



IALA MODEL COURSE

L2.2.5 & 6

AIDS TO NAVIGATION - TECHNICIAN TRAINING

LEVEL 2 MODULE 2 ELEMENTS 2.5 & 2.6

MAINS AC UTILITY POWER SYSTEMS; DIESEL
AND PETROL GENERATORS

Edition 2.0

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FOREWORD

The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) recognises that training in all aspects of Aids to Navigation (AtoN) service delivery, from inception through installation and maintenance to replacement or removal at the end of a planned life-cycle, is critical to the consistent provision of that AtoN service.

Taking into account that under the SOLAS Convention, Chapter 5, Regulation 13, paragraph 2; Contracting Governments, mindful of their obligations published by the International Maritime Organisation, undertake to consider the international recommendations and guidelines when establishing aids to navigation, including recommendations on training and qualification of AtoN technicians, IALA has adopted Recommendation E-141 on Standards for Training and Certification of AtoN personnel.

IALA Committees working closely with the IALA World-Wide Academy have developed a series of model courses for AtoN personnel having E-141 Level 2 technician functions. This model course on Mains AC Utility Power Systems; Diesel and Petrol Generators should be read in conjunction with the Training Overview Document IALA WWA.L2.0 which contains standard guidance for the conduct of all Level 2 model courses

This model course is intended to provide national members and other appropriate authorities charged with the provision of AtoN services with specific guidance on the training of AtoN technicians in power systems. Assistance in implementing this and other model courses may be obtained from the IALA World-Wide Academy at the following address:

The Dean
IALA World-Wide Academy
10 rue des Gaudines
78100 Saint Germain-en-Laye
France

Tel: (+) 33 1 34 51 70 01
Fax: (+) 33 1 34 51 82 05
e-mail: academy@iala-aism.org
Internet: www.iala-aism.org

PART 1 - COURSE OVERVIEW

1. SCOPE

This course is designed to give a basic understanding of alternating current (AC) supplies and distribution from utility providers and local generators for use in an AtoN. It is intended to provide technicians with the theoretical and practical training necessary to understand the use of AC utility power systems and diesel and/or petrol driven generators in supplying power to aids to navigation stations.

In many countries, national regulations require the connection of AC supplies to any equipment to be conducted by competent and qualified electricians. This course is **not** intended to train technicians in specialist electrical connection nor in the installation of high power diesel generators at fixed aids to navigation stations. It is limited to the testing of electrical supplies from existing mains junction boxes, permanent diesel or temporary petrol generators.

This course is intended to be supported by further training modules on energy storage systems, maintenance records and protection against damage to aids to navigation stations from lightning. Details of these supporting model courses can be found in the Level 2 Technician training overview document IALA WWA L2.0.

2. OBJECTIVE

On completion of this course, participants will have acquired a basic level of competency in the understanding of AC power supply, distribution and identification of component parts within an AtoN environment and related hazards. This course is **not** intended to cover any national regulatory requirements for standards of Electrical Competency.

3. COURSE OUTLINE

This mainly practical course is intended to cover the knowledge required for a technician to assess mains AC utility power systems and diesel and/or petrol generators used to power aids to navigation and associated equipment. The complete course comprises 2 classroom, 2 practical modules and a practical test of competence. Each of these deals with a specific subject covering the use of mains AC utility power and diesel and/or petrol generators.

4. TEACHING MODULES

Table 1 *Table of Teaching Modules*

Module Title	Time in hours	Overview
Introduction to mains AC utility power sources	2.0	This module describes mains AC utility power sources and transformers
Introduction to diesel and petrol generators	1.0	This module describes the types and functions of diesel and petrol generators
Testing mains AC power supplies	2.0	This module describes how to assess AC power at an AtoN station
Diesel and petrol generators	3.0	This module describes how to test the power output from a permanent diesel or temporary petrol generator at an AtoN station

Module Title	Time in hours	Overview
Evaluation	1.0	Practical test of electrical supplies
Total Hours	9.0	Two-day course

5. SPECIFIC COURSE RELATED TEACHING AIDS

This course will be both classroom and workshop/site based. Classrooms should be equipped with blackboards, whiteboards, and overhead projectors to enable presentation of the subject matter.

Mains AC utility power and demonstration diesel and/or petrol generators should be made available in a suitable workshop or existing AtoN station.

6. ACRONYMS

To assist in the use of this model course, the following acronyms have been used:

AC	Alternating current
AtoN	Aid(s) to Navigation
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities - AISM
L	Level
SOLAS	International Convention for the Safety of Life at Sea, 1974 (as amended)
WWA	World Wide Academy

7. DEFINITIONS

The definition of terms used in this Guideline can be found in the International Dictionary of Marine Aids to Navigation (IALA Dictionary) at <http://www.iala-aism.org/wiki/dictionary>.

8. REFERENCES

In addition to any specific references required by the Competent Authority, the following material is relevant to this course:

- 1 IALA Guideline 1067-0 on the Selection of Power Systems for aids to Navigation and associated Equipment.
- 2 IALA Guideline 1067-2 on Power Sources.
- 3 Manufacturers of petrol and diesel generators handbooks.

PART 2 – TEACHING MODULES

1. MODULE 1 – AN INTRODUCTION TO MAINS AC UTILITY POWER SOURCES

1.1. SCOPE

This module describes mains AC utility power sources and transformers.

1.2. LEARNING OBJECTIVE

To gain a **basic** understanding of the theory behind the use of mains AC utility power sources.

1.3. SYLLABUS

1.3.1. LESSON 1 – MAINS AC POWER CONSIDERATIONS

- 1 Occupational safety and health considerations.
- 2 Availability of mains AC utility power.
- 3 Advantages of mains AC utility power.
- 4 Disadvantages of mains AC utility power.
- 5 Heating or dehumidification considerations.

1.3.2. LESSON 2 – ASSOCIATED EQUIPMENT

- 1 Cables and connectors.
- 2 Circuit protection (fuses; circuit breakers etc.).
Transformers and charge regulators.
- 3 Backup systems by means of electrical energy storage solutions.
- 4 Float charge systems.
- 5 Cycle charge systems.

2. MODULE 2 – AN INTRODUCTION TO DIESEL AND PETROL GENERATORS

2.1. SCOPE

This module describes the types and functions of diesel and petrol generators.

2.2. LEARNING OBJECTIVE

To gain a **satisfactory** understanding of the types of diesel and petrol generators that are used to power AtoN stations within their organisations.

2.3. SYLLABUS

2.3.1. LESSON 1 – DIESEL GENERATORS

- 1 Occupational safety, health and environmental considerations.
- 2 Types and functions of diesel generators used for major loads at AtoN stations.
- 3 Advantages and disadvantages of diesel generators.
- 4 Periodic maintenance requirement.
- 5 Fuel storage.

- 6 Ventilation.
- 7 Fire suppressants.
- 8 Alternator operation.

2.3.2. LESSON 2 - PETROL GENERATORS

- 1 Occupational safety, health and environmental considerations.
- 2 Types of petrol generators used and their functions.
- 3 Advantages and disadvantages of petrol generators.
- 4 Fuel storage and transport safety implications.
- 5 Alternator operation

3. MODULE 3 – TESTING MAINS AC POWER SUPPLIES

3.1. SCOPE

This module describes how to test AC power at an AtoN station.

3.2. LEARNING OBJECTIVE

To gain a **basic** understanding of how to assess an existing mains AC utility power supply at a fixed AtoN station.

3.3. SYLLABUS

3.3.1. LESSON 1 – PRACTICAL ELECTRICAL SAFETY

- 1 Review of potential electrical hazards.
- 2 Review of battery safety for any battery systems being charged by the mains.
- 3 Earthing considerations and tests.
- 4 Signs of corrosion.
- 5 Electrical safety precautions and equipment.
- 6 Test equipment required to check electrical supplies.

3.3.2. LESSON 2 - PRACTICAL ELECTRICAL TESTING

- 1 Review of tools and test equipment.
- 2 Initial examination and checks of cables and connections.
- 3 Testing of existing supply.
- 4 Isolation of backup systems.
- 5 Earthing tests.
- 6 Completion of maintenance records.

4. MODULE 4 – DIESEL AND PETROL GENERATORS

4.1. SCOPE

This module describes how to test the power output from a diesel or petrol generator at an AtoN station.

4.2. LEARNING OBJECTIVE

To gain a **satisfactory** understanding of how to test the power output from a fixed or temporary generators at major or minor AtoN stations.

4.3. SYLLABUS

4.3.1. LESSON 1 – PRACTICAL TESTS OF ELECTRICAL SUPPLY FROM AN INSTALLED GENERATOR

- 1 Review of occupational safety considerations:
 - a Exhaust fumes.
 - b Fuel hazards.
 - c Fire hazards.
 - d Electric shock.
 - e Automatic starting.
- 2 Review of tools and test equipment.
- 3 Checks on existing cables, circuits and breakers.
- 4 Earthing tests.
- 5 Completion of maintenance records.

4.3.2. LESSON 2 - PRACTICAL TESTS OF ELECTRICAL SUPPLY FROM A PORTABLE GENERATOR

- 1 Review of occupational safety considerations including petrol hazards.
- 2 Review of tools and test equipment.
- 3 Checks on existing cables, circuits and breakers.
- 4 Testing and isolation of existing supplies and backup systems.
- 5 Starting procedures and safety checks for the generator.
- 6 Checks on voltage output from a generator.
- 7 Completion of maintenance records.

5. ASSESSMENT

Participants will be assessed on their competency at the end of Module 4.