

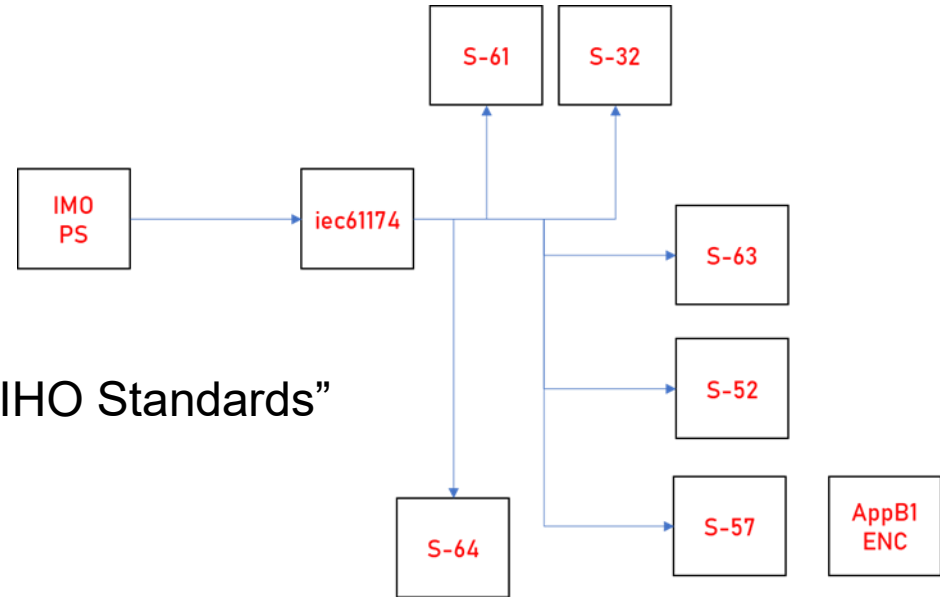


IHO Test Datasets for S-100

Jonathan Pritchard
v1.0 March 2nd - 2020

- Recently completed project evaluating extent and detail of IHO support for ECDIS testing under S-100
- Contents
 - S-100 and ECDIS
 - Scope and sanity test of testing required
 - Overview of test content
 - Strategies for their creation

A refresher on type approval structure



References in IMO PS and IEC61174 to “IHO Standards”

- 4.9 ECDIS should be capable of accepting both non-encrypted ENC's and ENC's encrypted in accordance with the IHO Data Protection Scheme³.
- 4.1 The chart information to be used in ECDIS should be the latest edition, as corrected by official updates, of that issued by or on the authority of a Government, government-authorized Hydrographic Office or other relevant government institution, and conform to IHO standards².

² IHO Special Publication S-52 and S-57 (see appendix 1).

³ IHO Special Publication S-63 (see appendix 1).

IHO S-52, appendix 1:2012, *Guidance on Updating the Electronic Navigational Chart edition 4.0*

IHO S-52, Annex A:2014, *Presentation library edition 4.0*

IHO S-57, *IHO transfer standard for digital hydrographic data*

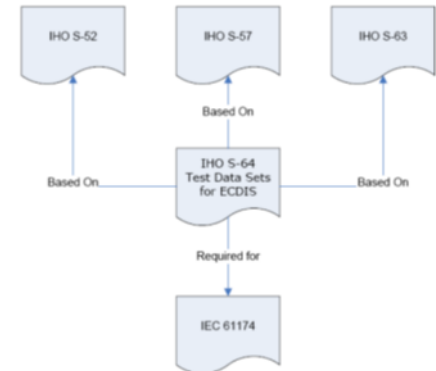
IHO S-57, appendix B.1, *ENC product specification*

IHO S-61:1999, *Product specification for raster navigational charts (RNC)*

IHO S-63, *IHO data protection scheme*

IHO S-64, *Test data sets for ECDIS*

- S-64 consists of test datasets to be used by OEMs and test bodies in support of testing against IEC61174 to ascertain whether a given system conforms to the provisions of the IMO PS
- S-64 tests the entirety of ECDIS operation
- Although other standards are “referenced” the content of S-64 is mainly determined from S-52, S-57 and S-63
- Progressively more detail as standards move from IMO PS to IEC61174 to relevant IHO standard (via S-64)

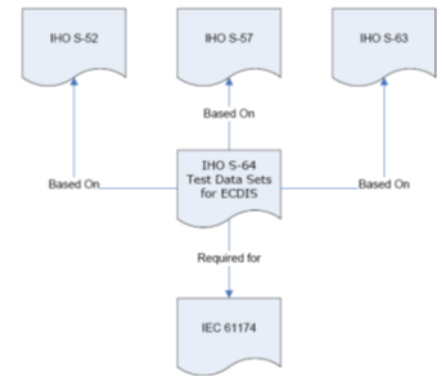


To implement testing of S-100 ECDIS



Need to understand:

- How the multiple S-100 product specifications work within the scope of the ECDIS performance standard (IMO PS) in relation to the concept of a chart and “ENC” under SOLAS.
- How those product specifications are then supported by other IHO standards for testing purposes under IEC61174.
- Current Working (Over)view:
 - S-100 will be added to the type approval regime (by references in both IMO PS and IEC61174) “IHO Standards”
 - The test regime (executed under S-64) will include ECDIS operation of a specific set of S-100 product specifications.
 - The enhancement to the test specifications will also include functionality of the ECDIS to use “arbitrary” product specification data.



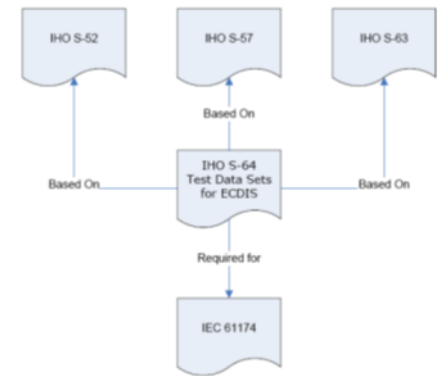
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(Additional) Current Working View:

ECDIS, in the transition period from S-57 to S-100 based operation will be “Dual Fuel”

Although this is still to be worked out in detail, broadly:

- ECDIS will be able to ingest, store, manage, display and “use” (in IMO PS terms) both S-57 and (at least) S-101 data simultaneously.
- Producers will produce both S-57 and S-101 to cater for both S-100 ECDIS and legacy S-57 ECDIS during the transition period (+ other product specifications as necessary)
- Testing, therefore, will need to encompass both S-57 and S-100 data and be in place before S-100 type approved ECDIS can be used to satisfy the carriage requirement.

20. In order to maintain ECDIS devices already installed on SOLAS vessels which are technically not ready nor required to be upgraded to S-101 ENC compatibility, and to comply with the applicable IMO regulations pertaining to existing navigation equipment, identical coverage will be provided for S-57 ENCs and S-101 ENCs for a transition period until there is no significant number of legacy systems in the field and all ECDIS in operation have become S-101 compatible. This situation is expected near the end of the decade, but will be continuously monitored to enable a decision to be made by the responsible IMO body.

21. As a consequence, new ECDIS systems to be brought into the market at the time when S-101 ENC coverage starts (2024) will have to be capable to process both transfer standard formats: S-57 ENCs and S-101 ENCs.

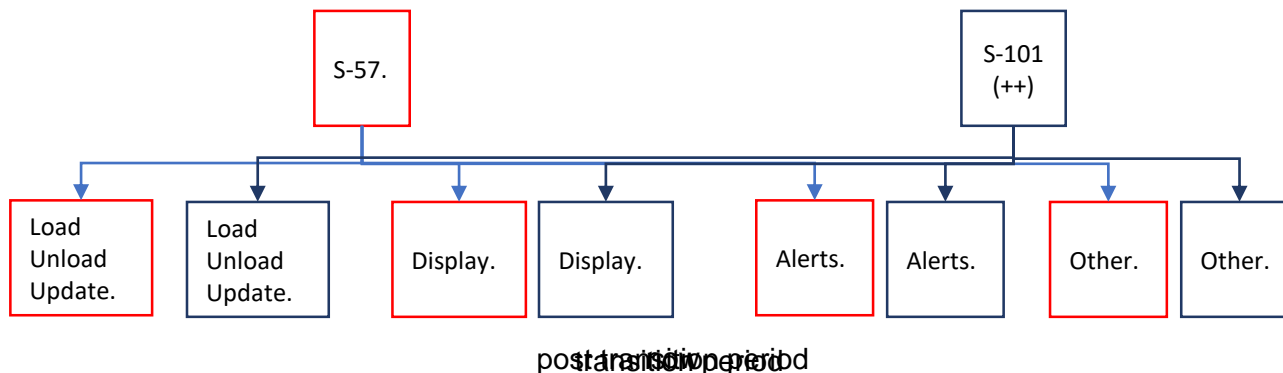
22. Safety of navigation will be maintained by cartographic content of both S-57 and S-101 standards. From the user's perspective, presentation of cartographic and functional features to meet the IMO mandated content in a mixed environment of S-57 ENCs and S-101 ENCs in one ECDIS device will be seamless and presented under the identical presentation regime for charted features and navigational objects.

Layout of tests:

Current S-64 Layout (reflects IMO PS groupings):

- Chart Loading and Updating (Section 2) – encrypted and non-encrypted data
- Chart Display (Section 3)
- Other Functions associated with Chart display (Section 4)
- Detection and Notification of: (Section 5,6 and 7)
 - Navigational Hazards
 - Areas for which Special conditions exist
 - The safety contour

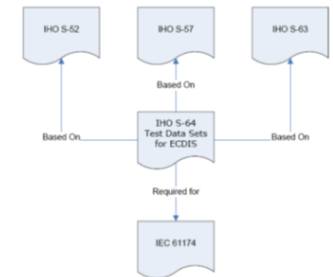
Proposal: To extend coverage of testing to S-100, include, within a revision of S-64, discrete standalone tests covering the new standard side by side with the existing data.



Where is the ECDIS functionality

In order to cater for “post transition period” (no S-57 or S-52) the S-100 regime must replicate all the ECDIS functionality existing within the current IHO standards base:

- Data content, structure etc... (S-57)
- Portrayal (S-52)
- “Other” (in S-52 and S-64 currently)
 - Installation and operation of updates and manual updates
 - Validation of data content – ECDIS status reports
 - Pick Report functionality
 - Alert/Indication functionality
 - North Arrow, Scale Range indicators, unofficial/official boundaries etc...
 - Chart 1
 - Messages
 - etc...
- Need to find a home for these details, mostly S-101?
- And
 - Are there any S-58 implications?
 - Testing Strategy/Structure and process?
 - Minimal change to existing S-57 test content



“based on”

Results

The update process shall install the updates up to update no. 3 and reject the installation of updates no. 4 and 5 with a permanent indication, “Chart information not up-to-date” when this chart is in use (either displayed or used as largest scale available for the chart related alerts and indications) until the not up-to-date situation is removed by successful application of a re-issue, a new edition or complete sequence of updates.

S-64 structure, new edition



1. Data Loading and Updating (all product specifications, including existing S-57 tests)
 - Loading/Unloading of S-100 catalogues (Feature/Portrayal, Interoperability, Alarm/indication if applicable + others as defined in S-100)
 - Loading/Unloading of data, S-101 and other product specifications.
 - Loading of arbitrary product specifications into the system
2. Data Display and interoperability.
 - S-101
 - Other predefined S-100 product specifications (i.e. S-102, S-111)
 - Arbitrary S-100 product specifications
 - Testing of interoperability and flexible interrogation (i.e. S-98 + pick report formatting)
 - Any co-existence tests required for side-by-side S-57/S-101 display.
3. Associated functions (existing chart display marginalia + any others required by e.g. interoperability) – expansion of existing Section 4.
4. Detection and Notification of:
 - Navigational Hazards
 - Areas for which Special conditions exist
 - Rendering of safety contour
 - Interoperability tests between stated S-100 product specifications using pre-defined alert/indication catalogues including safety contour rendering
 - Ability of new S-100 product specifications to expose features which make up hazards, areas and safety contour to operate correctly.
 - Any co-existence tests required for side-by-side S-57/S-101 operation
5. Other operations specifically related to the implementation of S-100 Dual-Fuel ECDIS

New test functionality required



- Introduction of new catalogues and data to the system
 - Load, installation, upgrade, rollback and tests of features introduced (and removed) by them.
 - Catalogues should contain (at least) detailed tests for core navigation data (S-101 + others) and test upgrades of:
 - Feature
 - Portrayal
 - Pick report / interrogation
 - Alarm/indication and SC generation
 - Context Parameters and Viewing Group definitions
 - Interoperability under S-98
- Additional tests with arbitrary (dummy) product specifications designed specifically for test scenarios. Simple (but functionally complete) product specification introduced to the EUT and tested against the same list.
- Testing should include the ability of these product specifications to be used to enhance the ENC data on the system
- Dual-fuel operation – ensuring IMO PS functions behave “as they should” when S-57 and S-100 data co-exist on the system and a user is using both for navigation.

- “Equivalents of S-57 tests”
 - Where a test requires an “equivalent” dataset and the content is 1-1 convertible from the existing S-57 we can just convert it.
 - Needs to be consideration of the DCEG (and UOC) though to make sure cell is encoded appropriately. Much of this is likely to be manual
 - S-64 in many parts can remain unchanged, just referencing additional (S-100 based) datasets for performing tests.
- New tests
 - Need to be created from scratch
 - Selection of which product specifications to include and to what detail
 - S-64 needs explanation and guidance for testing in parallel to existing tests
 - Needs to include (or reference) messages and expected results

More Detail – go to paper... look at tables P23-31 and P33-38

- IMO/IEC
 - Additions to workplan to include S-100 in references for “IHO Standards”
 - Additions to IEC61174 for new functionality
- S-101
 - ECDIS functionality not currently included
- S-100
 - Supporting parts – S-98
 - Others?
- S-64
 - Draft of new edition
 - Dual fuel ECDIS further detail required
 - Some parts of this can be started now, structure + 1-1 tests

The S-100WG is asked to...



- **Note the contents of the report and covering paper regarding IHO test datasets for S-100 based ECDIS**
- **Note the dependencies on rigorous definition of Dual Fuel ECDIS operation**
- **Endorse the approach to the creation of the new version of IHO S-64**