



IALA MODEL COURSE

L2.1.12

AIDS TO NAVIGATION– TECHNICIAN
TRAINING

MODULE 1 ELEMENT 12

LEVEL 2 - POWER SOURCES ON BUOYS

Edition 2.0

June 2016



DOCUMENT REVISION

Revisions to this IALA Document are to be noted in the table prior to the issue of a revised document.

Date	Page / Section Revised	Requirement for Revision
June 2016	Entire document	Minor textual changes



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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 an introduction to power sources on buoys 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 the installation and maintenance of power sources on buoys. Assistance in implementing this and other model courses may be obtained from the IALA World-Wide Academy at the following address:

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Tel: (+) 33 1 34 51 70 01
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PART 1- COURSE OVERVIEW

1. SCOPE

This course is intended to provide technicians with an introduction to the installation, servicing and maintenance of power sources on buoys in a safe and efficient manner.

All persons working on power sources on buoys should be deemed by the competent authority to be responsible individuals.

2. OBJECTIVE

Upon successful completion of this course, trainees will have acquired sufficient knowledge and skill to service and maintain AtoN power sources on buoys whilst working within their organisations.

3. COURSE OUTLINE

This course is intended to cover the knowledge and practical competence required for a technician to properly install, service and maintain power sources on buoys. The complete course comprises 5 modules, each of which deals with a specific subject representing an aspect of power sources on buoys servicing and maintenance. Each module begins by stating its scope and aims, and then provides a teaching syllabus. This is a practical, job-centred course designed to provide trainees with a realistic, hands-on educational experience.

4. TEACHING MODULES

Table 1 Table of Teaching Modules

Module Title	Time in hours	Overview
Safety	1.5	This module explains the potential hazards on buoy power systems and how to work safely with them
Battery types	1.5	This module covers the different types of energy storage types suitable for use on buoys
Battery maintenance	2.5	Explains how to maintain, operate and dispose of batteries for maximum life and safe disposal
Charging	1.0	Covers different types of charging methods available and charge regulation
General considerations and site visit	3.0	Covers general items of battery installation and operation before a site visit to consolidate knowledge gained on the course in a practical manner
Evaluation	1.0	
Total Hours	10.5	2 day course

5. SPECIFIC COURSE RELATED TEACHING AIDS

- 1 This course involves classroom instruction and a practical in a work area. Classrooms should be equipped with blackboards, whiteboards, and overhead projectors to enable presentation of the subject matter.
- 2 Trainees should have access to the types of equipment that they will be expected to work with on the job.

6. ACRONYMS

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

AtoN	Aid(s) to Navigation
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
L	Level (training)
NiCd	Nickel Cadmium
NiMH	Nickel Metal Hydride
PV	Photovoltaic(s)
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 Selection of Power Systems for Aids to Navigation and Associated Equipment
- 2 IALA Guideline 1067-1 on Total Electrical Loads of Aids to Navigation
- 3 IALA Guideline 1067-2 on Power Sources
- 4 IALA Guideline 1067-3 on Electrical Energy Storage for Aids to Navigation
- 5 Technical documentation from equipment manufacturers.

PART 2 – COURSE MODULES

1. MODULE 1 – SAFETY

1.1. SCOPE

This module explains the potential hazards on buoy power systems and how to work safely with them.

1.2. LEARNING OBJECTIVE

To gain a **basic** understanding of how to work on buoy power sources in a safe manner.

1.3. SYLLABUS

1.3.1. LESSON 1 - STORED ENERGY

- 1 Battery stored energy.
- 2 Danger of exposed terminals.
- 3 Solar PV voltages.

1.3.2. LESSON 2 - CHEMICAL HAZARDS

- 1 Acid electrolyte.
- 2 Toxic chemicals on high technology batteries.
- 3 Hydrogen.

1.3.3. LESSON 3 - PERSONAL PROTECTION EQUIPMENT

- 1 Gloves, goggles, apron.

1.3.4. LESSON 4 - ELECTROLYTE SPILLAGE MANAGEMENT

- 1 Spillage of electrolyte and safe clean up.

2. MODULE 2 – BATTERY TYPES

2.1. SCOPE

This module covers the different types of energy storage types suitable for use on buoys.

2.2. LEARNING OBJECTIVE

To gain a **basic** understanding of the different types of batteries suitable for use in power systems on buoys.

2.3. SYLLABUS

2.3.1. LESSON 1 - NON RECHARGEABLE BATTERIES

- 1 Alkaline, Lithium.
- 2 Applications – when a non-rechargeable would be selected.
- 3 Safe disposal.

2.3.2. LESSON 2 - RECHARGEABLE BATTERIES

- 1 Gel/ liquid lead acid.
- 2 NiMH/NiCd.

- 3 Lithium.
- 4 Applications – when a rechargeable battery would be selected.
- 5 Battery housing and ventilation.

2.3.3. LESSON 3 - MATCHING LOADS TO BATTERIES

- 1 Voltages in common use.

3. MODULE 3 – BATTERY MAINTENANCE

3.1. SCOPE

Explains how to maintain, operate and dispose of batteries for maximum life and safe disposal.

3.2. LEARNING OBJECTIVE

To gain a **basic** understanding of how to maintain batteries and how to optimise battery life.

3.3. SYLLABUS

3.3.1. LESSON 1 - BATTERY STORAGE

- 1 Storage locations.
- 2 Effects of complete discharge in storage.
- 3 Maintaining charge during storage.

3.3.2. LESSON 2 - RECHARGEABLE BATTERIES

- 1 Advantage of battery conditioning prior to use in service.
- 2 Methods of battery conditioning.
- 3 Frequency of battery conditioning.

3.3.3. LESSON 3 - ROUTINE MAINTENANCE

- 1 Visual inspection:
 - a Swelling of the casing.
 - b Terminal and connection integrity.
 - c Signs of electrolyte leakage.
 - d Corrosion.
 - e Corrosion prevention as per manufacturer's recommendations.
 - f Policy decision on when to replace.

3.3.4. LESSON 4 - TESTING

- 1 Expected voltages.
- 2 Discharge testing.
- 3 Use of proprietary condition monitors and test equipment.

3.3.5. LESSON 5 – DISPOSAL

- 1 Safe disposal.
- 2 Local regulation.

4. MODULE 4 – BATTERY CHARGING

4.1. SCOPE

This module covers different types of charging methods available and charge regulation.

4.2. LEARNING OBJECTIVE

To gain a **basic** understanding of the options for charging buoy batteries and how to maintain charging systems.

4.3. SYLLABUS

4.3.1. LESSON 1 - CHARGING SOURCES

- 1 Solar PV.
- 2 Wind generation.
- 3 Wave actuated generators.

4.3.2. LESSON 2 - CHARGE REGULATION

- 1 Regulation integral to the charging source.
- 2 Regulation external to the charging source.

4.3.3. LESSON 3 - CHARGE SYSTEMS MAINTENANCE

- 1 Charge output checks

5. MODULE 5 – GENERAL CONSIDERATIONS AND SITE VISIT

5.1. SCOPE

This module covers general items of battery installation and operation before a site visit to consolidate knowledge gained on the course in a practical manner

5.2. LEARNING OBJECTIVE

To gain a **basic** understanding of the overview of conditions and general issues pertinent to power systems on buoys.

5.3. SYLLABUS

5.3.1. LESSON 1 - ENVIRONMENTAL PROTECTION

- 1 Terminal covers:
 - a a. Open.
 - b b. Sealed.
- 2 Battery boxes:
 - a a. Sealed
 - b b. Vented
- 3 Location:
 - a. Access.
 - b. Theft.

c. Wave protection.

5.3.2. LESSON 2 - SITE VISIT

- 1 Visit to a buoy yard to view power system installations.
- 2 Visit to battery conditioning installation.