AN OPTIMAL USER-INTERFACE FOR EPIMS DATABASE CONVERSIONS AND SSQ 25002 EEE PARTS SCREENING

Final Report
NASA/ASEE Summer Faculty Fellowship Program--1995
Johnson Space Center

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Date Submitted:	August 15, 1995
Contract Number:	NGT-44-001-800

ABSTRACT

The Electrical, Electronic, and Electromechanical (EEE) Parts Information Management System (EPIMS) database was selected by the International Space Station Parts Control Board for providing parts information to NASA managers and contractors. Parts data is transferred to the EPIMS database by converting parts list data to the EPIMS Data Exchange File Format. In general, parts list information received from contractors and suppliers does not convert directly into the EPIMS Data Exchange File Format. Often parts lists use different variable and record field assignments. Many of the EPIMS variables are not defined in the parts lists received. The objective of this work was to develop an automated system for translating parts lists into the EPIMS Data Exchange File Format for upload into the EPIMS database. Once EEE parts information has been transferred to the EPIMS database it is necessary to screen parts data in accordance with the provisions of the SSQ 25002 Supplemental List of Qualified Electrical, Electronic, and Electromechanical Parts, Manufacturers, and Laboratories (QEPM&L). The SSQ 25002 standards are used to identify parts which satisfy the requirements for spacecraft applications. An additional objective for this work was to develop an automated system which would screen EEE parts information against the SSQ 25002 to inform managers of the qualification status of parts used in spacecraft applications. The EPIMS Database Conversion and SSQ25002 User Interfaces are designed to interface through the World-Wide-Web (WWW)/Internet to provide accessibility by NASA managers and contractors.

INTRODUCTION

Historically, NASA was able to acquire quality electrical, electronic, and electromechanical (EEE) parts through the military supply system. As defense contractors have reduced in number, it is becoming increasingly more difficult to identify parts suppliers which can provide parts which satisfy the performance specifications required for spacecraft applications. NASA has been forced to perform considerable parts screening in-house. The EEE Parts Information Management System (EPIMS) database provides an on-line system which NASA managers and contractors can use to screen parts used in spacecraft design. However, it has been difficult uploading parts list information into the EPIMS database since most parts lists maintained by suppliers and contractors do not conform to the requirements of the EPIMS Data File Exchange Format.

EPIMS DATABASE CONVERSION SYSTEM

The EPIMS database contains 79 unique variables which describe EEE parts. The purpose of the EPIMS Database Conversion System is to map information from a parts list into the EPIMS variables. In most cases, not all 79 variables will be assigned values for each part. However, the EPIMS Database Conversion System must provide the capability to accommodate all EPIMS variables when performing a parts list to EPIMS Data Exchange File Format conversion. A major challenge in developing an automated system for performing the parts list to EPIMS database conversions was correctly translating each EPIMS variable with the parts list field which most accurately describes the corresponding data. The first attempt at developing the EPIMS database translator was to select the assignments for each EPIMS variable based on the supplier or contractor which submitted the parts list. The flaw in this technique is that an incorrect assignment for an EPIMS variable could not be adjusted without modifying the conversion table for the specific supplier or contractor. It was decided that the parts list to EPIMS conversion mapping must be dynamic to support flexible changes to EPIMS variable assignments. The intent was to enable the user to easily modify EPIMS variable assignments without modifying the software interface which supports the conversion. The EPIMS variable assignments for each supplier and contractor were made accessible through an HTML form which can be viewed and modified on the World Wide Web (WWW). If an observer sees an error in the assignment of EPIMS variables for their respective parts list, variable assignments may be modified through the HTML form. An example WWW form used for translating parts lists into the EPIMS Data File Exchange Format has been included in Figure 1. Each entry in the form can accommodate any one of the 79 unique EPIMS variables supported in the EPIMS database. After the user views the EPIMS variable assignments for their parts list and corrects any entries, the form is submitted for EPIMS conversion. The final product will be the EPIMS Data Exchange Files required for upload into the EPIMS database. For security reasons, a user may not transfer parts list data without owning a valid account number and password. An HTML hotlink is provided to enable the user to log on to perform the transfer of parts data.

HARRIS CORP. EPIMS DATABASE CONVERSION

The EPIMS Database Conversion Program receives the contractor parts list data through file **inputdata** on the web server and generates EPIMS Data Exchange Format Files **part, parts_list, element, and nspar.**

View or Transfer Contractor Parts List

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1. **SYS** [level0_id]
2. **GENERIC** [gnrc_part_nbr]
3. **PROCPN** [spec_nbr]
4. **TITLE** [part_descr]
5. **CODE** [cage_code]
6. **DFSCM** [fsc_nbr]
7. **DRAWING** [element_draw_nbr]
8. **SUPPLIER** [mfr_part_nbr]
9. **SFSCM** [subc_cage_code]
10. **CARDQTY** [part_qty]
11. **USEDIN** [element_name]

Convert Data to EPIMS [Submit]

Figure 1. Example of HTML Form for Converting Parts List Data to EPIMS

The most complex task of the EPIMS Database Conversion System development was creating the UNIX Bourne shell script required to process the entries received from each WWW form. The form processing software was written in UNIX Bourne shell script since this could be activated through the web server. The forms processor receives each entry from the form and creates an awk program that will map the parts list data to the desired variable fields for the EPIMS Data File Exchange Format files. Once the awk

program has been created which satisfies the desired EPIMS variable assignments submitted by the user, the awk code will process the parts list data to create the required EPIMS Data File Exchange Format files used for upload of parts list data into the EPIMS database. The flowchart shown in Figure 2 describes the logic used to perform the mapping of EPIMS variables to the parts list data. The forms processor sequences through each EPIMS variable required to generate the EPIMS Data Exchange Files **part, parts_list, element,** and **nspar.** The Variable (*k*) shown in Figure 2 refers to each variable included in the contractor parts list data file containing *n* variables (column headers). The number of variables will vary with the particular contractor submitting parts list data to EPIMS. Each variable assignment received through the HTML form will be compared to each EPIMS variable used in the creation of the EPIMS Data Exchange Files. If a match is found, an awk code statement is created which will transfer the corresponding field of the contractor's parts list to the required field in the EPIMS Data Exchange File. The EPIMS variables *pl_number, version, ... reviewer_userid* shown in Figure 2 represent a sample of the 96 entries used to create the EPIMS Data Exchange Files. Although there are 79 unique EPIMS variables, some of these are repeated in the EPIMS Data Exchange Files.

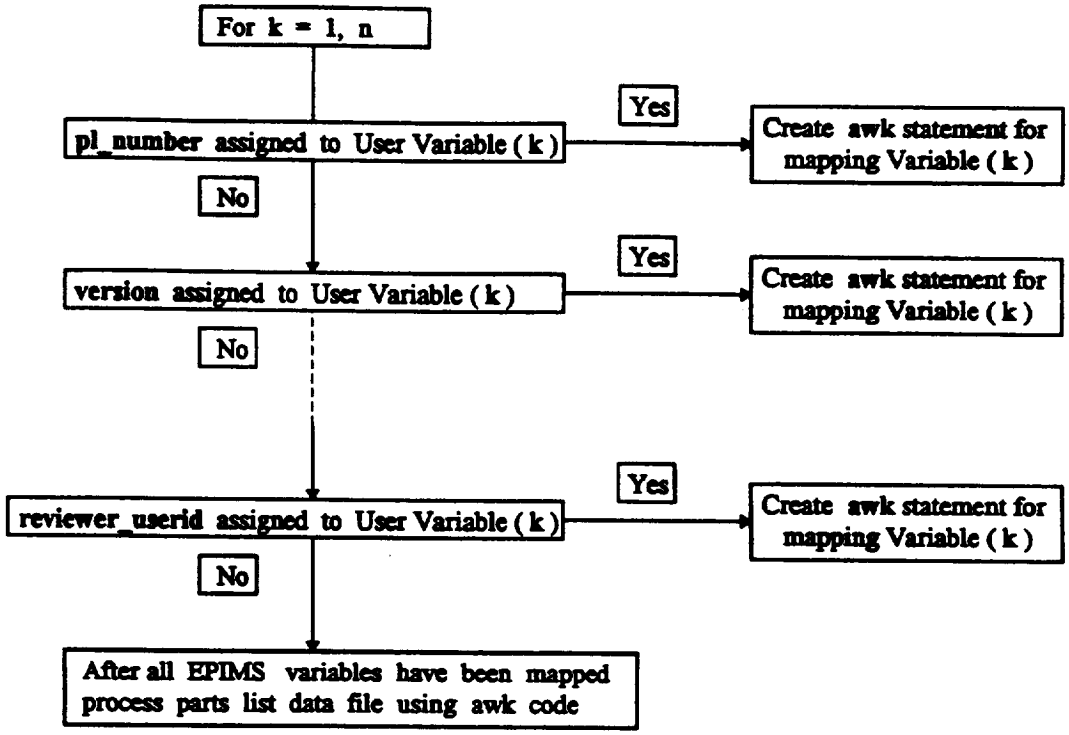

Figure 2. Flowchart for Performing EPIMS Variable Conversions

GENERIC EPIMS DATABASE CONVERSION FORM

Although HTML forms were created to accommodate current EEE parts suppliers and contractors, it would be desirable to create a Generic EPIMS Database Conversion Form which could be configured to translate parts list data from other parts list formats which may be submitted to NASA. The Generic EPIMS Database Conversion Form shown in Figure 3 lists all 79 EPIMS variables. The user indicates the appropriate column number which maps with the corresponding EPIMS variable. The forms processor for the Generic EPIMS Database Conversion Form generates the required awk code to map the field number of the submitted parts list with its corresponding EPIMS variable. The awk code then generates the EPIMS Data Exchange Files using data from the submitted parts list.

GENERIC EPIMS DATABASE CONVERSION FORM

Use this form to translate EEE parts lists for suppliers and contractors which do not have a EPIMS Conversion Translator form.

Next to each EPIMS variable, indicate the column number of the field (1-79) from the parts list which describes the same information. For example, if your parts list includes the CAGE code in column 5 you would set: cage_code [5]

The EPIMS Database Conversion Translator receives the parts list data in file "inputdata" in the cgi-bin directory and generates EPIMS Data Exchange Files: "part", parts_list", "element", and "nspar" .

1. pl_number [TBD]

2. version [TBD]

3. spec_part_nbr [TBD]

⋮

78. review_cmt [TBD]

79. reviewer_userid [TBD]

Figure 3. Generic EPIMS Database Conversion Form

SSQ 25002 EEE PARTS SCREENING

The SSQ 25002 Supplemental List of Qualified Electrical, Electronic, and Electro-mechanical (EEE) Parts, Manufacturers, and Laboratories (QEPM&L) is used to qualify EEE parts for spacecraft design. The SSQ 25002 includes appendices which identify the qualification status of EEE parts, manufacturers, and laboratories. The current version of SSQ 25002 contains the appendices listed in Table 1.

Appendix	Description
A	Type I SSQ Parts - Qualified
B	Type II SSQ Parts - Qualifications Pending
C	Type III SSQ Parts - Obsolete/Canceled
D	Type I Nonstandard Parts - Qualified
E	Type II Nonstandard Parts - Qualifications Pending
F	Type III Nonstandard Parts - Obsolete/Canceled
G	Type I Manufacturers - Qualified
H	Type II Manufacturers - Qualifications Pending
I	Type III Manufacturers - Disapproved
J	Type I Laboratories - Qualified
K	Type II Laboratories - Qualifications Pending
L	Type III Laboratories - Disapproved
M	List of Cage Codes

Table 1. SSQ 25002 Appendices Used for Screening EEE Parts

It is not uncommon for a parts list to contain thousands of parts so it would be preferable to automate parts list screening to identify parts which require investigation concerning their suitability for spacecraft design. It is especially important to identify EEE parts which are disqualified for use in spacecraft design applications. The SSQ 25002 EEE Parts Screening program was developed to automate the process of screening EEE parts lists. The EEE parts are screened by comparing each part number against the list of qualified, qualifications pending, and obsolete/canceled parts contained in appendices A through F. Should a part number match a part number listed in appendices A through F, information about the screened EEE part will be written in its respective display list which can be observed through the web browser. Each appendix listed in Table 1 has a corresponding parts list in the web browser for observation by the user. Each part is also screened by cage code to verify the qualification status of the manufacturer or laboratory which created the part. The flowchart shown in Figure 3 describes the SSQ 25002 EEE Parts Screening procedure for identifying parts which are placed in files QUAL_SSQ, PEND_SSQ, DISQUAL_SSQ, QUAL_NSTD, PEND_NSTD, and DISQUAL_NSTD for observation on the web browser.

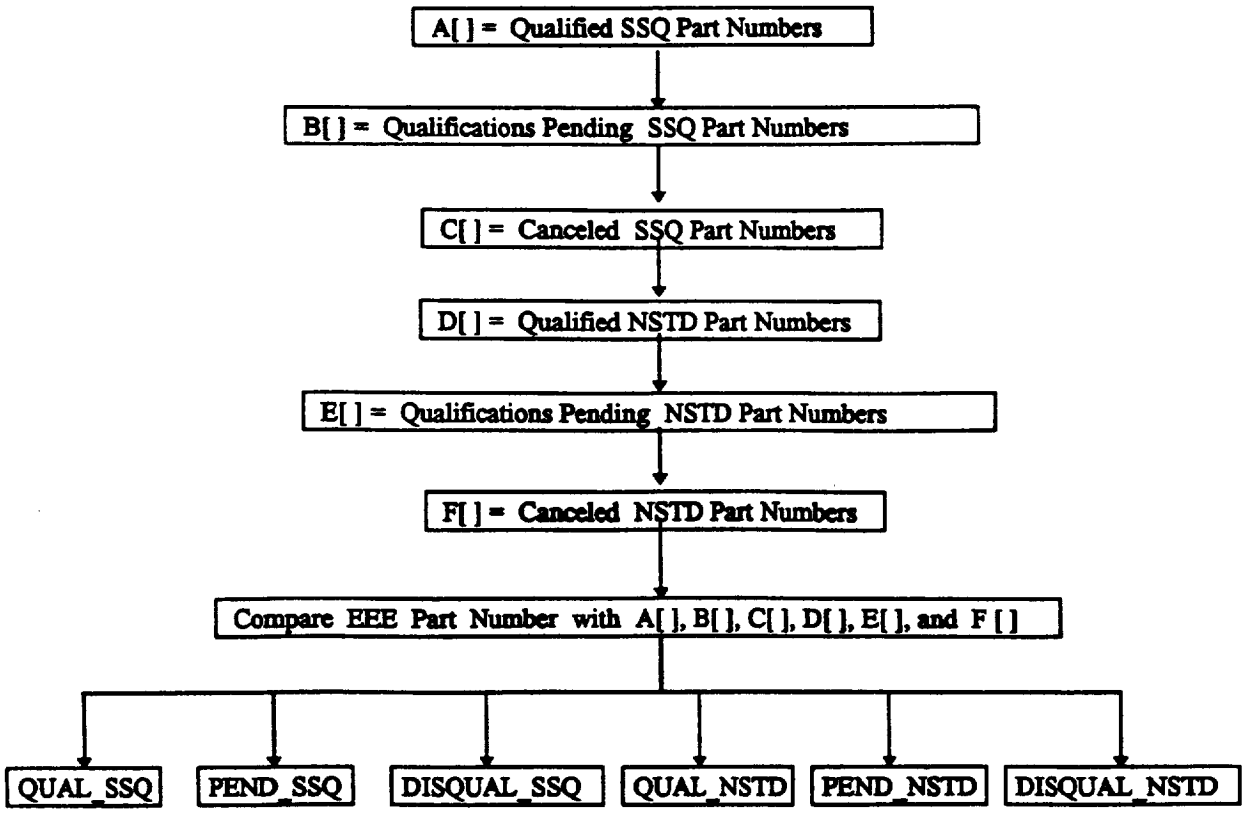

Figure 4. Flowchart for Screening EEE Parts by Part Number

Manufacturers and laboratories who develop EEE parts for spacecraft design are inspected to ensure parts are fabricated in accordance with design specifications. Each part record includes a CAGE code which identifies the manufacturer or laboratory that created the part. The SSQ 25002 EEE Parts Screening Program implements the flowchart shown in Figure 5 in which the CAGE code from each part in the submitted parts list is compared with the CAGE codes listed in appendices G through M. These appendices identify qualified, qualifications pending, and disqualified manufacturers and laboratories as well as valid and invalid CAGE codes. The SSQ 25002 EEE Parts Screening Program identifies parts produced by manufacturers and laboratories which have a Type I, Type II, or Type III qualification status and displays this information on files QUAL_MFGR, PENS_MFGR, DISQUAL_MFGR, QUAL_LAB, PEND_LAB, and DISQUAL_LAB for observation through the web browser. Parts which do not have a valid CAGE code are displayed in file UNLISTED_CAGE. It is essential that the user takes note of any parts which have been supplied by disqualified manufacturer or laboratory since these parts are not suitable for spacecraft applications.

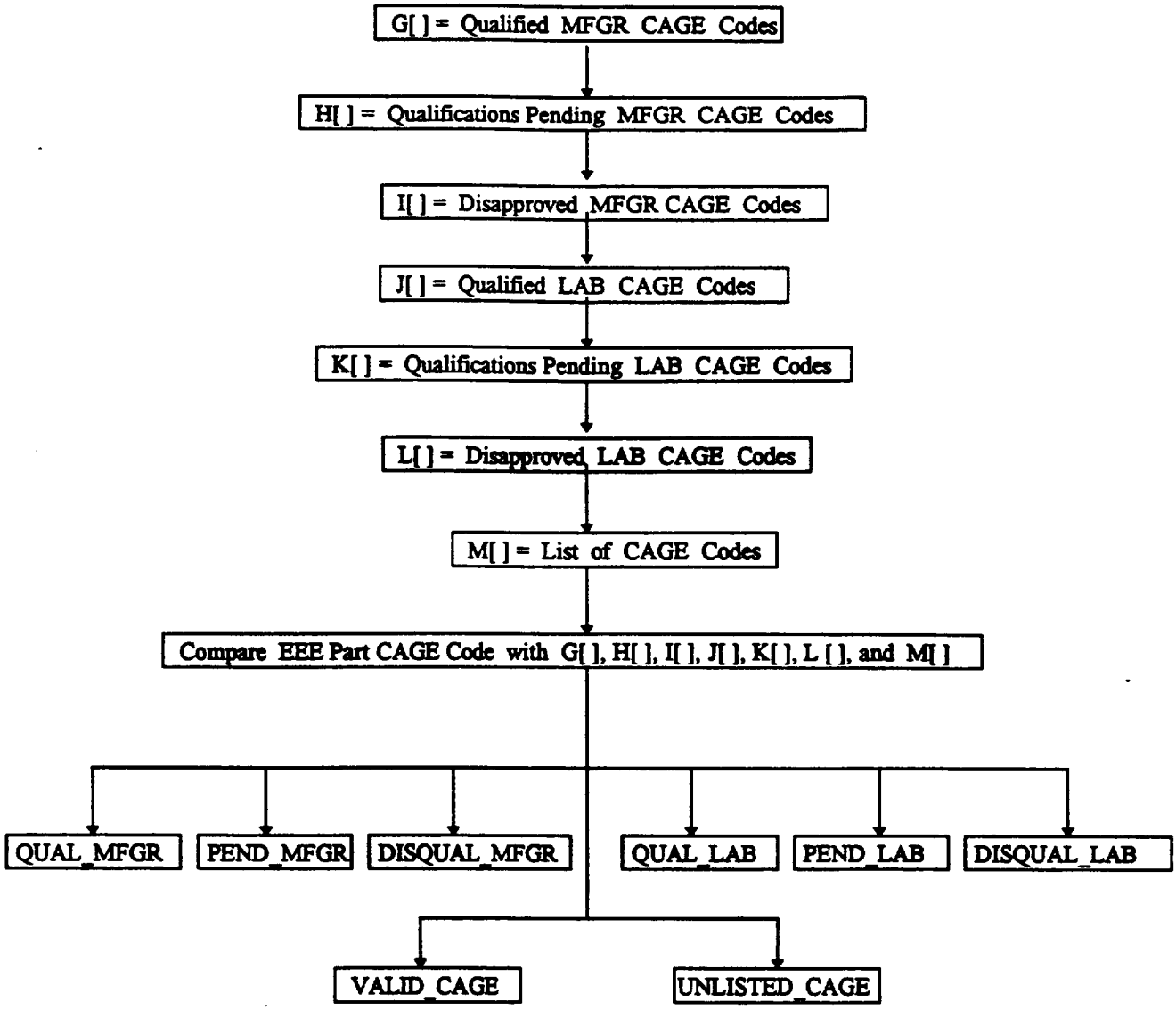

Figure 5. Flowchart for Screening EEE Parts by Cage Code

UPDATING SSQ 25002 APPENDICES

The information contained in the SSQ 25002 appendices must be updated whenever the qualification status of a EEE part, manufacturer, or laboratory changes. The SSQ 25002 appendices used in the screening program were acquired from downloading MS Excel Worksheets using the text format in files apxA_data through apxM_data on the UNIX fileserver. The capability of adding information for each of these appendices has been implemented on respective HTML forms which access data from each appendix. However, for security reasons, it may not be advisable to incorporate the update feature through the web server.

CONCLUSIONS

The primary objective for the EPIMS Database Conversion and SSQ 25002 EEE Parts Screening systems is to simplify the task of uploading parts information to the EPIMS database and screening parts for qualification for spacecraft design applications. The WWW/Internet provides accessibility of EEE parts information as well as flexibility in modifying EPIMS variable assignments for submitted parts lists. However, classified information, such as the qualification status of laboratories and manufacturers must be restricted to authorized viewers. A major challenge in developing EEE parts data processing systems is maintaining the desired security of information while simplifying the user interface. The general approach used in the development of the EPIMS Database Conversion and SSQ 25002 EEE Parts Screening systems was to establish designated files on the web server for processing EEE parts data but restricting file transfers to authorized users.