

-SQA- SCOTTISH QUALIFICATIONS AUTHORITY

**Hanover House
24 Douglas Street
GLASGOW G2 7NQ**

NATIONAL CERTIFICATE MODULE DESCRIPTOR

-Module Number-	2210561	-Session-1991-92
-Superclass-	XS	

-Title-	VEHICLE ELECTRICAL SYSTEM: STARTER CIRCUIT
----------------	---

-DESCRIPTION-

Purpose This module is designed to develop the necessary skills and knowledge required to carry out the removal and replacement and diagnostic testing of starter systems.

It is aimed at those intending to pursue a career in the vehicle repair industry who are not electrical specialists. It is also designed to complement RTITB modules LV301B and LV302C.

It should be noted that adequate supporting industrial experience will also be necessary.

Preferred Entry Level	94395	Battery and Charging Systems: Removal, Replacement and Adjustment of Components.
	94396	Battery and Charging Systems: Condition Assessment and Fault Diagnosis (x 1/2).
	64468	Mobile Plant Electrics 1: Introduction.

Outcomes	The student should: <ol style="list-style-type: none">1. identify types of starter motor and solenoid;2. outline the electrical and mechanical operation of inertia and pre-engaged starter;3. carry out systematic diagnostic procedures for a starter circuit using a voltmeter;4. remove, inspect and refit starter and related components.
-----------------	---

Assessment
Procedures

Acceptable performance in this module will be satisfactory achievement of all the Performance Criteria specified for each Outcome.

The following abbreviations are used below:

PC Performance Criteria
IA Instrument of Assessment

Note: The Outcomes and PCs are mandatory and cannot be altered. The IA may be altered by arrangement with SQA. (Where a range of performance is indicated, this should be regarded as an extension of the PCs and is therefore mandatory.)

OUTCOME 1

IDENTIFY TYPES OF STARTER MOTOR AND SOLENOID

PCs

- (a) The identification of an inertia starter is correct.
- (b) The identification of a pre-engaged starter is correct.
- (c) The identification of a remote type, solenoid, is correct.
- (d) The identification of an integral type solenoid is correct.

IA Objective Test

The student will be presented with an objective test to test the recall of knowledge relating to the identification of types of starter motor and solenoid.

The objective test could take the form of a matching exercise.

The test will consist of 4 items corresponding to the Performance Criteria.

Satisfactory achievement of the Outcome will be based on all Performance Criteria being met. This will be demonstrated by the student producing 4 correct responses.

OUTCOME 2

DESCRIBE THE ELECTRICAL AND MECHANICAL OPERATION OF INERTIA AND PRE-ENGAGED STARTER

PCs

- (a) The description of the operation of a pre-engaged starter is correct in terms of the mechanical operating principles.

- (b) The description of the operation of an inertia starter is correct in terms of the mechanical operating principles.
- (c) The description of the operation of a starter motor is correct in terms of the electrical operating principles.
- (d) The description of the operation of a starter solenoid is correct in terms of the electrical operating principles.

IA Objective Test

The student will be presented with an objective test to test the recall of knowledge relating to the description of the electrical and mechanical operation of inertia and pre-engaged starter. The objective test could take the form of short answer questions.

The test will consist of 4 items corresponding to the Performance Criteria.

Satisfactory achievement of the Outcome will be based on all the Performance Criteria being met. This will be demonstrated by the student producing 4 correct responses.

OUTCOME 3 CARRY OUT SYSTEMATIC DIAGNOSTIC PROCEDURES FOR A STARTER CIRCUIT USING A VOLTMETER

PCs

- (a) The procedures followed to carry out diagnostic tests for a starter circuit are systematic, and in accordance with manufacturer's recommended procedures.
- (b) The recording of readings from diagnostic tests is accurate corresponding to the actual readings taken.
- (c) The identification of circuit and circuit component assembly serviceability, from the finding of diagnostic tests, is correct for specified components.
- (d) Identification of defective components ensures that remedial action is highlighted.

IA Assignment

The student will be presented with an assignment to test the application of knowledge and skills relating to the procedures followed to undertake diagnostic tests for a starter circuit using a voltmeter.

The student will carry out systematic diagnostic procedures for a starter circuit using a voltmeter, report upon serviceability and remedial action as appropriate.

It should be noted that the diagnostic testing procedures refer to a vehicle with a serviceable battery.

Satisfactory achievement of the Outcome will be based on all Performance Criteria being met.

OUTCOME 4 REMOVE, INSPECT AND REFIT STARTER AND RELATED COMPONENTS

- PCs
- (a) The procedures followed for the removal and refitting of a starter motor are in accordance with appropriate technical data corresponding to the vehicle.
 - (b) The procedures followed for the removal and refitting of inertia, pre-engaged pinion and drive assemblies are in accordance with procedures outlined in appropriate technical data corresponding to the vehicle.
 - (c) The procedures followed for the removal and refitting of a pre-engaged starter solenoid are in accordance with procedures outlined in appropriate technical data corresponding to the vehicle.
 - (d) The visual inspection of starter and related components, determines serviceability against component manufacturer's standards.

IA Practical Exercise

The student will be presented with a series of practical tasks to test the application of skills and knowledge relating to the removal, refitting and inspection of a starter and related components.

The exercise will consist of a series of tasks relating to Performance Criteria as follows:

- (a) removal and refitting of a starter motor;
- (b) removal and refitting of an inertia pre-engaged pinion and drive assemblies;
- (c) removal and refitting of a pre-engaged starter motor;
- (d) visual inspection of:
 - (i) starter motor case;
 - (ii) pinion and drive assembly;
 - (iii) starter solenoid;
 - (iv) cable and cable connection condition;
 - (v) ignition barrel.

Satisfactory achievement of the Outcome will be based on all Performance Criteria being met.

**The following sections of the descriptor are offered as guidance.
They are not mandatory.**

CONTENT/CONTEXT

Safe working practice should be observed at all times.

Corresponding to Outcomes 1-4:

2. Electrical operation should be kept to the basic concept of a motor to enable the student to understand the significance of voltage readings.

This module should be taught in the context most suited to the students' particular needs.

This module is intended to give students an understanding of the methods of operation and common faults, both mechanical and electrical, found on starter systems.

SUGGESTED LEARNING AND TEACHING APPROACHES

This module should be undertaken in a service workshop equipped with a variety of vehicles. Suitable meters and test cards would be an advantage.

In Outcome 3 it should be noted that the diagnostic testing referred to assumes that the vehicle has a serviceable battery.

In Outcome 4 it may be desirable to carry out some parts of the exercise on loose components to prevent damage to the vehicle.

A suitable checklist should be used to record the students' performance in practical exercises.

© **Copyright SQA 1991**

09/02/98 JH/CD