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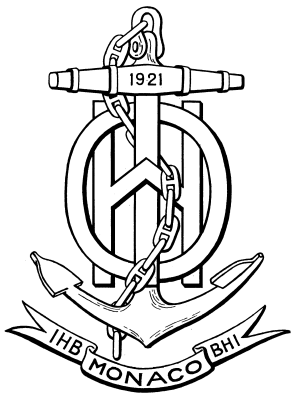

PRODUCT SPECIFICATION for RASTER NAVIGATIONAL CHARTS (RNC)

1st Edition, January 1999

Special Publication No. 61

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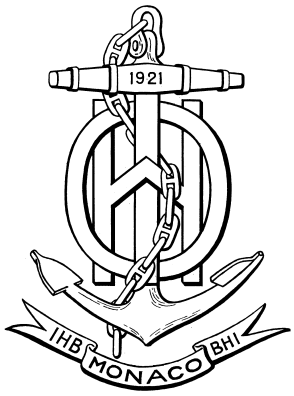

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FOREWORD

In December 1998, the International Maritime Organization's Maritime Safety Committee adopted an amendment [IMO resolution MSC.86 (70)] to the then-current Performance Standards for Electronic Chart Display and Information Systems (ECDIS), adopted by IMO resolution A.817 (19), as amended by IMO resolution MSC.64 (67), which are also annexed to IHO Publication S-52.

IMO resolution MSC.86 (70) permits ECDIS equipment to operate in a Raster Chart Display System (RCDS) mode in the absence of Electronic Navigational Charts (ENC). When operating in the RCDS mode, ECDIS should be used together with an appropriate folio of up-to-date paper charts.

The RCDS mode of operation is described in a new Appendix 7 to the IMO Performance Standards for ECDIS. For convenience it is annexed to this publication, with the kind permission of the IMO. A key component of the RCDS mode is the Raster Navigational Chart (RNC). Section 4.1 of Appendix 7 states that the RNC must conform to IHO standards. The necessary RNC Product Specification was developed by the IHO's Transfer Standard Maintenance and Application Development Working Group (TSMAD) during 1997 and 1998 and was adopted by the IHO's Committee on Hydrographic Requirements and Information Systems (CHRIS) in October 1998.

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1 INTRODUCTION

1.1 The elements of this product specification define the minimum requirements a Raster Navigational Chart (RNC) must have to satisfy the draft performance standard for a Raster Chart Display System (RCDS).

1.2 This product specification does not define underlying raster data structures of a raster navigational chart. The national hydrographic office producing the raster navigational chart should select that data structure.

2 DEFINITIONS

2.1 For the purpose of this product specification:

2.1.1 **Raster Chart Display System (RCDS)** means a navigation information system displaying RNCs with positional information from navigation sensors to assist the mariner in route planning and route monitoring, and if required, display additional navigation-related information.

2.1.2 **Raster Navigational Chart (RNC)** means a digital facsimile of a paper nautical chart, produced by or distributed on the authority of a government authorized hydrographic office. RNC is used in these specifications to mean either a single chart or a collection of charts.

2.1.3 **Notice to Mariners (NtM)** means a published change to an RNC produced by or distributed under the authority of a government authorized hydrographic office.

3 RNC REQUIREMENTS

3.1 An RNC should contain an image file, which is a digital facsimile of an existing, official paper chart. It should also contain meta-data describing the RNC as stated in this product specification.

3.2 The arrangement of the image data and the meta-data into one or more digital files should be determined by the national hydrographic offices originating the RNC.

3.3 Image Files

3.3.1 The digital format of the image file should be determined by the national hydrographic office producing the RNC.

3.3.2 The resolution of the digital image (pixels-per-inch) and any method used to compress or process that image file should be sufficient to display clearly all information that was contained on the original paper nautical chart. In particular, methods such as antialiasing should be employed to achieve maximum contrast and fidelity of displayed chart information compared to the printed chart.

3.3.3 The accuracy of the digital image file, as measured by the ability to determine the correct geographic coordinates of an individual pixel when the image file is used together with the RNC meta-data, should allow a ship's position to be displayed at least as accurately as when using the original paper chart.

3.4 **Meta-Data**

3.4.1 The digital format of the meta-data should be determined by the national hydrographic office originating the RNC.

3.4.2 The following meta-data should be included for each RNC. Where an image file contains more than one discrete chart image, e.g. chart insets, in addition to the main panel of the chart the meta-data should be included for each such discrete chart image.

3.4.2.1 Producing agency identifier specified using the producing agency codes listed in Annex A to Appendix A of IHO publication S-57.

3.4.2.2 RNC number.

3.4.2.3 Chart identifier (e.g. chart number) if different from the RNC.

3.4.2.4 RNC edition date.

3.4.2.5 Chart edition date and/or chart edition number.

3.4.2.6 Last update or Notice to Mariners applied.

3.4.2.7 Previous updates or Notice to Mariners applied.

3.4.2.8 Chart scale.

3.4.2.9 Orientation of north (where appropriate for the chart projection in use).

3.4.2.10 Projection and associated projection parameters.

3.4.2.11 Horizontal datum.

3.4.2.12 Horizontal datum shift to WGS84 or PE-90 if the chart datum is not one of those two datums.

3.4.2.13 Vertical datums.

3.4.2.14 Depth and height units.

3.4.2.15 Pixel resolution of the image file as measured in pixels-per-millimeter or pixels-per-inch.

3.4.2.16 A mechanism, such as parameters and an algorithm, to allow geographical positions to be converted to RNC (pixel) coordinates and vice-versa.

3.4.2.17 Colour palettes for daytime, nighttime and dusk.

3.4.2.17.1 Colours used for daytime viewing should be those used on the paper versions of the same charts.

3.4.2.17.2 Colours for dusk and nighttime should follow as closely as practicable the Colours and Symbols Standards specified in IHO Special Publication S-52, Appendix 2.

3.4.2.18 Sufficient information which will allow each note, diagram, item of marginalia or other chart subarea of special interest to be found and displayed clearly, simply and quickly even though that subarea may not be located on the portion of the chart currently being displayed.

3.4.2.19 Sufficient information to allow any source diagram, which provides information about data quality, to be displayed clearly, simply and quickly even though the source diagram may not be located on the portion of the chart currently being displayed.

3.5 **Updates**

3.5.1 The following meta-data should be included for each RNC update. Where an RNC image file contains one or more discrete chart image, e.g. chart insets, in addition to the main panel of the chart, the meta-data should be sufficient to identify to which the update applies.

3.5.1.1 Producing agency identifier specified using the producing agency codes listed in Annex A to Appendix A of the IHO publication S-57.

3.5.1.2 Update number.

3.5.1.3 Update date.

3.5.1.4 RNC to which the update applies.

3.5.1.5.1 Chart edition date to which the update applies.

3.5.1.6 Any changes to the meta-data of the RNC being updated (e.g. if a chart note changes, the relevant changes in RNC meta-data need to be included in the update).

3.5.1.7 Sufficient information to allow the update to be applied automatically to the RNC and for the update to be displayed.

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ANNEX A

RCDS MODE OF OPERATION
(Appendix 7 to the IMO Performance Standards for ECDIS)

Notes: 1) The RCDS Mode of Operation, adopted by IMO resolution MSC.86 (70) in December 1998, is reproduced in this publication for convenience, with the kind permission of the International Maritime Organization, London.

2) This should be read in conjunction with the IMO Performance Standards for ECDIS, which have been reproduced in Annex B to Publication S-52, 5th Edition.

Whenever in this appendix reference is made to provisions of the Annex related to ECDIS, ECDIS should be substituted by RCDS, SENC by SRNC and ENC by RNC, as appropriate.

All paragraphs of the Annex related to ECDIS are indicated as to whether they apply to RCDS, do not apply to RCDS, or are modified in order to apply to RCDS. These paragraphs are followed by additional requirements for ECDIS equipment in the RCDS mode.

1. INTRODUCTION

1.1 Paragraph applies to RCDS.

1.2 When operating in the RCDS mode, ECDIS equipment should be used together with an appropriate folio of up-to-date paper charts.

1.3 - 1.7 Paragraphs apply to RCDS.

1.8 RCDS should provide appropriate alarms or indications with respect to the information displayed or malfunction of the equipment (see Table 1 of this Appendix).

2. DEFINITIONS

2.1 Raster Chart Display System (RCDS) means a navigation information system displaying RNCs with positional information from navigation sensors to assist the mariner in route planning and route monitoring, and if required, display additional navigation-related information.

2.2 Raster Nautical Chart (RNC) means a facsimile of a paper chart originated by, or distributed on the authority of, a government-authorized hydrographic office. RNC is used in these standards to mean either a single chart or a collection of charts.

2.3 System Raster Nautical Chart Database (SRNC) means a database resulting from the transformation of the RNC by the RCDS to include updates to the RNC by appropriate means.

2.4-2.5 Paragraphs do not apply to RCDS.

2.6 Paragraph applies to RCDS.

3. DISPLAY OF SRNC INFORMATION

3.1 Paragraph applies to RCDS.

3.2 SRNC information available for display during route planning and route monitoring should be subdivided into two categories:

.1 the RCDS standard display consisting of RNC and its updates, including its scale, the scale at which it is displayed, its horizontal datum, and its units of depths and heights; and

.2 any other information such as mariner's notes.

3.3 Paragraph applies to RCDS.

3.4 When a RNC is displayed on the RCDS, it should provide an indication advising the mariner if a more detailed (larger scale) RNC is available for the displayed area.

3.5 It should be easy to add to, or remove from, the RCDS display any information additional to the RNC data, such as mariner's notes. It should not be possible to remove any information from the RNC.

3.6 - 3.7 Paragraphs do not apply to RCDS.

3.8-3.10 Paragraphs apply to RCDS.

3.11 There should always be an indication if the ECDIS equipment is operating in the RCDS mode.

4. PROVISION AND UPDATING OF CHART INFORMATION

4.1 The RNC used in RCDS should be the latest edition of that originated by, or distributed on the authority of, a government authorized hydrographic office and conform to IHO standards. RNCs not on WGS-84 or PE-90 should carry meta-data (i.e., additional data) to allow geo-referenced positional data to be displayed in the correct relationship to SRNC data.

4.2 The contents of the SRNC should be adequate and up-to-date for that part of the intended voyage not covered by ENC.

4.3- 4.8 All paragraphs apply to RCDS.

5. SCALE

This section applies to RCDS.

6. DISPLAY OF OTHER NAVIGATIONAL INFORMATION

6.1-6.3 All paragraphs apply to RCDS.

7. DISPLAY MODE AND GENERATION OF THE NEIGHBOURING AREA

7.1 It should always be possible to display the SRNC in "chart-up" orientation. Other orientations are permitted.

7.2-7.4 All paragraphs apply to RCDS.

8. COLOURS AND SYMBOLS

8.1 IHO recommended colours and symbols should be used to represent SRNC information.

8.2 Paragraph applies to RCDS.

8.3 Paragraph does not apply to RCDS.

8.4 Paragraph applies to RCDS.

9. DISPLAY REQUIREMENTS

9.1-9.2 Paragraphs apply to RCDS.

9.3 Paragraph does not apply to RCDS.

9.4 Paragraph applies to RCDS.

9.5 RCDS should be capable of displaying, simply and quickly, chart notes which are not located on the portion of the chart currently being displayed.

10. ROUTE PLANNING, MONITORING AND VOYAGE RECORDING

10.1-10.2 Paragraphs apply to RCDS.

10.3 Paragraph does not apply to RCDS.

10.4 Route Planning

10.4.1-.10.4.3 Paragraphs apply to RCDS.

10.4.4-.10.4.5 Paragraphs do not apply to RCDS.

10.4.6 Paragraph applies to RCDS.

10.4.7 It should be possible for the mariner to enter points, lines and areas which activate an automatic alarm. The display of these features should not degrade the SRNC information and it should be clearly distinguishable from the SRNC information.

10.5 Route monitoring

10.5.1 Paragraph applies to RCDS.

10.5.2 It should be possible to display a sea area that does not have the ship on the display (e.g. for look ahead, route planning), while route monitoring. If this is done on the display used for route monitoring, the automatic route monitoring functions in 10.4.6 and 10.4.7 should be continuous. It should be possible to return to the route monitoring display covering own ship's position immediately by single operator action.

10.5.3-10.5.4 Paragraphs do not apply to RCDS.

10.5.5-10.5.8 Paragraphs apply to RCDS.

10.5.9 The RCDS should only accept data referenced to the WGS-84 or PE-90 geodetic datum. RCDS should give an alarm if the positional data is not referenced to one of these datums.

10.5.10-10.5.13 Paragraphs apply to RCDS.

10.5.14 RCDS should allow the user to manually align the SRNC with positional data. This can be necessary, for example, to compensate for local charting errors.

10.5.15 It should be possible to activate an automatic alarm when the ship crosses a point, line, or is within the boundary of a mariner-entered feature within a specified time or distance.

10.6 Voyage recording

10.6.1-10.6.4 All paragraphs apply to RCDS.

11. ACCURACY

11.1-11.2 All paragraphs apply to RCDS.

12. CONNECTIONS WITH OTHER EQUIPMENT

12.1-12.2 All paragraphs apply to RCDS.

13. PERFORMANCE TESTS, MALFUNCTION ALARMS AND INDICATIONS

13.1-13.2 All paragraphs apply to RCDS.

14. BACK-UP ARRANGEMENTS

All paragraphs apply to RCDS.

15. POWER SUPPLY

15.1-15.2 All paragraphs apply to RCDS.

Table 1

ALARMS AND INDICATIONS IN THE RCDS MODE OF OPERATION

Para	Requirement	Information
10.4.6, 10.5.5	Alarm	Deviation from route
10.4.7, 10.5.15	Alarm	Approach to critical point, line, area or mariner-entered feature
10.5.7	Alarm	Position system failure
10.5.8	Alarm	Approach to critical point
10.5.9	Alarm	Different geodetic datum
13.2	Alarm	Malfunction of RCDS mode
3.11	Indication	ECDIS operating in the raster mode
3.4, 5.1	Indication	Information under-scale or overscale
5.2	Indication	Larger scale RNC available for the area of the vessel

The definitions of indicators and alarms are given in Appendix 5.

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