

ENC Import Strategy

Guidelines for Manufacturers Implementing the
IHO S-63 Edition 1.1 Data Protection Scheme

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A Strategy for Importing Encrypted ENC's to an ECDIS

1 BACKGROUND

When encrypted ENC Services were first introduced the ECDIS had no problems managing the low volume of data available. Over the years the number of ENC's has grown considerably to the extent that it has impacted on the time it takes the ECDIS to import and convert them.

The IHO S-57 Product Specifications prescribes the delivery of a single exchange set across multiple media sets. It is considered that this was written with unencrypted ENC's in mind, where the user has access to all ENC's in the exchange set. The specifications did not really take account of encrypted ENC where the user is provided with selective access based on the ENC cells required.

In the early days OEM's only had access to unencrypted ENC's to test the systems they were developing. Since no ENC encryption standard had been defined they developed their systems to read all records in the CATALOG.031 file. When the Primar Security Scheme was published most OEM's modified their systems to manage encrypted ENC's but did not change the import strategy to optimise the process.

With the number of ENC's now available a single exchange set across several CD's would mean that the CATALOG.031 file would contain an inordinate number of records. ENC Data Servers quickly realised that this method of delivery would be impractical and unworkable. It was decided by both UKHO VAR and Primar to issue multiple exchange sets across multiple sets of media.

The method developed by OEM's for importing ENC's, together with the delivery method adopted by Data Servers, has resulted in a slow and convoluted import process for the user. The purpose of this paper is to propose a strategy for optimising the import of S-63 encrypted ENC's.

2 INTRODUCTION

These guidelines are primarily aimed at manufacturers developing new systems compliant with the S-63 Edition 1.1 Data Protection Scheme. It was written with a mind to improving the import of ENC's to the ECDIS and making it more efficient and intuitive for the user.

First it is worth looking at the files that we have to work with and there intended purpose. The following table below only describes information that relates to the import of ENC's:

File	S-63 Ed 1.1 Section	Import Specific Information
PRODUCTS.TXT	6.2	This contains a flag that identifies the source media of each ENC in service.
SERIAL.ENC	6.3.1	This file identifies the data server ID. It also carries the week number & issue date of the media, the type of media (base or update) and the media number of a set of media.
STATUS.LST	6.5.1	This file provides information about the media in service and their issue dates. It also provides some human readable information that can be displayed to the user.
CATALOG.031	6.4	This file is used to identify where all files are stored in the exchange set. The CATD-COMT field contains the DSID information which is normally available in the ENC file were it not encrypted.
PERMIT.TXT	4.3	Each permit string contains a field encoded with the Data Server ID

3 S-58 Validation Checks

The IHO S-58 Standard specifies the checks that, at minimum, producers of ENC validation tools should include in their validation software. This software will be used by **hydrographic offices** to help ensure that their ENC data are compliant with the S-57, Appendix B1 ENC Product Specification. The checklist has been compiled for the IHO from lists of checks provided by a number of hydrographic offices and software companies.

It is the responsibility of the hydrographic offices to verify and validate the content and structure of all ENC's. In most instances ENC's are further validated by Regional ENC Co-ordinating Centres (RENCs) to ensure ENC's are produced to a standard and consistent quality.

In July 2006 the IHB sent a letter to all manufacturers strongly recommending that they turn off/remove the S-58 validation checks (see ANNEX A). That is with the exception of those specifically identified for ECDIS. These are listed in the table below:

Checks Relating to ECDIS		
1	Check that the file extension is sequential until a new edition of the base set is issued.	Error
2	Check if DSID-UPDN is out of sequence.	Error
3	Check for proper usage of file extension, EDTN, UPDN, UADT and ISDT for re-issues of an ENC.	Error
4	Check that EDTN starts one higher than the previous edition number.	Error
5	Check that the file names of a base set and the re-issue are identical.	Error

4 ENC Import Optimisation

As mentioned in the introduction there are fields within various files of an encrypted exchange set that can be used to optimise the import process. These are identified and described in more detail in the following subsections.

4.1 The PERMIT.TXT File

New or replacement permits should always be installed first before any attempt is made to install encrypted ENC data.

The following list identifies the logical sequence for importing and managing ENC permit files.

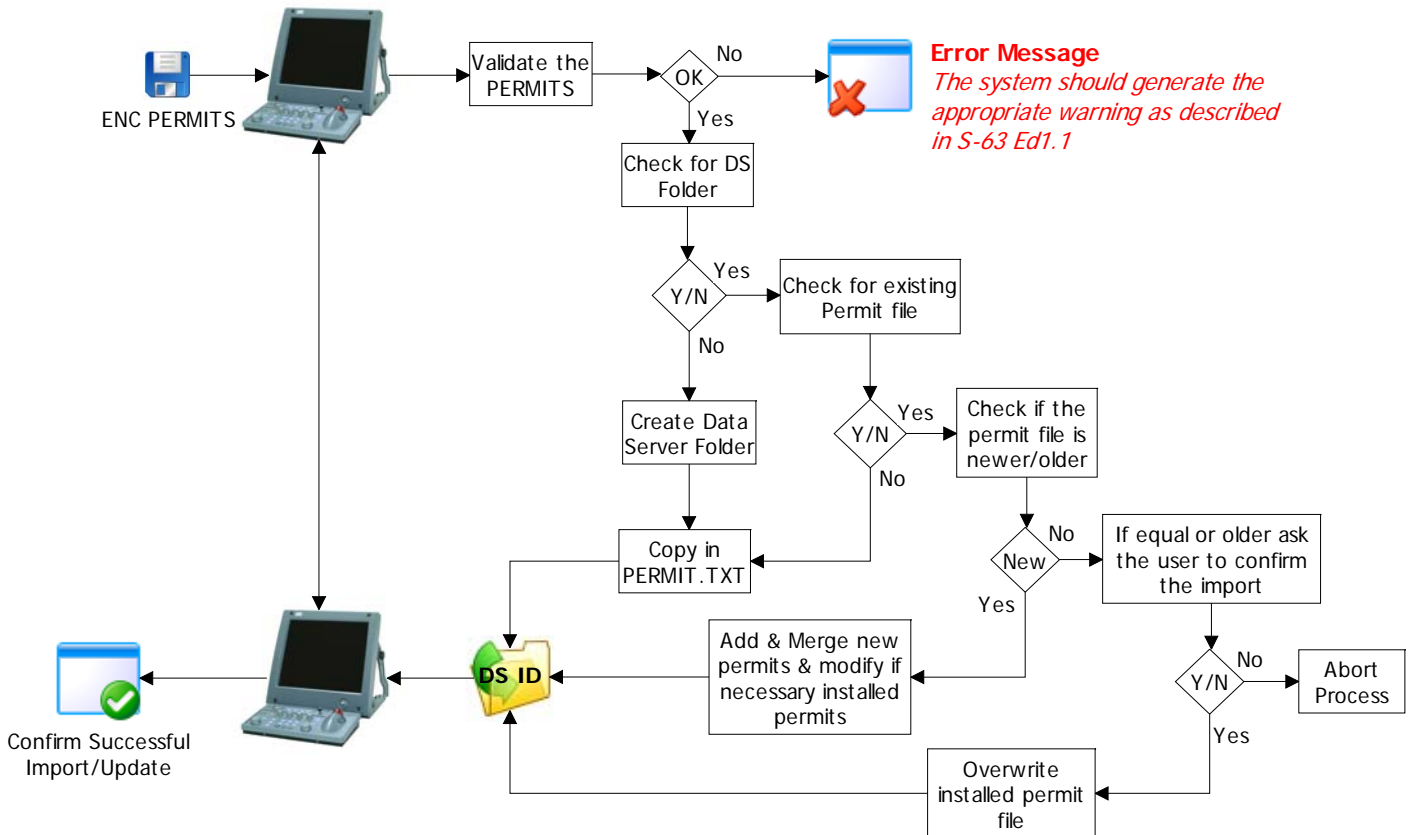
1. Validate each permit string as defined in S-63 and if necessary return the appropriate error message. If OK go to (2), if corrupt or invalid inform the user and terminate the import. A message similar to the one below should be displayed.

SSE XX – The permit file is corrupt or invalid contact your service provider and request a new permit file.

2. Check to see if there is a folder for this Data Server ID (DS ID). If no create one and copy the validated PERMIT.TXT file to it. If yes go to (3).

3. If a folder already exists the system should check whether it already contains a permit file? If no¹ copy the validated PERMIT.TXT file to this folder. If yes go to (4).
4. If a permit file already exists in the DS folder the system should check the header of the new permit file to see if it is newer than the currently installed one. If yes go to (5) but if no system should inform the user. However in this instance the system should give the user the option to force the install as follows.

This permit file is dated older than or equal to the currently installed one. Do you want to continue? Yes or No



Identify Data Server and Import and Validate ENC Permits

5. If the PERMIT.TXT header is dated later than the currently installed permit file then modifications have been made to the users licence, i.e. new permits have been added, new expiry date (licence renewed), encryption keys have changed, and/or ENC edition number changed². Under these conditions the system should merge any new permits and amend any existing ones.

The new permit file has been installed, XX permits have been added to this licence and XX have been modified.

¹ A Data Server folder may have already been created when a SERIAL.ENC file was read but no permits were found. See note in section 4.2.

² To be backwardly compatible with S-63 Edition 1.0

In some cases permits may have been removed or not renewed³ when the licence has been updated for additional permits. This is especially true now that many Data Servers offer flexible licensing, e.g. 3, 6, 9 or 12 month periods. In these cases no further updating will be allowed by the ECDIS after the ENC permits expire. The system should inform the user of these instances and inform the user with a message similar to the following:

XX permits have been removed from your licence. Do you want to delete these ENC's from the SENC when they expire? Failure to do so may result in ENC's not being updated after they expire and therefore not suitable for navigation. Yes or No

6. When a new permit file has been imported for the first time or existing permits have been amended the system should prompt the user to install the latest update (or base if no update is available) media.

ENC Permits have been installed successfully now install the latest UPDATE MEDIA supplied by your service provider.

4.2 The SERIAL.ENC File

The SERIAL.ENC file should be read first when the ENC Media is first installed. That is because it is the only file in an encrypted exchange set that identifies the DS. This seeks to associate all other files in the exchange set with a particular service. Section 6.3 of S-63 Ed1.1 describes the format.

It also contains information about the week and date of issue, the type of media, the version of S-63 and the media number in a set of media. This information will be used for the management of ENC importing as outlined below and described in more detail later in this paper.

- *The Data Server ID (DS ID), as mentioned previously, is the only file on the ENC media that actually identifies the DS. It should be used to identify the DS folder on the system and manage all files, permits and data, from the same DS.*
- *The Week Number and Date of Issue, this can be used to check the status of the media against that already installed.*
- *Media Type identifies the different types of media, i.e. base or update.*
- *The version of S-63, in the case of S-63 Edition 1.1 it is Version 2.0. This allows manufacturers to differentiate between the two versions (currently) and the functional differences.*
- *Media number in a set of media, this allows systems to manage the import process and identify which media has been installed and which media is still required to complete the import process.*

When importing ENC's the system should read the contents of this file and validate that the correct media has been inserted in the drive, e.g. Base or Update/correct media volume. It should also check that the date in the SERIAL.ENC on the media corresponds to the date held in the STATUS file installed on the system. The system should issue a warning message if information prompted for using information in the STATUS.LST file does not agree with SERIAL.ENC file on the media. Illustrative examples as follows:

- *The inserted media is an update please insert <Base Media X, dated day month year> in the <drive>.*
- *There are no licenced cells on this media please insert <Base Media X, dated day month year> in the <drive>.*
- *This is the wrong base media please install <Base Media X, dated day month year> in the <drive>.*

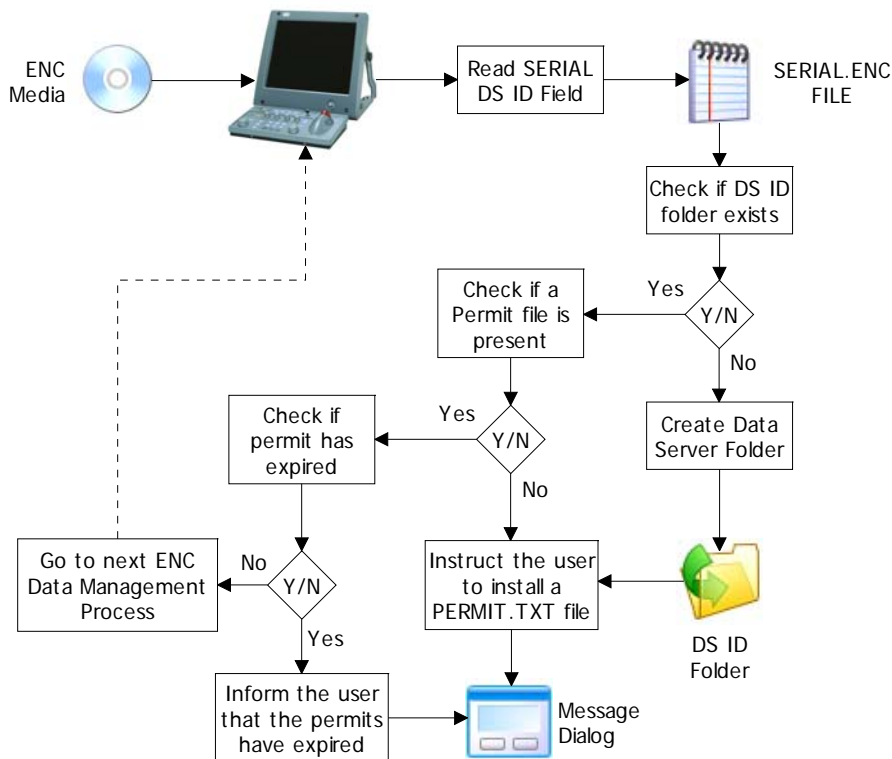
³ ENC's already converted and stored in ECDIS are only removed if a cancellation update is issued or the user manually removes them.

4.2.1 The SERIAL.ENC file DS ID

If a folder corresponding to the Data Server ID on the media has not been created the user should be prompted to install the permits first. A message similar the example below should be displayed.

There are no ENC Cell Permits installed for this Service. Please load the PERMIT.TXT file supplied by this service provider.

NOTE: The system can still create a unique folder based on the Data Server ID contained in the SERIAL.ENC file. Also if a permit file compliant with Ed1.0 of S-63 (no DSID) is installed then these should be stored in this folder. If a valid permit file is installed in the DS ID folder the system should then copy the PRODUCTS.TXT to the same folder (See section 4.3 below).



Confirm Data Server Folder and check that Valid ENC Permits are available

4.3 The PRODUCTS.TXT File

This file is described in detail in section 6.2 of S-63 Ed1.1. The PRODUCTS.TXT file on the update media contains a record for each ENC in a DS's service. Each record has a field which identifies the source media where the latest edition of each base cell [EN Profile] can be located. The PRODUCTS.TXT⁴ file should be copied and stored immediately after the SERIAL.ENC file is read.

The product listing also contains additional fields that are relevant to ENC management & import. These are identified in the table below and highlighted in blue.

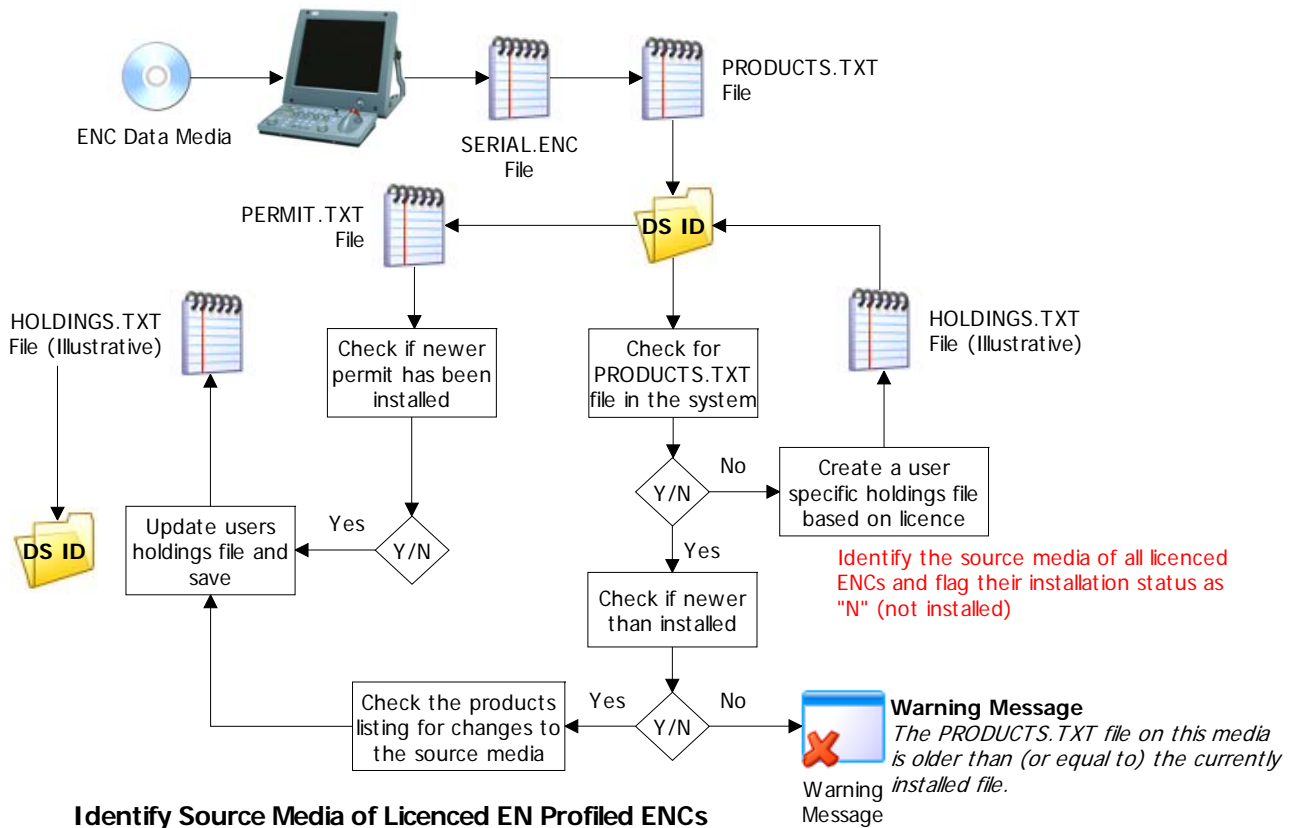
⁴ A full, up to date, product listing is required to be stored on the system so that the ECDIS can manage the import of certain types of ENC's, e.g. ENC re-issues. It can also be used to generate a graphical catalogue of all ENC's in a service. Licenced and unlicensed cells can be differentiated by colour.

A Strategy for Importing ENC's to the ECDIS v0.9

Field	Field Description
1	Product Name
2	Base Cell Issue Date [EN Application Profile]
3	Base Cell Edition
4	Issue Date Latest Update [ER Application Profile]
5	Latest Update Number
6	File Size
7	Cell limit - Southernmost latitude
8	Cell limit - Westernmost longitude
9	Cell limit - Northernmost latitude
10	Cell limit - Easternmost longitude
11	10 Data Coverage Coordinates
12	Compression
13	Encryption
14	Base cell update number (For Re-Issues)
15	Last update number for previous edition (For New Editions)
16	Base Cell (EN Application Profile) Location
17	Cancelled Cell Replacements

A method must be identified for quantifying the source media required to carry out a full import of the user's ENC holdings and a method of flagging each import status in respect of the ECDIS.

It would be useful if a user specific file is created based the user's holdings (licenced ENC's). This file should be updated every time a new ENC permit file or ENC media is imported. The system should check for the following conditions.



- New permits added to a licence
- Permits removed from a licence
- A new ENC has been added to the DS's service and licenced to the user.
- A New Edition/Re-Issue of an ENC is issued (Source media may change)

An illustration of how this could be implemented is provided in Section 4.5 later in this paper.

4.4 The STATUS.LST File

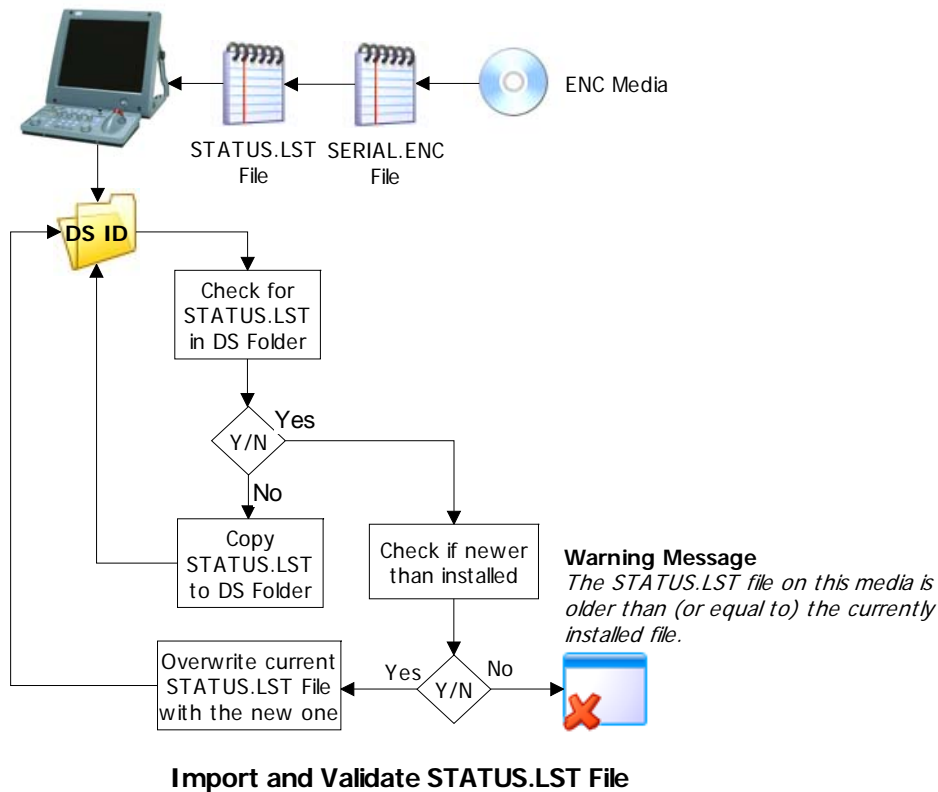
The STATUS.LST (Section 6.5.1 in S-63 Ed1.1) contains information relating to the current status of all base media in a data server's service. It also includes human readable text that the system can use to prompt users with.

The system should check the STATUS.TXT header file when the update media is loaded to check whether it is newer than the one currently installed on the ECDIS. If the same or older the system should report a warning to the user similar to the following:

.The STATUS file on this media is older than (or equal to) the currently installed file. Please insert an update dated later than <DDMMYYYY>.

Where <DDMMYYYY> is the date of the currently installed STATUS.TXT file.

However the system still should check the *Holdings* file (Section 4.5) to see if there are any EN profiled ENC's that are flagged as *Not Imported*. If there are any ENC's *not imported* prompt the user to install the relevant media.



The STATUS file is used in conjunction with the *Holdings* file described in the next section. The *Holdings* file identifies the status of each licenced ENC and the source media. When new ENC permits and media are applied to the system the *Holdings* file is updated. The system identifies which base media is required from the *Holdings* file and extracts the necessary text string from the *Status* list.

4.5 The Holdings File (Illustrative only)

At this point all the S-63 files have been read and/or copied to the system, i.e. PERMIT.TXT, SERIAL.ENC, PRODUCTS.TXT and STATUS.LST. Now a method has to be found that allows the ECDIS to make use of information supplied with S-63 Edition 1.1 encrypted ENC's. To make use of the human readable texts in the STATUS.LST file (see Section 4.4); the system must be able to quantify the media required to carry out a full and intuitive import. It also needs to manage the import status of each media when new permits or media are applied to the ECDIS.

The following information needs to be stored and maintained in the ECDIS:

1. The media volume where the base file [EN Profile] of the ENC is located, e.g. B2, M1;B3, U1, etc. This information is already held in the 16th field of each PRODUCTS.TXT record.
2. A media import flag, e.g. N or Y.
 Where N = No, base ENC is installed and there are no newer versions available
 Y = Yes, a newer edition or a re-issue is available for an installed ENC and requires importing.

Note: This flag will be set to "N" for each ENC when a PERMIT.TXT file is loaded for the first time.

The following example is one method that could be used to manage a user's holdings. It is acknowledged that manufacturers may have other ideas for managing this function. This example is based on modifying the PRODUCTS.TXT file.

It requires the system to select records in the product listing that are licenced and copying these to a separate file. The DS ID, week of issue and the date provided in the latest SERIAL.ENC should be copied and appended above the list of records. Unnecessary fields 6 – 13 can be removed from each record as they do not relate to ENC data management and import. The system should then add an additional field to the end of each record string. This additional field will carry the import status of the ECDIS in respect of the latest ENC base edition.

4.4.1 Holding File Format

The header file contains the following information:

Field ID	Field Description
1	Data Server ID
2	Week of Issue
3	Date of publication

Each record contains the following information:

Field ID	Field Description
1	ENC Cell Name
2	Base Cell Issue Date [EN Application Profile]
3	Base Cell Edition Number
4	Issue Date Latest Update [ER Application Profile]
5	Latest Update Number
6	Base cell update number (For Re-Issues)

7	Last update number for previous edition (For New Editions)
8	Base Cell (EN Application Profile) Location
9	Cancelled Cell Replacements
10	Import Status (Y or N)

The format for each of these fields and their content are the same as defined in S-63 Edition 1.1.

EXAMPLE:

```

GBWK07-10 20100218
GB50384C.000,20090615,3,,,0,1,B3,GB50384D;GB50384E,Y
GB50734E.000,20080821,2,,,0,2,B3,,Y
GB5Z955A.000,20091022,1,,,0,0,B3,,Y
ES200303.000,20080624,2,20091109,14,0,1,B4,,Y
ES201080.000,20050812,1,20091113,11,0,0,B4,,Y
HR3C0022.000,20080620,1,20090131,1,0,0,B4,,Y
HR3C0023.000,20080620,1,,,0,0,B4,,Y
US5CN41M.000,20090925,1,,,0,0,B5,,Y
US5CN42M.000,20091007,1,,,0,0,B5,,Y
JP34G1S8.000,20091009,3,,,0,4,B7,,Y
JP34H8U0.000,20091009,3,,,0,1,B7,,Y
ZA5N0010.000,20060818,2,20080603,2,0,0,B7,,Y
ZA5N0020.000,20061207,1,20080603,5,0,0,B7,,Y
FR369300.000,20081011,1,20090918,7,0,0,B8,,N
FR369400.000,20080223,1,,,0,0,B8,,N
ES201082.000,20080709,1,20090702,9,0,0,U1,,N
GB60242T.000,20080310,4,20080929,4,0,0,U1,,N
JP2514OG.000,20091009,2,20091030,8,7,0,U1,,N
    
```

In the example above ENC's on base media 3, 4 and 7 have been installed (nothing further) but ENC's on base 8 and update media have yet to be imported.

NOTE: It may be a good idea to sort (by field 8) the records in the *Holdings* file so that Base 1 ENC's are at the top of the list, with ENC's on the Update Media being at the bottom. The system can then cycle through the user prompts in numerical order logically concluding with the update.

4.4.2 New or Updated Permits

When the user requests a change in ENC coverage a new licence is issued containing a new set of permits. Additionally the ENC permit file is periodically re-issued to maintain product consistency⁵. This can affect the contents of the holdings file stored on the ECDIS.

When a new or re-issued permit file is imported to the system the *Holdings* file should be amended to reflect any changes. Any new record(s) should be created and merged into the *Holdings* file using the full product listing stored on the system. When the latest PRODUCTS.TXT file is read the *Media Location* and *Import Status* flags should be updated. If there is a new ENC (added to licence) or a new edition of an installed ENC the system should update these flags accordingly, i.e. the media location of the ENC with the import flag set to "N".

NOTE: Any changes to the update status of the same ENC edition will be managed in the normal way with the Update CD and the ECDIS SENC.

⁵ Some systems require the edition field in the permit string to be consistent with the edition number of the ENC data file. This is not a requirement in Ed1.1 of S-63 and the periodic re-issue of permits will become, in time, unnecessary.

4.4.3 New Edition of an ENC Issued

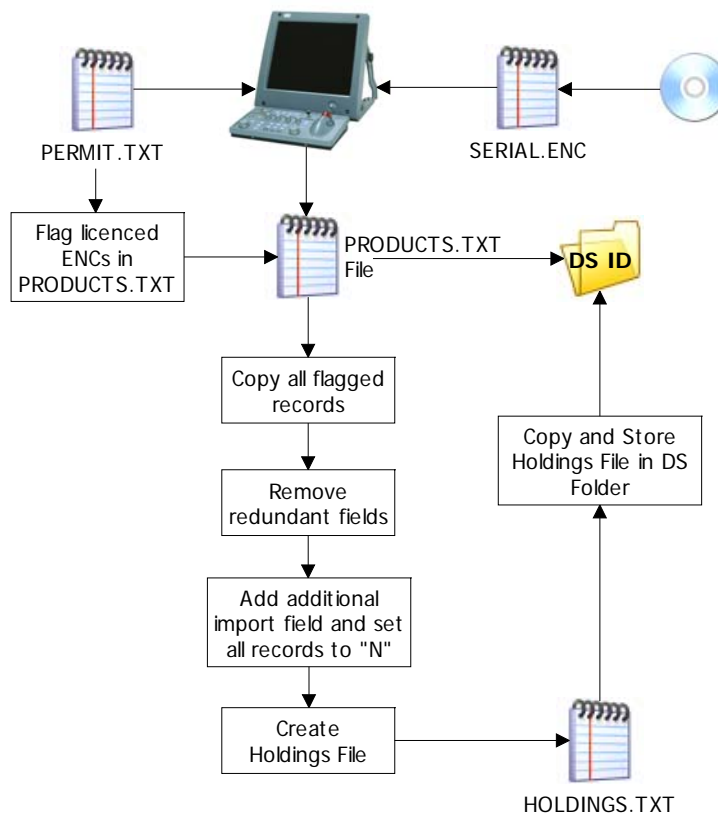
If an ENC New Edition or Re-Issue is issued the system should identify this in the PRODUCTS.TXT file⁶ when read in. This will usually be the update media however in the absence of an update, e.g. when the bases are re-issued, the relevant base media should be flagged.

4.4.4 New ENC Issued

If a new ENC is issued in a DS's service and the user adds this to his licence it will always be flagged as *Not Imported (N)* in the *Holdings File*. The PRODUCT.TXT file will identify the source of each new ENC. The system should prompt the user to install the appropriate media.

4.4.5 Holdings File - Additional Fields

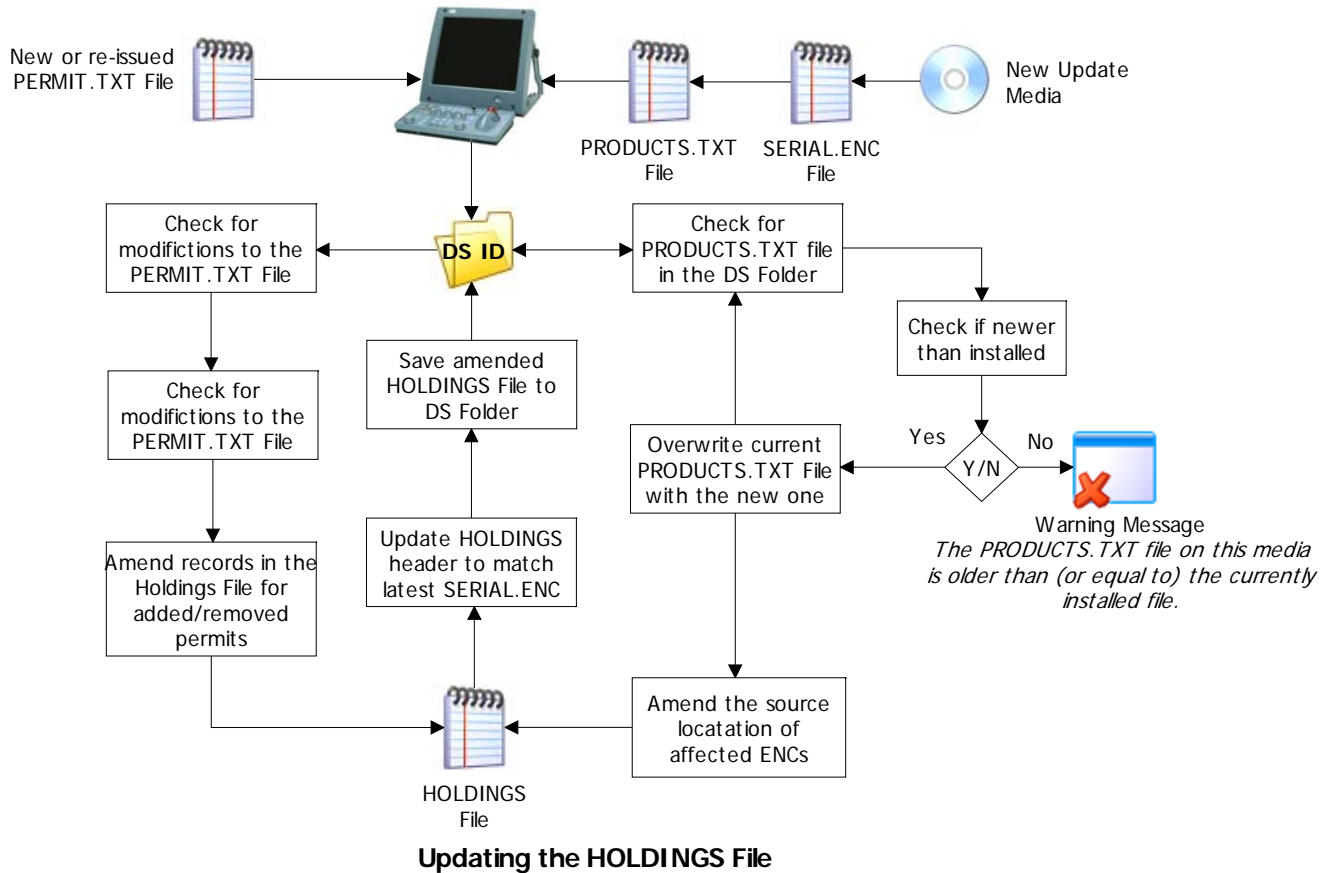
Fields 8 and 10 are used to manage the import of media the other fields in the *Holdings File* can be used to manage data on the media with data already contained in the SENC. If this file is used for this purpose it would make it unnecessary to use the store PRODUCT.TXT file or the CATD-COMT field to manage the import of ENC's.



Create and store a HOLDINGS.TXT file for the first time

⁶ This will be indicated in the relevant fields of the ENC record, e.g. Edition number will have increased or the *Re-Issue Update Number flag* will be included or changed.

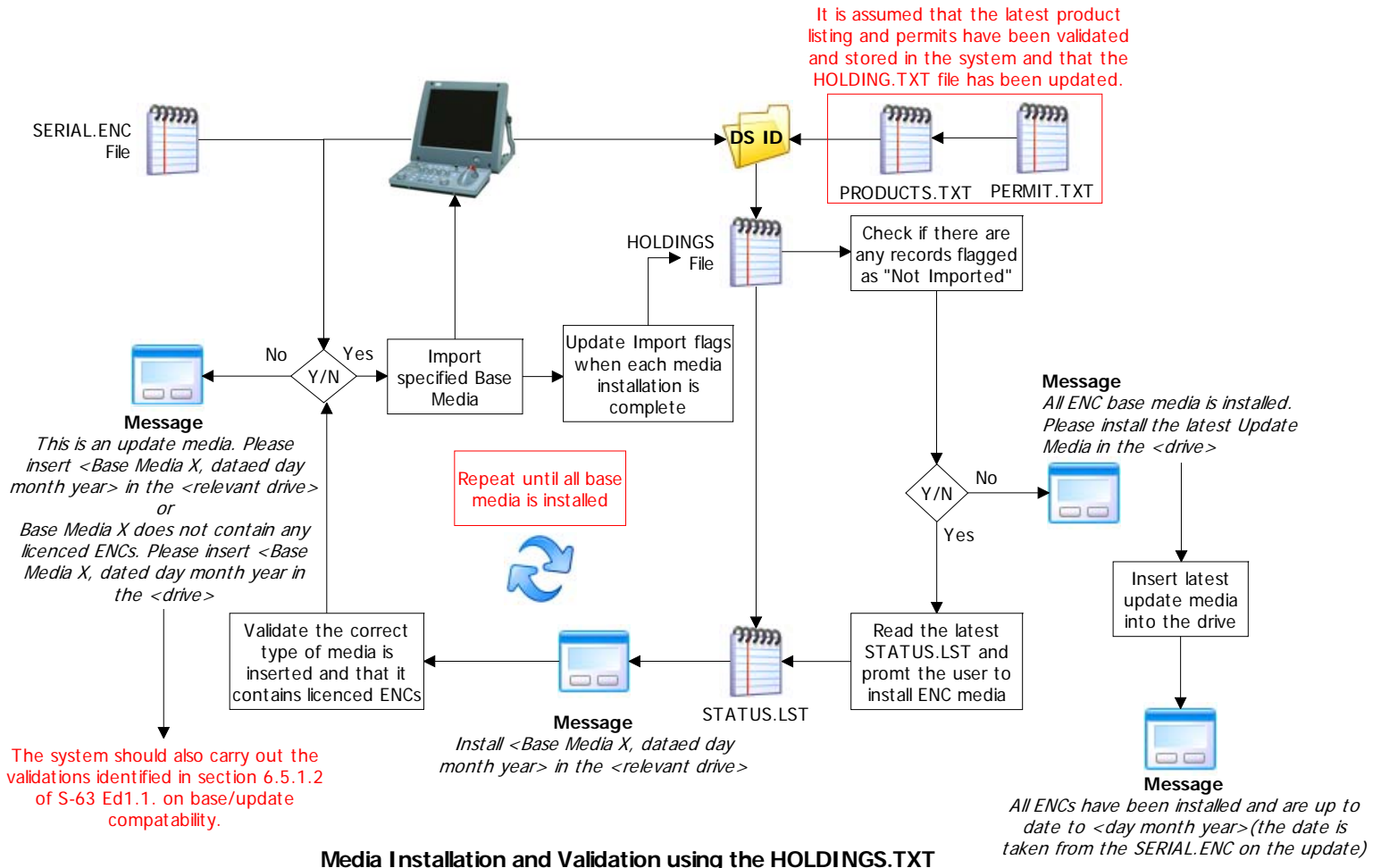
A Strategy for Importing ENC's to the ECDIS v0.9



5 ENC IMPORT (End to End)

The preceding sections have outlined the files and their content that can be used to optimise the import and conversion of ENC's to the ECDIS. The following list identifies the logical sequence of processes required to install all licenced ENC's and their updates.

1. Identify the source (DS ID) of the PERMIT.TXT file
2. Create a Data Server folder and copy PERMIT.TXT to it. If already created carry out the validation processes described in section 4.1.
3. Identify the source (DS ID) of the ENC update media (base if no update available) from the SERIAL.ENC.
4. Read the PRODUCTS.TXT file and flag all ENC's with a valid permit (How this is done is up to the Manufacturer). This can be in a separate file or using an existing file supplied by the data server.
5. Determine the source media and import status of all licenced ENC's [EN Profile] on the ENC media based on the file flagged in (4).
6. Copy the STATUS.LST file from the ENC media to the system if it passes validation with any previously installed file.
7. Using the information collated at (4) and (5) prompt the user to install the first base media.
8. Repeat for all required base media.
9. Finally prompt the user to install the update media again to update ENC's installed from the bases.



5.1 The CATALOG.031 File

In the case of encrypted ENC's the CATALOG.031 file is only used to manage the import of licensed ENC's. There is no point in reading the complete file. It should only be used to identify the source of all licensed ENC's (and any updates) plus any additional files that are associated with them, e.g. text and/or picture files.

The system should only read those records that correspond with ENC's in the PERMIT.TXT file. Once all the data management functions identified previously have been carried out the import process can begin.

ANNEX A

**18th CHRIS MEETING
Cairns, Australia, 25-29 September 2006**

IHB LETTER ON S-58 ENC VALIDATION CHECKS

IHB File No. S3/8151/ECDIS

20 July 2006

To: ECDIS System Manufacturers

Dear Sir,

It has been brought to the attention of the IHO that some ECDIS system manufacturers have mistakenly incorporated some or the entire suite of ENC validation checks listed in IHO publication S-58 - *Recommended ENC Validation Checks*. This has resulted in mariners being presented with misleading error messages indicating that officially produced and released ENC data contains errors, when it does not. In some cases, official ENC data is even being reported as not suitable for navigational use.

The purpose of this letter is to make it clear that the majority of the checks in S-58 are intended for use in the ENC validation software that is used by Hydrographic Offices or Regional ENC Coordinating Centres. **These S-58 checks were not intended to be used in ECDIS software.** The introduction to S-58 reads, in part "...specifies the checks that, at a minimum, producers of ENC validation tools should include in their validation software. This software will be used by hydrographic offices to help ensure that their ENC data are compliant with the S-57, Appendix B1 ENC Product Specification..."

Of particular concern are the S-58 checks classified as '*warnings*.' These checks are intended to highlight apparent discrepancies in the data so that HO's or RENCs can investigate them further. Upon investigation, the data will usually be found to be correct and no change to the ENC data is required. Such investigations are carried out by the ENC producer, as well as by the Regional ENC Coordinating Centre before the data is released. Once an ENC has been officially released, it is therefore not necessary or recommended that these checks be performed again by ECDIS software, since any warnings of this type that are generated will be incorrect and will be misleading for the user.

In section 2.3 of S-58 there is a short list of '*Checks relating to ECDIS*'. These are the only checks that are intended for incorporation in ECDIS software. If there are additional checks that ECDIS manufacturers feel are necessary for safe operation they should forward proposals to the IHO Transfer Standard and Application Development Working Group (TSMAD) for inclusion in section 2.3 of S-58. In this way, a single, agreed list of tests will be maintained.

In the meantime, it is strongly recommended that those ECDIS manufacturers who have mistakenly incorporated the S-58 checks intended for ENC producers should remove them from their software as soon as possible. The IHB or the established RENCs can provide further guidance to manufacturers on which ECDIS may be affected.

On behalf of the Directing Committee
Yours sincerely,
Rear Admiral Kenneth BARBOR
Director