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SCISRS

SIGMA CENTER INFORMATION STORAGE AND RETRIEVAL SYSTEM

JERRY M. FRIEDMAN AND MARC PLATT

July 1964

BROOKHAVEN NATIONAL LABORATORY

ASSOCIATED UNIVERSITIES, INC.

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UPTON, NEW YORK

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SCISRS was written for the IBM 7094 (and with slight modification for the 7094 - 7044 direct coupled system) at Brookhaven National Laboratory - Applied Mathematics Department by Jerry Friedman and Marc Platt to service the needs of the Sigma Center. Elliot Auerbach and Charles Porter originated the idea for SCISRS; the specifications for the system were developed by Elliot Auerbach in consultation with the staff of the Sigma Center and formulated in collaboration with the authors. Contributions were also made by John Altson and Jonathan Goldstine of the Mathematics Department.

I. OVERVIEW AND OBJECTIVES

A: Sigma Center and the need for computer-based design.

In order to make its present files of information more readily accessible and particularly to allow rapid mechanized encoding of data from the present highly automated measurement systems, the Sigma Center has need for high-speed, highly compact and easily retrievable storage of its data. Such a storage and retrieval system would have to compensate for pre-knowledge with speed and efficiency.

The cross-section files of the Sigma Center consist basically of a large number of data "lines" each containing four to nine numerical quantities. For an element of (1) atomic number Z , and for an isotope of (2) mass number A (or for a mixture of isotopes), at (3) a neutron energy, often with (4) an associated resolution, there is given (5) a neutron cross section (or some other quantity), and frequently (6) an associated error. A non-elastic cross section may also involve (7) a secondary particle energy. A differential cross section must involve (8) an angle and perhaps (9) an associated angular resolution. Each datum line carries some non-numerical information as well: the cross-section type, the source of information (publication or person), the institution at which the work was done, the method used, the standard used for normalization, the date of publication.

It is estimated that there are 500,000 data cards on file now and an estimated 200,000 cards per year to be received in the future. For a library of this magnitude, magnetic tape is the logical answer. It becomes more evident that a computer oriented system is indicated when one considers that the basic function of any information disseminating center is the comprehensive output of available data in a usable format, as well as selective retrieval of subsets of this data. It is untenable that a staff of clerks run a retrieval by hand, when the accumulated data numbers in the millions and anticipated requests run from

- a) results of all experiments done at BNL in October 1964;
to
- b) all total cross-section experiments done at energies
from .5 to 1.3 MeV at BNL by experimenter X between
June 1963 and May 1964.

The answer to this dilemma is SCISRS - Sigma Center Information Storage and Retrieval System.

B: Overview of SCISRS

SCISRS functions as the master librarian for the Sigma Center. As data is received, it is converted to the input format accepted by SPASM - the storage section of the system. Data may either be deleted from or inserted into the master library of all accumulated Sigma Center data. Within SPASM, the data is codified and condensed while it is being checked for errors. Erroneous data cards are rejected and written on the standard monitor print tape, preceded by an indication of where the error was found.* The condensed data that has been accepted by SPASM is then referenced by an identifying word which is set up in a KEY table. This word contains the atomic number and mass (Z,A), of the data as well as the position of the data in memory. A sort on (Z,A) then operates only on the KEY table, interchanging entries so that the end result is a table of words arrayed in increasing (Z,A), each uniquely connected to some data. At this point, the number of data cards for each (Z,A) which were correctly processed is written on the standard monitor print tape. The data is then further sorted by Sigma Type, Energy, Secondary Energy, Cosine (if a differential Sigma Type), and Date, again utilizing the KEY words.

At this stage, the actual merging of new and old data begins. Each piece of new data (which is now completely sorted by all the above-mentioned criteria) to be added to the library is now "inserted."

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* The first error found causes rejection, and no further checks are made on the erroneous data card.

That is, the library* , which is divided into logical records by (Z,A) , is copied up to the place where the new data belongs; the new data is written, and the copying continues. Comments which accompany data to be inserted are saved with their associated references and are inserted in the comment record which follows every logical (Z,A) record. Should data be tagged for deletion from the library, an exact match of the input data (except for information governed by column 72), is found in the library and "deleted", i.e. NOT copied. Comments to be deleted are handled similarly. Thus the final output from SPASM is a master library tape, completely edited, and containing all information received by the Center to date.

Now the logical question is, "how does one extract information from the master library and how selective can one be in one's request?" RETREV answers this. Requests can be made on values or ranges of any combination of the following criteria that can be connected by a mathematical "and".

- 1) Atomic Number
- 2) Atomic Weight
- 3) Sigma Type
- 4) Energy
- 5) Energy Error Type
- 6) Secondary Energy

---

* It should be mentioned that the master library is subdivided into three logical sublibraries; where sublibrary 1 begins at (Z,A) equals (0,1); sublibrary 2 at (30,0); and sublibrary 3 at (84,0). This procedure has been initiated to reduce unnecessary tape handling and scanning.

- 7) Secondary Energy Identification
- 8) Cosine
- 9) Datum
- 10) Status
- 11) Standard
- 12) Institution
- 13) Date

The only restriction is that each request must fit an 80 column punched card and conform to a general format. RETREV allows a number of independent requests to be processed simultaneously during one pass of the library. At present the requester is given his choice of three modes of output: *

- 1) Binary tape - in essence a miniature library consisting only of requested data.
- 2) BCD tape - expanded line images of requested data, 1 piece of data per record.
- 3) Printed listing - expanded line images of requested data. (Essentially a listing of 2.)

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* The system is designed so that user supplied special purpose output routines, if properly constructed, may be used in addition to the standard output routines.

II. SPASM

A) INPUT

1. Data Cards

All cross-section data gathered by the Sigma Center is punched onto standard 80-column cards, one piece of data with its associated information per card. These are prepared in a fixed format (See Appendix Ia for details of data card format).

2. Comment Cards

Up to 5 cards of additional explanatory information are allowed to follow each data card. However, these comments are actually associated with a (Z,A) and reference. Therefore only one data card, representative of the (Z,A) and reference, should have comment cards. All other data of the same class need only have a symbol to indicate that the same comments apply (See column 72 Appendix Ia). The text of comment cards is arbitrary (See Appendix Ib for format), except that a sequence of 12 blanks will be considered equivalent to the end of text.

3. Control Cards

Preceding a group of cards to be added to the library, there must be a control card with the letters INSERT in cols. 1-6. Similarly, groups of cards to be deleted (or edited) from the library must be preceded by a card with the letters DELETE in cols. 1-6. Both modes may appear randomly in the input to a single run of SPASM.

4. Tape

A deck composed of the above 3 types of cards is then transcribed to magnetic tape. (Some data will arrive from other institutions already on tape). This tape is the input to SPASM.

In addition, the most current library tape is also input to be merged with the new data when producing a new library.

B. PACK

1. Method of packing data

The initial stage of the SPASM program is a codification and packing of the input data. PACK reads card images from the input tape, and condenses from the 14-word card image into a 7-word (8 words if a differential scattering) packed form (See Appendix II). To facilitate this, 3 methods of codification are used.

i) Alphanumeric codes, as found in input dictionaries (See Appendix VI), are converted to strictly numeric codes which place them relative to some fixed origin, usually the first word of the dictionary.

ii) Numeric data without exponent have the following information extracted and stored

- a) binary equivalent of integral part
- b) binary equivalent of decimal part
- c) sign
- d) decimal or no decimal indicator
- e) position of decimal (if any)
- f) number of trailing blanks

iii) Numerical data with exponent (i.e. energy, cross section) have the following information extracted and stored*

- a) normalized mantissa
- b) sign of normalized mantissa
- c) corrected exponent
- d) sign of corrected exponent
- e) position of original decimal point (if any)
- f) number of trailing blanks in original format
- g) number of leading zeros after original decimal point

2. Error rejection of input

Various error checks are made during the encoding of the data and a card image is rejected if

- a) further encoding is impossible
(i.e., the symbols given for Sigma-type do not appear in the input dictionary),
- b) there is a suspicion of incorrectly transcribed information
(i.e. an energy error type of "A" (energy figure approximation), for which no numerical value of the energy error should be specified, finds a numerical entry).

Should an error be found, the data is rejected and the card image

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* It is to be noted that in addition to facilitating an exact comparison, this method of storage yields exact accuracy and significance upon retrieval, requiring only 32 bits for a five digit number plus exponent.

(with the card images of any associated comments) is written on the standard monitor print tape along with a coded indication of type of error and where it was found. (See Appendix III for error codes.)

3. KEY TABLE

For each piece of data that is successfully packed, a single word entry is made in a KEY table (see Figure 1) with the following information recorded.

- a) Z, and A ;
- b) an indicator for differential or non-differential cross-section type (i.e. 7 vs. 8 - packed words);
- c) an indicator to determine whether the data is to be inserted or deleted ;
- d) an indicator to determine whether there are any accompanying additional comments ;
- e) if the delete indicator is set, an indicator to determine whether associated comments in the library are also to be deleted;*
- f) the absolute address of the initial word of the packed data in memory .

It should be noted that a table of this sort allows many logical decisions to be made without resorting to internal probing of the now packed data. Since there exists a one-to-one correspondence between entries in the KEY table and packed card images, movement of data in memory as a result of sorting is reduced to interchanges of words within the KEY table.

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* Caution: When deleting comments along with a piece of data, a corresponding comment replacement should be made if there is data remaining on the library which is also referenced by the deleted comments.

4. Program Flow-Capcity

The general flow of PACK is as follows: data is read, packed, and KEY table entries are set up. Data failing an error test is written on the standard monitor print tape. After each piece of data is processed, control is temporarily sent to QKST (see II C). Upon completed processing of all input, or upon attainment of PACK's maximum storage capacity of 3000 cards, (in which case and additional input is written on the standard monitor print tape with an appropriate message), control is once again passed to QKST. QKST returns to PACK with the KEY table completely sorted by Z and A. The number of cards successfully packed for each (Z,A) is then written on the print tape, together with a count of the total number of cards accepted and total rejected for the run. Control is then transferred unconditionally to the main sort program - SIGST (see II D).

C. QKST - Quick Sort

This program performs an initial sort on (Z,A), sorting only elements of the KEY table. KEY table entries are interchanged such that the resulting order is that of ascending Z and A.

QKST is a subroutine of PACK and is transferred to every time an additional entry is made to the KEY table. QKST interrupts itself and returns to PACK when the input tape is no longer in operation, i.e. PACK is ready to process the next data record.

This means that much of the initial sort on (Z,A) is done in "zero" time, while PACK is waiting for the next piece of input data. Thus when PACK has finished processing all data, the KEY table is at least partially sorted by (Z,A). At this time a final QKST is done, without interrupt, until the KEY table is completely sorted by (Z,A). Control is then returned to PACK.

D. SIGST - SIGma Sort

Starting with the KEY table, presorted by (Z,A), SIGST now handles the main sorting job of further subdividing each group of (Z,A) by the following criteria.

1. Sigma Type - ascending dictionary order
2. Energy - ascending numerical order
3. Secondary Energy - ascending numerical order
4. Cosine (for differential Sigma Type) - descending order (+1 to -1)
5. Date - inverse chronological order

Although SIGST examines the above criteria by extracting and comparing quantities internal to the actual packed data group, all interchanges are done as in QKST, by manipulation of the corresponding KEY table entries.

Thus at completion, SIGST leaves the KEY table ordered by (Z,A), Sigma Type, Energy, Secondary Energy, Cosine and Date with the original packed data undisturbed. Control passes unconditionally to the second chain of the SPASM program - MERGE.

E. MERGE

MERGE, the second chain in the SPASM program, merges the new data produced by PACK and sorted by QKST and SIGST with the latest master library, producing a new updated library containing all data processed to date.

Procedure is as follows: The first entry in the KEY table is examined for (Z,A), and since this is known to be the smallest (Z,A) to be updated into the library, it is immediately determined which of the three logical sublibraries are needed. For example, if the first item has a (Z,A) of (92,235), it is unnecessary to update sublibrary 1 or 2, which contain no (Z,A) greater than (83,000) and which will be left unaltered. Only logical sublibrary 3 is worked on.

Once it is determined which sublibrary or sublibraries will be needed, the (Z,A) of the first KEY table entry is compared with the (Z,A) of the first record on the library. Should the (Z,A) of the KEY table be the smaller, and should the mode indicator say this item is to be inserted, a new record* is generated consisting of the packed data corresponding to the first KEY entry, together with all subsequent data referenced by KEY entries of equal (Z,A). A record containing

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* "Record" as used here, signifies a logical record and may correspond to several physical records on tape.
(See II G. 2 - library format)

the comments associated with this (Z,A) is then written. Should the mode indicator specify delete, this is an error as no matching data exists in the library, and as such is saved for error outputting.

If the (Z,A) of the KEY cable is the greater, the (Z,A) record from the library, along with its comment record, is copied onto the new library unaltered, and the next (Z,A) record in the library is now compared with the first KEY entry.

In the case where the (Z,A) from the KEY table is equal to the (Z,A) of a record from the library, a more detailed search is necessary. The position of the data identified with the KEY entry must be found relative to data existing on the library. This is accomplished by comparing, first by sigma type, the packed data from the library record. Obviously, if the KEY-referenced data is greater by sigma type than the n^{th} item of the library record, but less by sigma type than the $(n+1)^{\text{st}}$, it belongs between them. If we are in the insert mode, insertion is made. If in the delete mode, once again no matching data exists in the library and an error condition has occurred. Should the KEY-referenced data be equal by sigma type to a library entry, we proceed to test by the next criterion, (which is energy) and so on, until either a place in the library for the KEY-referenced data has been found, it is rejected as an improper delete, or it is equal to some piece of data from the library by all sortable criteria. For this final case, if in

the insert mode, the KEY-referenced data is inserted directly behind the "equal" library data. If in the delete mode, a complete comparison of the two groups of data is made to determine if they are identical. If they are found to be identical, nothing is written in the new library - in essence a deletion. Should they prove unequal anywhere*, the library data is transcribed as if it were less by one of the sort criteria and the entire compare, beginning with sigma, is repeated for the next library data. (The data to be deleted may exist, equal by all sortable criteria, further along in the (Z,A) record.)

There is a separate logical comment record associated with every logical data record in the library. Comments are identified solely by a (Z,A) and reference. After a given (Z,A) data record has been "merged" (items inserted or deleted or unchanged) and written into the new library, its associated comment record is also written, with comments from any of the newly inserted data added. If however, an item was successfully deleted from the library, with an indication that corresponding comments also be deleted, its identifying reference (which was stored at the time of deletion) is compared with the references which identify comments in the comment record. When a match is found, the corresponding comments are not transcribed to the new library. After all the data in memory has been processed and merged with the library, a check is made to see if any "undeletable"

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* except for information governed by column 72 of input card.

data" were found. If not, the program exits. If so, a third chain is called to unpack and write on the print tape, the undeletable data which were discovered.

F. INVERT

This third chain of SPASM is only called if "undeletable" data has been found in MERGE. Since it is desirable to return to the user a list of all erroneous input data, and since in the MERGE stage, all input data has already been reduced to the internal packed format, INVERT is needed to invert the process and return the original input card image on the standard Monitor print tape.

G. OUTPUT

1. Printed output from SPASM

- a) List of errors found in input to PACK together with an indication of where the error was found and of what general type. (see Appendix III - SPASM ERROR CODES).
- b) Listing of input cards (if any) which exceeded maximum storage capacity of 3000 accepted cards.
- c) List of those (Z,A) which were successfully processed.
- d) List (from INVERT) of cards (if any) in the delete mode for which no match could be found in the library.
- e) Statement of which sublibraries were updated this run.
- f) Statement: "End of current merge run"

2. Tape output

The merged output (input) library has the following format: a data record consisting of a head word (figure 2), (containing the (Z,A) and the number of words in the record) followed by packed

card images in correct sort place, (see Appendix II). The maximum size of a physical record is 1500 words. If the logical record continues, a bit denoting this is set in the head word. Any number of physical continuation records can exist to constitute one logical record. Following the logical (Z,A) record is a logical comment record for the same (Z,A). The head word has the same format as in the data record, plus an indicator identifying the record as a comment record. Reference identification and comments follow. There is one logical data record and one logical comment record for each (Z,A). The tape is terminated by an EOF and the word END. Intermediate tapes on the library are terminated by an EOF and the word CONT. (See figure 3 for library format.)

III. RETREV

A. Function

RETREV enables the user to retrieve data from the Sigma Library by subsets of the following thirteen criteria.

Z, A, Sigma Type, Energy, Energy Error Type, Secondary Energy, Secondary Energy Identification, Cosine, Datum (Value of Cross Section), Status, Standard, Institution, and Date.

A request may consist of any combination of the above criteria which can be logically connected by "and" (with a range of values permitted for each) and which can be punched on one 80-column card.

For example, one request may ask for "all data with Sigma Type between ABS and DEF and from institution BNL and with date between 63B and 64A". Note that the order for alphabetic criteria like Sigma Type is the dictionary order, so that the request would include all Sigma Types that appear in Dictionary A between, and including, ABS and DEF (See Input Dictionary A, Appendix VI). It is anticipated that the system will handle N independent requests in one pass of the library tape, where N is a function of the bulk of anticipated output per request. At this writing (June 1964), N has a maximum value of five (5).

B. Input

1. Control Cards

A control card must precede each request card.

It carries the following information (See Appendix IVa):

- i) name of output subroutine to be used in columns 1 - 6.
- ii) "R" in column 7 if output is to be sorted by reference within each (Z,A) group - otherwise blank.
- iii) "S" in column 8 if comments are to be suppressed on the output - otherwise blank.
- iv) arbitrary heading - explanatory or identifying text in columns 10 - 00.

2. Request Cards

Immediately following the control card is the actual request card. It contains the following information and punctuation (See Appendix IVb for details of card format):

- i) a code letter to identify criterion;
- ii) value of criterion to be retrieved on
[if a range of values is desired, a comma
(" , ") to separate the arguments];
- iii) a "\$" to separate criteria;
- iv) a right parenthesis ")" to end the request.

Within the fields described, blanks are permitted anywhere for readability and are ignored by the program (except when an integral part of the argument as Sigma Type AN^(b)).

(See Appendix IVC for sample requests).

3. Tape

The library tapes from which REVREV will retrieve are also provided as input. After examining all requests, RETREV will determine which of the three sublibraries will be needed. Of course, if even one request makes no condition on Z and A (meaning all), the entire library will be searched.

C. Methods of Retrieval

1. Decoding Request Cards.

The control and request cards for each request are read, and the name of the output subroutine from the control card is saved, as well as the indicators for Reference Sorted Retrieval and Comment Suppression. The text on the control card is also stored and will head the final output of each request.

The request card is decoded, and the arguments packed in the same internal format as PACK (See Appendix II), to facilitate comparisons within the master library.* The arguments are set up in Argument Tables. There is one Argument Table for each of the thirteen criteria and an automatic linkage is set up between the particular criteria requested. (Thus, only those criteria listed on the request card are searched for. All other criteria not requested are effectively treated as all accepted.)

---

* The arguments are to be in the same format as the input to SPASM (See App.1a)

2. Error Rejection

As each request card is decoded and packed, necessary error checks are made. A request will be rejected if

- i) the argument cannot be found in the dictionary -
(Sigma Type, Energy Error Type, Secondary Error Identification, Institution),
- ii) the argument exceeds accepted numerical limits -
((Z,A), Energy, Secondary Energy, Cosine, Datum Status),
- iii) the numbers of characters used to express an argument exceeds the number allowed in the SPASM input (Appendix Ia) i.e. energy can be no longer than five digits plus exponent, an energy argument of six digits is rejected.

For rejected requests both the control and request cards are written on the monitor print tape along with an error code.

(See Appendix V for list of error codes).

3. Search of Library

The library (or sublibraries, if the entire library is not needed) is scanned and each piece of data tested to see if it fulfills any of the requests.

A request that specifies (Z,A) is only tested against the first piece of data on a record whose (Z,A) does not fall within the request range. If a piece of data satisfies one

or more requests by all criteria specified, it is stored in an appropriate memory buffer (which may overflow onto magnetic tape) set aside for each request. Comments too are saved, unless the "suppress comments" indicator is set.

Thus, after one scan of the library (or sublibraries) all data meeting each request have been segregated.

D. REST - REference Sort

Once the search is completed, the data satisfying the requests for which the "reference sort" indicator is set, are sorted within (Z,A) by reference. REST is the second chain in the RETREV program and is called only if needed. If possible the sorts are done in memory; otherwise, a modified tape sort is employed.

E. Output

1. Print or BCD Tape

For those requests which have PRINT or BCDTP in columns 1 - 6 of the control card, the EXPAND chain is called and an unpack into an expanded line image (BCD) is performed (See Appendix VI - output Dictionaries). The requests are written on a special tape (BCDTP), or the print tape (PRINT), one file per request. This produces printed listings or BCD tapes as requested by the user.

2. PACKed TAPes

A separate magnetic tape is written for each request which has PACTAP in columns 1 - 6 of its control card. Each tape is a miniature version of the master library, in that each (Z,A) constitutes a logical record. It is anticipated that this option may be used by institutions wanting a specialized "miniature" library for which they will write their own unpack and output programs to perform special functions.

F. UNPACK

UNPACK is a separate program which will unpack the entire library or any subset composed of logical data records and comments onto a print tape. This is used when a printed listing of the entire library or of any particular (Z,A) record is desired, and thus there is no need to use the entire retrieval program. UNPACK is essentially the same program as that used internally in the EXPAND chain for unpacking the miniature "request" libraries.

IV. OPERATIONS

A. SPASM

SPASM is written entirely in FAP for the IBM 7094 including FAP input-output. It is run as a chain job under the FORTRAN Monitor.

1. Chain 1 - PACK, QKST, SIGST, Dictionaries

- a) PACK - Main program which packs 14-word data card images to a maximum of 8 words in memory, handles comment cards associated with the data, checks format for errors, and sets up a KEY table which indirectly references packed data in memory with one-word codified entries.
- b) QKST - Subroutine of PACK which sorts the items in the KEY table which reference completely packed data. The sort is by a bit-by-bit interchange method and is partially executed in machine idle time as a new data card is being read into memory.
- c) SIGST - Main sort program which operates indirectly from the KEY table, already completely sorted by (Z,A). All sorting here is algebraic.
- d) Input Dictionaries - Subroutines of PACK. The dictionaries are assembled separately to facilitate changes or additions without reassembling the entire program.

2. Chain 2 - MERGE

Main program which merges packed and sorted input
with the existing master library.

Thus the SPASM input deck consists of the following cards
and program decks.

* XEQ

* on-line comment to operator specifying tape
assignments for data input tape, master library
tape (input) and updated master library (output).
(See below for tape unit designations).

* PAUSE

CHAIN (1 , 3)

Binary decks for PACK, QKST, SIGST, DICTIONARIES

CHAIN (2 , 3)

Binary deck for MERGE

EØF

3. Tape units used for SPASM at BNL

All tapes are defined symbolically and can be
changed by altering one card and reassembling the program.

C3 - Input data tape* - BCD card images

B8 - Input master library - Binary packed library -
high density (800 BPI)

C8 - Output master library - high density (800 BPI)

A3 - Monitor print tape - BCD - (556 BPI)
plus tapes used by monitor for chain job.

---

* All data to be added (deleted) to library must be preceded by a
control card containing INSERT (DELETE) in columns 1 - 6.

B. RETREV

RETREV is written entirely in FAP for the IBM 7094, including FAP input and output. It is run as a chain job under the FORTRAN Monitor system.

1. Chain 1 - Main program and Dictionaries

- a) Main program to read and pack request cards and check for errors in them, to scan the master library and retrieve data that meets any of the requests and if necessary to save the data on intermediate (or final) tapes, one tape per request. (For details, of request card format see Appendix IVb.)
- b) Input Dictionaries
These are the same as described in section (IVa1d) for the PACK program.

2. Chain 2 - REST

REference SorT to resort, within (Z,A) by reference, any output for requests which so specify. This chain is skipped if no request requires a REference SorT. If necessary REST uses a tape sort.

3. Chain 3 - EXPAND

This chain is used for those requests which specify an expanded line image for output. (See Appendix VII for sample output). The line images are built from the output dictionaries (Appendix VI). EXPAND writes all such requests either on the monitor print tape or on a special tape for those requests specifying (BCDTP), one file per request.

Thus the RETREV input consists of the following cards
and program decks

- * XEQ
- * on-line statement to operator to mount and ready
necessary scratch and intermediate storage tapes.
- * Pause

CHAIN 1
Binary deck for RETREV, output Dictionaries

CHAIN 2
Binary deck for REST

CHAIN 3
Binary deck for EXPAND

- * DATA

Control Card 1
Request card 1
Control card 2
Request card 2
.
:
Control card N
Request card N

EØF

4. Tape units used for RETREV at BNL

B2	request	1	intermediate	storage
A4	"	2	"	"
B1	"	3	"	"
A6	"	4	"	"
B6	"	5	"	"

C. Program Bookkeeping

The following summaries and explanatory information are outputted during a run of the SCISRS system.

1. PACK

- a) card images of those peices of data which were rejected together with an error code indicating the nature of the error (see Appendix III).
- b) the number of cards which were successfully packed (i.e. no fomate errors) for each (Z,A) inputted in the run.
- c) the total number of cards accepted, and the total number rejected for this run.

2. MERGE

- a) card images of the data which were found to be "undeletable".
- b) a listing of the approximate number of data lines accumulated to date for each (Z,A) in the sub-library or sublibraries updated during the current run.

3. RETRV

- a) card images of those requests which were found to be in error together with an indication of where the error occurred. (see Appendix V).
- b) card images of any requests exceeding the maximum number acceptable for one pass of the library.
- c) indication of those records from which retrieval was impossible because of tape redundancy.
- d) printed line images of retrieved data specifying PRINT output.

Figure 1: KEY TABLE ENTRY

- S - INSERT mode (0)
 DELETE mode (1)
- 18 - 8 words in packed group (1)
 7 words in packed group (0)
- 19 - Comments Attached Yes (1)
 No (0)
- 20 - If S = 1 are comments to be deleted Yes (1)
 No (0)

Figure 2: RECORD HEAD WORD

- S - Data Record (0)
 Comment Record (1)
- 35 - Does record continue Yes (1)
 NO (0)

FIGURE 3: MASTER LIBRARY RECORD FORMAT

Record 1

Head Word
data 1 (Z,A)1 (7 or 8 words)
data 2 (Z,A)1 (7 or 8 words)
⋮
data N (Z,A)1 (7 or 8 words)

LOGICAL RECORD

for (Z,A)1

Record 2

Head Word
data N+1 (Z,A)1 (7 or 8 words)
⋮

Record 3

Head Word
Reference a (Z,A)1 (2 words)
Comment text for Reference a (Z,A)1
Reference b (Z,A)1 (2 words)
Comment text for Reference b (Z,A)1

COMMENT RECORD

for logical (Z,A)1 record
Note that Reference a may
for example apply to data
1,2, and N+1, and Reference
b to data 3,N, and N+5

Data 1 is linked to its
comments by identical
Reference statement in its
packed format, and a comment
indicator (See Appendix II
for packed format and Ap-
pendix VII for an example).

Record 4

Head Word
data 1 (Z,A)2
⋮

APPENDIX I

INPUT FORMATS FOR SPASM

- a) Data Card Format
- b) Comment Card Format

DATA CARD FORMAT

APPENDIX Ia

Columns	ITEM	FORMAT	BITS
1-2	Z (atomic number)	Z=0 to Z=99 (leading zeros must appear) are represented by the two-digit configurations: 00 thru 99; Z=100 to Z=109 are represented: A0 thru A9.	[7]
3-5	A (mass number)	(a) Natural mixture: blank or 000 (b) Isotope of mass A: <u>Three-digit</u> configuration for A; 001, 256, etc. (leading zeros may be replaced by blanks). (c) Other mixtures: three-digit numbers 400-999 (each time such an assignment is made, it must be entered in catalog for identification).	[10]
6-8	σ -type (type of data given)	3-character code. (Input Dictionary "A", Appendix VI)	[8]
9-15	Energy (in MeV) (If thermal, fission, or reactor, spectrum average, give value noted below in col. 20.) (Certain types of data require a secondary energy, etc.--See Col. 21-26.)	Col. 9-13: mantissa, <u>left adjusted</u> : minus allowed in col. 9; if no decimal point is given, it is assumed to be after last digit (energy with leading zeros to the left of the decimal will be retrieved as if first non-zero character left adjusted). Col. 14-15: <u>+n</u> where n is the exponent of 10; the sign is necessary except that +0 may be replaced by blanks.	[1 wd]
16-18	Energy Error/Resolution (left adjusted)	If col. 19 = P: percent; decimal point allowed. If col. 19 = L or blank: "last figures" error in the mantissa of the energy (col. 9-13); <u>decimal point not allowed</u> . If col. 19 = M or N: value of resolution in units specified, decimal point allowed; if no	[11]

APPENDIX Ia

Columns	ITEM	FORMAT	BITS
		decimal point is given, it is assumed to be after last digits.	
19	Energy Error Units (Input Dictionary "B", Appendix VI)	P=percent error given; L="last figures" error given; M=microseconds/meter; N=nanoseconds/meter.	[2]
20	Energy Error Type (Input Dictionary "C", Appendix VI)	E=error given in cols. 16-19; R=resolution given in cols. 16-19.	[3]
	Cols. 16-19 are blank when these are used	A=energy figure approximate G=energy greater than figure given M=energy less than figure given F=fission spectrum average (E-1) T=thermal energy; Maxwellian average ($E=.0253 \times 10^{-6}$) *=reactor spectrum average ($E=.0253 \times 10^{-6}$)	
21-25	Secondary Energy or Other Numerical Quantity (See Input Dictionary "D" for units, Appendix VI)	Number (not over four figures), without exponent; decimal point may be given; if absent, it is assumed to be after last digit. Number left adjusted.	[17]
26	Identification of Secondary Energy or Other Numerical Quantity	One character symbol (Input Dictionary "D", Appendix VI)	[3]
[The following columns (27-37) are used only when col. 6=D:]			
27-31	cos θ	Signed number with decimal assumed at <u>left</u> ; left adjusted. +1(cos 0°) or -1(cos 180°) are denoted "F" or "B" respectively in col. 27.	[18]
32	Lab System Indicator	L=Lab system, blank=c.m. system.	[1]
33-35	cos θ Error or Resolution (left adjusted)	If col. 36=P: percent error (decimal point allowed).	[11]

APPENDIX Ia

Columns	ITEM	FORMAT	BITS
		If col. 36 = L or blank: "last figures" error in cos θ ; <u>decimal point not allowed</u> .	
36	cos θ Error Resolution Units	P = percent given; L = "last figures" error given.	[1]
37	cos θ Error or Resolution Indicator	E = error given; R = resolution given.	[1]
(Resume general use.)			
38-44	Value of Cross Section (or other data), as specified in cols. 6-8.	Cols. 38-42: mantissa, left adjusted; may have minus sign and decimal point; if no decimal is given, it is assumed to be after the last digit. (Cross section with leading zeros to the left of the decimal will be retrieved as if first non-zero character left adjusted.) Cols. 43-44: <u>+</u> where n is the exponent of 10; the sign is necessary except that +0 may be replaced by blanks	[1 wd]
45-47	Error in Value (left adjusted)	If col. 48 = P: percent error (decimal point allowed); If col. 48 = L: "last figures" error in mantissa of the value (col. 38-42) (<u>decimal point not allowed</u>); If col. 48 is blank, comment gives definition; If col. 48 otherwise, leave blank.	[11]
48	Error Type (Input Dictionary "E", Appendix VI)	One-character symbol: L = "last figures" error; P = percent error.	[3]
	These apply to value in cols. 38 - 44	A = approximately; G = greater than value given; M = less than value given; $\emptyset$ = order of magnitude; E = estimated or computer value (not measured). (b) = comments define quantity in columns 45 - 47.	

APPENDIX Ia

Columns	ITEM	FORMAT	BITS
49	Status (Input Dictionary "F" Appendix VI)	One-digit symbol.	[3]
50-51	Method (Input Dictionary "G" Appendix VI)	Two-character entry.	[6]
52	Standard (Input Dictionary "H" Appendix VI)	One-character entry.	[6]
53-55	Institution (Input Dictionary "I" Appendix VI)	Three letter symbol.	[8]
56	Information Source (Input Dictionary "J" Appendix VI)	One-letter symbol.	[4]
57-68	Reference	If not a journal; twelve characters of arbitrary text. If a journal (J or K in col. 56): col. 57-59: Journal col. 60-63: Volume number col. 64: Additional Identifying mark if needed col. 65-68: Page number ‡	[2 wds]
69-71	Date of Entry	Col. 69-70: year (last two digits only) Col. 71: month (Input Dictionary "L", Appendix VI)	[11]
72	Comment Entries	Blank: no additional comments; m: an integer 1 ≤ m ≤ 5 indicates that m cards with additional comments follow; =: (equal sign) indicates that the comments applicable to this entry are the same as for another entry bearing the same reference information for which extended comments are given; *: special symbol;	[4]

---

‡ Care should be taken that column 68 is not the only column that differentiates references. In comparing references, the programs do not "look" at column 68.

APPENDIX Ia

Columns	ITEM	FORMAT	BITS
72	Comment Entries (continued)	\$: (dollar sign) when card is to be deleted, indicates that comments associated with given data. (Cols. 57-68) are to be deleted.	

COMMENT CARD FORMAT

SPASM INPUT

APPENDIX Ib

Columns	ITEM	FORMAT
1-5	(Z,A)	As specified for Z and A specifically in Appendix Ia
6	BLANK	
7-80	Additional Explanatory Information	Arbitrary, except that twelve successive blanks will be considered equivalent to end of text for the card.

APPENDIX II

INTERNAL PACKED FORMAT - SPASM

INTERNAL PACKED FORMAT - SPASM

APPENDIX II

BITS	CONTENTS	REMARKS
<u>WORD 1</u>		
S-7	SIGMA TYPE	Number relative to first item in Dictionary "A", Appendix VI
8-14	YEAR	Binary equivalent of last two digits of year.
15-18	MONTH	Number relative to first item in Dictionary "L". Appendix VI
19-24	STANDARD	BCD equivalent of alphanumeric character.
25-35	COMMENT OR EVALUATION DATA	If an evaluation is indicated by an asterisk (*) in column 72, bit 35=1 and evaluation is contained in 29-34; if no evaluation bit 35=0; If comments are indicated bit 25=1 with the number of comment cards associated with this data in 26-28; If neither comments nor evaluation, 25-35 all zeros
<u>WORD 2</u>		
S-7	INSTITUTION	Number relative to first item in Dictionary "I", Appendix VI.
8-11	INFORMATION SOURCE	Number relative to first item in Dictionary "J", Appendix VI.
12-17	METHOD	Number relative to first item in Dictionary "G", Appendix VI.
18-20	STATUS	Numerical value from 0 to 7.
21-23	ENERGY ERROR TYPE	Number relative to first item in Dictionary "C", Appendix VI.
24	NOT USED	

APPENDIX II

BITS	CONTENTS	REMARKS
25-35	ENERGY ERROR	Bit 35=1 if decimal. In this case 33-34 contain position of decimal. (12. has decimal position of 1) 25-32 contain binary equivalents of the integer and decimal portions as a function of the position of the decimal

i.e.	<u>Dec</u> (pos)	<u>Int</u> (bin)	<u>Dec</u> (bin)
1	(xx.)	26-32	-
2	(x.x)	25-28	29-32
3	(.xx)	-	26-32

WORD 3 (Energy Word)

S	SIGN OF MANTISSA	
1	SIGN OF CORRECTED EXPONENT	
2-5	MAGNITUDE OF CORRECTED EXPONENT	
6-22	MAGNITUDE OF NORMALIZED MANTISSA	
23-26	NUMBER OF LEADING ZEROS FOR PURE DECIMAL MAN- TISSA	
27-28	NUMBER OF TRAILING BLANKS REPLACED BY ZEROS	Only trailing blanks after the decimal point are replaced by zeros.
30-32	POSITION OF ORIGINAL DECIMAL POINT	i.e. (xxx.x) = 2
33	NOT USED	
34-35	ENERGY ERROR UNITS	Number relative to first item in Dictionary "B", Appendix VI.

APPENDIX II

BITS	CONTENTS	REMARKS																		
<u>WORD 4</u> (Cross-section Word)																				
S-32	SAME FØRMAT AS FOR ENERGY WØRD (4) ABOVE																			
33-35	CRØSS SECTION ERRØR UNITS	Number relative to first item in Dictionary E (see Appendix VI)																		
<u>WORD 5</u> (Secondary Energy Word)																				
S	DECIMAL IN SECØNDARY ENERGY	YES = 1 NO = 0																		
1	SIGN ØF SECØNDARY ENERGY																			
2-18	SECØNDARY ENERGY	If S-Bit = 1; 2-4 contains position of decimal and 5-18 contains binary equivalent of integer and decimals parts as a function of position of decimal i.e.																		
		<table> <tr> <th><u>POS. OF DEC.</u></th><th><u>INT</u></th><th><u>DEC.</u></th></tr> <tr> <td>1 (XXXX.)</td><td>5-18</td><td>--</td></tr> <tr> <td>2 (XXX.X)</td><td>5-14</td><td>15-18</td></tr> <tr> <td>3 (XX.XX)</td><td>5-11</td><td>12-18</td></tr> <tr> <td>4 (X.XXX)</td><td>5-8</td><td>9-18</td></tr> <tr> <td>5 (.XXXX)</td><td>--</td><td>5-18</td></tr> </table>	<u>POS. OF DEC.</u>	<u>INT</u>	<u>DEC.</u>	1 (XXXX.)	5-18	--	2 (XXX.X)	5-14	15-18	3 (XX.XX)	5-11	12-18	4 (X.XXX)	5-8	9-18	5 (.XXXX)	--	5-18
<u>POS. OF DEC.</u>	<u>INT</u>	<u>DEC.</u>																		
1 (XXXX.)	5-18	--																		
2 (XXX.X)	5-14	15-18																		
3 (XX.XX)	5-11	12-18																		
4 (X.XXX)	5-8	9-18																		
5 (.XXXX)	--	5-18																		
		If S-Bit = 0; Binary equivalent of the integer in 2 - 18																		
19-21	SECØNDARY ENERGY TYPE	Number relative to first item in Dictionary D (see Appendix VI)																		
22-24	NUMBER OF TRAILING BLANKS REPLACED BY ZERØ IN SECONDARY ENERGY	Only trailing blanks following decimal point are replaced by zero.																		
25-35	CRØSS SECTION ERRØR	See Energy Error in WØRD 2 columns 25-35.																		

APPENDIX II

<u>BITS</u>	<u>CONTENTS</u>	<u>REMARKS</u>
<u>WORD 6</u>		
S-35	REFERENCE	BCD equivalent of alpha-numeric reference characters.
<u>WORD 7</u>		
S-35	REFERENCE	BCD equivalent of alpha-numeric reference characters.
<u>WORD 8</u> (Cosine Word - only for differential cross-sections)		
S	SIGN OF COSINE	
1	INDICATOR FOR COSINE OF MAGNITUDE ONE	
2-18	MAGNITUDE OF COSINE	Magnitude of cosine as five (5) decimal digits in binary equivalent.
19	LAB SYSTEM INDICATOR	Bit 19 = 1 - LAB System Bit 19 = 0 - C.M. System
20-30	COSINE ERROR RESOLUTION	Bit 30=1 if decimal. In this case 28-29 contain position of decimal point. 20-27 contain binary equivalents of the integer and decimal positions as a function of position of the decimal
i.e. Dec(pos) Int(bin) Dec(bin) 1(xx.)21-27- 2(x.x)20-2324-27 3(.xx)-21-27		
31-32	COSINE ERROR/RESOLUTION INDICATOR	00 - blank 01 - E 10 - R
33-34	NOT USED	
35	COSINE ERROR/RESOLUTION UNITS	Bit 35 = 1 - P Bit 35 = 0 - L

APPENDIX III

ERROR CODES FOR REJECTED SPASM INPUT DATA

ERROR CODES FOR REJECTED SPASM INPUT DATA
APPENDIX III

<u>ERROR</u>	<u>CAUSE</u>	<u>CARD COLUMN(S)</u>
1	No leading insert or delete card	-
2	Non-valid energy error type	20
3	Energy error symbol implies columns 16-19 blank	16-19
4	Non-valid energy error unit	19
5	Energy error/resolution blank	16-18
6	Decimal present in energy error/ resolution, but not percentage error	16-18 or 19
7*	Data field not all blank after initial blank	
C	Energy Error	16-18
E	Secondary Energy	21-25
F	Cosine	27-31
G	Cosine Error	33-35
H	Cross-section Error	45-47
I	Energy or Cross Section	9-15 or 38-44
8	Non-valid status	49
9	Non-valid month	71
10	Five integers in secondary energy	21-25
11	Non-valid lab system indicator	32
12	Non-valid Cos θ error/resolution indicator	37
13	Decimal present in Cos θ error/resolution, but not percentage error	33-35 or 36
14	Non-valid Cos θ error/resolution units	36
15	Non-valid cross-section error type	48
16	Cross-section error type implies columns 45-47 blank	45-47

ERROR CODES FOR REJECTED
SPASM INPUT DATA
APPENDIX III

<u>ERROR</u>	<u>CAUSE</u>	<u>CARD COLUMNS(S)</u>
17	Decimal present in cross-section error, but not percentage error	45-47 or 48
18	More than five comment cards indicated	72
19	Comment card has column 6 non-blank	6
20	Not used	-
21	Non-valid exponent in energy or cross section	14,15 or 43,45
22*	Non-numeric data in:	
A	Z	1-2
B	A	3-5
C	Energy Error	16-18
D	Year	69,70
E	Secondary Energy	21-25
F	Cosine	27-31
G	Cos Error	33-35
H	Cross-section Error	45-47
I	Energy or Cross section	9-15 or 38-44
23*	Symbol not in Dictionary	
A	Dictionary A	6-8
D	Dictionary D	26
G	Dictionary G	50-51
H	Dictionary H	52
I	Dictionary I	53-55
J	Dictionary J	56
24	Dollar sign but no DELETE requested	72

ERROR CODES FOR REJECTED
SPASM INPUT DATA
APPENDIX III

<u>ERROR</u>	<u>CAUSE</u>	<u>CARD COLUMN(S)</u>
25*	Non-numeric where trailing blanks allowed	
C	Energy Error	16-18
E	Secondary Energy	21-25
F	Cosine	27-31
G	Cosine Error	33-35
H	Cross-section Error	45-47
I	Energy or Cross section	9-15 or 38-44
26	Cosine, energy or cross-section: All blank	{ 9-15 27-31 38-44

*These error codes are prefixed by alphanumeric, i.e. A22.

APPENDIX IV

INPUT FORMATS FOR RETREV

- a) Request Control Card
- b) Request Card
- c) Sample Requests

APPENDIX IVa

INPUT FORMATS FOR RETREV - Request Control Card

<u>Columns</u>	<u>Item</u>	<u>Format</u>
1 - 6	Output Routine	Entry to subroutine used for output. May be "house" routine or routine supplied by user.*
7	Reference Sort option	<u>R</u> signifies a reference sort by (Z,A) be done preliminary to final outputting. Otherwise tape order will prevail.
8	Suppress Comment option	<u>S</u> signifies that comments associated with retrieved data are not to be outputted.
13 - 80	Heading or Explanatory Information	Completely arbitrary format. Anything punched in these columns will appear at head of output for this request.

---

* At present (June 1964) there are three "house" routines.

- BCDTP - produces a BCD tape of expanded line images of the retrieved data. One piece of data per record.
- PRINT - a printed listing of expanded line images.
(See Appendix VII).
- PACTAP - a miniature library tape in the binary mode consisting exclusively of the retrieved data.

APPENDIX IVb

INPUT FORMATS FOR RETREV - Request Card

a) Criterion Representation

<u>Code</u>	<u>Criterion</u>	<u>Maximum length of argument field</u>
Z	Atomic number	2
A	Atomic weight	3
G	Sigma	3
E	Energy	7
R	Energy error type	1
S	Secondary energy	5
N	Secondary energy identification	1
C	Cosine	5
D	Datum - (Cross Section)	7
U	Status	1
T	Standard	1
I	Institution	3
Y	Date	3

Format for the arguments of criterion must satisfy requirements listed for input (Appendix 1a)

b) Control Characters

<u>Character</u>	<u>Meaning</u>
, (comma)	separates arguments within criterion if a range of values is desired
) (right parenthesis)	end of request
\$ (dollar sign)	end of criterion

c) Sample Requests

i) Request Control Card

PRINT S BROOKHAVEN 92235 AT (21000-9,70000-9) FROM JAN 62 TO JUNE 64

```

0000 00 000000000000 0000000000 0 00 00 0 0000000000000000 000 00000000000000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
111111111111111111 1111111111 1111 111111111111111111 11111111 11111111111111
22222222 2222 222 22222222 22222222 22222222222222222222222222222222 22222222222222222222
3333 3333333333333333333333333333 333 3333333333 3333333333333333333333333333 33333333333333333333

```

Request Card

Z 92\$ A 235\$ I ENLS E 21000-9,70000-9\$ Y 62A,64F)

```

000000 00000000000000000000000000000000 00 0 000000 0000 000000000000000000000000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
1111111111111111 11111111111111111111 111111111111111111 111111111111111111111111
2222222222 222222 2222222222 2222222222 22222222222222222222222222222222 222222222222222222222222
33333333333 3333333 3 33333333 33333333333333 33333333 333333333 3333333333333333333333333333

```

The above request might have been originally phrased:

Please forward a printed listing (PRINT) of all available information on 92235, regardless of type of cross section, that has been reported from BROOKHAVEN NATIONAL LABORATORY at energies between 21000×10^{-9} and 70000×10^{-9} inclusive, and in the time JANUARY 1962 to JUNE 1964. Please disregard all comments (S) associated with this information.

28

PACTAPR

[illegible]

Request Card

1 BNL\$ Y60A,99)

[illegible]

The above request might have been originally phrased:

Please forward all results reported by BROOKHAVEN NATIONAL LABORATORY since JANUARY 1960. Enclosed is a tape to be returned with retrieved data ordered by reference (R) within (Z, A), in a format identical to the master library (PACTAP).

APPENDIX V
RETREV ERRØR CØDES

APPENDIX V
RETREV ERRØR CØDES

<u>CØDE</u>	<u>REASØN FØR ERRØR</u>
1	Invalid request control card.
2	Criterion symbol not in table.
3	Request card has no end i.e. ")"
4*	Too many characters.
5*	Too many arguments given.
6*	Argument not in Dictionary.
7*	Non-Numeric where numerics only allowed.
8	First cosine character is not +, -, F, B, or .
9	Second cosine character after sign is not 1 or .
10	Control card but no following request card.

* These codes are of the form X N, where X symbolizes one of the following alphabetic codes which indicate criterion in which error was found.

<u>Code</u>	<u>Criterion</u>
Z	Z
A	A
G	Sigma Type
E	Energy
R	Energy Error type
S	Secondary Energy
N	Secondary Energy identification
C	Cosine
D	Datum
U	Status
T	Standard
I	Institution
Y	Date

APPENDIX VI: DICTIONARIES

Much of the information is coded into symbols of one to three characters. The following dictionaries give the abbreviations (input and retrieval abbreviations are the same unless otherwise noted).

Dictionary A: Type of Cross Section, Etc. Input abbreviation

is a 3-column entry, the first of which must be a letter (and not blank); output is given in up to twelve characters. Only those quantities (and all such quantities) which are functions of angle should begin with the letter "D". Any quantity which may have a negative energy associated with it should not use the twelfth place for output. Abbreviations for units of the data (up to three characters) are also given. [maximum 256.]

<u>INPUT DICTIONARY</u>	<u>INTERNAL NUMERICAL EQUIVALENT DECIMAL</u>	<u>OUTPUT DICTIONARY</u>	<u>ANGULAR CORRELATIONS BETWEEN REACTION PRODUCTS</u>
CFE	0	COR FIS FRAG	in fission, between fission fragments
CGG	1	COR (GAM,GAM)	in (n,γ) or $(n,n'\gamma)$, between gamma and gamma
CNG	2	COR (N,GAM)	in $(n,n'\gamma)$, between gamma and secondary neutron
CNP	3	COR (N,P)	in $(n,n'p)$, between proton and secondary neutron
CPG	4	COR (P,GAMMA)	in $(n,p\gamma)$, between proton and gamma
CTF	5	COR TERN FIS	in ternary fission, between alphas and fragments
<u>FITTING COEFFICIENTS (FOR POLYNOMIAL EXPANSIONS OF ANGULAR DISTRIBUTIONS) (millibarns per steradian)*</u>			
FCE	6	FIT COS ELAS	for powers of $\cos \theta$; elastic scattering (DEL)
FCI	7	FIT COS INEL	for powers of $\cos \theta$; inelastic scattering (DIN)

* Note: Power or order of coefficient will be given in secondary energy position; and in column 26 will appear a C if in center-of-mass system or an L if in laboratory system.

Dictionary A

<u>INPUT DICTIONARY</u>	<u>INTERNAL NUMERICAL EQUIVALENT DECIMAL</u>	<u>OUTPUT DICTIONARY</u>	<u>FITTING COEFFICIENTS (FOR POLYNOMIAL EXPANSIONS OF ANGULAR DISTRIBUTIONS) (millibarns per steradian) (Con't)</u>
FCT	8	FIT COS TOT	for powers of $\cos \theta$; total scattering (DIT)
FCP	9	FIT COS EL+	for powers of $\cos \theta$; elastic plus some inelastic scattering (DEP)
FCN	10	FIT COS NE	for powers of $\cos \theta$; non-elastic scattering (DNE)
FCR	11	FIT COS REAC	for powers of $\cos \theta$; for reaction (charged particle emission) cross sections
FLE	12	FIT LEG ELAS	for Legendre Polynomials; elastic scattering (DEL)
FLI	13	FIT LEG INEL	for Legendre Polynomials; inelastic scattering (DIN)
FLT	14	FIT LEG TOT	for Legendre Polynomials; total scattering (DIT)
FLP	15	FIT LEG EL+	for Legendre Polynomials; elastic plus some inelastic scattering (DEP)
FLN	16	FIT LEG NE	for Legendre Polynomials; non-elastic scattering (DNE)
FLR	17	FIT LEG REAC	for Legendre Polynomials; for reaction (charged particle emission) cross sections
<u>RESONANCE PARAMETERS</u>			
I	18	SPIN	spin of target nucleus (with $E=0$ in cols. 9-14)
J	19	SPIN COM NUC	spin of compound nucleus at resonance
S	20	PEAK TOT CS	σ_0 , peak total cross section at resonance, $4\pi\lambda_0^2 \Gamma_n / \Gamma$
W	21	STAT WEIGHT	g (statistical weight factor)
EN	22	RES ENERGY	energy of resonance (eV)
GA	23	GAMMA ALPHA	alpha width Γ_α (mV)
GF	24	GAMMA FISS	fission width Γ_f "
GG	25	GAMMA GAMMA	gamma width Γ_γ "
GN	26	GAMMA N	neutron width Γ_n "

Dictionary A

INPUT DICTIONARY	INTERNAL NUMERICAL EQUIVALENT DECIMAL	OUTPUT DICTIONARY	RESONANCE PARAMETERS (Con't)
GP	27	GAMMA P	proton width Γ_p (mv)
GT	28	GAMMA	total width Γ "
GAB	29	GAMMA ABS	absorption width (GG + GF) "
GNO	30	GAMMA N 0	reduced neutron width in mv for s-wave scattering $\Gamma_n^0 = \Gamma_n / \sqrt{E}$
GN1	31	GAMMA N 1	reduced neutron width in mv for p-wave scattering $\Gamma_n^1 = \Gamma_n [1 + (KR)^2] / (KR)^2 \sqrt{E}$, where $K = 2\pi/\lambda$, and R = nuclear radius
GN2	32	GAMMA N 2	reduced neutron width in mv for d-wave scattering: $\Gamma_n^2 = \Gamma_n [9 + 3(KR)^2 + (KR)^4] / (KR)^4 \sqrt{E}$
WGN	32	2G GAMMA N	$2g\Gamma_n$ (mv)
WGO	33	2G GAMMA NO	$2g\Gamma_n^0$ "
WAG	34	AB.2G.GAM N	$(2g\Gamma_n) \times$ (unknown isotopic abundance) (mv)
WOG	35	AB.2G.GAM NO	$2g\Gamma_n^0 \times$ (unknown isotopic abundance) (mv)
GFS	36	GAM F PEAK	$\Gamma_F \sigma_0$ (eV-barns)
GGs	37	GAM G PEAK	$\Gamma_Y \sigma_0$ (eV-barns)
GNS	38	GAM N PEAK	$\Gamma_n \sigma_0$ (eV-barns)
GTs	39	GAM T PEAK	$\Gamma \sigma_0$ (eV-barns)
G2S	40	GAM 2 PEAK	$\Gamma^2 \sigma_0$ (eV ² -barns)
G2G	41	2G GAM N/GAM	$2g\Gamma_n^2 / \Gamma$ (eV)
SF	42	PEAK FISS CS	Peak fission cross section, $\sigma_0 \Gamma_f / \Gamma$ (barns)
SP	43	AVE.SPACING	Average level spacing, D(spacing for both spin states unless stated in comment) (eV)
STF	44	STR.FUNCTION	Strength function for all levels

Dictionary A

INPUT DICTIONARY	INTERNAL NUMERICAL EQUIVALENT DECIMAL	OUTPUT DICTIONARY	RESONANCE PARAMETERS (Con't)
ST0	45	STR.FUNCT-S	s-wave strength function, $\langle \Gamma_n^0 \rangle \langle D \rangle$
ST1	46	STR.FUNCT-P	p-wave strength function, $\langle \Gamma_n^1 \rangle \langle D \rangle$
ORDINARY CROSS SECTIONS(barns) - (BNS) and OTHER QUANTITIES			
AD	47	ADUNDANCE	abundance of isotope (percent)
ABE	48	ABS.SQRT E	$\sigma_a \sqrt{E}$
ABS	49	ABSORPTION	$(n, \gamma) + (n, p) + (n, \alpha) + (n, f)$
ALF	50	ALPHA	α (capture-to-fission ratio)
A+1	51	ALPHA+1	$\alpha + 1$
B/T	52	BINRY/TERNRY	binary/ternary [(NF-NFA)/NFA]
ETA	53	ETA	η (neutrons per capture) [NUT x NF / (NG + NF)]
FPG	54	FIS-PROD GAM	fission product gamma rays
HL	55	HALF-LIFE	half-life for radioactive decay (with E=0); units in comment
LVL	56	LEVEL ENERGY	level energy above ground state (MeV)
MIS	57	MISCELLAN	anything not otherwise covered (defined on comment line)
NA	58	N,ALPHA	(n, α) cross section
NAC	59	N, A COMP NUC	"compound nucleus" portion of (n, α) cross section
NAD	60	N,A DIR INT	"direct interaction" " " "
ND	61	N,DEUTERON	(n,d) cross section
NDC	62	N,D COMP NUC	"compound nucleus" portion of (n,d) cross section

Dictionary A

<u>INPUT DICTIONARY</u>	<u>INTERNAL NUMERICAL EQUIVALENT DECIMAL</u>	<u>OUTPUT DICTIONARY</u>	<u>ORDINARY CROSS SECTIONS (barns) - (BNS) and OTHER QUANTITIES (Con't)</u>
NDD	63	N,D DIR INT	"direct interaction" portion of (n,d) cross section
NEG	64	GAM EMISSION	cross section for all gamma-emitting processes. If a particular gamma is meant, its energy is specified in Cols. 21-25.
NEM	65	N EMISSION	cross section for all neutron-emitting processes
NF	66	N,FISSION	(n,f) cross section
NFA	67	TERN.FISSION	ternary fission cross section
NFE	68	(N,F).SQRT E	$\sigma_{nf}\sqrt{E}$
NFY	69	FISS YIELD	fission yield (percent)
NG	70	N,GAMMA	(b, γ) cross section
NH	71	N,HE3	(n,He ³) cross section
NHC	72	N,HE3 COMP	"compound interaction" portion of (n,He ³) cross section
NHD	73	N,HE3 DIR	"direct interaction" " " "
NP	74	N,P	(n,p) cross section
NPC	75	N,P COMP NUC	"compound interaction" portion of (n,p) cross section
NPD	76	N,P DIR INT	"direct interaction" " " "
NT	77	N,T	(n,t) cross section
NTC	78	N,T COMP NUC	"compound interaction" portion of (n,t) cross section
NTD	79	N,T DIR INT	"direct interaction" " " "
NNA	80	N,N ALPHA	(n,n' α) cross section

Dictionary A

<u>INPUT DICTIONARY</u>	<u>INTERNAL NUMERICAL EQUIVALENT DECIMAL</u>	<u>OUTPUT DICTIONARY</u>	<u>ORDINARY CROSS SECTIONS (barns) - (BNS) and OTHER QUANTITIES (Con't)</u>
NND	81	N,ND	(n,n'd) cross section
NNG	82	N,N GAMMA	(n,n'γ) " "
NNH	83	N,N HE3	(n,n'He ³) " "
NNP	84	N,NP	(n,n'p) " "
NNT	85	N,NT	(n,n't) " "
N2A	86	N,2ALPHA	(n,2α) " "
N2N	87	N,2N	(n,2n) " "
N2P	88	N,2P	(n,2p) " "
N3A	89	N,3ALPHA	(n,3α) " "
N3N	90	N,3N	(n,3n) " "
NU	91	NU UNSPECIF	neutrons per fission, unspecified whether delayed or prompt or both
NUD	92	NU DELAYED	delayed neutrons per fission
NUP	93	NU PROMPT	prompt neutrons per fission
NUT	94	NU TOTAL	total neutrons per fission (NUD + NUP)
NUN	95	NU (N)	ν(n); neutrons per individual fission
PØT	96	POT.SCATTER	potential scattering cross section
SAM	97	SCAT AMPL	scattering amplitude (Fermis) (10 ⁻³ cm)
R	98	NUC.RADIUS	nuclear radius, R', calculated from PØT
REM	99	REMOVAL	"removal" cross section
RIA	100	RES INT ABS	resonance integral for absorption (barns)
RIF	101	RES INT FISS	" " " fission "

Dictionary A

<u>INPUT DICTIONARY</u>	<u>INTERNAL NUMERICAL EQUIVALENT DECIMAL</u>	<u>OUTPUT DICTIONARY</u>	<u>ORDINARY CROSS SECTIONS (barns) - (BNS) and OTHER QUANTITIES (Con't)</u>
RIG	102	RES INT GAM	resonance integral for (n, γ) (barns)
RIS	103	RES INT SCAT	" " " scattering (barns)
SAV	104	SCAT AVERGE	average scattering cross section
SBA	105	SCAT BOUND A	bound atom scattering cross section
SFA	106	SCAT FREE AT	free atom " " "
SCØ	107	SCAT COHER	coherent " " "
SNC	108	SCAT INCOH	incoherent " " "
SEL	109	ELASTIC SCAT	elastic scattering cross section
SIN	110	INELASTIC SC	inelastic scattering cross section
SCT	111	TOTAL SCAT	total scattering " " (SEL+SIN)
SEP	112	ELASTIC+IN	elastic plus some inelastic scattering (SEL + part of SIN)
SNE	113	NON-ELASTIC	non-elastic cross section
TØT	114	TOTAL	total cross section
SFG	115	SPECT F-GAMM	spectrum of prompt gammas emitted in fission
SFN	116	SPECT F-NEUT	spectrum of neutrons emitted in fission
SNG	117	SPECT N-GAMM	spectrum of gamma rays from (n, γ)
SAB	118	S(ALFA,BETA)	S(α,β): α given in energy column; β given in secondary energy column with C in col. 26
TSL	119	THERMAL SCAT	information on thermal scattering law
T	120	NUCLEAR TEMP	nuclear temperature (MeV)
bbb *	121	bbb...	not given

*b = blank character

Dictionary A

<u>INPUT DICTIONARY</u>	<u>INTERNAL NUMERICAL EQUIVALENT DECIMAL</u>	<u>OUTPUT DICTIONARY</u>	<u>DIFFERENTIAL NEUTRON CROSS SECTIONS (millibarns per steradian) - (M/S)</u>
DA	128	DIF (N, ALPHA)	(n, α)
DD	129	DIF (N, D)	(n, d)
DH	130	DIF (N, HE3)	(n, He ³)
DP	131	DIF (N, P)	(n, p)
DT	132	DIF (N, T)	(n, t)
DEL	133	DIF ELASTIC	(n, n); elastic scattering (like SEL)
DIN	134	DIF INELAST	(n, n'); inelastic scattering (like SIN)
DIT	135	DIF SCATTER	total scattering (DEL + DIN)
DEP	136	DIF ELAST+IN	elastic plus some inelastic (DEL + some of DIN)
DNE	137	DIF NON-ELAS	non-elastic scattering (DIT + D2N)
DNA	138	DIF (N, N ALF)	(n, n' α) (angular distribution of other- than-neutron product, unless comment says otherwise)
DND	139	DIF (N, ND	(n, n'd) (" " ")
DNG	140	DIF (N, NGAM)	(n, n' γ) (" " ")
DNH	141	DIF (N, N HE3)	(n, n'He ³) (" " ")
DNP	142	DIF (N, NP)	(n, n'p) (" " ")
DNT	143	DIF (N, NT)	(n, n't) (" " ")
DPN	144	DIF (NP+NNP)	(n, p) + (n, n'p) (" " ")
D2A	145	DIF (N, 2ALPH)	(n, 2 α) (" " ")
D2N	146	DIF (N, 2N)	(n, 2n) (secondary neutron angular distributions)
D2P	147	DIF (N, 2P)	(n, 2p) (emitted proton " ")

Dictionary A

<u>INPUT DICTIONARY</u>	<u>INTERNAL NUMERICAL EQUIVALENT DECIMAL</u>	<u>OUTPUT DICTIONARY</u>	<u>DIFFERENTIAL NEUTRON CROSS SECTIONS (millibarns per steradian) - (M/S) (Con't)</u>
D3N	148	DIF (N, 3N)	(n, 3n) (secondary neutron angular distributions)
DPL	149	DIF POL ELAS	polarization of elastically scattered neutrons
DPI	150	DIF POL INEL	polarization of inelastically scattered neutrons
DMI	151	DIF MISCEL	any differential cross section not otherwise covered (defined on comment card)

Dictionary B: Energy Error Units: Blank will be interpreted
as "last figures": L. [maximum 4.]

<u>INPUT DICTIONARY</u>	<u>INTERNAL NUMERICAL EQUIVALENT (DECIMAL)</u>	<u>OUTPUT DICTIONARY</u>	<u>ERROR INTERPRETATION (Column 19)</u>
L	0	L	in Last figure. [Blank = L]
P	1	P	in Percent.
M	2	M	in Microseconds/meter.
N	3	N	in Nanoseconds/meter.
(b) *	0	{ L (b)	in Last figure. (If column 20=E or R) otherwise.

---

* (b) = blank character

Dictionary C: Energy Error Type

(b) (blank) will be interpreted as "resolution": R. [maximum 8.]

<u>INPUT DICTIONARY</u>	<u>INTERNAL NUMERICAL EQUIVALENT (DECIMAL)</u>	<u>OUTPUT DICTIONARY</u>	<u>ENERGY & ERROR QUALIFICATIONS (Column 20)</u>
T	0	T	Thermal (Maxweillian) Spectrum Average (with $E = 0.0253 \times 10^{-6}$ MeV).
*	1	*	Reactor Spectrum Average (with $E = 0.253 \times 10^{-6}$ MeV).
F	2	F	Fresh Fission Spectrum Average (with $E = 1$ MeV).
M	3	M	Energy figure is upper limit ("Maximum value").
G	4	G	Energy figure is lower limit ("Greater than").
A	5	A	Energy figure is Approximate (or "of the order of").
R	6	R	"Error" figure is Resolution.
E	7	E	"Error" figure is truly Error.
(b) *	6	R	"Error" figure is Resolution.

---

* (b) = blank character

Dictionary D: Secondary Energy, Etc., Identification

One character and units (usually MeV). [maximum 7 + (b).]

<u>INPUT DICTIONARY</u>	<u>INTERNAL NUMERICAL EQUIVALENT (DECIMAL)</u>	<u>OUTPUT DICTIONARY</u>	<u>SECONDARY ENERGY QUALIFICATIONS (Column 26)</u>
N	0	N	Inelastic scattering energy E_n' in MeV.
X	1	X	Other emitted particle energy ($E_p, E_\alpha, E_d, E_{He3}, E_\gamma, E_t$) in MeV. (For a range of particle energies, average energy is given in Cols. 21-25, and the range appears on comment card.)
L	2	L	Level excited in inelastic scattering in MeV.
M	3	M	A Mixture of levels excited and not distinguished from one another. Same σ will appear for each level listed on comment card as part of the mixture (in MeV).
D	4	D	Degradation in energy of neutrons ($E - E'$) in MeV.
Q	5	Q	Q-value of reaction. (If a <u>range</u> of values, average Q-value is given in Cols. 21-25 and the range appears on comment card.)
C	6	C	Cold neutron inelastic scattering energy E_n' in mV. (If σ -type is SAB, this symbol C indicates that value of β in $S(\alpha, \beta)$ appears in Cols. 21-25.)
(b) *	7	(b)	Use comment to define quantity in Cols. 21-25.

* (b) = blank character

Dictionary E: Cross Section Error Type

[maximum 7 + (b) .]

<u>INPUT DICTIONARY</u>	<u>INTERNAL NUMERICAL EQUIVALENT (DECIMAL)</u>	<u>OUTPUT DICTIONARY</u>	<u>CROSS SECTION AND ERROR QUALIFICATIONS (Column 48)</u>
L	0	L	Last place error (decimals allowed).
P	1	P	Percent error " "
A	2	A	Approximately (the value itself; no error given in Cols. 45-57).
G	3	G	Greater Than (the value itself; no error given in Cols. 45-57).
M	4	M	Less Than (the value itself; no error given in Cols. 45-57).
O	5	O	Order of Magnitude (the value itself; no error given in Cols. 45-57).
E	6	E	Statistical Error only (last place error); total error not quoted.
(b)*	7	(b)	Use comment to define quantity in Cols. 45-47

---

* (b) = blank character

Dictionary F: Status. Blank will be interpreted as 5 [maximum 8]. Since status is numeric on input, no "packing" is necessary. Therefore internal format is binary equivalent of numeric code.

STATUS SYMBOLS (Column 49)

- 0. Result which has been withdrawn or superseded.
- 1. Obsolete recommended values.
- 2. Result renormalized to an out-of-date standard.
- 3. Result found by computation or theory.
- 4. Original result as published, but normalization is outdated.
- 5. Latest result of a given piece of work, renormalized to current standard if necessary [blank assumed to be 5].
- 6. Value currently recommended by Sigma Center.
- 7. Value recommended by someone else and published recently.
- ⓑ * Interpreted as Status 5.

---

* ⓑ = blank character

Dictionary G: Method. Two character entry (blanks
allowed). [Maximum 63 + (b) (b) .]

INPUT DICTIONARY	INTERNAL NUMERICAL EQUIVALENT (DECIMAL)	OUTPUT DICTIONARY	METHODS (Columns 50, 51)
4P	0	4P	4π cross section at $(90^\circ \pm 10^\circ)$ (unless another angle is specified on the comment card.)
AA	1	AA	Area analysis for resonance parameters.
AC	2	AC	Accelerator source [via (p,n) or (d,n), (t,p)] of mono-energetic neutrons.
BB	3	BB	Back-to-back fission counter.
BS	4	BS	Biased scintillator
BU	5	BU	Burn-up
BW	6	BW	Breit-Wigner (calculated from parameters by single-level Breit-Wigner formula).
CC	7	CC	Cloud chamber.
CG	8	CG	Capture gammas.
CØ	9	CØ	Coincidence of particles.
CS	10	CS	Crystal spectrometer.
CT	11	CT	Counter telescope.
EM	12	EM	Emulsions.
EN	13	EN	Enriched isotope used.
FD	14	FD	Fission detection (fission counting).
GS	15	GS	Gas scintillation counter.
HB	16	HB	Hornyak button.
HE	17	HE	He ³ spectrometer.
IC	18	IC	Ion chamber.

Dictionary G :

<u>INPUT DICTIONARY</u>	<u>INTERNAL NUMERICAL EQUIVALENT (DECIMAL)</u>	<u>OUTPUT DICTIONARY</u>	<u>METHODS (COLUMNS 50, 51)</u>
ID	19	ID	Integrated differential cross-section.
IM	20	IM	Integral measurement (diffusion, etc.)
LC	21	LC	Long counter.
LR	22	LR	Left-right for polarization.
MB	23	MB	Manganese bath (eta).
MF	24	MF	Magnetic field rotation for polarization.
ML	25	ML	Multi-level fit (for resonance parameters).
MR	26	MR	Moxon-Rae detector
MS	27	MS	Mass spectrometer.
ØS	28	ØS	Oscillator (pile oscillator).
PC	29	PC	Proportional counter.
PD	30	PD	Pulse die-away (in a chain-reacting assembly).
PN	31	PN	Solid state counter (p-n junction).
PØ	32	PØ	Polarized beam and/or target.
RA	33	RA	Activation (radioactivation).
RC	34	RC	Recoil chamber.
RG	35	RG	Ring geometry.
S	36	S	Scattering.
SA	37	SA	Shape analysis for resonance parameters.
SC	38	SC	Scintillating crystal.
SF	39	SF	Spiral fission chamber.

Dictionary G:

<u>INPUT DICTIONARY</u>	<u>INTERNAL NUMERICAL EQUIVALENT (DECIMAL)</u>	<u>OUTPUT DICTIONARY</u>	<u>METHODS (Columns 50,51)</u>
SI	40	SI	Self-indication.
SS	41	SS	Spherical shell (transmission).
ST	42	ST	Scintillator tank.
TD	43	TD	Threshold detector.
TE	44	TE	Total - (elastic or non-elastic).
TF	45	TF	Time-of-Flight.
TR	46	TR	Total reflection from mirrors.
TT	47	TT	Thick and thin targets (for resonance parameters).
(b) (b) *	48	(b) (b)	Not given

---

* (b) = blank character

DICTIONARY H: STANDARD. One Character

INPUT*
AND
OUTPUT

STANDARDS (Column 52)

0	$\text{Al}^{27}(\text{n},\alpha) + \text{Cu}^{63}(\text{n},2\text{n}) + \text{Cu}^{65}(\text{n},2\text{n})$
1	Iron
=	Normalized to total cross section
+	Normalized to total reaction cross section
A	Au
B	Boron
C	Carbon
D	$\text{Cu}^{63}(\text{n},2\text{n})$
E	He
F	Cf^{252} spontaneous fission rate
G	Cobalt
H	Hydrogen
I	Indium
-	Absolute determination; no standard
K	$\text{Al}^{27}(\text{n},\text{p})$
L	$\text{Al}^{27}(\text{n},\alpha)$
M	Mn
N	Na
Ø	$\text{U}^{235}(\text{n},\text{f})$ (Oralloy)
P	$\text{P}^{31}(\text{n},\text{p})$
Q	Pu^{239}
*	Another isotope of the same element

DICTIONARY H

INPUT*
AND
OUTPUT

STANDARDS (Column 52)

(b)**	Not given
/	Normalized to absolute measurements
S	$S^{32}(n,p)$
T	$Th(n,f)$
U	$U^{238}(n,f)$

---

* STANDARD is stored internally as the BCD equivalent of above character, therefore no internal numerical equivalent pertains. It is to be noted that the STANDARD Dictionary is arranged in increasing numerical order of BCD representation and therefore retrieval for a range of STANDARD is possible.

** (b) = blank character

Dictionary I: Institution. Input abbreviation is a 3-column entry (the first column of which must not be blank unless all blank); output is a twelve-column entry (blanks allowed).

[maximum 255 + (b)(b)(b).]

<u>INPUT</u> <u>DICTIONARY</u>	<u>INTERNAL</u> <u>NUMERICAL</u> <u>EQUIVALENT</u> <u>(DECIMAL)</u>	<u>OUTPUT</u> <u>DICTIONARY</u>	<u>LABORATORIES AND INSTITUTIONS</u>
			<u>(Columns 53 - 55)</u>
AI	0	ATOMICS INT.	Atomics International, Canoga Park, Calif.
ALD	1	ALDERMASTON	AWRE, Aldermaston, Berkshire, England
ANL,	2	ARGONNE	Argonne National Lab., Argonne, Illinois
ARK	3	U.ARKANSAS	University of Arkansas, Fayetteville
AUL	4	AUSTRALIA	
AUS	5	AUSTRIA	
BAR	6	BARTOL	Bartol Research Foundation, Swarthmore, Pa.
BAS	7	BASEL	University of Basel, Switzerland
BAT	8	BATTELLE	Battelle Memorial Inst., Columbus, Ohio
BEL	9	BELL	Bell Telephone Labs., Murray Hill, N.J.
BET	10	BETTIS	Bettis Atomic Power Division, Westinghouse, Pittsburgh, Pennsylvania
BKB	11	B.KIDRICH	Inst. Boris Kidrich, Belgrade, Yugoslavia
BNL	12	BROOKHAVEN	Brookhaven National Lab., Upton, N.Y.
BOM	13	BOMBAY	Bombay, India
BOSE	14	BOSE	Bose Inst., Calcutta, India
BRK	15	BERKELEY	University of California, Radiation Lab. Berkeley

Dictionary I:

<u>INPUT</u> <u>DICTIONARY</u>	<u>INTERNAL</u> <u>NUMERICAL</u> <u>EQUIVALENT</u> <u>(DECIMAL)</u>	<u>OUTPUT</u> <u>DICTIONARY</u>	<u>LABORATORIES AND INSTITUTIONS</u>
BRN	16	BROWN	Brown University, Providence, Rhode Island
BUL	17	BULGARIA	
B+W	18	BABCOCK	Babcock & Wilcox Co., Lynchburg, Virginia
BZL	19	BRAZIL	
CBR	20	CANBERRA	Australian University, Canberra
CAL	21	CAL TECH	California Institute of Tech., Pasadena, California
CAR	22	CARNEGIE T.	Carnegie Institute of Tech., Pittsburgh, Pa.
CAT	23	CATANIA	University of Catania, Italy
CCP	24	USSR	
CER	25	CERN	CERN, Geneva, Switzerland
CHI	26	U. CHICAGO	University of Chicago, Illinois
CHL	27	CHILE	
CIS	28	C.I.S.E.	C.I.S.E., Milan, Italy
CLC	29	CALCUTTA	Calcutta, India
CAN	30	CANADA	
CØL	31	COLUMBIA U.	Columbia University, New York, N.Y.
CØN	32	CONVAIR	Convair, San Diego, California
CR	33	CHALK RIVER	A.E.C.L., Chalk River, Ontario, Canada
CSE	34	CASE	Case Institute of Tech., Cleveland, Ohio
CAD	35	CADARCHE	C.E.N. - Cadarache, Bouches du Rhône, France
DEN	36	DENMARK	
DKE	37	DUKE	Duke University, Durham, North Carolina

Dictionary I:

<u>INPUT</u> <u>DICTIONARY</u>	<u>INTERNAL</u> <u>NUMERICAL</u> <u>EQUIVALENT</u> <u>(DECIMAL)</u>	<u>OUTPUT</u> <u>DICTIONARY</u>	<u>LABORATORIES AND INSTITUTIONS</u>
DUB	38	DUBNA	Joint Institute for Nuclear Research, Dubna, U.S.S.R.
ETH	39	ETH	Eigentechnische Hochschule, Zurich, Switz.
FON	40	FONTENAY	C.E.A. - Fontenay-aux-Roses, Seine, France
FR	41	FRANCE	
GA	42	GEN. ATOMIC	General Atomic, San Diego, California
GEL	43	GEEL	Euratom-Geel, Belgium
GER	44	GERMANY	
GES	45	GE-SCHENECT	GE - Schenectady [different from KAPL]
GLS	46	GLASGOW	University of Glasgow, Scotland
GRE	47	GRENOBLE	C.E.A. - Grenoble, Isère, France
GRN	48	GRONINGEN	Gröningen, The Netherlands
HAN	49	HANFORD	Hanford Atomic Products, Richland, Washington
HAR	50	HARWELL	AERE, Harwell, Berkshire, England
HAV	51	HARVARD	Harvard University, Massachusetts
IND	52	INDIA	
IOW	53	IOWA	Iowa State University, Iowa City
IP	54	INST.PH.USSR	Institute of Physics, U.S.S.R.
ISL	55	ISRAEL	
ISP	56	ISPRA	Euratom, Ispra, Italy
ITY	57	ITALY	
JAD	58	B.JADROWYCH	Institute Badar Jadrowych, Warsaw, Poland

Dictionary I:

<u>INPUT</u> <u>DICTIONARY</u>	INTERNAL NUMERICAL EQUIVALENT (DECIMAL)	<u>OUTPUT</u> <u>DICTIONARY</u>	<u>LABORATORIES AND INSTITUTIONS</u>
JAE	59	JAERI	Japan Atomic Energy Research Inst.
JAP	60	JAPAN	
JEN	61	JENER	Jener, Norway
JHU	62	J.HOPKINS	John Hopkins University, Baltimore, Maryland
KAP	63	KNOLLS	Knolls Atomic Power Lab., Schenectady, N.Y.
KON	64	KONAN U.	Konan University, Japan
KRL	65	KARLSRUHE	Karlsruhe, West Germany
KTØ	66	KYOTO	University of Kyoto, Japan
KTY	67	U. KENTUCKY	University of Kentucky, Lexington, Kentucky
LAS	68	LOS ALAMOS	Los Alamos Scientific Lab., New Mexico
LEB	69	LEBEDEV	Lebedev Institute, U.S.S.R.
LØK	70	LOCKHEED	Lockheed Aircraft Corp., Palo Alto, Calif.
LVN	71	LOUVAIN	University of Louvain, Belgium
LRL	72	LIVERMORE	Lawrence Radiation Lab., Livermore, Calif.
LVP	73	LIVERPOOL	University of Liverpool, England
MAR	74	MARQUETTE	Marquette University, Milwaukee, Wisconsin
MCG	75	MCGILL	McGill University, Montreal, Quebec, Canada
MCM	76	MCMASTER	McMaster University, Hamilton, Ontario, Canada
MEX	77	MEXICO	
MIT	78	MIT	Massachusetts Institute of Technology, Cambridge, Massachusetts
MND	79	MOUND	Mound Lab., Miamisburg, Ohio
MØL	80	MØL	B.C.M.N., Mol, Belgium

Dictionary I:

<u>INPUT</u> <u>DICTIONARY</u>	<u>INTERNAL</u> <u>NUMERICAL</u> <u>EQUIVALENT</u> <u>(DECIMAL)</u>	<u>OUTPUT</u> <u>DICTIONARY</u>	<u>LABORATORIES AND INSTITUTIONS</u>
MØN	81	MONTREAL	University of Montreal, Quebec, Canada
MTN	82	MONTANA	University of Montana, Helena
MTR	83	MTR	Phillips Petroleum Co. - MTR Site, Idaho Falls, Idaho
MUN	84	MUNICH	Munich, Germany
NAA	85	N.AMER.AV.	North American Aviation, Canoga Park, Calif.
NBS	86	BUR. STAND.	National Bureau of Standards, Washington, D.C.
NED	87	NETHERLANDS	
NEU	88	NEUCHATEL	University of Neuchatel, Neuchatel, Switz.
NØR	89	NORWAY	
NØT	90	NOTRE DAME	University of Notre Dame, South Bend, Ind.
NRD	91	USNRDL	U.S. Naval Radiological Defense Lab., San Francisco, California
NRL	92	USNRL	U.S. Naval Research Lab., Washington, D. C.
NWU	93	NORTHWESTERN	Northwestern University, Evanston, Ill.
NZL	94	NEW ZEALAND	
ØRL	95	OAK RIDGE	Oak Ridge National Lab., Tennessee
ØKF	96	OXFORD	Oxford University, England
PAR	97	PARIS	
PEN	98	U. PENN	University of Pennsylvania, Philadelphia, Pa.
PØL	99	POLAND	
PSU	100	PENN STATE	Pennsylvania State University, University Park, Pa.

Dictionary I:

<u>INPUT</u> <u>DICTIONARY</u>	<u>INTERNAL</u> <u>NUMERICAL</u> <u>EQUIVALENT</u> <u>(DECIMAL)</u>	<u>OUTPUT</u> <u>DICTIONARY</u>	<u>LABORATORIES AND INSTITUTIONS</u>
RBZ	101	R. BOSKOVIC	Institute "Ruder Boskovic", Zagreb, Yugo.
RIC	102	RICE	Rice Institute, Houston, Texas
RIS	103	RISO	Risø, Roskilde, Denmark
RØS	104	ROSSENDORF	Rossendorf bei Dresden, Germany
RPI	105	RPI	Rensselaer Polytechnic Institute, Troy, N.Y.
RUM	106	RUMANIA	
SAC	107	SACLAY	C.E.N. - Saclay, Seine et Oise, France
SAH	108	SAHA	Saha Institute, Calcutta, India
SØC	109	SOCONY	Socony Mobil Oil Co., Dallas, Texas
SRL	110	SAVANNAH R.	DuPont Savannah River Lab., Aiken, South Carolina
STF	111	STANFORD	Stanford University, Menlo Park, Calif.
SWD	112	SWEDEN	
SWT	113	SWITZERLAND	
TAT	114	TATA	Tata Institute, Bombay, India
TEX	115	TEXAS U.	University of Texas, Austin, Texas
TNC	116	TEX. NUCLEAR	Texas Nuclear Corp., Austin, Texas
TUK	117	TURKEY	
UK	118	UNITED KING.	United Kingdom
UKR	119	UKRAINE	Ukrainian S.S.R.
UNC	120	UN. NUCLEAR	United Nuclear Corp., White Plains, N.Y.
VAL	121	VALLECITOS	G.E. - Vallecitos Atomic Lab., Pleasanton, California

Dictionary I:

INPUT DICTIONARY	INTERNAL NUMERICAL EQUIVALENT (DECIMAL)	OUTPUT DICTIONARY	LABORATORIES AND INSTITUTIONS
VIR	122	VIRGINIA	University of Virginia, Charlottesville
WAD	123	WRIGHT	Wright Air Development Center, Ohio
WES	124	WESTINGHOUSE	Westinghouse Research Lab. or Commercial Atomic Power Dep't, Pittsburgh, Pa., [not BETTIS]
WIN	125	WINFRITH	A.E.E., Winfrith, Dorset, England
WIS	126	U. WISCONSIN	University of Wisconsin, Madison
WUR	127	WÜRENLINGEN	Würenlingen, Switzerland
YAL	128	YALE	Yale University, New Haven, Connecticut
ZAG	129	ZAGREB	University of Zagreb, Yugoslavia
ZUR	130	ZURICH	Zurich, Switzerland [other than ETH]
ⓅⓅⓅ *	131	ⓅⓅⓅ	Not Given

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* Ⓟ = blank character

Dictionary J: Information Source/Category. One character

entry ((b) not allowed). [maximum 16.]

<u>INPUT</u> <u>DICTIONARY</u>	<u>INTERNAL</u> <u>NUMERICAL</u> <u>EQUIVALENT</u> <u>(DECIMAL)</u>	<u>OUTPUT</u> <u>DICTIONARY</u>	<u>INFORMATION SOURCE</u>
B	0	B	Book or Conference Proceedings
C	1	C	Book or Conference Proceedings - fortified by privately communicated information
J	2	J	Journal
K	3	K	Journal - fortified by privately communicated information
P	4	P	Preprint
R	5	R	Report
\$	6	\$	Report - fortified by privately communicated information
*	7	*	Scientific Meeting Abstract - as published
S	8	S	Scientific Meeting Abstract - fortified by private communication
T	9	T	Talk presentation during scientific meeting
U	10	U	"Private communication" written into someone else's publication
V	11	V	Verbal private communication to Sigma Center
W	12	W	Written private communication to Sigma Center
X	13	X	Pre-publication information not obtained directly from author
Y	14	Y	Information specifically labelled, "not to be published without permission from author"
Z	15	Z	Information that author requested not be released

Dictionary K: Journals. Since the input entry is

Stored without codification, no internal numerical equivalent is given. Journals are arranged in order of (approximate) frequency of usage.

<u>INPUT</u>	<u>OUTPUT</u>	<u>JOURNAL</u>
AP	ANN. OF PHYS	Annals of Physics (New York)
BAP	B.AM.PHY.SØC	Bull. Am. Phys. Soc. (Series II)
JET	SØV.PH.-JETP	Soviet Phys., JETP (Transl. of ZET)
JNE	J.NUC. ENERGY	J. Nucl. Energy. Pt. A+B, Reactor Sci. Tech. (UK)
NP	NUCL. PHYS.	Nuclear Phys. (Amsterdam)
PL	PHYS. LETTERS	Physics Letters (Amsterdam)
PPS	PRØC.PH.SØC.	Proc. Phys. Soc. (London)
PR	PHYS. REV.	Phys. Rev. (USA)
PRL	PHYS.REV.LET.	Phys. Rev. Letters (USA)
SJA	SØV. AT.EN.	Sov. (J.) At Energy (Translation of AE)
ZET	ZETF (USSR)	ZH. Eksper.Theor. Fiz. (USSR)
AE	AT.EN.(USSR)	Atomnaya Energiya (USSR)
CJP	CAN.J.PHYS.	Can. J. Phys. (Canada)
CR	CØMPT. REND.	Compt. Rend. (France)
DØK	DØKL.AK.NAUK	Dokl. Akad. Nauk S.S.S.R (USSR)
HPA	HELV.PHYS.A.	Helv. Phys.Acta (Switzerland)
JIN	J.IN.NUC.CH.	J.Inorg. Nucl. Chem. (UK)
JDR	J.D. PHYSIQUE	J. De Physique (et la Radium) (France)
NSE	NUC.SI.ENG.	Nuclear Sci. Eng. (USA)
PM	PHIL. MAG.	Phil. Mag. (UK)
AEJ	J.AT.EN.JAP.	J.At.Energy Sco. Japan (Nippon Genshiryoku Gakkaishi)
AF	ARKIV FYSIK	Arkiv för Fysik (Sweden)
AKE	ATØMKERN EN.	Atomkernenergie (Germany)
ANS	T.AM.NUC.SØC	Transactions Am. Nuclear Soc.

Dictionary K:

<u>INPUT</u>	<u>OUTPUT</u>	<u>JOURNAL</u>
AUJ	AUSTRAL.J.PH	Australian J. Phys.
BAS	B.AC.SC.USSR	Bull. Acad. Sci. USSR, Phys. Ser. (Columbia Transl.)
CJO	CAN.J.CHEM.	Can. J. Chem. (Canada)
IBK	I.B.KIDRICH	Bull. Inst. Nucl. Sci. "Boris Kidrich" (Yugoslavia)
IJP	IND.J.PHYS.	Indian J. Phys.
IZV	IZV.AK.NAUK	Izv. Akad. Nauk S. S. S. R., Ser. Fiz. (USSR)
JPJ	J.PH.SØC.JAP	J. Phys. Soc. Japan
KDV	KGL. DANSKE	Kgl. Danske Videnskab. Selskab, Mat.-Fyz. Medd (Denmark)
KE	KERNENERGIE	Kernenergie (Germany)
NC	NUØVØ CIM	Nuovo Cimento (Italy)
NIM	NUC.INST.MTH	Nuc. Instr. Methods (Amsterdam)
NSA	NUC.SCI.ABS.	Nuclear Science Abstracts (USA)
PHY	PHYSICA	Physica (Netherlands)
PIA	PROC.IND.AC.	Proc. Indian Acad. Sci., Section A
PRS	PRØC.RØY.SØC.	Proc. Roy. Soc. London (UK)
SCP	SC.PAP.TØKYØ	Sci. Papers Inst. Phys. Chem. Res. (Tokyo) (Japan)
SPD	SØV.PH.-DØKL	Soviet Physics-Doklady (Translation of DØK)
SPU	SØV.PH-USPKI	Soviet Physics-Uspekhi (Translation of UFN)
UFN	USPEKHI FIZ.	Uspekhi Fizik Nauk (USSR)
ZN	Z. NATURFØRS.	Z. Naturforschung (Germany)
ZP	Z. PHYSIK	Z. Physik (Germany)
ACR	ACTA CRYSTAL	Acta Crystallographica (Copenhagen)
ADP	ANN.D.PHYSIK	Annalen der Physik (Germany)
AHP	A. PHYS.HUNG.	Acta Phys. Hungaricae (Hungary)
APH	ANN.DE PHYS	Annales de Physique (France)
APP	A.PHYS.POL.	Acta Physica Polonica (Poland)
BCI	B.R.C. ISRAEL	Bull. Res. Council Israel, Section F.
BNE	J.BRIT.NUC.E	J. Brit. Nuclear Energy Soc. (UK)
BØS	T. BØSE RES.I	Trans. Bose Res. Inst. (Calcutta)

Dictionary K:

<u>INPUT</u>	<u>OUTPUT</u>	<u>JOURNAL</u>
CNT	CAN.NUC.TECH	Can. Nucl. Technol. (Canada)
EN	ENERGIA NUC.	Energia Nucleare (Italy)
ENF	ENERGIE NUCL	Energie Nucleaire (France)
ETP	EX.TECH.PHYS	Exptl. Tech. Physik (Germany)
FDP	FORTS. PHYSIK	Fortsch. Physik (Germany)
FT	FYSISK TIDS.	Fysisk Tidsskrift (Denmark)
IRE	IRE-NUC.SCI.	I.R.E. Trans. on Nucl. Sci. (USA)
JAP	J.APPL.PHYS.	J. Appl. Phys. (USA)
JBS	J.RES.N.B.S.	J. Res. Natl. Bur. Std. (USA)
JFI	J.FRANK.INST	J. Franklin Inst. (USA)
NAT	NATURE	Nature (London)
NAW	NEDERL.AKAD.	K. Ned. Akas. Wetensch., Proc. (Netherlands)
NE	NUCLEAR ENG.	Nuclear Engineering (UK)
NEA	NUC.ENG.ABS.	Nucl. Eng. Abstr. (UK)
NKA	NUKLEONIKA	Nucleonika (Poland)
NSJ	N.S.A. JAPAN	Nucl. Sci. Abstr., Japan
NUC	NUCLEONIS	Nucleonics (USA)
NUK	NUKLEONIK	Nucleonik (Germany)
NWS	NATURWISS.	Naturwissenschaften (Germany)
PA	PHYS. ABS.	Physics Abstracts (UK)
PJA	PRØC.JAP.AC.	Proc. Japan Academy
PNA	PRØC. NATL.AC	Proc. Nat'l Acad. Sci. (USA)
PND	PRØG.NUC.PH.	Prog. in Nucl. Phys. (USA)
PTP	PROG. THEO.PH	Progress Theoret. Physics (Japan)
REF	REF.ZH., FIZ.	Referativnyi Zhurnal, Fizika (USSR)
RIC	RICERCA SCI.	Recerca Scientifica (Italy)
RMP	REV.MØD.PHYG	Rev. Mod. Phys. (USA)
RPP	REP. PROG. PH.	Reports on Progress in Physics (UK)
RSI	REV. SCI. INST	Rev. Sci. Instr. (USA)
SAJ	S.AFR.J.SCI.	S. African J. Science
SPC	SOV. PH.-CRYST	Soviet Physics-Crystallography (Translation of KRI)

Dictionary K:

<u>INPUT</u>	<u>OUTPUT</u>	<u>JOURNAL</u>
SPT	SOV.PH.-TECH	Soviet Phys.-Tech. Phys. (Translation of ZTF)
ZAP	Z.ANG.PHYS	Zeits. Angewandte Physics (Germany)
ZK	Z. KRIST.	Z. Kristallographie (Germany)
AAB	AN.AC.BRASIL	An.Acad. Brasil.Cienc. (Brazil)
AAF	AN.AC.FENNIC	Ann.Acad. Sci. Fennicae, Series AVI (Physics)
ABS	AC.BELG.SCI.	Mem. Acad. Roy. Belgique, Cl. Sci. (Belgium)
ACJ	A.CHEM.SCAND	Acta Chem. Scandinavica (Denmark)
AHT	A. TECH. HUNG.	Acta Tech. (Acad. Sci.) Hungaricae (Hungary)
AIP	ADV. IN PHYS	Advances in Physics (Suppl. to Phil. Mag.) (UK)
AJ	ASTRØPHYS.J.	Astrophysical Journal (USA)
AJP	AM.J.PHYSICS	Am. J. Physics
AJS	AUSTRAL.J.SC.	Australian J. Sci.
APA	A.PHY.AUSTRIA	Acta Physica Austriaca (Austria)
APL	AP.PHYS. LETT	Appl. Phys. Letters (USA)
ARN	AN.REV.NUC.S	Annual Review of Nuclear Science (USA)
ARP	AC.ROM-S.PHY	Acad. Rep. Populare Romine, Studii Cercetari Fiz. (Roumania)
ARS	A.R.S.ESPAN.	An. Real Soc. Espan. Fis. Quim. (Spain)
APS	A. PØLY.SCAND	Acta Polytech. Scandinavica (Sweden)
AT	ATØMES	Atomes (France)
BCS	B.AC.R.BELG.	Bull. Acad. Roy. Belgique, Cl. Sci. (Belgium)
BJA	BR.J.AP.PHYS	Brit. J. Appl. Phys. (UK)
BPP	B.PØL. PHYS	Bull. Acad. Polon.Sci., Ser. Sci. Math. Astron. Phys. (Poland)
BPT	B.POL., TECH	Bull. Acad. Polon. Sci., Seri. Sci. Tech. (Poland)
CDP	CAHIERS PHYS	Cahiers Phys. (France)
CZC	CZECH COMM.	Collection of Czechoslovak Chemical Communications
CZJ	CZECH J.PHYS	Czech. J. Phys.
DA	DISSERT.ABST	Dissertation Abstr. (USA)
EXP	EXPERIENTIA	Experientia (Switzerland)

Dictionary K:

<u>INPUT</u>	<u>OUTPUT</u>	<u>JOURNAL</u>
JCP	J.CHEM.PHYS.	J.Chem. Phys. (USA)
JE	JADERNA EN.	Jaderna Energie (Czechoslovakia)
JNM	J.NUC.MAT'LS	J. Nucl. Materials (Amsterdam)
KRI	KRISTALLØG	Kristallografiya (USSR)
NCS	NUØ.CIM.SUP.	Nuovo Cimento Suppl. (Italy)
NF	NUCL. FUSIØN	Nuclear Fusion (Vienna)
NTN	NED.TIJD.NAT	Ned. Tijdschrift Natuurkunde (Netherlands)
NYA	N.Y.ACAD.SCI	Trans. N.Y. Academy of Sciences (USA)
ØAW	ØESTERR.AKAD	Øesterr. Akad. Wiss., Math-Naturw. Kl., Sitzungsberichte (Austria)
PB	PHYS. BLATTER	Phys. Blätter (Germany)
PCP	CAMB.PHIL.S.	Proc. Cambridge Phil. Soc. (UK)
PRE	P.R.S. EDIN.	Proc. Roy. Sco. Edinburgh (UK)
PZ	PHYSIK. Z.	Phys. Zeits. (Germany)
RMF	REV. MEX.FIS.	Rev. Mexicana Fis. (Mexico)
RR	RAD. RESEARCH	Radiation Research (USA)
RRJ	RES.REACTR.J	Research Reactor J. (USA)
RSE	R.S. EDIN., TR	Trans. Roy. Soc. Edinburgh (UK)
SCI	SCIENCE	Science (USA)
VAN	VEST.AK.NAUK	Vestnick Akad. Nuak S. S. S. R. (USSR)
ZMM	Z. MATH.MECH.	Z. Angew. Math. und Mech. (Germany)
ZMP	Z. MATH. PHYS.	Z. Angew. Math. Phys. (Switzerland)
ZPC	Z. PHYS. CHEM.	Z. Phys. Chem., Frankfurt (Germany)
ZTF	ZH.TEKH.FIZ.	Zh. Tekhn. Fiz. (USSR)
(*)	SEE COMMENT	(See comment for publication not listed in this dictionary)

Dictionary L: MONTHS. Input (one character) and output
(standard three letter abbreviation) are given ((b) allowed).

<u>INPUT</u> <u>DICTIONARY</u>	<u>INTERNAL</u> <u>NUMERICAL</u> <u>EQUIVALENT</u> <u>(DECIMAL)</u>	<u>OUTPUT</u> <u>DICTIONARY</u>
A	1	JAN
B	2	FEB
C	3	MAR
D	4	APR
E	5	MAY
F	6	JUN
G	7	JUL
H	8	AUG
I	9	SEP
J	10	OCT
K	11	NOV
L	12	DEC
(b)*	13	(b)(b)(b)

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* (b) = blank character

APPENDIX VII
SAMPLE INPUT AND OUTPUT

SAMPLE INPUT AND OUTPUT

1. The input then consists of the following cards
(See Appendix I)

06	NNG14.1	4.43 X	0.3	CS RICJPR	94 941 54E
06000ABZ.0253-6			4.4	M50SBHARRAERE R/R251657A	
06	NNG14.2		.19	CS NRLJPR	91 147653
06000NNG14.2	2.8 X		.036	CS NRLJPR	91 147653
06000ABS.0253-6			4.9 -3	M50SBHARRAERE R/R251657 1	
06000 BASED ON G-FACTOR=1.000, STD. BORON, ABS(TH)=766.6					
06000NNG14.2	6.0 X		.002	CS NRLJPR	91 147653
06000SIN14.			.52 -2	L SS LASJPR	97 1205550
06000NNG14.2	7.0 X		.002	CS NRLJPR	91 147653
06000NNG14.2	4.45 X		.069	CS NRLJPR	91 147653

[illegible]

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Appendix VII

2. The following is the printed output from SPASM. One card was rejected because of an error in cols. 6-8, the cross section type

EXECUTION

THE FOLLOWING DATA IS IN ERROR

ERROR A23

06000ABZ.0253-6

4.4

M50SBHARRAERE R/R251657A

THE FOLLOWING Z,A WERE PRE-PROCESSED IN THIS RUN
06000 8

TOTAL DATA LINES ACCEPTED THIS RUN 0008
TOTAL DATA LINES REJECTED THIS RUN 0001

TAPES GENERATED IN RUN 001

END OF CURRENT MERGE RUN

Appendix VII

3. After the SPASM run, the accepted data has been merged onto the library. The following is a listing of two records from the library tape--the record for (Z,A)=(06,000) and its associated comment record. (See Appendix II, and Figure 3)

000000162	142716512000	144533560000	271426501150	222773200244	000000364000	212551256051	615102050106
662700000	314212560000	020670500130	001651400357	504327044000	475160606011	046011040160	244656700000
212560000	020673600130	001121600257	000000364000	475160606011	016001040706	244656700000	270212560000
673600130	212145001257	502620050000	475160606011	016001040706	244656700000	270212560000	020673600130
154201257	504341044000	475160606011	016001040706	244656700000	270212560000	020673600130	221161002357
000050000	475160606011	016001040706	244656700000	270212560000	020673600130	221161002357	507000050000
160606011	016001040706	334671700000	210250560000	020665400230	003131000250	000000364004	475160606011
001020005							
11 RECORD	HAS 0342 CHARACTERS						
000000030	212551256051	615102050111	216225246046	456027402621	236346511301	330000007360	626324336022
146457360	212262746330	341307060633	066060605353	606060606060	606060606060	606060606060	
12 RECORD	HAS 0090 CHARACTERS						

Appendix VII

4. If at some future date one wished to run RETREV to get a print of all data on the library with (Z,A)=(06,000) the control and request cards might look as follows

PRINT   OUTPUT FOR (Z,A) = (06,000)   DATE OF REQUEST   6/1/64

206 \$ 1000)

[illegible]

Appendix VII

5. The result of retrieve in the PRINT mode with no Reference Sort, and no comment suppression would be as follows

Z06 \$ A000)
PRINT OUTPUT FOR (Z,A) = (06,000) DATE OF REQUEST 6/1/64

5 000 ABSORPTION	.0253-6 MEV		4.9 -3	M 5 058 HARWELL	R AERE R/R2516	57
5 000 N,N GAMMA	14.1 +0 MEV	4.43 x	.3 +0	5 CS RICE	J PHYS. REV.	94 941 54MAY
5 000 N,N GAMMA	14.2 +0 MEV		.19 +0	5 CS USNRL	J PHYS. REV.	91 1476 53
5 000 N,N GAMMA	14.2 +0 MEV	2.8 x	.036 +0	5 CS	J	53
5 000 N,N GAMMA	14.2 +0 MEV	4.45 x	.069 +0	5 CS	J	53
5 000 N,N GAMMA	14.2 +0 MEV	6.0 x	.002 +0	5 CS	J	53
5 000 N,N GAMMA	14.2 +0 MEV	7.0 x	.002 +0	5 CS	J	53
5 000 INELASTIC SC	14. +0 MEV		.52 +0	002L 5 SS LOS ALAMOS	J PHYS. REV.	97 1205 55MAR

AERE R/R251

BASED ON G-FACTOR=1.000, STD. BORON, ABS(TH)=766.6