



# IALA MODEL COURSE

L2.3.10

AIDS TO NAVIGATION - TECHNICIAN TRAINING

LEVEL 2 MODULE 3 ELEMENT 3.10

RANGE, SECTOR AND PRECISION DIRECTION  
LIGHTS

**Edition 2.0**

**December 2016**

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International Association of Marine Aids to Navigation and Lighthouse Authorities  
Association Internationale de Signalisation Maritime



# DOCUMENT REVISION

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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
May 2013		Edition 1
December 2016	Page 8, 9, 10, 11, 12	Module 1 – Section 1.3.1 – Minor changes. Module 2 – Section 2.3.1/2.3.2 – Minor changes. Module 3 – Section 3.3.1 / 3.3.2 – Minor changes. Module 4 – Section 4.3.1 / 4.3.2 – Minor 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 AtoN Service Craft and Buoy Tenders 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 an introduction to service craft and buoy tenders. Assistance in implementing this and other model courses may be obtained from the IALA World Wide Academy at the following address:

The Secretariat  
IALA World-Wide Academy  
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78100 Saint Germain-en-Laye  
France

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

### 1. SCOPE

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It is anticipated that the practical surveying aspects of the installation and alignment of range, sector and Precision Direction lights will be conducted by AtoN managers or IALA Industrial Members. This course is intended to provide technicians with the theoretical and practical training necessary to have a basic understanding of the requirement for accurate alignment before gaining a satisfactory understanding of how to install, align and set to work range, sector and Precision Direction lights; the latter under appropriate supervision.

This course should only be conducted after participants have completed successfully Level 2 Module 3 Elements 3.1-3, which includes an introduction to marine lanterns, light characters and ranges and Module 3 Elements 3.4-6 on Light Flashers; Lamp Changers and Self Contained Marine Lanterns which provides competency in the maintenance of marine lanterns. This course is intended to be supported by further practical training modules on power supplies, remote monitoring and the maintenance of structures. Details of these supporting model courses can be found in the Level 2 Technician training overview document IALA WWA L2.0.

### 2. OBJECTIVE

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Upon successful completion of this course, participants will have acquired sufficient knowledge to install, align and set to work range, sector and Precision Direction lights fitted at AtoN stations within their organizations; the latter under supervision.

### 3. COURSE OUTLINE

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This principally practical (hands-on) course is intended to cover the knowledge required for a technician to install, align and set to work range, sector and Precision Direction lights fitted at AtoN stations within their organizations, the latter under supervision. The complete course comprises 4 classroom/workshop teaching modules and one or more site visits during which a practical competency test will be conducted. Each teaching module deals with a specific subject concerning range, sector and Precision Direction lights and begins by stating its scope and aims. It then provides a teaching syllabus.

## 4. TEACHING MODULES

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*Table 1 Table of Teaching Modules*

Module Title	Time in hours	Overview
Introduction to directional lights	3.0	This module describes the types and functions of directional lights used by the organisation and the importance of their correct alignment
Leading (Range) Lights	4.0	This module describes how range lights fitted to a transit or a port traffic signal should be installed, aligned and set to work
Sector Lights	3.0	This module describes how sector lights should be installed, aligned and set to work
Precision Direction Lights	5.0	This module describes how Precision Direction lights should be installed, aligned and set to work under supervision
Evaluation	3.0	Practical test.
<b>Total Hours</b>	<b>18.0</b>	Three-day course

## 5. SPECIFIC COURSE RELATED TEACHING AIDS

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This course is either classroom or workshop based. Instruction spaces should be equipped with blackboards, whiteboards, and overhead projectors to enable presentation of the subject matter.

Examples of range, sector and Precision Direction lanterns used in the AtoN service should be made available.

## 6. ACRONYMS

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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 (technician training - WWA)
LED	Light Emitting Diode
PDL	Precision Direction Light(s)
SOLAS	International Convention for the Safety of Life at Sea, 1974 (as amended)
TBS	True Bearing from Seaward
WWA	World-Wide Academy

## 7. DEFINITIONS

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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

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

- 1 IALA NAVGUIDE.
- 2 IALA Recommendation E-112 for Leading Lights.
- 3 IALA Recommendation E-111 for Port Traffic Signals.
- 4 IALA Guideline 1023 for the Design of Leading Lines.
- 5 IALA Guideline 1069 on the Synchronisation of Lights.
- 6 IALA Guideline 1065 on Vertical Divergence.
- 7 IALA Guideline 1041 on Sector lights.
- 8 Manufacturers' handbooks on marine signal lanterns used by the organisation.

## PART 2– TEACHING MODULES

### 1. MODULE 1 – INTRODUCTION TO DIRECTIONAL LIGHTS

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#### 1.1. SCOPE

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This module describes the types and functions of directional lights used by the organisation and the importance of their correct alignment.

#### 1.2. LEARNING OBJECTIVE

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To gain a **basic** understanding of the importance of correct alignment in both the horizontal and vertical plane and a **satisfactory** understanding of the types and functions of directional beacons used by the organisation at AtoN stations.

#### 1.3. SYLLABUS

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##### 1.3.1. LESSON 1 – THEORETICAL ASPECTS OF THE ALIGNMENT OF DIRECTIONAL LIGHTS

- 1 Angles, bearings and sectors – general.
- 2 True Bearing from Seaward (TBS).
- 3 TBS of a leading line derived from a transit.
- 4 Horizontal alignment and Angle of Uncertainty.
- 5 Vertical separation and alignment.
- 6 Accuracy requirements for position of directional lights.
- 7 Tower/platform stability.
- 8 Chart exercise for transit design.

##### 1.3.2. LESSON 2 – DIRECTIONAL LIGHTS AND THEIR FUNCTIONS

- 1 Leading (Range) lights:
  - a Range Lights.
  - b Port Signal Lights.
- 2 Sector lights:

- a Beacons fitted with masked coloured lenses.
  - b Beacons fitted with internal or external filter panels.
  - c Beacons with masked different coloured light sources.
  - d LED sector lights.
- 3 Precision Direction Lights.

## 2. MODULE 2 – LEADING (RANGE) LIGHTS

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### 2.1. SCOPE

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This module describes how range lights fitted to a transit or port traffic signal should be installed, aligned and set to work.

### 2.2. LEARNING OBJECTIVE

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To gain a **satisfactory** understanding of how to install range lights to a transit or port traffic signal before aligning them and setting them to work.

### 2.3. SYLLABUS

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#### 2.3.1. LESSON 1 – RANGE LIGHTS – COMPONENTS AND ASSEMBLY

- 1 Components of a range light.
- 2 Choice of beam spreader.
- 3 Variable power settings.
- 4 Setting flash characters.
- 5 Sun-switch / astronomical clock installation.
- 6 Synchronization/remote switching.
- 7 Remote monitoring.

#### 2.3.2. LESSON 2 - RANGE LIGHT INSTALLATION

- 1 Safety aspects:
  - a Working at height.
  - b Electrical safety.
- 2 Mounting on pre-fitted bracket / pedestal.
- 3 Power connection.
- 4 Synchronization/remote switching installation.

#### 2.3.3. LESSON 3 – RANGE LIGHTS – ALIGNMENT AND SETTING TO WORK

- 1 Levelling hardware.
- 2 Horizontal alignment to pre-determined TBS.
- 3 Checks on horizontal and vertical alignment of range light sets.
- 4 Synchronization checks.
- 5 Alignment check from seaward by qualified Engineer/Surveyor.
- 6 Alignment re-adjustment.

7 Report writing.

## 3. MODULE 3 – SECTOR LIGHTS

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### 3.1. SCOPE

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This module describes how sector lights should be installed, aligned and set to work.

### 3.2. LEARNING OBJECTIVE

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To gain a **satisfactory** understanding of how to install a sector light before aligning and setting it to work.

### 3.3. SYLLABUS

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#### 3.3.1. LESSON 1 – SECTOR LIGHTS – COMPONENTS AND ASSEMBLY

- 1 Components of a sector light.
- 2 Choice of filter material.
- 3 Setting flash characters.
- 4 Sun-switch / astronomical clock installation.
- 5 Synchronization/remote switching.
- 6 Remote monitoring.

#### 3.3.2. LESSON 2 - SECTOR LIGHT INSTALLATION

- 1 Electrical safety aspects.
- 2 Mounting on pre-fitted bracket / pedestal.
- 3 Power connection.

#### 3.3.3. LESSON 3 – SECTOR LIGHTS – ALIGNMENT AND SETTING TO WORK

- 1 Levelling hardware.
- 2 Horizontal alignment to pre-determined TBS.
- 3 Focusing checks.
- 4 Alignment check from seaward by qualified Engineer/Surveyor.
- 5 Alignment re-adjustment.
- 6 Report writing.

## 4. MODULE 4 – PRECISION DIRECTION LIGHTS

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### 4.1. SCOPE

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This module describes how Precision Direction lights should be installed, aligned and set to work under supervision.

### 4.2. LEARNING OBJECTIVE

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To gain a **satisfactory** understanding of how to install a Precision Direction light before aligning and setting it to work under supervision.

## 4.3. SYLLABUS

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### 4.3.1. LESSON 1 – PRECISION DIRECTION LIGHTS (PDL) – COMPONENTS AND ASSEMBLY

- 1 Components of a PDL.
- 2 Setting flash characters.
- 3 Sun-switch / astronomical clock installation.
- 4 Synchronization/remote switching.
- 5 Remote monitoring.

### 4.3.2. LESSON 2 - PDL INSTALLATION UNDER SUPERVISION

- 1 Safety aspects:
  - a Working at height.
  - b Platform stability.
  - c Electrical safety.
- 2 Mounting on pre-fitted bracket/pedestal.
- 3 Power connection.
- 4 Lightning protection.

### 4.3.3. LESSON 3 – PDL – ALIGNMENT AND SETTING TO WORK

- 1 Levelling hardware.
- 2 Horizontal alignment to pre-determined TBS.
- 3 Focussing checks.
- 4 Checks on horizontal and vertical alignment of range light sets.
- 5 Synchronization checks.
- 6 Alignment check from seaward by qualified Engineer/Surveyor.
- 7 Alignment re-adjustment.
- 8 Report writing.

## 5. EVALUATION

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During the site visit, each participant should be tasked to conduct installation and alignment checks on the appropriate equipment. Evaluation of competency will be determined by the instructor and/or IALA Industrial Member Engineer during the site visit.

## 6. SITE VISIT

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The purpose of site visit is to permit participants to consolidate the practical knowledge gained in the classroom/workshop through a visit to an operational AtoN station fitted with range, sector or Precision Direction lights.