

Domain	AUTOMOTIVE ELECTRICAL AND ELECTRONICS	Unit ID: 478
Title:	Apply knowledge of automotive electrical and electronic applications	
Level: 2		Credits: 10

Purpose

This unit standard specifies the competencies required to apply knowledge of automotive electrical and electronic applications. It includes procedures for demonstrating knowledge of the following used in automotive circuits: capacitors and choke coils; resistors; AC (alternating current); semi-conductors; transistors; amplifier application; thyristors; digital fundamentals; display devices; multiplex wiring; microprocessors. This unit standard is intended for those who work as automotive electricians.

Special Notes

1. Entry information

Prerequisite:

 - Unit 65 - *Apply safety rules and regulations in an automotive mechanics workshop* or demonstrated equivalent knowledge and skills.
2. This unit standard is to be delivered and assessed in the context of automotive electrical and electronic operations and should be assessed in conjunction with other relevant technical unit standards selected from this domain.
3. Assessment evidence may be collected from a real workplace or a simulated real workplace or an appropriate simulated environment in which automotive electrical and electronic operations are carried out.
4. Glossary of terms:
 - *'choke coils'* refers to coils in which a fine wire is wound used to absorb oscillations in a switched circuit
5. Regulations and legislation relevant to this unit standard include the following:
 - Labour Act No. 6, 1992
 - Occupational Health and Safety Regulations No.18, 1997 and all subsequent amendments.

Quality Assurance Requirements

This unit standard and others within this subfield may be awarded by institutions which meet the accreditation requirements set by the Namibia Qualifications Authority and the Namibia Training Authority and which comply with the national assessment and moderation requirements. Details of specific accreditation requirements and the national assessment arrangements are available from the Namibia Qualifications Authority and the Namibia Training Authority. All approved unit standards, qualifications and national assessment arrangements are available on the Namibia Training Authority website www.nta.com.na.

Elements and Performance Criteria

Element 1: Demonstrate knowledge of capacitors and choke coils for automotive applications

Range

Choke coils are limited to iron (ferrite) cored and air cored.

Performance Criteria

- 1.1 Factors that effect capacitors are explained in terms of plate area, distance apart, and dielectric material.
- 1.2 Capacitor operation is described by plotting charge and discharge of voltage and current.
- 1.3 Choke coils and their application are described according to the manufacturers' specification.

Element 2: Demonstrate knowledge of AC (alternating current) used in automotive applications

Range:

Frequency of AC is limited to sine curve terms.

AC values are limited to peak values, average value, and RMS (root main square).

Performance Criteria

- 2.1 Frequency of AC is calculated from a given signal on an oscilloscope.
- 2.2 AC values relating to automotive applications are derived by reference to an oscilloscope trace of a signal generator and transformer.
- 2.3 Impedance in an AC circuit containing capacitance, inductance and resistance is explained in terms of the effects on lead and lag of voltage and current.

Element 3: Apply knowledge of semi-conductors used in automotive applications

Range

P-N junction characteristics are limited to positive and negative charged electron transfer, forward bias, and reverse bias.

Circuit operations of diodes are limited to constructing a functional electrical circuit, including one or more of the following: rectifier diode, Zener diode, light emitting diode (LED) and photo diode.

Diode ratings are limited to wattage, current, forward and reverse voltage.

Replacement procedures are limited to rectifier diodes and LEDs.

Performance Criteria

- 3.1 P-N junction characteristics are identified.
- 3.2 Circuit operations of diodes are identified and demonstrated.
- 3.3 Diode ratings for a given automotive application are stated.
- 3.4 Use of diodes in automotive application is described in terms of a dual charging system, transient protection, and a Zener diode as a voltage stabiliser.
- 3.5 Replacement procedure for a diode in an automotive circuit is described according to diode manufacturers' specifications.

Element 4: Apply knowledge of transistors used in automotive circuits

Range:

Symbols, operation and terminal layout are limited to BJT (bipolar junction transistor) and FET (field effect transistor).

Transistor testing procedures are limited to manufacturers' forward and reverse junction resistance specifications.

Transistor bias is limited to forward and reverse junction.

Performance Criteria

- 4.1 The symbols, operation, and terminal layout of transistors are described according to manufacturers' specifications.
- 4.2 The use of a BJT as a switch in an automotive circuit is described according to manufacturers' specifications.
- 4.3 Common emitter amplifier function is described in terms of signal inversion and application.
- 4.4 Automotive transistor testing procedures are described and implemented according to manufacturers' specifications.

4.5 Transistor bias is explained according to manufacturers' specifications.

Element 5: Demonstrate knowledge of amplifier application for automotive circuits

Range

Amplifier couplings are limited to direct AC and transformer.

Amplifier operation is limited to description in block form and amplifying analogue transducer signals.

Performance Criteria

- 5.1 Amplifier couplings for an automotive circuit are described in block form.
- 5.2 Darlington amplifier function and operation are described in terms of current gain and application.
- 5.3 Amplifier operation in an automotive circuit is described according to manufacturers' specifications.

Element 6: Demonstrate knowledge of thyristors in automotive circuits

Range

Thyristor operation is limited to symbol and action in a DC ignition circuit.

Thyristor ratings are limited to voltage and current handling.

Performance Criteria

- 6.1 Thyristor operation in an automotive circuit is described according to manufacturers' specifications.
- 6.2 Thyristor ratings for automotive circuits are described according to manufacturers' specifications.

Element 7: Demonstrate knowledge of digital fundamentals for automotive circuits

Range

Logic gate operation is limited to or, and, not, and truth tables.

Performance Criteria

- 7.1 The differences between analogue and digital electronics are compared.
- 7.2 Logic gate operation is described according to manufacturers' specifications.

Element 8: Demonstrate knowledge of display devices in automotive applications

Range

Display device function and operation are limited to seven digit, liquid crystal, and dot matrix.

Repair requirements are limited to testing procedures and replacement of unit.

Performance Criteria

- 8.1 Display device function and operation are described according to manufacturers' specifications.
- 8.2 Repair requirements for display devices are identified according to manufacturers' specifications.

Element 9: Demonstrate knowledge of multiplex wiring for automotive circuits

Performance Criteria

- 9.1 Multiplex wiring characteristics are identified.
- 9.2 The use of multiplexing for automotive circuits is identified.

Element 10: Demonstrate knowledge of microprocessors used in automotive circuits

Range

Operation of memory devices is limited to storing the programme and holding information data for inputs and outputs.

Terminology associated with microprocessors is limited to RAM (random access memory), ROM (read only memory), ECM (electronic control module), input-output, and KAM (keep alive memory).

Description of parts of a microprocessor is limited to description in block form; control module, arithmetic and logical unit, registers, accumulator, and clock.

Description of use of a microprocessor is limited to controlling a system, as an ECM, and signal recognition.

Sections of an ECM are limited to description in block form; microprocessor, memory section and input-output section.

Performance Criteria

- 10.1 The operation of memory devices for automotive are described according to manufacturers' specifications.

Terminology associated with microprocessors is described according to manufacturers' specifications.

10.2 Parts of a microprocessor are described according to manufacturers' specifications.

10.3 The use of microprocessors for automotive systems is described according to manufacturers' specifications.

10.4 Sections of an EMC are described according to manufacturers' specifications.

Registration Data

Subfield:	Automotive Engineering
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