electrical and electronic faults, in standard and enhanced / modified systems.
23. how to make suitable adjustments to components and units.

PERFORMANCE OBJECTIVES

To be competent you must:

- a. identify which vehicle electronic enhancement products meet the customers requirements and will also integrate fully with the vehicle factory fit electronic systems.
- b. support the identification of suitable vehicle enhancement installations, by reviewing vehicle:
 - vehicle technical data
 - diagnostic test procedures.
 - customer requirements
 - electrical component technical data

- c. wear suitable personal protective equipment and use suitable vehicle protection throughout all enhancement activities.
- d. prepare and test all the tools and equipment required, following manufacturers' instructions, prior to use.
- e. fit vehicle enhancement components which are compatible with the vehicle specification and customer requirements.
- f. carry out all electrical enhancement activities following:
 - manufacturers' instructions
 - your workplace procedures
 - health and safety requirements
 - legal requirements.
- g. work in a way which minimises the risk of :
 - damage to other vehicle systems
 - damage to other components and units
 - contact with leakages
 - contact with hazardous substances.
- h. when necessary, adjust the components fitted and vehicle systems correctly (including any reconfiguration of electronic systems) to ensure that they meet the manufacturer's specification for effective operation.
- i. ensure all vehicle enhancements made to the vehicle function to its specification.
- j. ensure that all vehicle systems function correctly prior to release to the customer.
- k. complete all enhancement activities within the agreed timescale.
- l. report any anticipated delays in completion to the relevant person(s) promptly.
- m. if there are any issues with the vehicle enhancement liaise with other relevant person(s) (or with the customer) to agree the next course of action.
- n. your records are complete, accurate, in the format required and signed by the customer, when necessary.
- o. when appropriate, explain to customers any action that has been taken regarding their vehicle in non technical terms to give a clear understanding of the work carried out.

Unit AE10 – Conduct Vehicle Enhancement and Installation Consultations with Customers in the Motor Vehicle Environment

UNIT OVERVIEW

This unit is about carrying out consultations with customers to investigate their concerns relating to electrical enhancements for their vehicle. It also includes making recommendations to ensure that the customer's concerns are addressed and explaining the outcomes that the enhancements will achieve so that customers fully understand the work that will be undertaken.

KEY WORDS AND PHRASES

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Customer Reactions

Examples include anger, confusion, frustration.

Consultations with Customers

Examples include face to face and telephone conversations including questioning. It also includes giving technical advice, product information and clarification of technical issues after work has been completed.

Vehicles:

These can be any of the following – light vehicles, commercial vehicles, motorcycles, mopeds and scooters.

SCOPE OF THIS UNIT:

1. **Electronic enhancements may be within**
 - a. audio systems
 - b. visual systems
 - c. communication systems
 - d. networking systems
 - e. body electric systems
 - f. data logging
 - g. safety systems
 - h. lighting systems
 - i. tow bar electrical systems
 - j. auxiliary power supplies
 - k. telematics / vehicle location systems
 - l. electronic security systems

2. Electronic Security Systems may be

- a. alarm systems
- b. immobiliser systems
- c. location / tracking systems
- d. electronic deadlocking systems

3. Electrical and electronic testing equipment covers:

- a. volt meters
- b. ammeters
- c. ohmmeters
- d. multimeters
- e. dedicated and computer based diagnostic equipment
- f. oscilloscopes

4. Tools and equipment:

- a. hand tools
- b. special purpose tools
- c. general workshop equipment

ESSENTIAL KNOWLEDGE

You need to understand:

Legislative and organisational requirements and procedures

1. the health and safety legislation and workplace procedures relevant to workshop practices and personal and vehicle protection when enhancing vehicle systems.
2. legal requirements relating to the vehicle (including road safety requirements).
3. your workplace procedures for
 - recording fault location and **correction activities**
 - reporting the results of tests.
 - the referral of problems
 - reporting delays to the completion of work.
4. the importance of working to recognised procedures and processes and obtaining the correct information for enhancement activities to proceed and how to formulate and construct procedures and processes in order for enhancement activities to proceed.
5. the importance of, documenting installation and enhancement information.
6. the importance of working to agreed timescales and keeping others informed of progress.
7. the relationship between time, costs and profitability.
8. the importance of reporting anticipated delays to the relevant person(s) promptly.

Electrical and electronic principles

9. electrical and electronic principles, including Ohms Law, voltage, power, current (AC/DC) resistance, magnetism, electromagnetism and electromagnetic induction, digital and fibre optics principles.
10. electrical symbols, units and terms.
11. electrical safety procedures.
12. how electrical and electronic units and components operate, including electrical component function, electrical inputs, outputs, voltage/current and their respective oscilloscope patterns.
13. the interaction between electrical, electronic and mechanical components within the systems defined.
14. how electrical systems interlink and interact, including multiplexing.
15. the principle operation of the electrical and electronic systems for electric, hybrid and alternative fuel vehicles.
16. how installed enhancements will interact and influence with factory fit electrical components, including networking systems.

Personal Skills

17. how to give straightforward presentations on technical matters.
18. how to communicate effectively with and listen to customers.
19. how to present yourself in a positive and professional manner to customers.
20. how to recognise and handle different customer reactions.
21. how to adapt your language when explaining technical matters to customers.
22. how to use effective questioning techniques.
23. how to care for customers and achieve customer satisfaction.
24. your organisation's requirements for personal appearance and conduct when dealing with customers.

PERFORMANCE OBJECTIVES

To be competent you must:

- a. respond to customer's concerns in a positive and friendly manner.
- b. give a positive impression of yourself and your organisation when dealing with customers.
- c. obtain sufficient, detailed information using suitably structured questions.

- d. when appropriate, you carry out a suitable road test to obtain further detailed information on, or clarification of a customer's request.
- e. provide customers with accurate, current and relevant advice and information on vehicle enhancement products.
- f. support the identification of **suitable vehicle enhancement installations**, by reviewing vehicle:
 - vehicle technical data
 - diagnostic test procedures.
 - customer requirements
 - electrical component technical data
- g. explain to the customer the implications of any enhancement(s) that may be needed clearly in simple and non complex terms.
- h. give technical advice and information accurately, clearly and in a form and manner which the customer will understand using simple and non complex terms.
- i. liaise with the customer and or other relevant person(s) to agree the next course of action.
- j. when appropriate, explain to customers the action that has been taken regarding their vehicle clearly in simple and non complex terms.
- k. when appropriate, ensure that your records are complete, accurate, in the format required and signed by the customer, when necessary.
- l. suggest possible methods for improving the customer care process to your manager, when necessary.

Unit BP18 - Remove and Fit Basic Motor Vehicle Mechanical, Electrical and Trim (MET) Components and Non Permanently Fixed Vehicle Body Panels

UNIT OVERVIEW

This unit is about the removal and fitting of mechanical, electrical and trim (MET) components to vehicles. It is also about checking the operation of the component(s) refitted to the vehicle.

SCOPE OF THIS UNIT:

1. **Basic MET components** includes:
 - a. bumpers
 - b. headlamp units
 - c. road wheels
 - d. batteries
 - e. bonnet and boot lid trim
 - f. interior trim components
 - g. exterior trim components

2. **Non permanently attached body panels** are
 - a. wings
 - b. doors
 - c. bonnets
 - d. boot lids and tailgates
 - e. bumper bars, covers and components

3. **Tools and equipment** are
 - a. spanners
 - b. socket set
 - c. screwdrivers
 - d. manufacturer's specified specialist tools
 - e. pliers and self locking grips
 - f. power drill and drill bits
 - g. trolley jack
 - h. axle stands
 - i. vehicle lifts
 - j. torque wrench

ESSENTIAL KNOWLEDGE

You need to understand:

Legislative and organisational requirements and procedures

1. the health, safety and legal requirements relating to the removal and fitting of basic MET components and non welded non-structural body panels.
2. your workplace procedures for:
 - the referral of problems
 - reporting of delays to the completion of work
 - completion of work records.
3. the work that needs to be done and the standard required.
4. the requirements for protecting the vehicle and contents from damage before, during and after removing and fitting activities.
5. the importance of selecting, using and maintaining the appropriate personal protective equipment when removing and fitting **basic MET components and non welded non-structural body panels.**

Removing and fitting basic MET components

6. how to find, interpret and use sources of information applicable to the removal and fitting of **basic MET components and non welded non-structural body panels.**
7. how to select, check and use all the **tools and equipment** required to remove and fit **basic MET components and non welded non-structural body panels.**
8. the correct procedures for removing and fitting **basic MET components and non welded non-structural body panels.**
9. the correct procedures for working with supplementary safety systems when fitting and removing **basic MET components and non welded non-structural body panels.**
10. the correct procedures for working with Gas Discharge (High Intensity Discharge) headlight systems and when fitting and removing **basic MET components and non welded non-structural body panels.**
11. the methods of storing removed panels and components and the importance of storing them correctly
12. the different types of fastenings and fixings and the reasons for their use
13. the need for correct alignment of panels and components and the correct methods used to achieve this
14. the types of quality checks that can be used to ensure correct alignment and operation of components to manufacturer's specification and their purpose

PERFORMANCE OBJECTIVES

To be competent you must:

- a use the appropriate personal protective equipment when removing and fitting **basic MET components and non welded non-structural body panels**.
- b protect the vehicle and its contents effectively when removing and fitting **basic MET components and non welded non-structural body panels**.
- c select and use the correct **tools and equipment** for the panels or components you are going to remove or fit.
- d ensure that the **tools and equipment** you require are in a safe working condition.
- e remove and fit **basic MET components and non welded non-structural body panels** following:
 - removal and fitting procedures
 - manufacturers' instructions
 - your workplace procedures
 - health, safety and legal requirements
- f avoid damaging other components, units and panels on the vehicle.
- g store all removed panels and components safely in the correct location.
- h realign the panels and components you have fitted correctly in a way which regains their original manufactured gaps.
- i check that the components you have fitted operate correctly following the manufacturer's specification.
- j report any additional faults you find during the course of your work to the relevant person(s) promptly.
- k report any delays in completing your work to the relevant person(s) promptly.
- l remove and fit **basic MET components or non welded non-structural body panels** within the agreed timescale.
- m complete work records accurately, in the format required and pass them to the relevant person(s) promptly.

Unit 37 - Give Customers a Positive Impression of Yourself and Your Organisation **(Imported ICS Unit – Institute of Customer Service)**

Overview

This unit sits within the Customer Service Theme of Development and Improvement. This Theme covers activities and approaches that play a vital part in customer service by seeking and implementing improvements and developments

What this unit is about

Organisations change the way they deliver service to their customers because customer expectations rise and because other organisations improve the services they offer. Often the most important ideas about how to improve customer service come from people dealing directly with customers.

Your job involves delivering customer service. If your organisation has decided to make changes, it is your job to support them and to present them positively to your customers. Also, by listening to customer comments you may have your own ideas about how the service you deliver could be improved.

This unit is all about how you provide support for changes that your organisation has introduced. In addition, it covers how you present your own ideas for improvements to someone in your organisation who can authorise trying out the change.

Performance Objectives

To support customer service improvements you must consistently:

1 Use feedback to identify potential customer service improvements

- 1.1 gather informal feedback from your customers
- 1.2 use customer feedback procedures to collect information from your customers
- 1.3 use the information from your customers to develop a better understanding of their customer service experience
- 1.4 identify ways the service you give could be improved based on information you have gathered
- 1.5 share your ideas for improving customer service with colleagues

2 Implement changes in customer service

- 2.1 identify a possible change that could be made to improve customer service
- 2.2 present your idea for improving customer service to a colleague with the appropriate authority to approve the change
- 2.3 carry out changes to customer service procedures based on your own idea or proposed by your organisation

- 2.4 keep your customers informed of changes to customer service
- 2.5 give customers a positive impression of changes that have been made
- 2.6 work positively with others to support customer service changes

3 Assist with the evaluation of changes in customer service

- 3.1 discuss with others how changes to customer service are working
- 3.2 work with others to identify any negative effects of changes and how these can be avoided

Knowledge and Understanding

To be competent at supporting customer service improvements you need to know and understand:

- a. how customer experience is influenced by the way service is delivered
- b. how customer feedback is obtained
- c. how to work with others to identify and support change in the way service is delivered
- d. why it is important to give a positive impression to your customer about the changes made by your organisation even if you disagree with them