ENDF

Evaluated Nuclear Data File

Description and Specifications

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Preface

A series of formats and specifications such as contained in this report are constantly revised and updated as errors are found and new material is added. Indeed, the reader will find that several sections have yet to be prepared. To facilitate the updating, this report has been prepared in a loose leaf form and the pages have been numbered within major sections. When other sections have been completed, they will be distributed and can easily be inserted or replace obsolete sections.
Acknowledgments

The work reported in this document is a collection of the suggestions and ideas of many people who participated in a series of three meetings held to develop an Evaluated Nuclear Data File (ENDF). The names and affiliations of these people are listed below.

Three people deserve particular mention: Jack Chernick of BNL for his support and encouragement; Paul Michael of BNL for the many lunch hours spent discussing the ENDF; and Ken Parker of Aldermaston for his help in assigning reaction classifications. The Aldermaston/Winfirth data file developed by Dr. Parker served as a model for the ENDF reported here and many features have been incorporated without alteration.

The author would like to thank the Reactor Mathematics and Computation Division of the American Nuclear Society for their cooperation, support, and sponsorship of the first two discussion meetings.

Finally, the author would not be involved with the ENDF were it not for a stimulating evening at the Colony Restaurant in Washington, D. C. with Al Henry of Westinghouse and George Joanou of General Atomic. The discussion that evening led to requesting the RMC division to sponsor the meetings.

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1. Introduction

This report is a description of a punched card/magnetic tape system for storing and distributing evaluated nuclear data. In the next few sections of this introduction we will describe some of the background of this work, define evaluated data, discuss the general design philosophy, and finally discuss the development of the system.

1.1 Review of the Discussion Meetings

Historically, the preparation of nuclear data (cross sections, etc.) for use in reactor calculations has been done by the individual laboratory stressing its own needs for materials, cross section types, and energy ranges. Each laboratory has developed its own methods for the storage and retrieval of this data. There is a need for a common link, an Evaluated Nuclear Data File (ENDF), between these existing systems. The Reactor Mathematics and Computation (RMC) division of the American Nuclear Society has sponsored two meetings to discuss this common link.

On July 19, 1963, a group of eighteen representatives from fifteen U.S. laboratories met in New York City to review existing cross section libraries and discuss means for interchanging these libraries. A subcommittee was appointed and met at Hanford on September 18-20, 1963 to examine library formats in more detail. The conclusions of these discussions were:

1. A need exists for a standard format for evaluated nuclear data.
2. The format should be as flexible as possible so that existing libraries can be translated into the standard format.

3. The format should be as flexible as possible so that future needs can be easily incorporated.

4. A center should be established and charged with the development and maintenance of the ENDF, and the collection and distribution of data.

Following these meetings a preliminary report containing detailed formats for the ENDF was prepared and sent to about 20 laboratories for review and comment. A group of 22 people were invited to attend a final meeting at BNL on May 4-5, 1964 to discuss changes in the preliminary formats and settle on a final version.

1.2 Definition of Evaluated Data

Much of the discussion concerning nuclear data and its role in reactor calculation is summarized in the flow diagram of Figure 1. The results of measurement and calculation of cross section are presently being collected at the BNL Sigma Center and are being stored on punched cards and magnetic tape. This raw data is then available to groups for evaluation. The evaluated data is sent to an ENDF center. From here it can be sent to individual laboratories and used to make up individual master libraries, special purpose libraries, and finally used in reactor codes. Note that the ENDF does not replace existing master libraries but forms a common link between them.

The distinction between raw and evaluated data is somewhat tenuous. A set of experimental points is raw data. If
Figure 1
someone draws a smooth curve through the points and reports a set of points from the smooth curve and a rule for interpolation, this is evaluated data. For the purposes of the ENDF, we adopt a mathematical definition: Evaluated data is a complete description of a function within a given domain. For example, for a given range of incident neutron energies, the data must be given such that a cross section can be calculated at every interior point in the range. This can be accomplished by giving a set of discrete values plus an interpolation formula, or by giving the coefficients of a built-in analytical expression. Thus, we visualize the data as a mathematical function, \( y(x_1, x_2, x_3 \ldots) \), where \( y \) can be a cross section, a probability, etc., and the \( x_1, x_2, x_3 \) are the variables incident energy, final energy, angle, etc. These variables have been ordered in such a way that, in a tabulation, \( x_1 \) is the most rapidly moving variable, \( x_2 \) is the next rapidly moving, and so on.

1.3 Design Philosophy

If the ENDF is to serve as a common link between libraries, it must be highly flexible and be able to accept nearly all existing data with a minimum of rearrangement. If this goal can be met, then translation from tape to tape of an existing library to the ENDF will be practical.

Flexibility is also essential if the ENDF is to easily accommodate future data. At present most data is in the form of \( \sigma(E) \) and \( \sigma(E,\mu) \). More complex reactions such as \( \sigma(E^1 - E,\mu) \) and multiparticle correlation functions are now being measured and computed by nuclear model calculations. The ENDF must be able to handle these multidimensional functions. The quantity
of data required to tabulate a multidimensional function could easily become so vast that it would be impractical to include it in the ENDF. There is hope, however, that much of this data can be fit with analytic forms. Thus the ENDF should be able to handle analytic as well as tabulated data.

The smallest unit of data which will be distributed is called a Data Record. The Data Record should contain sufficient Hollerith information to identify the data. The Data Record should also contain numerical data equivalent to the Hollerith information. Dictionaries are then required which have the advantage that they are easily extended to meet future needs.

To meet the above requirements, the ENDF formats will not be simple and this will be the main objection to the ENDF. Two steps will be taken to minimize difficulties caused by the complexity of the formats. First, a set of retrieval subroutines will be written which will decode the formats. They will be written in Fortran II and should be useable by most installations. The need for each installation to write their own retrieval system can be largely eliminated. A second step is to use a simplified sub-set of the formats. The sub-set (Version B) could be obtained by automatic translation from the complete formats (Version A).
2. General Description of the ENDF

A brief description of the ENDF will be given in the following pages. Detailed formats are given in Section 4.

The unit of data which we consider is called a Data Record and is defined as the data for a given
1. Isotope,
2. Reaction,
3. Range of incident energy, and
4. Evaluation.

Thus, the fission cross section of U\textsuperscript{235} between 0 and 10 ev obtained from the smooth curve in BNL 325 could be contained in a Data Record. All data included in the ENDF must be in the form of Data Records.

From a mathematical point of view, a Data Record contains a function \( y(x_1, x_2, x_3, \ldots) \). For example, \( \sigma(E), S(\alpha, \beta), c(E, \mu), c(E'-E, \mu), P(E'-E), \) etc. Thus, \( y \) may be a cross section, a probability, the thermal scattering law, or even \( \sqrt{E} \) times a cross section. The variables \( x_1, x_2, \ldots \) are associated with the variables \( E, E', \mu, \alpha, \beta, T, \) etc. The order in which these variables are listed is important, for in a tabulation, \( x_1 \) is the most rapidly moving variable, \( x_2 \) the next most rapidly moving, and so on. As an example, consider the elastic angular distribution, \( \sigma(E, \mu) \). Associate \( y \) with \( \sigma \), \( x_1 \) with \( E \), and \( x_2 \) with \( \mu \). This implies that the data is arranged as follows.

\[
\sigma(E_1, \mu_1), \sigma(E_2, \mu_1), \sigma(E_3, \mu_1), \ldots, \sigma(E_n, \mu_1) \\
\sigma(E_1, \mu_2), \sigma(E_2, \mu_2), \sigma(E_3, \mu_2), \ldots, \sigma(E_n, \mu_2) \\
\ldots \ldots \ldots \ldots \ldots \ldots
\]
\[ \sigma(E_n, \mu_n), \sigma(E_2, \mu_n), \sigma(E_3, \mu_n), \ldots, \sigma(E_m, \mu_n) \]

If we had written \( \sigma(\mu, E) \), the arrangement would be

\[ \sigma(E_1, \mu_1), \sigma(E_1, \mu_2), \sigma(E_1, \mu_3), \ldots, \sigma(E_1, \mu_m) \]

\[ \sigma(E_2, \mu_1), \sigma(E_2, \mu_2), \sigma(E_2, \mu_3), \ldots, \sigma(E_2, \mu_m) \]

\[ \ldots \]

\[ \sigma(E_n, \mu_1), \sigma(E_n, \mu_2), \sigma(E_n, \mu_3), \ldots, \sigma(E_n, \mu_m) \]

2.1 Storage and Transmission of Data Records

A Data Record exists physically as a deck of punched IBM cards. An ENDF Center will be established at BNL where the Data Records will be received and stored on magnetic tape. A schematic of this process and the distribution of data to individual installations is shown in Figure 2. A similar process at the individual installation is shown in Figure 3.

When a Data Record is received at the ENDF Center, a permanent identification number is assigned. This identification is in the form of an alphabetic character and a four digit number. The first Data Record received will be assigned the number A0001, the second A0002, etc. Periodically the ENDF Center will send out a Newsletter which will list the identification numbers on the Master Library Tape and a brief description of the contents of each Data Record. Data can be obtained from the ENDF Center by sending a list of the desired identification numbers and a magnetic tape.
**ENDF Center Operation**

Data Records on tape or cards from evaluator.
Order: random
Format: BCD card images

Program to put Data Records on Master Library tapes.

Master Library tapes.
Order: as received
Format: Packed card images

Program to read selected Data Records from Master Library tapes and write them on requestors tapes.

Requestors tape.
Order: Same as Master Library tape.
Format: Packed or unpacked card images.
**Individual Installation Operation**

Requestors tape from ENDF Center.
Order: Same as Master Library tape
Format: Packed or unpacked card images

Program to write packed or unpacked Data Records on Library tapes.

Installation Library tapes.
Order: Arbitrary
Format: Packed card images

Program to read selected Data Records from Library tapes and old Working Tape, order them, and write them on a new Working Tape.

Working Tape.
Order: Increasing Z, A, reaction type, and data type
Format: Card images

 Retrieval Program to read Data Records into memory, unscramble formats, process data, form averages, etc.

*Figure 3*
Individual installations will probably maintain library tapes similar in format to those at the ENDF Center but with fewer Data Records. Selected records can be taken from these library tapes, ordered, and placed on a working tape. The working tape can also be made up directly from Data Records on cards. The working tape is then used as input data to the retrieved programs which will compute the cross sections (or averages) needed in later reactor calculations.

2.2 Organization of a Data Record

A Data Record is defined by giving the following information:

1. The isotope or material, i.e., $^{235}\text{U}$
2. The general reaction type, i.e., elastic scattering
3. Specific information concerning what data is given for this reaction and the secondary particles involved, i.e., angular distribution for the secondary neutron
4. The range of incident particle energies, i.e., 1-10 Mev.
5. The source of the evaluated data, i.e., reference to a report describing the data and evaluation procedures.

A separate Data Record must be used when any of this information changes. This information is given on a set of cards called Heading Cards.

The data for a reaction can be given as a set of parameters (i.e., resonance parameters) or as a data tabulation. We consider the data to describe a function of the form

$$y_s(x_1, x_2, \ldots) = y_{s1}(x_1, x_2, \ldots), \quad E_1 \leq E < E_2$$
\( = y_{s2}(x_1, x_2, \ldots) \), \( E_2 \leq E < E_3 \)

etc.

For example, consider the \((n,2n)\) reaction. There are two secondary particles; \(S=1\) might refer to the first neutron, and \(S=2\) might refer to the second neutron. The data for either neutron may be further subdivided by energy ranges having limits of \(E_1\), \(E_2\), \(E_3\), etc. The function \(y_{sn}(x_1, x_2, \ldots)\) is contained in a Data Block. The structure of a Data Record is shown in Figure 4. The control cards SEC and ENR will be described more fully in later sections.

2.3 The Heading Cards

The first few cards of each Data Record are called the Heading Cards. There may be between 4 and 15 of these cards.

The first Heading Card gives a full description of the Data Record in Hollerith. These cards are easily read, and a listing of the first Heading Cards of all Data Records on a library tape would provide complete documentation of the tape. Some examples are shown in Figure 5. The first Heading Card is divided into six major areas.

1. Isotope or material identification. (Cols. 1-5)
2. Physical description of the reaction. (Cols. 7-25)

Example: \((N, \text{INELAS})\) \(1,N \text{ AECR}\)

The symbol \text{INELAS} is the reaction type and denotes inelastic scattering. Other types such as elastic (\text{ELAST}), fission (\text{FISS}) are listed in Dictionary 3. The first character inside the parenthesis is the incident particle type (\(N\) meaning neutron in this case). Other particle types are given in Dictionary 2. The integer following the parenthesis is the final state number, in this case
Structure of a Data Record

Heading Cards

SEC Control card for 1st secondary particle

ENR Control card for 1st energy range, 1st secondary particle

Data Block for 1st energy range, 1st secondary particle

ENR Control card for 2nd energy range, 1st secondary particle

Data Block for 2nd energy range, 1st secondary particle

...

ENR Control card for last energy range, 1st secondary particle

Data Block for last energy range, 1st secondary particle

SEC Control card for 2nd secondary particle

ENR Control card for 1st energy range, 2nd secondary particle

Data Block for 1st energy range, 2nd secondary particle

...

ENR Control card for last energy range, last secondary particle

Data Block for last energy range, last secondary particle

END Card

Figure 4
<table>
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<tr>
<th>Code</th>
<th>Description</th>
<th>Reasoner</th>
<th>Data</th>
<th>Date</th>
<th>Value</th>
<th>Additional Information</th>
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<tr>
<td>U238</td>
<td>(N, TOTAL)</td>
<td>CROS</td>
<td>C(EI)</td>
<td>BNL</td>
<td>10/62 1.000+2 2.000+6</td>
<td>EVA0267001</td>
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<td>(N, ELAST)</td>
<td>N CROS</td>
<td>C(EI)</td>
<td>BNL</td>
<td>11/62 1.000+0 1.500+6</td>
<td>EVA0268001</td>
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<td>U238</td>
<td>(N, ANGD)</td>
<td>N ANGD</td>
<td>C(EI, CL)</td>
<td>ANL</td>
<td>9/61 1.000-2 1.500+0</td>
<td>OMEVA03 1</td>
</tr>
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<td>PU239</td>
<td>(N, NOVEL)</td>
<td>N CROS</td>
<td>C(EI)</td>
<td>BNL</td>
<td>4/63 2.000-2 1.500+0</td>
<td>OMEVA0597001</td>
</tr>
<tr>
<td>U238</td>
<td>(N, INELAS)</td>
<td>2 N CROS</td>
<td>C(EI)</td>
<td>MB</td>
<td>4/63 0.100-0 1.000+1</td>
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<td>ENED</td>
<td>C(EI, EF)</td>
<td>BNL</td>
<td>5/63 0.100-0 1.000+0</td>
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<td>(N, INELAS)99 N</td>
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<td>BNL</td>
<td>5/63 0.100-0 1.000+1</td>
<td>OMEVA0601001</td>
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<tr>
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<td>N ENED</td>
<td>C(EI, EF)</td>
<td>GA6034</td>
<td>10/63 1.000-1 1.000+1</td>
<td>OMEVA0604001</td>
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<td>CROS</td>
<td>C(EI)</td>
<td>BNL</td>
<td>7/62 1.000-1 1.000+1</td>
<td>OMEVA0603001</td>
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<tr>
<td>U235</td>
<td>(N, NF)</td>
<td>N CROS</td>
<td>C(EI)</td>
<td>ANL</td>
<td>6/62 1.000-1 1.000+1</td>
<td>OMEVA0605001</td>
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<td>N CROS</td>
<td>C(EI)</td>
<td>BNL</td>
<td>12/63 1.000-1 1.000+1</td>
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</tr>
<tr>
<td>U235</td>
<td>(N, FISS)</td>
<td>N ENED</td>
<td>P(EF)</td>
<td>LAS</td>
<td>7/61 1.000-1 1.000+1</td>
<td>OMEVA0607001</td>
</tr>
<tr>
<td>U238</td>
<td>(N, 3NA)</td>
<td>N CROS</td>
<td>C(EI)</td>
<td>BNL</td>
<td>8/62 1.000-1 1.000+1</td>
<td>OMEVA0608001</td>
</tr>
</tbody>
</table>
indicating the nucleus is left in the 1st excited state. The next character denotes the secondary particle, in this case a neutron. The term AECR describes the type of data given (in this case angle-energy correlation). Other types such as angular distribution (ANGD), energy distribution (ENED), cross section (CRØS) are given in Dictionary 5.

3. Mathematical description of the data. (Cols. 7-39)
Example: C(CL,EF,EI)MB

The symbol C(CL,EF,EI) defines the mathematical function \( y(x_1, x_2, x_3) \) and is read \( \sigma(\mu_L, E_F, E_i) \). Thus \( x_1 \) is defined to be \( \mu_L \) (CL means cos \( \theta \), lab system), \( x_2 \) is \( E_F \) (EF means final energy), \( x_3 \) is \( E_i \) (EI means initial energy). A list of the various forms \( x \) is given in Dictionary 6. The symbol C is interpreted as \( \sigma \). Other forms are given in Dictionary 4. The final symbol MB gives the units of \( \sigma \) (milli barns in this case). Other units are given in Dictionary 7.

4. Source of evaluated data. (Cols. 41-53)
Example: BNL 8412 10/63

The first three characters define the laboratory where the data was evaluated (see Dictionary 9). The following four digit number is to be assigned by the evaluator. The last characters are the date (month/year) of the evaluation.

5. Range of incident energy. (Cols. 55-72)
Example: 1.000-6 1.000+2MEV

The range illustrated here is \( 10^{-6} \) to 100 Mev. Other codes
for energy units are given in Dictionary 8.

6. Final reference and sequence numbers.  (Cols. 73-80)
   Example:  A2693 001
   The first five characters is the identification number
   assigned by the ENDF Center.  When the deck is originally
   prepared, column 73 should be left blank, and 74-77
   should contain the same number as in item 4. above
   (i.e., 8412).

   The next three Heading cards are all numeric and contain the
   following information:

   1. Number of cards in the Data Record.
   2. Number of different secondary particle distributions given.
   3. A code describing the format for punching data cards.
   4. The number of comment cards used (≤ 10).
   5. The numerical equivalents (via the dictionaries) of all
      Hollerith fields on the first Heading card.
   6. Atomic weight (C12 scale).
   7. Reaction Q value.
   8. Temperature.
   9. Scale factor for all data in record.

   The fifth Heading card is optional.  If the evaluator wishes
   to punch his data cards in a format not given in Dictionary 16,
   the format is given on the fifth Heading card.

   The remaining Heading cards (up to 10 of them) are comment
   cards and should contain a complete description of the evaluation,
   references, evaluators names, etc.  Every effort should be made
   to make the information on these cards as complete as possible.
2.4 Control Cards

Two types of control cards were illustrated in Figure 4. These were the SEC (secondary particle) and ENR (energy range) control cards. There are also two other major control cards, the PDC (partial distribution) and END (end) control cards.

If more than one secondary particle distribution is given, the data for each secondary particle distribution must be preceded by a SEC card. The information given on this card is:
1. The number of this secondary particle distribution.
2. The total number of secondary particle distributions given.

If the energy range given in the Heading card is to be subdivided, and data given for each subrange, an ENR card must head the data for each range. The information given on this card is:
1. The number of this energy range.
2. Total number of energy ranges given for this particle.
3. Upper and lower energy limits of this range.

If a distribution is to be represented as the sum of partial distributions, a PDC card must head the data for each distribution. The information given on this card is:
1. The number of this partial distribution.
2. Total number of partial distributions given for this particle in this energy range.
3. The probability for this partial distribution.

The last card in a Data Record must be an END card. When processed by the ENDF Center, the END card will contain a form of "checksum" of the Data Record to insure the future integrity of the deck.
Each of the control cards (except the END card) may be followed by up to 10 comment cards which can be used to further describe the secondary particle, energy range, or partial distribution.

A second class of control cards are the Data Control Cards (DCC) which are used in a Data Block. These cards are described in the following section.

2.5 Data Blocks

There are a variety of different Data Block types.

1. One dimensional tabulated function
2. Two " " "
3. Three " " "
4. Four " " "
5. Five " " "
6. One dimensional analytic function
7. Two " " "
8. Three " " "
9. Discrete (delta) function
10. Reduced variable
11. Resolved resonance parameters
12. Unresolved " "
13. Isotope production data

Each Data Block is headed by a Data Control Card (DCC).

The information given (where appropriate) on a DCC is:

1. The symbol DCC and the Data Block type number.
2. Description of how data is arranged in the block.
3. Interpolation code (Dictionary 17).
4. Number of constants.
5. Length of data block.
6. Value of next higher order variable.

In certain cases the tabulated values of a function do not give a complete description of the function. For example, a common way to write the thermal scattering law is:

\[ S(\alpha, \beta) = S^*(\alpha, \beta) + e^{-\lambda \alpha} \delta(\beta) \]

The \( S^*(\alpha, \beta) \) is tabulated and \( \lambda \) is given on a Constants card. These Constants cards will be more important when analytic functions are discussed.

2.5.1 Data Blocks for tabulated functions

The notation \( y(x_1, x_2, x_3, \ldots) \) implies that \( x_1 \) is the fastest moving variable, \( x_2 \) is the next most rapidly moving variable, etc. Thus a two dimensional function \( y(x_1, x_2) \) is a set of one dimensional functions \( y(x_1) \), each at a different value of \( x_2 \). In the same way, an \( n \) dimensional function is a set of \( n-1 \) dimensional functions. In Figure 6 the Data Block for a one dimensional tabulated function is shown. The first card is a DCC 1 (DCC type 1) and the remaining cards have the tabulated values of \( y \) and \( x_1 \). A wide variety of ordering of this data is allowed. The Data Block for a tabulated two dimensional function \( y(x_1, x_2) \) is shown in Figure 7 and is simply a DCC 2 card followed by Data Blocks for one dimensional tabulated functions each at successive values of \( x_2 \). It is obvious how higher order functions are built up. Note that in Figure 8a a three dimensional function \( y(x_1, x_2', x_3) \) is shown. The tabulated aspect of the data refers only to the variable \( x_3 \). The \( y(x_1, x_2) \) at a given \( x_3 \) may be analytic in \( x_2 \) and \( x_1 \).
a. Data Block for tabulated $y(x_1)$

DCC1 Control Card
Constants
Tabulated values of $y$ and $x$

b. Data Block for analytic $y(x_1)$

DCC6 Control Card
Constants
Parameters for $y(x_1)$

c. Data Block for analytic $y(x_1, x_2)$

DCC7 Control Card
Constants
Parameters for $y(x_1, x_2)$

Figure 6
2.5.2 Data Blocks for Analytical Functions

If \( y(x_1) \) is an analytic function, for example, a Legendre expansion

\[
y(x_1) = \sum_{n=0}^{N} A_n P_n(x_1)
\]

the required data is \( N, A_0, A_1, \ldots, A_N \). This data is divided into constants \( (c_n) \) and parameters \( (p_n) \). In this case the constant is \( c_1 = N \) and the parameters are \( p_1 = A_0, p_2 = A_1, \ldots \). The distinction between constants and parameters is that parameters may be a function of lower order variables and constants cannot. For example

\[
y(x_1, x_2) = \sum_{n=0}^{N} A_n(x_1) P_n(x_2)
\]

The Data Block for an analytic \( y(x_1) \) is illustrated in Figure 6D. The \( c_n \) and \( p_n \) are on separate sets of cards and if the \( p_n \) are functions of lower order variables (as in Figure 8b) a separate Data Block is used for each \( p_n \).

To illustrate the various permutations that may be of interest, consider the elastic scattering cross section \( \sigma(\mu, E) \).

1. \( \sigma(\mu, E) = \sum_{n=0}^{N} A_n(E) P_n(\mu), A_n(E) \) tabular

Identify \( x_1 = \mu, x_2 = E \). Figure 7 is appropriate. The data order is:

\( A_0(E_1), A_1(E_1), A_2(E_1) \ldots \)
\( A_0(E_2), A_1(E_2), \ldots \)

.............

.............
Data Block for tabulated $y(x_1, x_2)$

DCC2 Control Card

Constants

DCC1 Control Card for first value of $x_2$

Constants

Tabulation of $y(x_1)$ at first value of $x_2$


DCC1 Control Card for last value of $x_2$

Constants

Tabulation of $y(x_1)$ at last value of $x_2$

or equivalently

DCC2 Control Card

Constants

Data Block for $y(x_1)$ at first value of $x_2$


Data Block for $y(x_1)$ at last value of $x_2$

Figure 7
a. Data Block for tabulated $y(x_1, x_2, x_3)$

DCC3 Control Card

Constants

Data Block for $y(x_1, x_2)$ at first value of $x_3$

Data Block for $y(x_1, x_2)$ at last value of $x_3$

b. Data Block for $y(x_1, x_2)$ analytic with respect to $x_2$

DCC6 Control Card

Constants

Data Block for first parameter, $p_1(x_1)$

Data Block for last parameter, $p_n(x_1)$

Figure 8
2. \( \sigma(E, \mu) = \sum_{n=0}^{N} A_n(E) P_n(\mu), A_n(E) \) tabular

Identify \( x_1 = E, x_2 = \mu \). Figure 8b is appropriate.

The data order is:

\[ A_0(E_1'), A_0(E_2'), A_0(E_3') \ldots \]
\[ A_1(E_1'), A_1(E_2'), A_1(E_3') \ldots \]

\[ \ldots \ldots \]

In this case it is not necessary that \( E_1 = E_1', E_2 = E_2', \) etc.

The following one dimensional analytic forms are available:

1. Power series
2. Two forms of a Legendre expansion
3. Rational approximation (ratio of two power series)
4. Two types of fission spectra
5. Single B-W formula with interference and a polynomial correction term

6.
7.
8.
9.

The following two dimensional analytic forms are available:

1. Double series expansion
2.
3.
4.
5.

2.5.3 Data Blocks for other nuclear data

Three other types of nuclear data can be specified by DCC's:
resolved resonance parameters, unresolved resonance parameters, and
isotope production data.

The following formulas for resolved resonances are included:

1. Breit-Wigner formula for a single isolated level involving \( \ell = 0 \) neutrons.
2. Breit-Wigner formula for \( \ell = 0 \) neutrons and many levels when elastic scattering and radiative capture are the only important processes.
3. The Reich-Moore formula
4. The Vogt formula
5. Multilevel formula for neutrons of all \( \ell \) in the case when only elastic scattering need be considered
6. Breit-Wigner formula for a single isolated level involving neutrons of any \( \ell \)
7. The Adler formula
8.
9.

The isotope production data contains the following information:

1. Isotopes produced by first and second decay of this isotope
2. Isotopes produced by various nuclear reactions and the isotopes produced by first and second decay of these products
3. Fission product yields
4. Decay constants

2.5.4 Partial Distributions

The function contained in a Data Block may be represented as the sum of partial distributions. A PDC card must precede each Data Block representing a partial distribution. An example is shown in Figure 9.
Data Block for tabulated $y(x_1, x_2)$

DCC2 Control Card
Constants

PDC Card for first distribution, first value of $x_2$
Data block for $y(x_1)$ at first value of $x_2$ for the first distribution

PDC Card for last distribution, first value of $x_2$
Data block for $y(x_1)$ at first value of $x_2$ for the last distribution

PDC Card for the first distribution, second value of $x_2$
Data block for $y(x_1)$ at the second value of $x_2$ for the first distribution

PDC Card for the last distribution, last value of $x_2$
Data Block for $y(x_1)$ at the last value of $x_2$ for the last distribution

Figure 9
2.6 Versions of the ENDF

The ENDF cards will usually be prepared according to the detailed specifications given in Section 4. These cards will be called Version A and will contain considerable Hollerith information, and be quite general in format and units. The writing of an effective retrieval system for the data is greatly simplified if the data were more standardized. Thus it is envisioned that Version A decks will be converted automatically to another version, Version B. This conversion will be done by the ENDF center. The specifications for Version B are by no means complete, but the following are the anticipated alterations.

1. All Hollerith information will have an equivalent numeric representation. Appropriate fields have been provided for on Version A cards but they may be left blank originally.

2. Energy units will be electron volts and cross section units will be barns and brans/steradian.

3. All comment cards will be deleted except for those in the Heading Cards.

4. Data cards shall have a fixed format.

5. The data for a one dimensional tabulated function shall be put in the form of $E_1$, $\sigma_1$, $E_2$, $\sigma_2$, etc., that is, in energy-cross section pairs.

2.7 Error Detection

Considerable care must be taken to insure that the data is free from errors and that errors are not introduced during the various manipulations and distribution of the data records. Binary records on tape will always have a logical checksum associated with them. This checksum combined with the usual redundancy checking should be sufficient. A similar technique
will be used for BCD information on cards or tape. The last card in a Data Record will have the symbol END punched in the first three columns. The remainder of the card will contain a character count (Modulo 8) of the entire Data Record.

The problem of insuring that the original data is free from errors is quite difficult. Various methods have been used for other libraries and it is anticipated that the more successful of these will be applied to the ENDF.
3. ENDF Computer Programs

Two classes of computer programs are needed for the ENDF. The first class will consist of programs to manipulate, print, edit, copy, and correct complete Data Records. The programs are called Service Routines and are designated by the symbol DFSR (Data File Service Routine). The second class of programs will take a Data Record, unscramble it, and compute desired values or averages of the data. The programs are called the Retrieval Routines and are designated by the symbol DFRR (Data File Retrieval Routine).

3.1 Service Routines

The Service Routines are concerned mainly with Data Records as complete units and rarely are concerned with the details within a Data Record. They are used to move Data Records from cards to tapes, tapes to tapes, and tapes to cards. In all of the manipulation, the Data Record is in the form of card images.

The following routines are needed (also refer to Figures 2 and 3 in Section 2).

**DFSR1** - Takes Data Records from cards or input tape and puts them on a Master Library tape in the form of packed card images. Various checking and sequencing operations are also done.

**DFSR2** - Reads selected Data Records from the Master Library tape and puts them on a requestors tape in the form of packed or unpacked card images.
**DFSR3** - Makes corrections on the Master Library tape. These corrections may be individual cards or complete Data Records.

**DFSR4** - Print/punch/copy selected portions of the Master Library tape.

**DFSR5** - Prints a list describing what Data Records are on the Master Library tape. This list is ordered by isotope, reaction type, and type of data given.

**DFSR6** - Takes Data Records received at an individual installation from the ENDF center and creates a Library tape for the installation.

**DFSR7** - Select Data Records from the installation Library, order them by isotope, reaction type, and data type and place them on a working tape which will be input to the Retrieval Routines.

The first five programs are intended for the ENDF center and are written largely in Fortran II. The last two programs are used at individual installations and are written entirely in Fortran II.

### 3.2 Retrieval Routines

The Retrieval Routines will be written entirely in Fortran II and will be in the form of subroutines. Users will then write a control program using the Retrieval Routines which will prepare the data in the form they want. The specifications for the Retrieval Routines have not been completed but the following description should provide a rough indication of how they can be used.
The users program calls the retrieval subroutine and provides a list of arguments. These arguments will be:

1. A description of what Data Records are to be used.
   For example, the sequence 0.001, A0256, 10.0, A0392, 1000., A0256, 1.0E+7 might indicate that in the range of incident energies from 0.001 ev to 10 ev, Data Record A0256 is to be used, from 10 to 1000 ev Data Record A0392 is to be used. An alternate description might be "use what is on the working tape in the order that exists there".

2. A description of what information is desired.
   The request might be for:
   a. the data as it stands
   b. values of the function at given values of the arguments
   c. averages of the data given a weighting function

3. Input data to the retrieval subroutine. When required, this would be values of the arguments (for 2b above), or energy ranges and weights (for 2c above).

4. information telling the retrieval subroutine where and in what order to store the data.

The user will generally not need to know the details in the Data Records. If his request is for \( \sigma_{\text{elastic}}(E) \) at various values of \( E \), and the Data Record contains \( \sigma_{\text{elastic}}(E,\mu) \), the angular integration will be done automatically.
The Retrieval Routines will be developed in various stages. The first stage will handle only the simplest types of data such as tabulated $\sigma(E)$ and $\sigma(E,\mu)$. This first stage should be completed by the spring of 1965 and be available in the summer of 1965. A complete retrieval program will be completed by mid-1966.
4. Detailed Card Formats

The following section gives the detailed card formats for the ENDF. Before that, a few general remarks are necessary.

A variety of formats are available for punching data cards. Built-in formats are given in Dictionary 16, but the user may supply his own format. Once this format is specified it must be used for all data cards in the Data Record except for Heading and Control card which have a fixed format. Where practical the A/W format (NCDF = 1) should be used. If the user supplies his own format, it should consist entirely of fixed or floating point fields (not integers). Integers when used should be punched as floating point numbers.

The notation [ ] means "a deck of cards". Suppose the data were given as \([a_1, a_2, a_3, a_4], [b_1, b_2, b_3]\). If the format selected provided for 4 or more words/card, the data would be punched

- card 1  \(a_1\ a_2\ a_3\ a_4\)
- card 2  \(b_1\ b_2\ b_3\)

If the format required 3 words/card, the data would be punched

- card 1  \(a_1\ a_2\ a_3\)
- card 2  \(a_4\)
- card 3  \(b_1\ b_2\ b_3\)
The field numbers in many of the following pages contain an *. These fields are numerical equivalents (via the dictionaries) of the Hollerith fields. The fields marked with an * may be left blank. When the decks are converted to Version B, they will be automatically filled in.

It is advisable to sequence number the decks in columns 78-80. The numbering should start with 000. The maximum number of cards allowed in a Data Record is 1000. If more cards are required the data should be broken up into two or more Data Records. The deck should also be labeled in columns 73-77. The use of an alphabetic character in column 73 should be avoided. A convenient number to use as a label is the number given in Field 14 of the First Heading Card.

The units used for cross sections and energy are arbitrary but once selected must be uniform throughout the Data Record. Wherever possible, the units of barns and ev should be used. Atomic weights are based on the physical scale in which $\frac{C}{12} = 12.000000$. On this scale the neutron mass is 1.008665. Avogadro's number is $0.602295 \times 10^{24}$, but $0.6023 \times 10^{24}$ is adequate for most work.

Confusion often arises about the value of a function outside of the given range. The ranges of incident energy are completely specified on the Heading Cards and Energy Range Cards, but no ranges are given for other variables such as final energy. The data given should reflect the fact that a distribution is zero by including the zeros in the data, and not limiting the data to the non-zero range and assuming it to be zero outside the range.
4.1 Heading Cards

The leading cards of a Data Record are the Heading Cards. The information given in these cards is:

1. Complete Hollerith description of the material, physical description of the reaction, mathematical description of the data, and brief description of the source of the data.

2. The numerical equivalents (from the dictionaries) of the above items.

3. The punched card format for the Data Record.

4. Further information about the source of data and the evaluation, applicable references, etc. This information is contained on Comment Cards and every effort should be made to include as complete a documentation of the data as possible.
<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chemical symbol (2 characters, Dictionary 1)</td>
<td>CHEMS</td>
<td>A2</td>
<td>1-2</td>
</tr>
<tr>
<td>2</td>
<td>Mass number (Integer ≤ 999)</td>
<td>MASSN</td>
<td>I3</td>
<td>3-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2X</td>
<td>6-7</td>
</tr>
<tr>
<td>3</td>
<td>Incident particle type (1 character, Dictionary 2)</td>
<td>PART</td>
<td>A1</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1X</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>Reaction type (6 characters, Dictionary 3)</td>
<td>REAC</td>
<td>A6</td>
<td>10-15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1X</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>Final state description (Integer ≤ 99, Dictionary 15)</td>
<td>NFS</td>
<td>I2</td>
<td>17-18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1X</td>
<td>19</td>
</tr>
<tr>
<td>6</td>
<td>Secondary particle type (1 character, Dictionary 2)</td>
<td>SECP</td>
<td>A1</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1X</td>
<td>21</td>
</tr>
<tr>
<td>7</td>
<td>Type of data given (4 characters, Dictionary 4)</td>
<td>DTYP</td>
<td>A4</td>
<td>22-25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1X</td>
<td>26</td>
</tr>
<tr>
<td>8</td>
<td>Form of the function y (1 character, Dictionary 5)</td>
<td>YFGRM</td>
<td>A1</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1X</td>
<td>28</td>
</tr>
<tr>
<td>9</td>
<td>Form of the variable x (2 characters, Dictionary 6)</td>
<td>PX(1)</td>
<td>A2</td>
<td>29-30</td>
</tr>
</tbody>
</table>

If more than 3 variables are needed, put the symbol xx here and put entire list on the First Heading Card Extension.
<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Form of the variable $x_2$ (2 characters, Dictionary 6)</td>
<td>PX(2)</td>
<td>A2</td>
<td>32-33</td>
</tr>
<tr>
<td>11</td>
<td>Form of the variable $x_3$ (2 characters, Dictionary 6)</td>
<td>PX(3)</td>
<td>A2</td>
<td>35-36</td>
</tr>
<tr>
<td>12</td>
<td>Cross section units (2 characters, Dictionary 7)</td>
<td>CSUN</td>
<td>A2</td>
<td>38-39</td>
</tr>
<tr>
<td>13</td>
<td>Installation code (3 characters, Dictionary 9)</td>
<td>EVAL</td>
<td>A3</td>
<td>41-43</td>
</tr>
<tr>
<td>14</td>
<td>Identification number assigned by evaluator (Integer ≤ 9999)</td>
<td>I4</td>
<td>44-47</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Month data was prepared (Integer ≤ 12)</td>
<td>NEM%</td>
<td>I2</td>
<td>49-50</td>
</tr>
<tr>
<td>16</td>
<td>Year (last 2 digits) data was prepared (Integer ≤ 99)</td>
<td>NEYR</td>
<td>I2</td>
<td>52-53</td>
</tr>
<tr>
<td>17</td>
<td>Lowest energy, x.xxx+y, where x.xxx is an unsigned four digit number, and +y is a signed one digit exponent</td>
<td>ELMW</td>
<td>E7.3</td>
<td>55-61</td>
</tr>
</tbody>
</table>

Form 1507
<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Highest energy (same form as field 17)</td>
</tr>
<tr>
<td>19</td>
<td>Energy units (3 characters, Dictionary a)</td>
</tr>
</tbody>
</table>

**Format**

- **Symbol**: ENERGY
- **Columns**: 87, 3
- **Width**: 63-69
- **Position**: 70-72
<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Form of the function y (1 character, Dictionary 5)</td>
<td>YFORM</td>
<td>A1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1X</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Form of the variable x₁ (2 characters, Dictionary 6)</td>
<td>FX(1)</td>
<td>A2</td>
<td>3-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1X</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Form of the variable x₂ (2 characters, Dictionary 6)</td>
<td>FX(2)</td>
<td>A2</td>
<td>6-7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1X</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Form of the variable x₃ (2 characters, Dictionary 6)</td>
<td>FX(3)</td>
<td>A2</td>
<td>9-10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1X</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>Form of the variable x₄ (2 characters, Dictionary 6)</td>
<td>FX(4)</td>
<td>A2</td>
<td>12-13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1X</td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>Form of the variable x₅ (2 characters, Dictionary 6)</td>
<td>FX(5)</td>
<td>A2</td>
<td>15-16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1X</td>
<td>17</td>
</tr>
<tr>
<td>FIELD</td>
<td>DESCRIPTION</td>
<td>SYMBOL</td>
<td>FORMAT</td>
<td>COLUMNS</td>
</tr>
<tr>
<td>-------</td>
<td>------------------------------------------------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>1</td>
<td>Number of cards in Data Record</td>
<td>NCIDR</td>
<td>I5</td>
<td>1-5</td>
</tr>
<tr>
<td>2</td>
<td>Number of secondary particle distributions given</td>
<td>NSECX</td>
<td>I5</td>
<td>7-11</td>
</tr>
<tr>
<td>3*</td>
<td>Value of NATØM corresponding to CHEMS from Dictionary 1</td>
<td>NATØM</td>
<td>I5</td>
<td>13-17</td>
</tr>
<tr>
<td>4*</td>
<td>Value of MASSN</td>
<td>MASSNX</td>
<td>I5</td>
<td>19-23</td>
</tr>
<tr>
<td>5*</td>
<td>Value of NPART corresponding to PART from Dictionary 2</td>
<td>NIPT</td>
<td>I5</td>
<td>25-29</td>
</tr>
<tr>
<td>6*</td>
<td>Value of NREAC corresponding to REAC from Dictionary 3</td>
<td>NREAC</td>
<td>I5</td>
<td>31-35</td>
</tr>
<tr>
<td>7*</td>
<td>Value of NFX</td>
<td>NFSX</td>
<td>I5</td>
<td>37-41</td>
</tr>
<tr>
<td>8*</td>
<td>Value of NPART corresponding to SECP from Dictionary 2</td>
<td>NSPT</td>
<td>I5</td>
<td>43-47</td>
</tr>
<tr>
<td>9*</td>
<td>Value of NTYP corresponding to DTYP from Dictionary 4</td>
<td>NDTYP</td>
<td>I5</td>
<td>49-53</td>
</tr>
<tr>
<td>10*</td>
<td>Value of NYFØR corresponding to YFØRM from Dictionary 5</td>
<td>NYFØR</td>
<td>I5</td>
<td>55-59</td>
</tr>
<tr>
<td>11*</td>
<td>Value of NCUSN corresponding to CSUN from Dictionary 7</td>
<td>NCUSN</td>
<td>I5</td>
<td>61-65</td>
</tr>
<tr>
<td>12*</td>
<td>Value of NENUN corresponding to ENUN from Dictionary 8</td>
<td>NENUN</td>
<td>I5</td>
<td>67-71</td>
</tr>
<tr>
<td>FIELD</td>
<td>DESCRIPTION</td>
<td>SYMBOL</td>
<td>FORMAT</td>
<td>COLUMNS</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>1</td>
<td>Punched card format code (Integer $\leq$ 99, Dictionary 16)</td>
<td>NCDF</td>
<td>I5</td>
<td>1-5</td>
</tr>
<tr>
<td></td>
<td>If the number 0 is used here, a Format Card must be used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>following the Fourth Heading Card</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Number of comment cards following the Fourth Heading Card</td>
<td>NCCRD</td>
<td>I5</td>
<td>7-11</td>
</tr>
<tr>
<td></td>
<td>(or Format Card if used). (Integer $\leq$ 10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3*</td>
<td>Value of NXFØR corresponding to FX(1) from Dictionary 6</td>
<td>NFX(1)</td>
<td>I5</td>
<td>13-17</td>
</tr>
<tr>
<td>4*</td>
<td>Value of NXFØR corresponding to FX(2) from Dictionary 6</td>
<td>NFX(2)</td>
<td>I5</td>
<td>19-23</td>
</tr>
<tr>
<td>5*</td>
<td>Value of NXFØR corresponding to FX(3) from Dictionary 6</td>
<td>NFX(3)</td>
<td>I5</td>
<td>25-29</td>
</tr>
<tr>
<td>6*</td>
<td>Value of NXFØR corresponding to FX(4) from Dictionary 6</td>
<td>NFX(4)</td>
<td>I5</td>
<td>31-35</td>
</tr>
<tr>
<td>7*</td>
<td>Value of NXFØR corresponding to FX(5) from Dictionary 6</td>
<td>NFX(5)</td>
<td>I5</td>
<td>37-41</td>
</tr>
<tr>
<td>8*</td>
<td>Value of NEVAL corresponding to EVAL from Dictionary 9</td>
<td>NEVAL</td>
<td>I5</td>
<td>43-47</td>
</tr>
<tr>
<td>9*</td>
<td>Value of IDEV</td>
<td>IDEVX</td>
<td>I5</td>
<td>49-53</td>
</tr>
<tr>
<td>10*</td>
<td>Value of NEMØ</td>
<td>NEMØX</td>
<td>I5</td>
<td>55-59</td>
</tr>
<tr>
<td>11*</td>
<td>Value of NEYR</td>
<td>NEYRX</td>
<td>I5</td>
<td>61-65</td>
</tr>
<tr>
<td>12*</td>
<td></td>
<td></td>
<td>I5</td>
<td>67-71</td>
</tr>
</tbody>
</table>
**Fourth Heading Card**  This card contains floating point data for the entire record.

<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Atomic Weight (C12 scale)</td>
<td>ATWGT</td>
<td>E11.0</td>
<td>1-11</td>
</tr>
<tr>
<td>2</td>
<td>Reaction Q value (if appropriate)</td>
<td>QVAL</td>
<td>E11.0</td>
<td>13-23</td>
</tr>
<tr>
<td>3</td>
<td>Temperature (°k) (if appropriate)</td>
<td>TEMPK</td>
<td>E11.0</td>
<td>25-35</td>
</tr>
<tr>
<td>4</td>
<td>Scale factor for all data in record.</td>
<td>SCALE</td>
<td>E11.0</td>
<td>37-47</td>
</tr>
<tr>
<td>5*</td>
<td>Lowest energy (repeat of field 17, First Heading Card)</td>
<td>ELÓWX</td>
<td>E11.0</td>
<td>49-59</td>
</tr>
<tr>
<td>6*</td>
<td>Highest energy (repeat of field 18, First Heading Card)</td>
<td>EHİGHX</td>
<td>E11.0</td>
<td>61-71</td>
</tr>
</tbody>
</table>
Format Card  If the number 0 was used in Field 1 of the Third Heading Card, the punched card format must be given here. Otherwise, omit this card.

<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A standard Fortran format statement is written here starting with ( and ending with ). This format will be used to read</td>
<td>PMT(I)</td>
<td>12A6</td>
<td>1-72</td>
</tr>
<tr>
<td></td>
<td>all data cards in the record except Heading Cards and Control Cards.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Form 1507
Comment Cards  Up to 10 Comment Cards may be used following the Format Card (if used) or the Fourth Heading Card if a Format Card is not used.

<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Any descriptive remarks.</td>
<td>CCRD</td>
<td>12A6</td>
<td>1-72</td>
</tr>
</tbody>
</table>

The information on these cards should include:

1. The evaluators name and installation
2. Date of evaluation
3. References to pertinent documents
4. Brief description of the evaluation procedure and the data used.
4.2 Secondary Particles

If more than one secondary particle is specified in the field NSECX of the Second Heading Card, a SEC control card must head the data for each secondary particle. If only one particle is specified, the SEC card is omitted. All secondary particles must be of the same type as specified on the First Heading Card. If distributions are given for more than one type of secondary, a separate Data Record must be used for each particle type. Fields 3 and 4 of the SEC card are to be read, for example, as the 1st of 3 secondary particles, or 2nd of 2 secondary particles.

The SEC card may be followed by a ENR, PDC, or DCC card.
<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SEC (left adjusted)</td>
<td>HCCT</td>
<td>A5</td>
<td>1-5</td>
</tr>
<tr>
<td>2*</td>
<td>100</td>
<td>NCCT</td>
<td>I5</td>
<td>7-11</td>
</tr>
<tr>
<td>3</td>
<td>Number of this secondary particle</td>
<td>NSEC</td>
<td>I5</td>
<td>13-17</td>
</tr>
<tr>
<td>4</td>
<td>Total number of secondary particles given</td>
<td>NSECX</td>
<td>I5</td>
<td>19-23</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>I5</td>
<td></td>
<td>25-29</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>I5</td>
<td></td>
<td>31-35</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>I5</td>
<td></td>
<td>37-41</td>
</tr>
<tr>
<td>8</td>
<td>Number of comment cards (≤10) following this card</td>
<td>NCCD</td>
<td>I5</td>
<td>43-47</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>E11.0</td>
<td></td>
<td>49-59</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>E11.0</td>
<td></td>
<td>61-71</td>
</tr>
</tbody>
</table>
4.3 Energy Range

It is often convenient to divide the data into various energy ranges so as to use a different model or representation in each range. If this is done an ENR card must head the data for each energy range. The ENR Card is omitted if only one range is used.

Fields 3 and 4 of the ENR Card are to be read, for example, as the 1st of 3 energy ranges, or 2nd of 2 energy ranges. Fields 9 and 10 give the limits of the energy range and the upper limit of the \( n \)th range should not exceed the lower limit of the \( n+1 \)st range. If the ranges do not completely cover the range given on the Heading Card, the data is assumed to be zero in those ranges not covered by ENR Cards.

The ENR Card may be followed by a PDC or DCC Card.
<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>FORMAT</th>
<th>SYMBOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ENR (left adjusted)</td>
<td>A5</td>
<td>HCCT</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>I5</td>
<td>NCCT</td>
</tr>
<tr>
<td>3</td>
<td>Number of this energy range</td>
<td>I5</td>
<td>NNRX</td>
</tr>
<tr>
<td>4</td>
<td>Total number of energy ranges used</td>
<td>I5</td>
<td>NENRX</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>I5</td>
<td>NCCD</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>I5</td>
<td>ESRL</td>
</tr>
<tr>
<td>7</td>
<td>Number of comment cards (≤10) following this card</td>
<td>I5</td>
<td>ESRH</td>
</tr>
<tr>
<td>8</td>
<td>Lower limit of energy range</td>
<td>E11.0</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Upper limit of energy range</td>
<td>E49.59</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>E11.0</td>
<td></td>
</tr>
</tbody>
</table>

Form 507
4.4 Partial Distributions

It is often convenient to split a function into partial distributions. This splitting is accomplished with a PDC control card. A PDC card must head the data for each partial distribution given. The PDC card may precede any DCC card, but may not precede an ENR or SEC card, nor may it immediately follow a DCC card. The PDC cards may not be nested, that is, a PDC card may not be used in a data block which is itself a partial distribution.

Fields 3 and 4 are to be read, for example, as the 1st of 3 partial distributions, or 2nd of 2 partial distributions.

The PDC card must be followed by a DCC card.
## Partial Distribution Control Card

<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PDC (left adjusted)</td>
<td>HCCT</td>
<td>A5</td>
<td>1-5</td>
</tr>
<tr>
<td>2*</td>
<td>300</td>
<td>NCCT</td>
<td>I5</td>
<td>7-11</td>
</tr>
<tr>
<td>3</td>
<td>Number of this partial distribution</td>
<td>NPD</td>
<td>I5</td>
<td>13-17</td>
</tr>
<tr>
<td>4</td>
<td>Total number of partial distributions given</td>
<td>NPDX</td>
<td>I5</td>
<td>19-23</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>I5</td>
<td>25-29</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>I5</td>
<td>31-35</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>I5</td>
<td>37-41</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Number of comment cards (≤10) following this card</td>
<td>NCCD</td>
<td>I5</td>
<td>43-47</td>
</tr>
<tr>
<td>9</td>
<td>Probability for this partial distribution</td>
<td>PPDST</td>
<td>E11.0</td>
<td>49-59</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>E11.0</td>
<td>61-71</td>
<td></td>
</tr>
</tbody>
</table>
An END card must be the last card of the Data Record. Field 3 is a character count (a form of check sum) for the entire Data Record and should be left blank when the deck is prepared. Field 3 will be filled in when the deck is placed on a Master Library tape.
## End Control Card

<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>END (left adjusted)</td>
<td>HCCT</td>
<td>A5</td>
<td>1-5</td>
</tr>
<tr>
<td>2*</td>
<td>500</td>
<td>NCCT</td>
<td>T5</td>
<td>7-11</td>
</tr>
<tr>
<td>3*</td>
<td>Data Record character count (modulo 8)</td>
<td></td>
<td></td>
<td>13-60</td>
</tr>
</tbody>
</table>
4.6 Data Control Cards

4.6.1 One Dimensional Tabulated Function

The DCC1 card controls the data for a one dimensional tabulated function, \( y(x_1) \). The tabulated values plus an interpolation method completely specifies the function. In some special cases a number of constants may also be required.

The data can be arranged on the cards in many ways according to the test NDBA. These arrangements are listed on the following pages.

If this tabulation is part of a higher dimensional function, \( y(x_1, x_2) \), at a given value of \( x_2 \), this value must also be given on the DCC1 card.

The DCC1 card is followed by the Comment Cards (if any), the Constants (if any), and then the tabulation of \( y(x_1) \).
<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCCL (left adjusted)</td>
<td>HCCT</td>
<td>A5</td>
<td>1-5</td>
</tr>
<tr>
<td>2*</td>
<td>401</td>
<td>NCCT</td>
<td>I5</td>
<td>7-11</td>
</tr>
<tr>
<td>3</td>
<td>Arrangement of data (see next page)</td>
<td>NDBA</td>
<td>I5</td>
<td>13-17</td>
</tr>
<tr>
<td>4</td>
<td>Interpolation code for ( y(x_1) ) (Dictionary 17)</td>
<td>INTER</td>
<td>I5</td>
<td>19-23</td>
</tr>
<tr>
<td>5</td>
<td>Number of constants</td>
<td>NCON</td>
<td>I5</td>
<td>25-29</td>
</tr>
<tr>
<td>6</td>
<td>Number of values of ( x_1 ) at which ( y ) is given</td>
<td>LDB</td>
<td>I5</td>
<td>31-35</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>I5</td>
<td>37-41</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Number of comment cards ((&lt;10)) following this card</td>
<td>NCCD</td>
<td>I5</td>
<td>43-47</td>
</tr>
<tr>
<td>9</td>
<td>Value of the next higher order variable, ( x_2 )</td>
<td>VHX</td>
<td>E11.0</td>
<td>49-59</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>E11.0</td>
<td>61-71</td>
<td></td>
</tr>
</tbody>
</table>
Data arrangement for DCC 1.

The data is in the form $y_i = y(Z_i)$, $i = 1, N$, where $Z$ denotes $x_1$. Various arrangements are allowed and depend on the value of NDBA.

\[
\text{NDBA} = 1 \left[ Z_1, y_1, z_2, \ldots, z_N, y_N \right] \\
= 2 \left[ z_1, z_2, \ldots, z_N, y_1, y_2 \ldots y_N \right] \\
= 3 \left[ z_1, z_2, \ldots, z_N \right]\left[ y_1, y_2, \ldots, y_N \right] \\
= 4 \left[ y_1, y_2, y_3, \ldots y_N \right], \text{the Z values are assumed to be the same as in the preceding data block.} \\
= 5 \left[ z_1, \Delta Z, y_1, y_2, y_3 \ldots y_N \right], \text{the Z points are equally spaced at intervals of } \Delta Z \text{ starting at } z_1. \\
= 6 \left[ z_1, \Delta Z \right], \left[ y_1, y_2, y_3 \ldots y_N \right] \\
\]

The notation $[\ ]$ means a deck of cards.
4.6.2 Two Dimensional Tabulated Function

The DCC2 controls data for a two dimensional function $y(x_1, x_2)$ which is tabulated with respect to $x_2$. The functional form of $y(x_1)$ at a given $x_2$ may be either tabulated or analytical. An interpolation code must be given to indicate how $y$ varies between successive values of $x_2$ for a given $x_1$. In some cases constants may also be required.

If $y(x_1, x_2)$ is part of a higher dimensional function, $y(x_1, x_2, x_3)$, then the value of $x_3$ must be given on the DCC2 card.

The DCC2 card is followed by the Comment Cards (if any), the Constants (if any) and then by a DCC1, DCC6, DCC9, or PDC card.
<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCC2 (left adjusted)</td>
<td>HCCT</td>
<td>A5</td>
<td>1-5</td>
</tr>
<tr>
<td>2*</td>
<td>402</td>
<td>NCCT</td>
<td>T5</td>
<td>7-11</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Interpolation code for $y(x_2)$ (Dictionary 17)</td>
<td>INTER</td>
<td>T5</td>
<td>19-23</td>
</tr>
<tr>
<td>5</td>
<td>Number of constants</td>
<td>NC_N</td>
<td>T5</td>
<td>25-29</td>
</tr>
<tr>
<td>6</td>
<td>Number of values of $x_2$ at which $y$ is given</td>
<td>LDB</td>
<td>T5</td>
<td>31-35</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>37-41</td>
</tr>
<tr>
<td>8</td>
<td>Number of comment cards ($\leq 10$) following this card</td>
<td>NCCD</td>
<td>T5</td>
<td>43-47</td>
</tr>
<tr>
<td>9</td>
<td>Value of the next higher order variable, $x_3$</td>
<td>VHX</td>
<td>E11.0</td>
<td>49-59</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td>E11.0</td>
</tr>
</tbody>
</table>
4.6.3. Three Dimensional Tabulated Function

The DCC3 card controls data for a three dimensional function \( y(x_1, x_2, x_3) \) which is tabulated with respect to \( x_3 \). The function form of \( y(x_1, x_2) \) at a given \( x_3 \) may be either tabulated or analytical. An interpolation code must be given to indicate how \( y \) varies between successive values of \( x_3 \) for a given \( x_1 \) and \( x_2 \). In some cases constants may also be required.

If \( y(x_1, x_2, x_3) \) is part of a higher dimensional function, \( y(x_1, x_2, x_3, x_4) \), then the value of \( x_4 \) must be given on the DCC3 card.

The DCC3 card is followed by the Comment Cards (if any), the constants (if any), and then by a DCC2, DCC6, DCC7, DCC9, DCC10, or PDC card.
Data Control Card 3  Three dimensional tabulated functions

<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCC3  (left adjusted)</td>
<td>HCCT</td>
<td>A5</td>
<td>1-5</td>
</tr>
<tr>
<td>2*</td>
<td>403</td>
<td>NCCT</td>
<td>I5</td>
<td>7-11</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>I5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Interpolation code for $y (x_3)$ (Dictionary 17)</td>
<td>INTER</td>
<td>I5</td>
<td>13-17</td>
</tr>
<tr>
<td>5</td>
<td>Number of constants</td>
<td>NCON</td>
<td>I5</td>
<td>25-29</td>
</tr>
<tr>
<td>6</td>
<td>Number of values of $x_3$ at which $y$ is given</td>
<td>LDB</td>
<td>I5</td>
<td>31-35</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>I5</td>
<td></td>
<td>37-41</td>
</tr>
<tr>
<td>8</td>
<td>Number of comment cards (&lt;=10) following this card</td>
<td>NCCD</td>
<td>I5</td>
<td>43-47</td>
</tr>
<tr>
<td>9</td>
<td>Value of the next higher order variable, $x_4$</td>
<td>VHIX</td>
<td>E11.0</td>
<td>49-59</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>E11.0</td>
<td></td>
<td>61-71</td>
</tr>
</tbody>
</table>
4.6.4. Four Dimensional Tabulated Function

The DCC4 card controls data for a four dimensional function \( y(x_1, x_2, x_3, x_4) \) which is tabulated with respect to \( x_4 \). The functional form of \( y(x_1, x_2, x_3) \) at a given \( x_4 \) may be either tabulated or analytical. An interpolation code must be given to indicate how \( y \) varies between successive values of \( x_4 \) for a given \( x_1, x_2, \) and \( x_3 \). In some cases constants may also be required.

If \( y(x_1, x_2, x_3, x_4) \) is part of a higher dimensional function, \( y(x_1, x_2, x_3, x_4, x_5) \), then the value of \( x_5 \) must be given on the DCC4 card.

The DCC4 card is followed by the Comment Cards (if any), the constants (if any), and then by a DCC3, DCC6, DCC7, DCC8, DCC9, DCC10, or PDC card.
<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCC4 (left adjusted)</td>
<td>HCCT</td>
<td>A5</td>
<td>1-5</td>
</tr>
<tr>
<td>2*</td>
<td>404</td>
<td>NCOT</td>
<td>I5</td>
<td>7-11</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>I5</td>
<td></td>
<td>13-17</td>
</tr>
<tr>
<td>4</td>
<td>Interpolation code for y (x₄) (Dictionary 17)</td>
<td>INTER</td>
<td>I5</td>
<td>19-23</td>
</tr>
<tr>
<td>5</td>
<td>Number of constants</td>
<td>NCØN</td>
<td>I5</td>
<td>25-29</td>
</tr>
<tr>
<td>6</td>
<td>Number of values of x₄ at which y is given</td>
<td>LDB</td>
<td>I5</td>
<td>31-35</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>I5</td>
<td></td>
<td>37-41</td>
</tr>
<tr>
<td>8</td>
<td>Number of comment cards (≤10) following this card</td>
<td>NCCD</td>
<td>I5</td>
<td>43-47</td>
</tr>
<tr>
<td>9</td>
<td>Value of the next higher order variable, x₅</td>
<td>VHX</td>
<td>E11.0</td>
<td>49-59</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>E11.0</td>
<td></td>
<td>61-71</td>
</tr>
</tbody>
</table>
4.6.5. Five Dimensional Tabulated Function

The DCC5 card controls data for a five dimensional function \( y(x_1, x_2, x_3, x_4, x_5) \) which is tabulated with respect to \( x_5 \). An interpolation code must be given to indicate how \( y \) varies between successive values of \( x_5 \) for given \( x_1, x_2, x_3, x_4 \). In some cases constants may also be required.

The DCC5 card is followed by the Comment Cards (if any), the constants (if any), and then by a DCC4, DCC6, DCC7, DCC8, DCC10, or PDC card.
<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
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<td>HCCT</td>
<td>A5</td>
<td>1-5</td>
</tr>
<tr>
<td>2*</td>
<td>405</td>
<td>NCCT</td>
<td>I5</td>
<td>7-11</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>I5</td>
<td></td>
<td>13-17</td>
</tr>
<tr>
<td>4</td>
<td>Interpolation code for $y(x_5)$ (Dictionary 17)</td>
<td>INTER</td>
<td>I5</td>
<td>19-23</td>
</tr>
<tr>
<td>5</td>
<td>Number of constants</td>
<td>NCØN</td>
<td>I5</td>
<td>25-29</td>
</tr>
<tr>
<td>6</td>
<td>Number of values of $x_5$ at which $y$ is given</td>
<td>LDB</td>
<td>I5</td>
<td>31-35</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>I5</td>
<td></td>
<td>37-41</td>
</tr>
<tr>
<td>8</td>
<td>Number of comment cards ($\leq 10$) following this card</td>
<td>NCCD</td>
<td>I5</td>
<td>43-47</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td>E11.0</td>
<td>49-59</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>E11.0</td>
<td>61-71</td>
</tr>
</tbody>
</table>
4.6.6. One Dimensional Analytic Function

The DCC6 card controls data for a one dimensional analytic function \( y(z) \). Various analytic forms are allowed. The data is divided into constants and parameters. The parameters may depend on lower order variables while the constants may not. As an example, consider the elastic angular distribution, \( \sigma(E,\mu) \), represented by

\[
\sigma(E,\mu) = \frac{1}{4\pi} \sum_{\ell=0}^{7} \frac{2\ell+1}{2} A_{\ell}(E) P_{\ell}(\mu)
\]

The appropriate form is \( \text{NAFT} = 2 \) (see following pages). The constants are \( L = 7 \), \( k = 1 \), and \( B_o = 4\pi \). The parameters are the \( A_{\ell}(E) \) which depend on one lower order variable, \( E \); hence \( \text{NVR} = 1 \). The DCC6 card is followed by the comment cards (if any), the constants \( L, k, B_o \), and then 8 decks (one for each \( A_{\ell}(E) \)), each starting with a DCC1 card (if \( A_{\ell}(E) \) is tabulated) or a DCC6 card (if \( A_{\ell}(E) \) is analytic).

If the function were given as:

\[
\sigma(\mu,E) = \frac{1}{4\pi} \sum_{\ell=0}^{L} \frac{2\ell+1}{2} A_{\ell}(E) P_{\ell}(\mu)
\]

then we might start with a DCC2 card (tabulated with respect to \( E \)) followed by as many decks as \( E \) values, each deck having a DCC6 card with the appropriate \( E \) in Field 9, comment cards (if any), constants \( L, k, B_o \), and the parameter cards with \( A_{\ell} \) at the specified \( E \). Note here \( L \) can vary with \( E \).
<table>
<thead>
<tr>
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<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCC5 (left adjusted)</td>
<td>HCCT</td>
<td>A5</td>
<td>1-5</td>
</tr>
<tr>
<td>2*</td>
<td>406</td>
<td>NCCT</td>
<td>I5</td>
<td>7-11</td>
</tr>
<tr>
<td>3</td>
<td>Type of analytic function (see next page)</td>
<td>NAFT</td>
<td>I5</td>
<td>13-17</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>I5</td>
<td>19-23</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Number of constants</td>
<td>NCØN</td>
<td>I5</td>
<td>25-29</td>
</tr>
<tr>
<td>6</td>
<td>Number of parameters</td>
<td>LDB</td>
<td>I5</td>
<td>31-35</td>
</tr>
<tr>
<td>7</td>
<td>Number of lower order variables left to be considered</td>
<td>NVR</td>
<td>I5</td>
<td>37-41</td>
</tr>
<tr>
<td>8</td>
<td>Number of comment cards (≤10) following this card</td>
<td>NCCD</td>
<td>I5</td>
<td>43-47</td>
</tr>
<tr>
<td>9</td>
<td>Value of next higher order variable</td>
<td>VHX</td>
<td>E11.0</td>
<td>49-59</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>E11.0</td>
<td>61-71</td>
<td></td>
</tr>
</tbody>
</table>
Types of one-dimensional analytic functions

NAFT = Polynomial, \( y(Z) = \sum_{\ell=0}^{L} A_{\ell} Z^{\ell} \),

constants \([ L ]\), parameters \([ A_{0}, A_{1}, A_{2}, \ldots A_{L} ]\)

NAFT = Legendre Series, \( y(Z) = \frac{1}{B_{0}} \sum_{\ell=0}^{L} \left( \frac{2\ell+1}{2} \right)^{k} A_{\ell} P_{\ell}(Z) \),

constants \([ L, k, B_{0} ]\), parameters \([ A_{0}, A_{1}, A_{2}, \ldots A_{L} ]\)

NAFT = Legendre Series, \( y(Z) = \frac{B_{1}}{B_{0}} \left[ 1 + \sum_{\ell=1}^{L} \left( \frac{2\ell+1}{2} \right)^{k} A_{\ell} P_{\ell}(Z) \right] \),

constants \([ L, k, B_{0} ]\), parameters \([ B_{1}, A_{1}, A_{2}, \ldots A_{L} ]\)

NAFT = Rational Approximation, \( y(Z) = \sum_{\ell=0}^{L} A_{\ell} Z^{\ell} / \sum_{i=0}^{I} B_{i} Z^{i} \),

constants \([ L, I ]\), parameters \([ A_{0}, A_{1}, \ldots A_{L}, B_{0}, B_{1}, \ldots B_{I} ]\)
NAFT = 5 Fission Spectrum, \( y(Z) = A_o e^{-Z/A_1} \sinh \sqrt{A_2 Z} \)

no constants, parameters \([ A_o, A_1, A_2 ]\)

NAFT = 6 Single Level, \( y(Z) = \frac{\alpha + \beta (Z-E_o)}{(Z-E_o)^2 + \frac{\Gamma^2}{4}} + \sum_{i=0}^{L} B_i Z^i \)

constants = \([ L ]\), parameters = \([ \alpha, \beta, \tau, E_o, B_o, B_1, \ldots, B_L ]\)

NAFT = 7 Improved Fission Spectrum, \( y(Z) = \alpha \left( \frac{Z}{\tau^2} \right) e^{-Z/\tau} + (1-\alpha) \frac{4Z}{\pi \beta^3} e^{-Z/\beta} \)

no constants, parameters \([ \alpha, \beta, \tau ]\)
4.6.7. Two Dimensional Analytic Function

The DCC7 card controls data for a two dimensional analytic function \( y(z_1, z_2) \). Various analytic forms are allowed. The data is divided into constants and parameters. The parameters may depend on lower order variables while the constants may not. As an example consider the elastic angular distribution, \( \sigma(\mu, E) \), represented by

\[
\sigma(\mu, E) = \sum_{l=0}^{6} \sum_{m=0}^{10} A_{lm} \mu^l E^m
\]

The appropriate form is NAFT = 1 (see following pages). The constants are \( L = 6, M = 10 \). The parameters are the \( A_{lm} \) and since they depend on no lower order variable, NVR = 0. The DCC7 card is followed by the comment cards (if any), the constants \( L \) and \( M \), and the parameters \( A_{lm} \).

If a higher order variable is also present, \( \sigma(\mu, E, E^1) \), the appropriate value of \( E^1 \) is put in Field 9 of the DCC7 card. If a lower order variable is present, \( \sigma(E^1, \mu, E) \), then NVR = 1, and the \( A_{lm} \) are functions of \( E^1 \). Each of the parameters \( A_{lm} \) is given by a deck starting with a DCC1 or DCC6 card.
# Data Control Card 7  Two dimensional analytic functions

<table>
<thead>
<tr>
<th>FIELD</th>
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<th>SYMBOL</th>
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</thead>
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<td>I5</td>
<td>7-11</td>
</tr>
<tr>
<td>3</td>
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<td>NAFT</td>
<td>I5</td>
<td>13-17</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>I5</td>
<td></td>
<td>19-23</td>
</tr>
<tr>
<td>5</td>
<td>Number of constants</td>
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<td>I5</td>
<td>25-29</td>
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<td>6</td>
<td>Number of parameters</td>
<td>LDB</td>
<td>I5</td>
<td>31-35</td>
</tr>
<tr>
<td>7</td>
<td>Number of lower order variables left to be considered</td>
<td>NVR</td>
<td>I5</td>
<td>37-41</td>
</tr>
<tr>
<td>8</td>
<td>Number of comment cards (≤10) following this card</td>
<td>NCCD</td>
<td>I5</td>
<td>43-47</td>
</tr>
<tr>
<td>9</td>
<td>Value of next higher order variable</td>
<td>VHX</td>
<td>E11.0</td>
<td>49-59</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>E11.0</td>
<td>61-71</td>
</tr>
</tbody>
</table>
Types of two-dimensional analytic functions \([\cdot\cdot\cdot]\) denotes a deck of cards

\[
\text{NAFT = 1 Power Series, } y(z_1, z_2) = \sum_{\ell=0}^{L} \sum_{m=0}^{M} A_{\ell m} z_1^\ell z_2^m
\]

constants = \([ L, M ]\), parameters = \([ A_{00}, A_{10}, A_{20}, \ldots, A_{M0}, A_{01}, A_{11}, \ldots, A_{LM} ]\)
4.6.8. Three Dimensional Analytic Function

The DCCS card controls data for three dimensional analytic functions, should the need for them ever arise.
4.6.9. Discrete Functions

It is often convenient to express energy distributions as discrete functions. For example, the inelastic cross section \( \sigma(\mu, E, E') \) might be represented as

\[
\sigma(\mu, E, E') = \sum_{\ell=1}^{L} \sigma_{\ell}(\mu, E) \delta [E' - B_{\ell}(E - A_{\ell})]
\]

where \( A_{\ell} \) is the energy of the level, \( B_{\ell} \) is the "reduction factor", and \( L \) is the number of levels. The DCC9 card is followed by comment cards (if any), the constants, and \( L \) decks for the \( \sigma_{\ell}(\mu, E) \), each deck starting with a DCC2, DCC6, DCC7, DCC8, DCC9, or DCC10 card. Each deck contains the \( A_{\ell} \) and \( B_{\ell} \) as constants.
<table>
<thead>
<tr>
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<th>DESCRIPTION</th>
<th>SYMBOL</th>
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<th>COLUMNS</th>
</tr>
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<tr>
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<td>A5</td>
<td>1-5</td>
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<td>NCCT</td>
<td>I5</td>
<td>7-11</td>
</tr>
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<td>Type of formula used (see next page)</td>
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<td>I5</td>
<td>13-17</td>
</tr>
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<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Number of constants</td>
<td>NCON</td>
<td>I5</td>
<td>25-29</td>
</tr>
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<td>6</td>
<td>Number of discrete levels, L</td>
<td>NLEV</td>
<td>I5</td>
<td>31-35</td>
</tr>
<tr>
<td>7</td>
<td>Number of lower order variables left to be considered, N-1</td>
<td>NVR</td>
<td>I5</td>
<td>37-41</td>
</tr>
<tr>
<td>8</td>
<td>Number of comment cards (≤10) following this card</td>
<td>NCCD</td>
<td>I5</td>
<td>43-47</td>
</tr>
<tr>
<td>9</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Types of Discrete Functions

\[ NTDF = 1 \quad y(x_1, x_2, \ldots x_N) = \sum_{\ell=1}^{L} y_\ell(x_1, x_2, \ldots x_{N-1}) \delta(x_N - A_\ell) \]

constants = \([A_1, A_2 \ldots A_L]\), parameters = \([y_1, y_2, \ldots y_L]\)

\[ NTDF = 2 \quad y(x_1, x_2, \ldots x_N) = \sum_{\ell=1}^{L} y_\ell(x_1, x_2, \ldots x_{N-1}) \delta(x_N - B_\ell(x_{N-1} - A_\ell)) \]

constants = \([A_1, B_1, A_2 \ldots B_L]\), parameters = \([y_1, y_2, \ldots y_L]\)

Note: The constants should follow the control card defining the \(y_\ell\). For example, if \(N=1\), the deck structure is

\[
\begin{bmatrix}
DCC9 \\
A_1, A_2 \ldots A_L \\
y_1, y_2 \ldots y_L
\end{bmatrix}
\]

If \(N=2\), and \(y_\ell(x_1)\) is tabulated, the deck structure is

\[
\begin{bmatrix}
DCC9 \\
DCC1 \\
A_1 \\
y_1(x_1) \\
DCC1 \\
A_2 \\
y_2(x_1) \\
\ldots \\
DCC1 \\
A_L \\
y_L(x_1)
\end{bmatrix}
\]

If \(N=3\), and \(y_\ell(x_1, x_2)\) is tabulated, the deck structure is

\[
\begin{bmatrix}
DCC9 \\
DCC2 \\
A_1 \\
y_1(x_1) \text{ at } 1^{st} x_2 \\
DCC1 \\
y_1(x_1) \text{ at } 2^{nd} x_2 \\
\ldots \\
DCC2 \\
A_2
\end{bmatrix}
\]

etc.
4.6.10. Reduction of Variables

It is often convenient to eliminate the dependence or change the form of a variable in certain energy ranges. Thus suppose the energy distribution \( P(E, E') \) were given in various energy ranges (\( E \) is the initial energy). In one range the full function might be tabulated. In another range the function might be independent of \( E \), \( P(E, E') = P(E') \). In still another range the dependence might be on \( (E'/E)^q \).

\[
P(E, E') = P\left((E'/E)^q\right) \quad \text{or perhaps} \quad P(E,(E'/E)^q)
\]

The DCC10 card is designed to control these options. The DCC10 cards if followed by comment cards (if any), constants (if any), and then an appropriate Data Block to describe the remaining function.
<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
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<tbody>
<tr>
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<td>HCCT</td>
<td>A5</td>
<td>1-5</td>
</tr>
<tr>
<td>2</td>
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<td>NCCT</td>
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<td>7-11</td>
</tr>
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<td>3</td>
<td>Type of reduced variable (see next page)</td>
<td>NTCV</td>
<td>I5</td>
<td>13-17</td>
</tr>
<tr>
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<td>I5</td>
<td>19-23</td>
</tr>
<tr>
<td>5</td>
<td>Number of constants given</td>
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<td>I5</td>
<td>25-29</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>I5</td>
<td>31-35</td>
</tr>
<tr>
<td>7</td>
<td>Number of lower order variables left to be considered</td>
<td>NVR</td>
<td>I5</td>
<td>37-41</td>
</tr>
<tr>
<td>8</td>
<td>Number of comment cards to follow</td>
<td>NCCD</td>
<td>I5</td>
<td>43-47</td>
</tr>
<tr>
<td>9</td>
<td>Value of next higher order variable</td>
<td>VHX</td>
<td>E11.0</td>
<td>49-59</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>E11.0</td>
<td>61-71</td>
</tr>
</tbody>
</table>
**Reduced Variable Types**

\[
\begin{align*}
\text{NVR} = 1 & \quad y(x_1, x_2) \rightarrow y(u) & \text{NTCV} = 1 & \quad u = x_1 \\
\text{NVR} = 2 & \quad y(x_1, x_2) \rightarrow y(x_pu) & \text{NTCV} = 2 & \quad u = x_2 \\
\text{NTCV} = 3 & \quad u = (x_2/x_1)^q \quad q = \text{constant}
\end{align*}
\]

**Final forms of** \(y(x_1, x_2)\)

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>1</td>
<td>(y(x_1))</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>(y(x_2))</td>
<td>(y(x_1, x_2))</td>
</tr>
<tr>
<td>3</td>
<td>(y[(x_2/x_1)^q])</td>
<td>([x_1, (x_2/x_1)^q])</td>
</tr>
</tbody>
</table>
4.6.11. Resolved Resonance Parameters

The data order for resolved resonance parameters and the types of resonance formulas used are identical to those in the Aldermaston/Winfrith Data File. It is recommended that the punched card format also conform to the A/W system (NCDF = 1, six numbers/card).

Two changes from the A/W system were made. The first is that in the ENDF all energies used in resonance formulas must be in ev. The second change is the addition of the Adler-type resonance formula.
### Data Control Card 11  Resolved Resonance Parameters

<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCCL1</td>
<td>HCCT</td>
<td>A5</td>
<td>1-5</td>
</tr>
<tr>
<td>2*</td>
<td>411</td>
<td>NCCT</td>
<td>I5</td>
<td>7-11</td>
</tr>
<tr>
<td>3</td>
<td>Type of resonance formula used (see next page)</td>
<td>NTRF</td>
<td>I5</td>
<td>13-17</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>I5</td>
<td>19-23</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>I5</td>
<td>25-29</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Number of resonances</td>
<td>NRES</td>
<td>I5</td>
<td>31-35</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>I5</td>
<td>37-41</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Number of comment cards (≤10) following this card</td>
<td>NCCD</td>
<td>I5</td>
<td>43-47</td>
</tr>
<tr>
<td>9</td>
<td>Nuclear Spin, I</td>
<td>SPIN1</td>
<td>E11.0</td>
<td>49-59</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>E11.0</td>
<td>61-71</td>
</tr>
</tbody>
</table>

Form 1507
NTRF = 1 Single level Breit-Wigner formula, \( t=0 \) neutrons, isolated resonances

The cross sections are defined by the equations

\[
\sigma_{nn}(E) = \pi \chi \sum \frac{g^2_{J^r}}{J^r} \frac{\chi r_n^2 + 4a r_n (E-E_r)}{(E-E_r)^2 + \Gamma_r^2/4} + b_n \sqrt{\frac{\varepsilon_n}{E}} + 4\pi a^2
\]

\[
\sigma_{nx}(E) = \pi \chi^2 \sum \frac{g^2_{J^r}}{J^r} \frac{\Gamma_n r_n^2}{(E-E_r)^2 + \Gamma_r^2/4} + b_x \sqrt{\frac{\varepsilon_x}{E}}
\]

where \( x \) refers to \( \alpha, f, \) etc., and \( \Gamma_r = \sum \Gamma_{rX} \). The required input is:

- \( E_L \) - Lower limit of range of validity of cross sections calculated from these parameters
- \( E_h \) - Upper
- \( a \) - Scattering length in units of \( 10^{-12} \) cm.
- \( T_1 \) - A test indicating the energy variation of \( \Gamma_n, \Gamma_\gamma \)

\[
T_1 = 1 \text{ if } \Gamma_n(E) = \Gamma_n^0, \Gamma_\gamma \text{ constant, } \Gamma_f \text{ constant}
\]

4.48
\[ NTRF = 1 \text{ (Cont'd)} \]

\[ T_2 \text{ - A test indicating the partial widths specified and their order} \]

\[ T_2 = 1 \quad \Gamma_n, \Gamma_Y \]

\[ T_2 = 2 \quad \Gamma_n, \Gamma_Y, \Gamma_f \]

\[ T_2 = 3 \quad \Gamma_n \]

\[ b_x \quad \text{Value of additional } 1/v \text{ component of } x \text{ cross section at energy } \epsilon_x \text{ (barns)} \]

\[ \epsilon_x \quad \text{Energy at which } b_x \text{ is evaluated (ev)} \]

\[ E_r \quad \text{The resonance energy (ev)} \]

\[ J_r \quad \text{The angular momentum of the compound nucleus} \]

\[ \Gamma_r \quad \text{The total width evaluated at } E_r \text{ (ev)} \]

\[ \Gamma_{rx} \quad \text{The partial width evaluated at } E_r \text{ (ev)} \]

The order of data on the cards is:

\[ T_2 = 1 \quad [E_1, E_n, a, T_1, T_2] \quad [\epsilon_n, b_n, \epsilon_Y, b_Y] \quad [E_1, J_1, \Gamma_1, \Gamma_{ln}, \Gamma_{1Y}] \]

\[ [E_2, J_2, \Gamma_2, \Gamma_{2n}, \Gamma_{2Y}] \quad [E_3, J_3, \Gamma_3, \Gamma_{3n}, \Gamma_{3Y}] \text{ etc.} \]

\[ T_2 = 2 \quad [E_1, E_n, a, T_1, T_2] \quad [\epsilon_n, b_n, \epsilon_Y, b_Y, \epsilon_f, b_f] \quad [E_1, J_1, \Gamma_1, \Gamma_{ln}, \Gamma_{1Y}, \Gamma_{1f}] \]

\[ [E_2, J_2, \Gamma_2, \Gamma_{2n}, \Gamma_{2Y}, \Gamma_{2f}] \text{ etc.} \]

\[ T_2 = 3 \quad [E_1, E_n, a, T_1, T_2] \quad [\epsilon_n, b_n] \quad [E_1, J_1, \Gamma_1, \Gamma_{ln}] \quad [E_2, J_2, \Gamma_2, \Gamma_{2n}] \text{ etc.} \]
NTRF = 2 Single level Breit-Wigner Formula for $l=0$ neutrons and many levels for elastic scattering and radiative capture

The cross sections are defined by the equations

$$
\sigma_{\text{nn}}(E) = \pi \lambda^2 \left\{ \sum_r g_{J_r} \frac{\Gamma_{nn}^2 - 2\Gamma_{nn} \Gamma_a / \lambda^2 + 4(\alpha / \lambda) \Gamma_{nn} (E-E_r)}{(E-E_r)^2 + \Gamma_r^2 / 4} + \sum_r \sum_{s \neq r} g_{J_r} g_{J_s} \frac{2\Gamma_{nn} \Gamma_{ss} [\Gamma_{rs}^2 + (E-E_r)(E-E_s)]}{[(E-E_r)^2 + \Gamma_r^2 / 4][(E-E_s)^2 + \Gamma_s^2 / 4]} \right\} + b_n \frac{e_n}{E} + 4\pi a^2
$$

$$
\sigma_{\text{N\gamma}}(E) = \pi \lambda^2 \sum_r g_{J_r} \frac{\Gamma_{nn} \Gamma_{\gamma r}}{(E-E_r)^2 + \Gamma_r^2 / 4} + b_{\gamma} \frac{e_{\gamma}}{E}
$$

The order of data on the cards is the same as for NTRF = 1 with $T_2 = 1$
NTRF = 3 The Reich–Moore Formula – A multilevel formula with few fission channels for \( f = 0 \) neutrons

The theory is given by Reich and Moore (Phys. Rev., 111, 929 (1958)) and has been applied to \( \text{U}^{233} \) (Phys. Rev., 118, 718 (1960)), \( \text{U}^{235} \) (Phys. Rev., 112, 191 (1958)) and \( \text{Pu}^{241} \) (IDO-16679 (1961)). The following quantities are needed for each resonance (numbered by \( \lambda \)).

\[
\begin{align*}
E_{\lambda} & \quad \text{Channel energy (ev)} \\
J_{\lambda} & \quad \text{Spin of compound nucleus} \\
2B_{\lambda 2}^{2} & \quad 2B_{\lambda 2}^{2} \\
S_{12} & \quad \text{Sign of } \beta_{\lambda 1} \beta_{\lambda 2} \\
S_{13} & \quad \text{Sign of } \beta_{\lambda 1} \beta_{\lambda 3} \\
\Gamma_{\lambda} & \quad \text{Total width (ev)} \\
\Gamma_{\lambda n} & \quad \text{Neutron width (ev)} \\
\Gamma_{\lambda y} & \quad \text{Radiation width (ev)} \\
\Gamma_{\lambda f} & \quad \text{Fission width (ev)} \\
T_{1} & \quad \text{Test indicating the energy variation of } \Gamma_{\lambda n}, \Gamma_{\lambda y}, \Gamma_{\lambda f} \text{ with energy} \\
& \quad T_{1} = 1 \text{ implies } \Gamma_{\lambda n} = \Gamma_{\lambda n} / E ; \Gamma_{\lambda y}, \beta_{\lambda 2}, \beta_{\lambda 3} \text{ are independent of energy} \\
E_{\mu} & \quad \text{Lower limit of range of validity of cross sections calculated from these parameters} \\
E_{\nu} & \quad \text{Upper } \\
a & \quad \text{Scattering length in units of } 10^{-12} \text{ cm} \\
b_{x} & \quad \text{Value of additional } 1/v \text{ component of } x \text{ cross section at energy } \epsilon_{x} \text{ (barns)} \\
\epsilon_{x} & \quad \text{Energy at which } b_{x} \text{ is evaluated (ev)} \\
c & \quad \text{The number of fission channels}
\end{align*}
\]
NTRF = 3 (Cont'd)

The order of data on cards is:

\[
[E, E_h, a, T_1, c] \ [e_n, b_n, e_\gamma, b_\gamma, e_\beta, b_\beta] \ [E_1, J_1, \Gamma_1, \Gamma_{1n}, \Gamma_{1\gamma}, \Gamma_{1f}]
\]

\[
[2^{3/2} s_{12}, 2^{3/2} s_{13}, 2^{3/2} s_{12}] \ [E_2, J_2, \Gamma_2, \Gamma_{2n}, \Gamma_{2\gamma}, \Gamma_{2f} \ [2^{3/2} s_{22}, 2^{3/2} s_{22}, 2^{3/2} s_{13}] \text{ etc.}
\]
NTRF = 4  The Vogt many channel, few level formula for \( l = 0 \) neutrons

The theory is given by Vogt (Phys. Rev., 112, 203 (1958)). The required input is similar to the Reich-Moore formula (NTRF = 3) except that the \( \beta_\lambda \) are replaced by a vector \( g_{\lambda f} \) of length \( C \), where \( C \) is the number of fission channels. The units of \( g_{\lambda f} \) are \((\text{ev})^2\).

The order of data on cards is:

\[
[E_1', E_h, a, T_1, C] \quad [\varepsilon_n, b_n, \varepsilon_\gamma, b_\gamma, \varepsilon_f, b_f] \quad [E_1, J_1, \Gamma_1, \Gamma_{1n}, \Gamma_{1\gamma}, \Gamma_{1f}]
\]

\[
[g_{1f1}, g_{1f2}, g_{1f3}, \ldots, g_{1fc}] \quad [E_2, J_2, \Gamma_2, \Gamma_{2n}, \Gamma_{2\gamma}, \Gamma_{2f}] \quad [g_{2f1}, g_{2f2}, \ldots, g_{2fc}] \quad \text{etc.}
\]
NTRF = 5  The multilevel formula with pure scattering as used by Hibdon

Specifications not yet completed.
$\text{NTRF} = 6$ Breit-Wigner formula for a single isolated level involving neutrons of any $i$.

Specifications not yet completed.
The cross section is given by the formula (Trans. Am. Nuc. Soc., Vol. 7, No. 1, pg. 86 (1964))

\[
\sigma_{nx} = 4\pi a^2 + \frac{C}{\sqrt{E}} \sum_{j=1}^{NR+NN} (G_j \psi_j + H_j \chi_j) + \frac{1}{\sqrt{E}} \sum_{k=k_1}^{k_2} b_k E^k
\]

\[G_j = \alpha_j \cos 2a/\lambda + \beta_j \sin 2a/\lambda\]
\[H_j = \beta_j \cos 2a/\lambda - \beta_j \sin 2a/\lambda\]

NR = Number of levels in the energy band analyzed

NN = Number of external neighboring levels

The required input data is:

\[E_l\] - Lower limit of range of validity of cross sections calculated from these parameters (ev)
\[E_h\] - Upper
\[a\] - Scattering length in units of \(10^{-12}\) cm

\[T_1\] - Test indicating the type of cross section, \(x\)

\[T_1 = 1\] Total
\[= 2\] Fission
\[= 3\] Capture
\[= 4\] Scattering
NTRF = 7  (Cont’d)

NB - Number of energy bands considered

For each energy band i the required data is:

\( E_i^1 \) - Lower energy limit of band (ev)
\( E_i^2 \) - Upper " " " "
\( N_i \) - Number of levels in band
\( k_i^1 \) - Lowest power of E in polynomial correction term
\( k_i^2 \) - Highest " " " " " "
\( b_i^k \) - Coefficients in the polynomial correction term
\( \mu_j^i \) - Parameter describing the energy of level j
\( \nu_j^i \) - " " " halfwidth of level j
\( \alpha_j^i \) - Parameter used in the G and H functions
\( \beta_j^i \) - " " " " " "

The order of data on cards is:

\([E_i^1, E_i^2, a, T_i, NB] [E_i^1, E_i^1, NL_i^1, k_i^1, k_i^2] [b_i^k_1, \ldots b_i^k_{k_i^2}] [\mu_i^1, \nu_i^1, \alpha_i^1, \beta_i^1] [\mu_i^1, \nu_i^1, \alpha_i^1, \beta_i^1] [\mu_i^2, \nu_i^2, \alpha_i^1, \beta_i^1] [\mu_i^2, \nu_i^2, \alpha_i^1, \beta_i^1] \ldots [\mu_i^{NL}, \nu_i^{NL}, \alpha_i^{NL}, \beta_i^{NL}] [E_i^{NL}, E_i^{NL}, NL_i^{NL}, k_i^{NL}, k_i^{NL}2] [b_i^{NL}_k, \ldots b_i^{NL}_{k_i^{NL2}}] [\mu_i^{NL2}, \nu_i^{NL2}, \alpha_i^{NL2}, \beta_i^{NL2}] [\mu_i^{NL2}, \nu_i^{NL2}, \alpha_i^{NL2}, \beta_i^{NL2}] \ldots \) etc.
Although little work has been done in this area, it seems clear that the approximations to the full R-matrix theory used for resolved resonances will apply to the unresolved region. Hence the formulas and card formats given for the resolved resonances can be used here if we replace the resonance energy by the mean spacing (D) and consider only one level. Detailed formats are then similar to those in Section 4.6.11. All energies used must be in eV.
<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCC12</td>
<td>HCCT</td>
<td>A5</td>
<td>1-5</td>
</tr>
<tr>
<td>2*</td>
<td>412</td>
<td>NCCT</td>
<td>I5</td>
<td>7-11</td>
</tr>
<tr>
<td>3</td>
<td>Type of formula used (see next page)</td>
<td>NTRF</td>
<td>I5</td>
<td>13-17</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>I5</td>
<td></td>
<td>19-23</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>I5</td>
<td></td>
<td>25-29</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>I5</td>
<td></td>
<td>31-35</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>I5</td>
<td></td>
<td>37-41</td>
</tr>
<tr>
<td>8</td>
<td>Number of comment cards (≤10) following this card</td>
<td>NCCD</td>
<td>I5</td>
<td>43-47</td>
</tr>
<tr>
<td>9</td>
<td>Nuclear spin, I</td>
<td>SPIN</td>
<td>E11.0</td>
<td>49-59</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>E11.0</td>
<td>61-71</td>
</tr>
</tbody>
</table>
NTRF = 1  Single level Breit-Wigner formula, \( l = 0 \) neutrons, isolated resonances

Same card format as NTRF = 1, Section 4.6.11, except that only one set of parameters is given and the resonance energy is replaced by the mean spacing, D.
4.6.13. Radioactive Decay and Fission Product Yield Data

If \((Z,A)\) represents the nuclide specified on the Heading Cards, then we consider the sequence

\[
(Z,A) \xrightarrow{\text{reaction}} (Z_{1},A_{1}) \xrightarrow{\text{decay}_1} (Z_{2},A_{2}) \xrightarrow{\text{decay}_2} (Z_{3},A_{3})
\]

where the reaction might be \((n,\gamma)\), \((n,2n)\) or no reaction in which case \((Z_{1},A_{1}) = (Z_{1},A)\).

Data for the above sequence is given on Radioactive Decay Cards.

The \((Z,A)\) designation and the fractional yield of fission products is given of the Fission Product Yield cards.

The DCCL3 card is followed by comment cards (if any), Radioactive Decay cards (if any), and the Version Product Yield cards (if any).
<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCC13</td>
<td>HCCT</td>
<td>A5</td>
<td>1-5</td>
</tr>
<tr>
<td>2*</td>
<td>513</td>
<td>NCCT</td>
<td>I5</td>
<td>7-11</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>I5</td>
<td></td>
<td>13-17</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>I5</td>
<td></td>
<td>19-23</td>
</tr>
<tr>
<td>5</td>
<td>Number of Radioactive Decay Data cards</td>
<td>NRDD</td>
<td>I5</td>
<td>25-29</td>
</tr>
<tr>
<td>6</td>
<td>Number of fission product yields given</td>
<td>NFPY</td>
<td>I5</td>
<td>31-35</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>I5</td>
<td></td>
<td>37-41</td>
</tr>
<tr>
<td>8</td>
<td>Number of comment cards (&lt;10) following this card</td>
<td>NCCD</td>
<td>I5</td>
<td>43-47</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td>E11.0</td>
<td>49-59</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>E11.0</td>
<td>61-71</td>
</tr>
</tbody>
</table>
## Radioactive Decay Card

<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reaction type (Integer NREAC from Dictionary 3) (note 2)</td>
<td>RTYP</td>
<td>E11.0</td>
<td>1-11</td>
</tr>
<tr>
<td>2</td>
<td>Identification number of isotope produced by this reaction (note 1)</td>
<td>ZAI</td>
<td>E11.0</td>
<td>13-23</td>
</tr>
<tr>
<td>3</td>
<td>Decay constant (days$^{-1}$) of the isotope ZAI</td>
<td>DCl</td>
<td>E11.0</td>
<td>25-35</td>
</tr>
<tr>
<td>4</td>
<td>Identification number of isotope produced by the decay of ZAI</td>
<td>ZAI2</td>
<td>E11.0</td>
<td>37-47</td>
</tr>
<tr>
<td>5</td>
<td>Decay constant (days$^{-1}$) of the isotope ZAI2</td>
<td>DC2</td>
<td>E11.0</td>
<td>49-59</td>
</tr>
<tr>
<td>6</td>
<td>Identification number of isotope produced by the decay of ZAI2</td>
<td>ZAI3</td>
<td>E11.0</td>
<td>61-71</td>
</tr>
</tbody>
</table>

**Note 1:** The identification number of a nuclide is given by

$1000 \times Z + A$. For example,

- Hydrogen $- 1001$
- $^{238} \text{U} - 92238$

**Note 2:** RTYP = 0 implies spontaneous decay of the original isotope. If used, this card should be first and the remaining RTYP should be in increasing order.
<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
<th>SYMBOL</th>
<th>FORMAT</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Identification number of first fission product (note 1)</td>
<td>FP(1)</td>
<td>E11.0</td>
<td>1-11</td>
</tr>
<tr>
<td>2</td>
<td>Fictional yield of first fission product</td>
<td>YLD(1)</td>
<td>E11.0</td>
<td>13-23</td>
</tr>
<tr>
<td>3</td>
<td>Identification number of second fission product (note 1)</td>
<td>FP(2)</td>
<td>E11.0</td>
<td>25-35</td>
</tr>
<tr>
<td>4</td>
<td>Fractional yield of second fission product</td>
<td>YLD(2)</td>
<td>E11.0</td>
<td>37-47</td>
</tr>
<tr>
<td>5</td>
<td>Identification number of third fission product (note 1)</td>
<td>FP(3)</td>
<td>E11.0</td>
<td>49-59</td>
</tr>
<tr>
<td>6</td>
<td>Fractional yield of third fission product</td>
<td>YLD(3)</td>
<td>E11.0</td>
<td>61-71</td>
</tr>
</tbody>
</table>

Note 1: The identification number of a nuclide is given by
1000 Z + A. For example,

Hydrogen - 1001
U^{238} - 92238

Note 2: Repeat the above pattern on successive cards until all fission products have been listed.
4.7 Thermal Scattering Law

The scattering law is written in the form \( S(\alpha, \beta) + e^{-\lambda \delta(\beta)} \), where \( S(\alpha, \beta) \) is a tabulated function. The formats follow those in the A/W library. The mathematical description on the first heading card should read \( S(AL, BT) \) or \( S(AL, BT, T) \) if the temperature dependence is considered. The following constant are also required.

\( \sigma_f \) - The free atom cross section (barns).

\( \varepsilon \) - The value of \( E/kT \) above which the static nucleus model of elastic scattering is adequate.

\( A \) - The effective value of the ratio mass of "molecule" to mass of neutron to be used.

\( E_m \) - The upper energy limit for constant \( \sigma_f \). Above this energy \( \sigma_{el} \) must be used in conjunction with the monatomic gas law.

\( \lambda \) - The parameter in the \( \delta \) - function contribution to \( S(\alpha, \beta) \). If there is no contribution from this term, set \( \lambda \) to zero.

These constants are placed on the constants cards following the DCC2 card. The deck structure is given on the following pages.
Temperature Independent $S(\alpha, \beta)$

[Heading cards]
[DCC2 card with the number of $\beta$ values]
[$c_f, \varepsilon, A, E_m, \lambda$]
[DCC1 card with the first value of $\beta$]
  [values of $\alpha$]
  [values of $S$]
[DCC1 card with second value of $\beta$]
  [values of $\alpha$]
  [values of $S$]

...
Temperature Dependent $S(\alpha, \beta)$

[Heading cards]

[DCC3 card to control temperature dependence]

[Deck on preceding page starting with DCC2 card for 1st temperature]

[ " " " " " " " " " 2nd " " ]

.
.
.
.

[END card]
5. **Dictionaries**

The dictionaries referred to in the preceding sections are given on the following pages.
5.1 Dictionary 1 - Chemical Symbols

The following 2 character chemical symbols may be used in field 1 (Cols. 1-2) of the first Heading Card. Single characters may be either left or right adjusted in the field. When the deck is converted to Version B the corresponding number NATOM will be put in field 3 (Cols. 13-17) of the second Heading Card.

<table>
<thead>
<tr>
<th>NATOM</th>
<th>CHEMS</th>
<th>NATOM</th>
<th>CHEMS</th>
<th>NATOM</th>
<th>CHEMS</th>
<th>NATOM</th>
<th>CHEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>H</td>
<td>26</td>
<td>FE</td>
<td>51</td>
<td>SB</td>
<td>76</td>
<td>ØS</td>
</tr>
<tr>
<td>2</td>
<td>HE</td>
<td>27</td>
<td>CØ</td>
<td>52</td>
<td>TE</td>
<td>77</td>
<td>IR</td>
</tr>
<tr>
<td>3</td>
<td>LI</td>
<td>28</td>
<td>NI</td>
<td>53</td>
<td>I</td>
<td>78</td>
<td>PI</td>
</tr>
<tr>
<td>4</td>
<td>BE</td>
<td>29</td>
<td>CU</td>
<td>54</td>
<td>XE</td>
<td>79</td>
<td>AU</td>
</tr>
<tr>
<td>5</td>
<td>B</td>
<td>30</td>
<td>ZN</td>
<td>55</td>
<td>CS</td>
<td>80</td>
<td>HG</td>
</tr>
<tr>
<td>6</td>
<td>C</td>
<td>31</td>
<td>GA</td>
<td>56</td>
<td>BA</td>
<td>81</td>
<td>TL</td>
</tr>
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<td>7</td>
<td>N</td>
<td>32</td>
<td>GE</td>
<td>57</td>
<td>LA</td>
<td>82</td>
<td>PB</td>
</tr>
<tr>
<td>8</td>
<td>Ø</td>
<td>33</td>
<td>AS</td>
<td>58</td>
<td>CE</td>
<td>83</td>
<td>BI</td>
</tr>
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<td>9</td>
<td>F</td>
<td>34</td>
<td>SE</td>
<td>59</td>
<td>PR</td>
<td>84</td>
<td>PØ</td>
</tr>
<tr>
<td>10</td>
<td>NE</td>
<td>35</td>
<td>BR</td>
<td>60</td>
<td>ND</td>
<td>85</td>
<td>AT</td>
</tr>
<tr>
<td>11</td>
<td>NA</td>
<td>36</td>
<td>KR</td>
<td>61</td>
<td>IL</td>
<td>86</td>
<td>RN</td>
</tr>
<tr>
<td>12</td>
<td>MG</td>
<td>37</td>
<td>RB</td>
<td>62</td>
<td>SM</td>
<td>87</td>
<td>FR</td>
</tr>
<tr>
<td>13</td>
<td>AL</td>
<td>38</td>
<td>SR</td>
<td>63</td>
<td>EU</td>
<td>88</td>
<td>RA</td>
</tr>
<tr>
<td>14</td>
<td>SI</td>
<td>39</td>
<td>Y</td>
<td>64</td>
<td>GD</td>
<td>89</td>
<td>AC</td>
</tr>
<tr>
<td>15</td>
<td>P</td>
<td>40</td>
<td>ZR</td>
<td>65</td>
<td>TB</td>
<td>90</td>
<td>TH</td>
</tr>
<tr>
<td>16</td>
<td>S</td>
<td>41</td>
<td>CB</td>
<td>66</td>
<td>DY</td>
<td>91</td>
<td>PA</td>
</tr>
<tr>
<td>17</td>
<td>CL</td>
<td>42</td>
<td>MØ</td>
<td>67</td>
<td>HØ</td>
<td>92</td>
<td>U</td>
</tr>
<tr>
<td>18</td>
<td>A</td>
<td>43</td>
<td>MA</td>
<td>68</td>
<td>ER</td>
<td>93</td>
<td>NP</td>
</tr>
<tr>
<td>19</td>
<td>K</td>
<td>44</td>
<td>RU</td>
<td>69</td>
<td>TM</td>
<td>94</td>
<td>PU</td>
</tr>
<tr>
<td>20</td>
<td>CA</td>
<td>45</td>
<td>RH</td>
<td>70</td>
<td>YB</td>
<td>95</td>
<td>AM</td>
</tr>
<tr>
<td>21</td>
<td>SC</td>
<td>46</td>
<td>PD</td>
<td>71</td>
<td>LU</td>
<td>96</td>
<td>CM</td>
</tr>
<tr>
<td>22</td>
<td>TI</td>
<td>47</td>
<td>AG</td>
<td>72</td>
<td>HF</td>
<td>0</td>
<td>blank</td>
</tr>
<tr>
<td>23</td>
<td>V</td>
<td>48</td>
<td>CD</td>
<td>73</td>
<td>TA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>CR</td>
<td>49</td>
<td>IN</td>
<td>74</td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>MN</td>
<td>50</td>
<td>SN</td>
<td>75</td>
<td>RE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.2 Dictionary 2 - Particle Types

The following one character particle types are to be used in fields 3 (Col. 8) and 6 (Col. 0) of the first Heading Card. When the deck is converted to Version B the corresponding number NPART will be put in fields 5 (Cols. 25-29) and 8 (Cols. 43-47) of the second Heading Card.

<table>
<thead>
<tr>
<th>NPART</th>
<th>PART</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>N</td>
<td>Irrelevant</td>
</tr>
<tr>
<td>1</td>
<td>N</td>
<td>Neutron</td>
</tr>
<tr>
<td>2</td>
<td>G</td>
<td>Gamma</td>
</tr>
<tr>
<td>3</td>
<td>P</td>
<td>Proton</td>
</tr>
<tr>
<td>4</td>
<td>A</td>
<td>Alpha</td>
</tr>
<tr>
<td>5</td>
<td>E</td>
<td>Electron</td>
</tr>
<tr>
<td>6</td>
<td>D</td>
<td>Deuteron</td>
</tr>
<tr>
<td>7</td>
<td>T</td>
<td>Triton</td>
</tr>
<tr>
<td>8</td>
<td>H</td>
<td>Helium 3</td>
</tr>
<tr>
<td>9</td>
<td>F</td>
<td>Fission fragment</td>
</tr>
<tr>
<td>10</td>
<td>U</td>
<td>Special particle (see note 1)</td>
</tr>
<tr>
<td>11</td>
<td>V</td>
<td>&quot; &quot; &quot; &quot; &quot; &quot;</td>
</tr>
<tr>
<td>12</td>
<td>W</td>
<td>&quot; &quot; &quot; &quot; &quot; &quot;</td>
</tr>
<tr>
<td>13</td>
<td>X</td>
<td>&quot; &quot; &quot; &quot; &quot; &quot;</td>
</tr>
<tr>
<td>14</td>
<td>Y</td>
<td>&quot; &quot; &quot; &quot; &quot; &quot;</td>
</tr>
<tr>
<td>15</td>
<td>Z</td>
<td>&quot; &quot; &quot; &quot; &quot; &quot;</td>
</tr>
</tbody>
</table>

Note 1. If these particles are used, they should be defined on the Comment Cards.
5.3 Dictionary 3 - Reaction Types

The following reaction types are to be used in field 4 (cols. 10-15) of the first Heading Card. If the symbol is less than 6 characters, the symbol may be either left or right adjusted in the field. When the deck is converted to Version B, the corresponding number NREAC will be put in field 6 (cols. 31-35) of the second Heading Card. Note that the number NREAC is equivalent to the PCN in the Aldermaston/Winfrith format. The descriptions of the reactions are illustrated for neutron induced reactions.

<table>
<thead>
<tr>
<th>NREAC</th>
<th>REAC</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TOTAL</td>
<td>Total</td>
</tr>
<tr>
<td>2</td>
<td>ELAST</td>
<td>Elastic</td>
</tr>
<tr>
<td>3</td>
<td>NONEL</td>
<td>Non-elastic</td>
</tr>
<tr>
<td>4</td>
<td>INELAS</td>
<td>Inelastic</td>
</tr>
<tr>
<td>5-15</td>
<td></td>
<td>not used</td>
</tr>
<tr>
<td>16</td>
<td>PAIR</td>
<td>Pair production</td>
</tr>
<tr>
<td>17</td>
<td>TRIPLE</td>
<td>Triplet production</td>
</tr>
<tr>
<td>18</td>
<td>FISS</td>
<td>Fission = (f,f) + (n,f'f)+...</td>
</tr>
<tr>
<td>19</td>
<td>F</td>
<td>(n,f)</td>
</tr>
<tr>
<td>20</td>
<td>NF</td>
<td>(n,f'f)</td>
</tr>
<tr>
<td>21</td>
<td>2NF</td>
<td>(n,2nf)</td>
</tr>
<tr>
<td>22</td>
<td>NA</td>
<td>(n,n')α</td>
</tr>
<tr>
<td>23</td>
<td>N3A</td>
<td>(n,n')3α</td>
</tr>
<tr>
<td>24</td>
<td>2NA</td>
<td>(n,2n)α</td>
</tr>
<tr>
<td>25</td>
<td>3NA</td>
<td>(n,3n)α</td>
</tr>
<tr>
<td>26</td>
<td></td>
<td>not used</td>
</tr>
<tr>
<td>27</td>
<td>ABSØRF</td>
<td>absorption (fission + capture)</td>
</tr>
<tr>
<td>28</td>
<td>NP</td>
<td>(n,n')p</td>
</tr>
</tbody>
</table>
## Dictionary 3 (Cont'd.)

<table>
<thead>
<tr>
<th>NREA C</th>
<th>REAC</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>29-100</td>
<td></td>
<td>to be assigned</td>
</tr>
<tr>
<td>101</td>
<td>PARABS</td>
<td>Parasitic absorption</td>
</tr>
<tr>
<td>102</td>
<td>G</td>
<td>((n,\gamma))</td>
</tr>
<tr>
<td>103</td>
<td>P</td>
<td>((n,p))</td>
</tr>
<tr>
<td>104</td>
<td>D</td>
<td>((n,d))</td>
</tr>
<tr>
<td>105</td>
<td>T</td>
<td>((n,t))</td>
</tr>
<tr>
<td>106</td>
<td>H</td>
<td>((n,\text{He}^3))</td>
</tr>
<tr>
<td>107</td>
<td>A</td>
<td>((n,\alpha))</td>
</tr>
<tr>
<td>108</td>
<td>2A</td>
<td>((n,2\alpha))</td>
</tr>
<tr>
<td>109-</td>
<td></td>
<td>to be assigned</td>
</tr>
</tbody>
</table>
5.4 Dictionary 4 - Type of Data

The following 4 character data type descriptions are to be used in field 7 (Cols. 22-25) of the first Heading Card. When the deck is converted to Version B, the corresponding NDTYP will be put in field 9 (Cols. 49-53) of the second Heading Card. Symbols with less than 4 characters may be either right or left adjusted in the field.

<table>
<thead>
<tr>
<th>NDTYP</th>
<th>DTYP</th>
<th>Description</th>
<th>G.C.N. (Note 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>Irrelevant</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>CRØS</td>
<td>Cross section</td>
<td>1 or 8</td>
</tr>
<tr>
<td>2</td>
<td>ANGD</td>
<td>Angular distributor</td>
<td>2 or 9</td>
</tr>
<tr>
<td>3</td>
<td>ENED</td>
<td>Energy distributor</td>
<td>3 or 10</td>
</tr>
<tr>
<td>4</td>
<td>AECR</td>
<td>Angle-energy correlation</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>CØRR</td>
<td>Multi-dimensional correlation</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>RERP</td>
<td>Resolved resonance parameters</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>UNRP</td>
<td>Unresolved resonance parameters</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>TSCL</td>
<td>Thermal scattering law</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>BURN</td>
<td>Burnup data</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>NU</td>
<td>(\nu) Neutrons/fission</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>ETA</td>
<td>(N) Neutrons/capture</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>ALPH</td>
<td>(\alpha) (Capture/fission)-1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>ØPAL</td>
<td>(1 + \alpha) (Capture/fission)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>NBAR</td>
<td>(\bar{N}) Neutrons/collision</td>
<td></td>
</tr>
</tbody>
</table>

Note 1. This is the General Classification Number used in the Aldermaston/Winfirth Nuclear Data File.
5.5 **Dictionary 5 - Form of y**

The following symbols describing the function \( y \) are to be used in field 8 (Col. 27) of the first Heading Card. When the deck is converted to Version B, the corresponding symbol NYFØR will be put in field 10 (Cols. 55-59) of the second Heading Card.

<table>
<thead>
<tr>
<th>NYFØR</th>
<th>YFØRM</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>Irrelevant</td>
</tr>
<tr>
<td>1</td>
<td>C</td>
<td>( y = \sigma ), The Desired Cross Section</td>
</tr>
<tr>
<td>2</td>
<td>P</td>
<td>( y = P ), A Probability Distribution</td>
</tr>
<tr>
<td>3</td>
<td>S</td>
<td>( y = S ), The Scattering Law</td>
</tr>
<tr>
<td>4</td>
<td>V</td>
<td>( y = \sqrt{E_i} \sigma )</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.6 **Dictionary 6 - Form of x**

The following symbols describing the variables x are to be used in fields 9 (Cols. 29-30), 10 (Cols. 32-33), and 11 (Cols. 35-36) of the first Heading Card. When the deck is converted to Version B, the corresponding number NXFØR will be put in fields 3-5 of the third Heading Card.

<table>
<thead>
<tr>
<th>NXFØR</th>
<th>XFØRM</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Irrelevant</td>
</tr>
<tr>
<td>1</td>
<td>EI</td>
</tr>
<tr>
<td>2</td>
<td>EF</td>
</tr>
<tr>
<td>3</td>
<td>DE</td>
</tr>
<tr>
<td>4</td>
<td>UI</td>
</tr>
<tr>
<td>5</td>
<td>UF</td>
</tr>
<tr>
<td>6</td>
<td>DU</td>
</tr>
<tr>
<td>7</td>
<td>AL</td>
</tr>
<tr>
<td>8</td>
<td>AC</td>
</tr>
<tr>
<td>9</td>
<td>CL</td>
</tr>
<tr>
<td>10</td>
<td>CC</td>
</tr>
<tr>
<td>11</td>
<td>T</td>
</tr>
<tr>
<td>12</td>
<td>AL</td>
</tr>
<tr>
<td>13</td>
<td>BT</td>
</tr>
<tr>
<td>NXPØR</td>
<td>XFØRM</td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>41</td>
<td>A1</td>
</tr>
<tr>
<td>42</td>
<td>A2</td>
</tr>
<tr>
<td>43</td>
<td>A3</td>
</tr>
<tr>
<td>44</td>
<td>A4</td>
</tr>
<tr>
<td>45</td>
<td>A5</td>
</tr>
<tr>
<td>46</td>
<td>Cl</td>
</tr>
<tr>
<td>47</td>
<td>C2</td>
</tr>
<tr>
<td>48</td>
<td>C3</td>
</tr>
<tr>
<td>49</td>
<td>C4</td>
</tr>
<tr>
<td>50</td>
<td>C5</td>
</tr>
<tr>
<td>51</td>
<td>E1</td>
</tr>
<tr>
<td>52</td>
<td>E2</td>
</tr>
<tr>
<td>53</td>
<td>E3</td>
</tr>
<tr>
<td>54</td>
<td>E4</td>
</tr>
<tr>
<td>55</td>
<td>E5</td>
</tr>
</tbody>
</table>

99 XX See note 1.

Note 1. The special symbol XX in field 9 of the first Heading Card indicates more than 3 variables are used and a Heading Card Extension is required.
5.7 Dictionary 7 - Cross Section Units

The following symbols for cross section units are to be used in field 12 (Cols. 38-39) of the first Heading Card. When the deck is converted to Version B, this dictionary will be eliminated. The data will be scaled so that the units are barns and the symbol BN will be put in field 12.

<table>
<thead>
<tr>
<th>NCSUN</th>
<th>CSUN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>Irrelevant</td>
</tr>
<tr>
<td>1</td>
<td>BN</td>
<td>Barns</td>
</tr>
<tr>
<td>1</td>
<td>B</td>
<td>Barns</td>
</tr>
<tr>
<td>2</td>
<td>MB</td>
<td>Millibarns</td>
</tr>
</tbody>
</table>
5.8 **Dictionary 8 - Energy Units**

The following symbols for energy units are to be used in field 19 (Cols. 70-72) of the first Heading Card. When the deck is converted to Version B, this dictionary will be eliminated. The data will be scaled so that energies are in electron volts and the symbol EV will be put in field 19. Symbols with less than 3 characters may be either right or left adjusted in the field.

<table>
<thead>
<tr>
<th>NENUN</th>
<th>ENUN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>Irrelevant</td>
</tr>
<tr>
<td>1</td>
<td>MV</td>
<td>Milli-Electron Volts</td>
</tr>
<tr>
<td>2</td>
<td>EV</td>
<td>Electron Volts</td>
</tr>
<tr>
<td>3</td>
<td>KEV</td>
<td>Thousand Electron Volts</td>
</tr>
<tr>
<td>4</td>
<td>MEV</td>
<td>Million Electron Volts</td>
</tr>
<tr>
<td>5</td>
<td>K</td>
<td>Degrees Kelvin</td>
</tr>
<tr>
<td>6</td>
<td>A</td>
<td>Angstroms</td>
</tr>
</tbody>
</table>
5.9 Dictionary 9 - Installation Codes

The following 3 letter codes should be used to denote the installation where the data was evaluated.

<table>
<thead>
<tr>
<th>NEVAL</th>
<th>EVAL</th>
<th>Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ALD</td>
<td>AWRE, Aldermaston, England</td>
</tr>
<tr>
<td>2</td>
<td>ANL</td>
<td>Argonne National Lab., Lemont, Illinois</td>
</tr>
<tr>
<td>3</td>
<td>ARK</td>
<td>U. of Arkansas, Fayetteville</td>
</tr>
<tr>
<td>4</td>
<td>AUS</td>
<td>Austria</td>
</tr>
<tr>
<td>5</td>
<td>AUL</td>
<td>Australia</td>
</tr>
<tr>
<td>6</td>
<td>BAR</td>
<td>Bartol Research Foundation, Swarthmore, Pennsylvania</td>
</tr>
<tr>
<td>7</td>
<td>BAS</td>
<td>U. of Basel, Switzerland</td>
</tr>
<tr>
<td>8</td>
<td>BAT</td>
<td>Battelle Memorial Inst., Columbus, Ohio</td>
</tr>
<tr>
<td>9</td>
<td>BEL</td>
<td>Bell Telephone Labs., Murray Hill, New Jersey</td>
</tr>
<tr>
<td>10</td>
<td>BET</td>
<td>Westinghouse, Bettis Atomic Power Division, Pittsbugh, Pennsylvania</td>
</tr>
<tr>
<td>11</td>
<td>BKB</td>
<td>B. Kidrich, Belgrade, Yugoslavia</td>
</tr>
<tr>
<td>12</td>
<td>BNL</td>
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</tr>
<tr>
<td>13</td>
<td>BOM</td>
<td>Bombay, India</td>
</tr>
<tr>
<td>14</td>
<td>BOS</td>
<td>Bose Inst., Calcutta, India</td>
</tr>
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<td>15</td>
<td>BRK</td>
<td>U. of California, Berkeley</td>
</tr>
<tr>
<td>16</td>
<td>BRN</td>
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</tr>
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<td>17</td>
<td>BUL</td>
<td>Bulgaria</td>
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<tr>
<td>18</td>
<td>BW</td>
<td>Babcock &amp; Wilcox Co., Lynchburg, Virginia</td>
</tr>
<tr>
<td>19</td>
<td>BZL</td>
<td>Brazil</td>
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<tr>
<td>20</td>
<td>CAN</td>
<td>Australian U., Canberra</td>
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<td>21</td>
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### Dictionary 9 (Cont'd.)

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<th>EVAL</th>
<th>Installation</th>
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<td>Chile</td>
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<td>C. I. S. E., Milan, Italy</td>
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<td>Calcutta, India</td>
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<tr>
<td>30</td>
<td>CND</td>
<td>Canada</td>
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<td>Columbia U., New York City, New York</td>
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<td>32</td>
<td>CON</td>
<td>Convair, San Diego, California</td>
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<td>33</td>
<td>CRC</td>
<td>Chalk River, Ontario, Canada</td>
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<td>CSE</td>
<td>Case Institute of Tech., Cleveland, Ohio</td>
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<td>CTL</td>
<td>Chatillon, Fontenay-aux-Roses, France</td>
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<td>Denmark</td>
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<td>GEV</td>
<td>GE-Vallecitos Atomic Lab., San Jose, California</td>
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### Dictionary 9 (Cont'd.)

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<th>Installation</th>
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<td>ISL</td>
<td>Israel</td>
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<td>ISP</td>
<td>Euratom, Ispra, Italy</td>
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<tr>
<td>56</td>
<td>ITY</td>
<td>Italy</td>
</tr>
<tr>
<td>57</td>
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<td>Japan Atomic Energy Research Inst.</td>
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<td>58</td>
<td>JAP</td>
<td>Japan</td>
</tr>
<tr>
<td>59</td>
<td>JEN</td>
<td>JENER, Norway</td>
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<td>60</td>
<td>JHU</td>
<td>Johns Hopkins U., Baltimore, Maryland</td>
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<td>JIN</td>
<td>Joint Inst. for Nuclear Research, Georgian S. S. R. (Dubna)</td>
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<tr>
<td>62</td>
<td>KAP</td>
<td>Knolls Atomic Power Lab., Schenectady, New York</td>
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<tr>
<td>63</td>
<td>KON</td>
<td>Konan U., Japan</td>
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<td>KRL</td>
<td>Karlsruhe, West Germany</td>
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<td>KTO</td>
<td>U. of Kyoto, Japan</td>
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<td>KTY</td>
<td>U. of Kentucky, Lexington, Kentucky</td>
</tr>
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<td>67</td>
<td>LAS</td>
<td>Los Alamos Scientific Lab., New Mexico</td>
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<tr>
<td>68</td>
<td>LEB</td>
<td>Lebedev Inst., U. S. S. R.</td>
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<tr>
<td>69</td>
<td>LOK</td>
<td>Lockheed Aircraft, Sunnyvale, California</td>
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<td>LOV</td>
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<td>Installation</td>
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<tr>
<td>82</td>
<td>MUN</td>
<td>Munich, Germany</td>
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<td>NAA</td>
<td>NAA, Atomics International, Kanooga Park, California</td>
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<tr>
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<td>NBS</td>
<td>National Bureau of Standards, Washington, D. C.</td>
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<tr>
<td>85</td>
<td>NED</td>
<td>Netherlands</td>
</tr>
<tr>
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<td>NEV</td>
<td>U. of Neuchatel, Switzerland</td>
</tr>
<tr>
<td>87</td>
<td>NOR</td>
<td>Norway</td>
</tr>
<tr>
<td>88</td>
<td>NOT</td>
<td>U. of Notre Dame, South Bend, Indiana</td>
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<tr>
<td>89</td>
<td>NRD</td>
<td>U. S. Naval Research Defense Lab., San Francisco, California</td>
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<tr>
<td>90</td>
<td>NRL</td>
<td>U. S. Naval Research Lab., Washington, D. C.</td>
</tr>
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<td>91</td>
<td>NWU</td>
<td>Northwestern U., Evanston, Illinois</td>
</tr>
<tr>
<td>92</td>
<td>NZL</td>
<td>New Zealand</td>
</tr>
<tr>
<td>93</td>
<td>ORL</td>
<td>Oak Ridge National Lab., Tennessee</td>
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<td>94</td>
<td>OXF</td>
<td>U. of Oxford, England</td>
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<tr>
<td>95</td>
<td>PAR</td>
<td>Paris</td>
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<tr>
<td>96</td>
<td>POL</td>
<td>Poland</td>
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<tr>
<td>97</td>
<td>PSV</td>
<td>Penn State U., University Park, Pennsylvania</td>
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<tr>
<td>98</td>
<td>RBZ</td>
<td>Inst. &lt;&lt;R. Boskovic&gt;&gt;, Zagreb, Yugoslavia</td>
</tr>
<tr>
<td>99</td>
<td>RIC</td>
<td>Rice Inst., Houston, Texas</td>
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<td>100</td>
<td>RIS</td>
<td>Riso, Roskilde, Denmark</td>
</tr>
<tr>
<td>101</td>
<td>ROS</td>
<td>Rosendorf bei Dresden, Germany</td>
</tr>
<tr>
<td>102</td>
<td>RPI</td>
<td>Rensselaer Polytechnic Inst., Troy, New York</td>
</tr>
<tr>
<td>103</td>
<td>RUM</td>
<td>Rumania</td>
</tr>
<tr>
<td>104</td>
<td>SAC</td>
<td>Saclay, Paris, France</td>
</tr>
<tr>
<td>105</td>
<td>SAH</td>
<td>Saha Inst., Calcutta, India</td>
</tr>
<tr>
<td>NEVAL</td>
<td>EVAL</td>
<td>Installation</td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>--------------------------------------------------</td>
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<td>106</td>
<td>SOC</td>
<td>Socony Mobil Oil Co., Dallas, Texas</td>
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<tr>
<td>107</td>
<td>SR</td>
<td>Savannah River Lab., Aiken, South Carolina</td>
</tr>
<tr>
<td>108</td>
<td>STF</td>
<td>Stanford U., Menlo Park, California</td>
</tr>
<tr>
<td>109</td>
<td>SWD</td>
<td>Sweden</td>
</tr>
<tr>
<td>110</td>
<td>SWT</td>
<td>Switzerland</td>
</tr>
<tr>
<td>111</td>
<td>TAT</td>
<td>Tata Inst., Bombay, India</td>
</tr>
<tr>
<td>112</td>
<td>TEX</td>
<td>U. of Texas, Austin</td>
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<tr>
<td>113</td>
<td>TNC</td>
<td>Texas Nuclear Corp., Austin, Texas</td>
</tr>
<tr>
<td>114</td>
<td>TUK</td>
<td>Turkey</td>
</tr>
<tr>
<td>115</td>
<td>UKR</td>
<td>Ukraine</td>
</tr>
<tr>
<td>116</td>
<td>UMT</td>
<td>U. of Montana, Helena, Montana</td>
</tr>
<tr>
<td>117</td>
<td>UNC</td>
<td>United Nuclear Corp., White Plains, New York</td>
</tr>
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<td>118</td>
<td>UPA</td>
<td>U. of Pennsylvania, Philadelphia, Pennsylvania</td>
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<tr>
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<td>UVA</td>
<td>U. of Virginia, Charlottesville, Virginia</td>
</tr>
<tr>
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<td>WAD</td>
<td>Wright Air Development Center, Ohio</td>
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<tr>
<td>121</td>
<td>WAP</td>
<td>Westinghouse Atomic Power Dept., Pittsburgh, Pennsylvania</td>
</tr>
<tr>
<td>122</td>
<td>WIN</td>
<td>AEEW, Winfrith, England</td>
</tr>
<tr>
<td>123</td>
<td>WIS</td>
<td>U. of Wisconsin, Madison, Wisconsin</td>
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<tr>
<td>124</td>
<td>WUR</td>
<td>Wurenlingen, Switzerland</td>
</tr>
<tr>
<td>125</td>
<td>YAL</td>
<td>Yale U., New Haven, Connecticut</td>
</tr>
<tr>
<td>126</td>
<td>ZAG</td>
<td>U. of Zagreb, Yugoslavia</td>
</tr>
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<td>ZUR</td>
<td>Zurich, Switzerland</td>
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<tr>
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5.10 Dictionary 10 - Control Card Types

The following control card types are used:

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<th>NCCT (Note 1)</th>
<th>Description</th>
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<td>SEC</td>
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<td>Secondary particle</td>
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<td>ENR</td>
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<td>Energy range</td>
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<tr>
<td>PDC</td>
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<td>Partial distribution</td>
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<td>Tabulated function (1D)</td>
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<td>DCC 5</td>
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<td>DCC 6</td>
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<td>Analytic function (1D)</td>
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<td>Reduced variables</td>
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<td>Unresolved resonances</td>
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<td>Radioactive decay and fission yield</td>
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5.11 **Dictionary 11 - Allowed Characters**

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<tr>
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</tr>
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</table>
5.15 **Dictionary 15 - Final State Numbers**

The following final state numbers are to be used in field 5 (Cols. 17-18) of the first Heading Card. When the deck is converted to Version B, the number\( \text{NFS} \) will be put in field 7 (Cols. 37-41) of the second Heading Card.

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<tbody>
<tr>
<td>0</td>
<td>Ground state</td>
</tr>
<tr>
<td>1</td>
<td>1\textsuperscript{st} excited state</td>
</tr>
<tr>
<td>2</td>
<td>2\textsuperscript{nd} excited state</td>
</tr>
<tr>
<td>---</td>
<td>-----</td>
</tr>
<tr>
<td>20</td>
<td>20\textsuperscript{th} excited state</td>
</tr>
<tr>
<td>---</td>
<td>-----</td>
</tr>
<tr>
<td>98</td>
<td>A range of final states</td>
</tr>
<tr>
<td>99</td>
<td>All final states</td>
</tr>
</tbody>
</table>
5.16 Dictionary 16 - Data Card Formats

Card formats for data, constants, and parameters must be specified by giving a value to NCDF (Field 1) on the third Heading Card. The following formats are built in, but NCDF = 1 (the Aldermaston/Winfirth format) is recommended.

<table>
<thead>
<tr>
<th>NCDF</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>User supplies his own format (see note below)</td>
</tr>
<tr>
<td>1</td>
<td>(6(E11.0, 1x)) Aldermaston/Winfirth format</td>
</tr>
<tr>
<td>2</td>
<td>(7E10.0)</td>
</tr>
<tr>
<td>3</td>
<td>(8E9.0)</td>
</tr>
<tr>
<td>4</td>
<td>(9E8.3)</td>
</tr>
<tr>
<td>5</td>
<td>(10F7.4)</td>
</tr>
<tr>
<td>6</td>
<td>(12P6.3)</td>
</tr>
</tbody>
</table>

Note: If NCDF = 0 is used, a Format card must follow the fourth Heading Card.
5.17 **Dictionary 17 - Interpolation Codes**

The following values of NTERP are to be used in field 4 (Cols. 19-23) of a DCC 1-5 type control card to indicate the type of interpolation to be used between tabulated values.

<table>
<thead>
<tr>
<th>NTERP</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Irrelevant</td>
</tr>
<tr>
<td>1</td>
<td>Piece-Wise Constant</td>
</tr>
<tr>
<td>2</td>
<td>y Linear in x</td>
</tr>
<tr>
<td>3</td>
<td>y Linear in ln x</td>
</tr>
<tr>
<td>4</td>
<td>lny Linear in x</td>
</tr>
<tr>
<td>5</td>
<td>lny Linear in ln x</td>
</tr>
</tbody>
</table>
Appendix A - Material Identification System

Materials are identified by two numbers, \( Z \) (2 digits), and \( A \) (3 digits). If the material is a single isotope, then \( Z \) is its atomic number, and \( A \) is its mass number. If the material is a natural mixture of isotopes of the same \( Z \), then \( A \) is set to zero. If the material is a mixture of isotopes with different \( Z \), set \( Z \) to zero and give the appropriate \( A \) number from the lists given on the following pages. Assignment of numbers in these lists is arbitrary but should conform to the following divisions.

1 - 99  Hypothetical materials
100 - 199 Liquid moderators and coolants
200 - 299 Solid moderators
300 - 399 Metal alloys, cladding, and structural materials
400 - 499 Lumped poisons
500 - 599
600 - 699
700 - 799
800 - 899
900 - 999
## Liquid Moderators and Coolants

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<thead>
<tr>
<th>A</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Water, $\text{H}_2\text{O}$</td>
</tr>
<tr>
<td>101</td>
<td>Heavy Water, $\text{D}_2\text{O}$</td>
</tr>
<tr>
<td>102</td>
<td>Biphenyl, $\text{C}<em>{12}\text{H}</em>{10}$</td>
</tr>
<tr>
<td>103</td>
<td>Sodium Hydroxide, NaOH</td>
</tr>
<tr>
<td>104</td>
<td>Santowax R, $\text{C}<em>{18}\text{H}</em>{14}$</td>
</tr>
<tr>
<td>105</td>
<td>Dowtherm A</td>
</tr>
<tr>
<td>106</td>
<td>Benzene</td>
</tr>
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</table>
### Hypothetical Materials

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<tr>
<td>001</td>
<td>Pure $1/\sigma$ absorber, $\sigma_a \ (2200 \text{ m/s}) = 1.0$</td>
</tr>
<tr>
<td>002</td>
<td>Pure Scatterer, $\sigma_s = 1.0$</td>
</tr>
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</table>
### Solid Moderators

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<tr>
<td>200</td>
<td>Beryllia, BeO</td>
</tr>
<tr>
<td>201</td>
<td>Beryllium Carbide, Be₂C</td>
</tr>
<tr>
<td>202</td>
<td>Beryllium Flouride, BeF₂</td>
</tr>
<tr>
<td>203</td>
<td>Zirconium Hydride, ZrH₂</td>
</tr>
<tr>
<td>204</td>
<td>Polystyrene, ((\text{CH})_n)</td>
</tr>
<tr>
<td>205</td>
<td>Polyethylene, ((\text{CH}_2)_n)</td>
</tr>
<tr>
<td>A</td>
<td>Description</td>
</tr>
<tr>
<td>-----</td>
<td>---------------------------</td>
</tr>
<tr>
<td>300</td>
<td></td>
</tr>
<tr>
<td>301</td>
<td>Zircalloy 1</td>
</tr>
<tr>
<td>302</td>
<td>Zircalloy 2</td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
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<td>304 Type Stainless Steel</td>
</tr>
<tr>
<td>305</td>
<td></td>
</tr>
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<tr>
<td>308</td>
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</tr>
<tr>
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</table>
Lumped Poisons

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<tr>
<td>400</td>
<td>$^{233}$U Fission products</td>
</tr>
<tr>
<td>401</td>
<td>$^{235}$U</td>
</tr>
<tr>
<td>402</td>
<td>$^{239}$Pu</td>
</tr>
<tr>
<td>403</td>
<td>$^{241}$Pu</td>
</tr>
</tbody>
</table>
Appendix B - Sample Data Records

TI (N=TOTAL,) CROS (CIEL) (BNL 0008) 4/64 2*000-3 3*000-1EV
0 0
0 1
0.0 0.0 0.0 1.0
(12F6.3) TAKEN FROM PRELIMINARY BNL 325 1964
DCC1 401 1 6 0 20
.002 27. .003 22. .004 19.7 .005 18. .006 16.8 .007 16.
.008 15.2 .009 14.6 .01 14. .02 11.3 .03 10. .04 9.2
.05 8.7 .06 8.1 .07 7.85 .08 7.5 .09 7.3 .1 7.1
END

U235 (N=ABSORP,) CROS (CIEL) (BNL 1000002) 4/64 0*000+0 0*500+0EV
0 0
2 1
0.0 0.0 0.0 1.0
FLUHARTY ET AL., PREPRINT
ENR 200 1 2
DCC6 406 1 0 1 3 0
2 0
115 27 -329 09 986.74
ENR 200 2 2
DCC6 406 6 0 1 7 0
2 0
0.335 1.410 0.148 0.283 108.14 -188.93 162.23
END

U238 (N=ELAST,) N ANGD (CIEL) (BNL 0001) 4/64 0.100+0 2*000+0MEV
0 1
238.046468 0.0 0.0 1.0
(12F6.3) OPTICAL MODEL CALCULATION BY MOORE AND AUERBACH, BNL 818, AUG 1963
DCC2 402 0 3 0 20
DCC1 401 5 3 0 21
1.000-0.100 1.230 1.181 1.135 1.092 1.052 1.014 0.978 0.945 0.914 0.886
0.860 0.836 0.814 0.794 0.777 0.761 0.747 0.736 0.726 0.718 0.712
DCC1 401 5 3 0 21
1.000-0.100 1.239 1.184 1.139 1.092 1.052 1.014 0.978 0.945 0.914 0.886
0.860 0.836 0.814 0.794 0.777 0.761 0.747 0.736 0.726 0.718 0.712
0.650 0.619 0.593 0.570 0.552 0.537 0.525 0.516
DCC1 401 5 3 0 21
1.000-0.100 1.239 1.184 1.139 1.092 1.052 1.014 0.978 0.945 0.914 0.886
0.860 0.836 0.814 0.794 0.777 0.761 0.747 0.736 0.726 0.718 0.712
0.506 0.477 0.455 0.437 0.424 0.415 0.409 0.406
0.406 0.408 0.412
DCC1 401 5 3 0 21
1.000-0.100 1.239 1.184 1.139 1.092 1.052 1.014 0.978 0.945 0.914 0.886
0.860 0.836 0.814 0.794 0.777 0.761 0.747 0.736 0.726 0.718 0.712
0.404 0.382 0.367 0.356 0.349 0.345 0.343 0.342 0.343 0.344 0.347
0.404 0.382 0.367 0.356 0.349 0.345 0.343 0.342 0.343 0.344 0.347
DCC1 401 5 3 0 21
1.000-0.100 1.471 1.210 0.996 0.822 0.684 0.576 0.493 0.431 0.386 0.355
0.352 0.321 0.313 0.309 0.307 0.305 0.302 0.299
0.296 0.291 0.287
DCC1 401 5 3 0 21
1.000-0.100 1.564 1.231 0.970 0.766 0.611 0.496 0.414 0.357 0.321 0.299
0.289 0.285 0.284 0.285 0.283 0.277 0.268 0.256 0.243 0.230
DCC1 401 5 3 0 21
0.7
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<th>0.540</th>
<th>0.420</th>
<th>0.041</th>
<th>0.293</th>
<th>0.267</th>
<th>0.257</th>
</tr>
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<tbody>
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<td>0.257</td>
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<td>0.268</td>
<td>0.272</td>
<td>0.272</td>
<td>0.266</td>
<td>0.255</td>
<td>0.237</td>
<td>0.216</td>
<td>0.193</td>
<td>0.171</td>
</tr>
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<td>401</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>21</td>
<td>0</td>
<td>8</td>
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<td></td>
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</tr>
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<td>0.659</td>
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<td>0.227</td>
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<td>0.237</td>
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<td>0.261</td>
<td>0.268</td>
<td>0.266</td>
<td>0.256</td>
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<td>0.149</td>
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<td>0</td>
<td>21</td>
<td>0</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>0.615</td>
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<td>0.265</td>
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<td>0.190</td>
<td>0.152</td>
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<td>8</td>
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<td>0.063</td>
<td>0.077</td>
<td>0.135</td>
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<td>401</td>
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<td>0</td>
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<td>0</td>
<td>8</td>
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<td>0.047</td>
<td>0.057</td>
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<td>0.210</td>
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<td>0.095</td>
<td>0.068</td>
<td>0.061</td>
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<td>0</td>
<td>21</td>
<td>0</td>
<td>8</td>
<td></td>
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</tr>
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<td>0.246</td>
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<td>0.194</td>
<td>0.154</td>
<td>0.113</td>
<td>0.080</td>
<td>0.059</td>
<td>0.060</td>
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<td>0.166</td>
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<tr>
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<td>3</td>
<td>0</td>
<td>21</td>
<td>0</td>
<td>8</td>
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<td>0.098</td>
<td>0.031</td>
<td>0.060</td>
<td>0.124</td>
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<td>0.060</td>
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<td>DCC</td>
<td>401</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>21</td>
<td>0</td>
<td>8</td>
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<td>1.000-0.100</td>
<td>4.457</td>
<td>2.231</td>
<td>0.981</td>
<td>0.348</td>
<td>0.086</td>
<td>0.027</td>
<td>0.065</td>
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<td>0.161</td>
<td>0.118</td>
<td>0.080</td>
<td>0.054</td>
<td>0.046</td>
<td>0.060</td>
<td>0.102</td>
<td>0.180</td>
</tr>
</tbody>
</table>

END
ENDF

Evaluated Nuclear Data File Service Routines*

Henry C. Honeck
Evelyn Gottesfeld
Brookhaven National Laboratory

January 1, 1965

*Work performed under the auspices of the United States Atomic Energy Commission
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1. Introduction

This report gives a brief description of the operation of the ENDF Center at BNL and a detailed description of the computer programs developed to maintain the center. These programs are designated by the symbol DFSR (Data File Service Routine).
2. Operation of the ENDF Center

The ENDF Center will receive and distribute Data Records in the form described in the ENDF Specifications. A series of computer programs have been written which will handle the receiving and distributing of data and provide necessary bookkeeping.

The Center will operate in the following way. Data in the form of complete Data Records will be sent to the Center and will be added to the library tapes by the program DFSR1. This program will also produce listings and punched cards for later use. Some of these cards will be collected and printed as a Newsletter which will be sent to all interested parties about four times a year. Upon receipt of the Newsletter, a user may request data by submitting a tape and a letter indicating the desired data. The data is taken from the library tapes by DFSR2 and placed on the users tape to be returned to him. If errors in the data are found, the program DFSR3 can be used to correct the library tapes. A program DFSR4 is also available to print/punch/copy selected Data Records from the library tapes.

When DFSR1 puts a Data Record on the library tape, it automatically assigns it an identification number consisting of one alphabetic character and four numerical digits. For example, A0258. This is the permanent identification number of the Data Record and must be used in all references to the Data Record. Should the record be subsequently deleted from the library, an entry is still retained on the library giving the identification number and date deleted. The Data Records are numbered on the first
library tape by A0001, A0002, etc. If the last record on the
first library tape is A0864, then the first number on the second
library is A0865.

The order of Data Records on the Library Tapes is the order
received. To facilitate finding desired Data Records, a program
DFSR5 was written which prints a one-line message for each Data
Record. These lines are ordered first by isotope, then by reac-
tion type, and finally by data type. This list will also be in-
cluded in the Newsletter.

All correspondence should be addressed to:

ENDF Data Center
c/o The Sigma Center
Brookhaven National Laboratory
Upton, L.I., New York 11973
3. Description of the Library Tapes

Data Records are stored on magnetic tapes (Library tapes) in the form of packed card images. Specifically, if KK is the number of cards in the Data Record, the input tape INP is read with the statements

```
READ INPUT INP, 10, ((R(I,K),I=1,14), K=1,KK)
10 FORMAT(12A6,A5,A3)
```

The library tape LIB is written with the statement

```
WRITE TAPE LIB,KK,(RL(I),I=1,14), ((R(I,K),I=1,14),K=1,KK)
```

The image RL is called the Lead Card and contains the identification of the Data Record, the number of cards in the Data Record, the date the Data Record was added, and the date the Data Record was last corrected.

The capacity of such a tape (556 bpi) is about $1.2 \times 10^5$ cards and since about three pairs of $(E,o)$ occur on each card, the tape has a capacity of $3.6 \times 10^5$ data points. Provision has been made for four library tapes for a total of $1.4 \times 10^6$ data points. The Aldermaston/Winfrith Data File received by BNL contains 38 elements, 25,000 cards, and 551 Data Records. This represents about 20% of the capacity of one tape and 5% of four tapes. The average Data Record is 50 cards so that a tape will hold about 2400 Data Records. Thus, four tapes should be adequate for the next few years.
4. Procedure for Submitting Data

Data submitted to the Data Center must be in the form of complete Data Records. Two methods may be used to send the data, but the second (magnetic tape) is preferred.

1. BCD punched IBM cards
2. BCD punched IBM card images on IBM magnetic tape. Each card image should be one record. No extra cards or tape marks between Data Records. An end-of-file mark at the end of the tape. Be sure to mark density on the tape.

In both cases the Data Records may or may not be sequence numbered. If the First Heading Card contains blanks in columns 78-80, the deck is assumed not to be numbered and the DFSR1 program will provide sequence numbers. If the First Heading Card contains non-blanks in columns 78-80, the deck is assumed to be numbered starting with 000 and the deck will be checked. The DFSR1 program will reject the Data Record if a sequencing error is found.

In a similar manner, columns 13-60 of the END card should be blank if the character count has not been made.
5. Procedures for Requesting Data

Data Records may be requested from the Data Center by sending an IBM magnetic tape (clearly marked with the desired density) and a letter containing the identification numbers (from the Newsletters) of the desired Data Records. It would be helpful if the requestor could send cards 5 and 6 for the input to DFSR2 leaving NUST blank. Requests for "all data for $^{235}$U", etc., will not be processed. The identification numbers must be used. A typical request might read

A0101 0 A0105 0 A0110-A0117 0 A0120

which is interpreted as meaning that Data Records A0101, A0105, A0110 through A0117, and A0120 are wanted. The records will be written by DFSR2 on the requestors tape as either packed or unpacked card images of the Data Records. No special marks occur between Records and an EOT ends the tape. The tape and a processing message will be returned to the requestor.

An alternate method of requesting data is to request a copy of a portion (or all) of the library tape(s). The form here is packed BCD card images plus information as to when record was added to the library and when corrected. The request here must be of the form A0110-A0117 meaning Data Records A0110 through A0117 are wanted. Only one such request can be put on the requestors tape.
6. Description, Flow Diagrams, and Listings of the Programs

6.1 Non-Standard Functions

The Service Routines were written largely in Fortran II and are intended for use by the BNL center or a few other centers. It became readily apparent that some jobs could not be done in Fortran II and that FAP routines or non-standard features of the BNL Monitor system must be used. This section gives a brief description of the non-standard functions on the BNL Monitor System.

The routine NEXEM is used to sense tape errors and EØF in a Fortran II program. The statement

CALL NEXEM1 (I1,I2,I3,...)

used near the beginning of a program tells the Monitor that conditions I1, I2, I3, .... are to be tested by the Fortran II program and execution is not to be terminated by the Monitor.

The values of the integers that are used are:

10 - redundancy reading tape
11 - end of file reading tape
13 - redundancy writing tape
15 - end of tape during writing

Thus, one of the first statements in DFSR1 is:

CALL NEXEM1 (10,11,13,15)

Later in the program, following a WRITE TAPE statement, the following statement is used:

IF(NEXEM2(11)) b, b, a

where control passes to b if no error of type 11 occurred, and to a if an error of type 11 occurred.
The ability to unpack data words and compare bits is essential in BCD data processing. The ENDF programs, using the BNL extended version of the standard FBM FORTRAN system, contain functions enabling them to shift a word left or right the desired number of bits and to logically compare two words for equality.

In the following descriptions the arguments $A_i$ represent operands, the arguments $N$ the bit shift counts. The $N$ and $A_i$'s may be constants, variables, or expressions; if expressions, these are evaluated by the system before the instruction sequences are generated.

Regarding the shift functions, programmers should note that a FORTRAN arithmetic statement generates a STØ, while a Boolean statement generates a SLW, hence a logical left shift must be a Boolean statement whose shift length is either a floating point name or an octal number. A fixed point name may be equivalenced to a floating point variable or, as an alternative, used in the statement

$$Y = \text{ABSF}(N)$$

where $y$ then replaces $N$ as an argument.

A. Logical Compare - a boolean "exclusive or"

Function: BERAF ($A_1$, $A_2$)

CAL $A_1$

ERA $A_2$

Example: IF(BERAF($A_1$, $A_2$)) ml, m2, ml

Note: Equality exists at m2.
B. Logical left shift

Function: SHIFTLF(N,A)

    CAL A
    ALS N

Example: B SR = SHIFTLF (14000000,R)

Notes: R is shifted left 12 bit places (2 BCD characters) and stored in SR. R in memory is untouched. Since the statement is Boolean, a SLW is generated, thus preserving the hi-order position of R. Floating point names are used throughout the statement and the shift count N is an octal number in the decrement position.

C. Logical right shift

Function: SHIFTRF(N,A)

    CAL A
    ARS N

Example: Y(I) = SHIFTRF(6,R)
Name: DFSRL

Purpose: To create a library tape from Data Record card images.

Language: FORTRAN II

Input: The program deck consisting of:

1. The binary deck DFSRL
2. A * Data Card
3. The 5 Input Cards (see detail listing following this writeup)
4. An EOF card

Tapes: A. Input

1. One to five INPT tapes of BCD Data Record

B. Output

1. Library tapes NLIBA and NLIBB
2. Output Print tapes NOUTA and NOUTB
3. Output Punch tapes NPUNA and NPUNB
4. Error print output tape NOUTE
5. Error punch output tape NPUNE

Method:

Data Records are read and processed one at a time. Each file is defined by its END card, which is a card punched with END in col. 1-3.

A Data Record may be up to 1000 cards in length, including the END card. It may or may not be sequenced (col. 78-80) and may or may not already have check sums present in the END card. Sequencing, when present, is from 0-999.

Each Data Record is assigned an identification number one higher than the preceding record on the library tape unless the Input Data field HOLID indicates that a new library tape is to be started.
A Lead Card is developed, containing the number at cards in the Data Record (KX), the new ID number, and the date. The Lead Card will precede the Data Record on the library tape.

Each card in the Data Record is sequence checked. If the sequence field is blank, sequence numbers are inserted. An out-of-sequence condition causes the erroneous Data Record to be printed on the output error tape NØUTE in the format dictated by error print indicator IØUTE, and to be written for punching on tape NPUNE according to IPUNE. A detailed listing of these indicators is present in the PRINT AND PUNCH Service Routine writeups.

The entire Data Record (exclusive of the END card) is scanned from column 1-72, and a character count (modulo 8) of each legitimate character is kept. This is the logical checksum of the record and is kept in words 2-9 of the END card. The logical checksum is recomputed for each tape pass and compared with the original sum to insure the integrity of the data. DFSRL accepts the Data Record with or without this sum. If the character count is not present, it is inserted, and then becomes a permanent part of the record. If the sum is present, the new count is compared with the original, and a discrepancy causes error printing and punching as heretofore described. The presence of an illegal character will also cause the Data Record to be printed on the output error tape instead of the library tape.

After checking, the data record is printed on output tapes NØUTA and NØUTB, and written for punching on tapes NPUNA and NPUNB, unless the tape numbers indicate otherwise (see note in detail listing of Input Data).
The Lead Card and Data Record are then written in packed BCD onto the library tape. An end-of-tape condition on the library tape causes backspacing to the last Data Record and termination of the tape. A message is printed indicating the first and last records on the full tape, and the current Data Record begins a new tape. Processing continues until the end of the last input tape is reached.

**Service Routines:**

1. RDIN - Read a Data Record (BCD)
2. RDLIB - Read a library tape record (packed BCD)
3. WRLIB - Write a record on the library tape (packed BCD)
4. PRDR - Print selected portions of the Data Record on tape NØUT
5. PUND - Write selected portion of a Data Record on a punch tape
6. SEQ - Check sequence number of a Data Record and change the ID number
7. AID - Increase the sequence number
8. NTCD - Determine the number of Heading cards in the Data Record
9. HIC - Hollerith to integer conversion
10. IHC - Integer to Hollerith conversion
11. DRCC - Calculate and compare character occurrence sums
### INPUT DATA TO MAKE UP THE LIBRARY TAPE

<table>
<thead>
<tr>
<th>CARD</th>
<th>COLUMNS</th>
<th>FORMAT</th>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-6</td>
<td>A6</td>
<td>DATEA</td>
<td>The date in the form NOV 30, 1964</td>
</tr>
<tr>
<td></td>
<td>7-12</td>
<td>A6</td>
<td>DATEB</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>13-14</td>
<td>2x</td>
<td></td>
<td>Hollerith identification. If this field is blank, the identification will be picked up from the last Data Record on the library. If it is not blank, a new library tape will be started, beginning with this ID.</td>
</tr>
<tr>
<td></td>
<td>15-19</td>
<td>A5</td>
<td>HØLID</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1-10</td>
<td></td>
<td></td>
<td>The characters LIBRARY</td>
</tr>
<tr>
<td></td>
<td>11-15</td>
<td>I5</td>
<td>NLIBA</td>
<td>1st library tape number</td>
</tr>
<tr>
<td></td>
<td>16-20</td>
<td>I5</td>
<td>NLIBB</td>
<td>2nd library tape number</td>
</tr>
<tr>
<td>3</td>
<td>1-10</td>
<td></td>
<td></td>
<td>The characters PRINT</td>
</tr>
<tr>
<td></td>
<td>11-15</td>
<td>I5</td>
<td>NØUTA</td>
<td>1st print output tape number</td>
</tr>
<tr>
<td></td>
<td>16-20</td>
<td>I5</td>
<td>IØUTA</td>
<td>Printing mode for NØUTA - described in PRINT Routine writeup as IPRN</td>
</tr>
<tr>
<td></td>
<td>21-25</td>
<td>I5</td>
<td>NØUTB</td>
<td>2nd print output tape number</td>
</tr>
<tr>
<td></td>
<td>26-30</td>
<td>I5</td>
<td>IØUTB</td>
<td>Printing mode for NØUTB</td>
</tr>
<tr>
<td></td>
<td>31-35</td>
<td>I5</td>
<td>NØUTE</td>
<td>Error print output tape number</td>
</tr>
<tr>
<td></td>
<td>36-40</td>
<td>I5</td>
<td>IØUTE</td>
<td>Printing mode for NØUTE</td>
</tr>
<tr>
<td>4</td>
<td>1-10</td>
<td></td>
<td></td>
<td>The characters PUNCH</td>
</tr>
<tr>
<td></td>
<td>11-15</td>
<td>I5</td>
<td>NPUNA</td>
<td>1st output punch tape number</td>
</tr>
<tr>
<td></td>
<td>16-20</td>
<td>I5</td>
<td>IPUNA</td>
<td>Punching mode for NPUNA</td>
</tr>
<tr>
<td></td>
<td>21-25</td>
<td>I5</td>
<td>NPUNB</td>
<td>2nd output punch tape number</td>
</tr>
<tr>
<td></td>
<td>26-30</td>
<td>I5</td>
<td>IPUNB</td>
<td>Punching mode for NPUNB</td>
</tr>
<tr>
<td></td>
<td>31-35</td>
<td>I5</td>
<td>NPUNE</td>
<td>Error output punch tape number</td>
</tr>
<tr>
<td></td>
<td>36-40</td>
<td>I5</td>
<td>IPUNB</td>
<td>Punching mode for NPUNE</td>
</tr>
<tr>
<td>CARD</td>
<td>COLUMNS</td>
<td>FORMAT</td>
<td>SYMBOL</td>
<td>DESCRIPTION</td>
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<tr>
<td>------</td>
<td>---------</td>
<td>--------</td>
<td>---------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>5</td>
<td>1-10</td>
<td>I5</td>
<td>NINX</td>
<td>The characters INPUT</td>
</tr>
<tr>
<td>11-15</td>
<td>I5</td>
<td></td>
<td>NINX</td>
<td>Number of input tapes</td>
</tr>
<tr>
<td>16-20</td>
<td>I5</td>
<td></td>
<td>INPT(1)</td>
<td>1st input tape number</td>
</tr>
<tr>
<td>21-25</td>
<td>I5</td>
<td></td>
<td>INPT(2)</td>
<td>2nd &quot; &quot; &quot;</td>
</tr>
<tr>
<td>26-30</td>
<td>I5</td>
<td></td>
<td>INPT(3)</td>
<td>3rd &quot; &quot; &quot;</td>
</tr>
<tr>
<td>31-35</td>
<td>I5</td>
<td></td>
<td>INPT(4)</td>
<td>4th &quot; &quot; &quot;</td>
</tr>
<tr>
<td>36-40</td>
<td>I5</td>
<td></td>
<td>INPT(5)</td>
<td>5th &quot; &quot; &quot;</td>
</tr>
</tbody>
</table>

Note: For output tapes, blank, zero tape numbers cause suppression of printing or punching on those tapes.
**ENDF* SERVICE ROUTINE

FORTRAN

LABEL

CDFSRI1 CREATE LIBRARY TAPE FROM DATA RECORD CARD IMAGES

DIMENSION R(14,1000),RL(14),INPT(5),NOTAP(6)
COMMON,RL,KX
EQUIVALENCE(NOTAP,NOUTA),(NOTAP(2),NOUTB),(NOTAP(3),NOUTC),(NOTAP(4),NPUNA),(NOTAP(5),NPUNB),(NOTAP(6),NPUNE)
CALLNEXEM(10,11,13,15)

CINPUT DATA ON TAPE 5

NINP=5
R1TNINP,2000,DATEA,DATEB,HOLID,NLIBA,NLIBB,NOUTA,
1NOUTA,NOUTB,IOUTB,NOUTE,1OUTE,1PUNA,1PUNA,
2NPUNA,1PUNB,1PUNB,1PUNA,1PUNE,NINX,1INPT(JIN),JIN=1,NINX)

2000 FORMAT(2A6,2XA5/10X215/10X615/10X615/10X615/10X615)

RL(3)=DATEA
RL(4)=DATEB
RL(5)=606060606060
RL(6)=606060606060
IF(NOUTA)14,4,3

CPRINT INPUT DATA ON NOUTA

3 WOTNOUTA,30000,DATEA,DATEB,HOLID,NLIBA,NLIBB,NOUTA,
1NOUTA,NOUTB,IOUTB,NOUTE,1OUTE,1PUNA,1PUNB,1PUNB,
2NPUNA,1PUNB,1PUNA,1PUNE,NINX,(INPT(JIN),JIN=1,NINX)

3000 FORMAT(1H2A6,2XA5/10H LIBRARY 215/10H PRINT 615/10H PUNCH

1615/10H INPUT 619)

CPRINT DATE ON ALL OUTPUT TAPES

4 DO6I=1,6
NT=NOTAP(I)
IF(NT)16,6,5

5 WOTNOUTA,4000,DATEA,DATEB

4000 FORMAT(1H2A6,12X)

6 CONTINUE

B BT=606060606060
B IF(HOLID*(-BT))10,7,10

CGET ID FROM LAST DATA RECORD ON LIBRARY TAPE-READ TO EOF + BSP

7 CALLRDLIB(NLIBA,L,NOUTA)

C TEST EOF

IF(L-1)17,9,7

CINCREASE ID NO. BY ONE

9 CALLAID(RL(1))
GOTO11
10 RL(1)=HOLID
11 NLIBA=NLIBA

CJIN IS CURRENT INPUT TAPE NO.

JIN=1
12 NINP=INPT(JIN)

CREAD A CARD IMAGE DATA RECORD

13 CALLRDIN(NINP,L,NOUTA)
IF(L-1)14,20,13

C CHECK SEQUENCE NOS.

14 CALLSEQ(L,NOUTA)
IF(L)29,15,25

CPARITY SCAN

15 CALLKRCCK(L)
IF(L-1)16,30,35
CSUMS CHECK OUT, PRINT + PUNCH
16 CALLPUNCH(IPUNA,NPUNA)
   CALLPUNCH(IPUNB,NPUNB)
   CALLPRINT(IOUTA,NOUTA)
   CALLPRINT(IOUTB,NOUTB)
CWRITE RECORD ON LIBRARY TAPE
17 CALLWRLIB(NLIB,L,NOUTA)
   IF(L)40,18,40
18 CALLAID(RL(1))
CREAD THE NEXT DATA RECORD
GOTO13
C ERROR ROUTINES----------------------------------------
C EOF ON INPT TAPE—ANY MORE TAPES TO BE READ
20 JIN=JIN+1
   IF(JIN-NINX)12,12,75
C PRINT P PUNCH ERROR FILE
25 CALLPRINT(IOUTE,NOUTE)
   CALLPUNCH(IPUNE,NPUNE)
GOTO13
CPARITY SUMS DO NOT MATCH, L=1
30 IF(NOUTA)25,25,32
31 FORMAT(25H CHARACTER CHECK FAILURE IN A6)
32 WOTNOUTA,31,RL(1)
GOTO25
CILLEGAL CHARACTER IN FILE
35 IF(NOUTA)25,25,37
36 FORMAT(25H ILLEGAL CHARACTER IN A6)
37 WOTNOUTA,36,RL(1)
GOTO25
CEND OF TAPE ON/O P LIBRARY TAPE, STEP UP
40 NLIB=NLIBB
GOTO17
75 DO77JIN=1,NINX
    INPT=INPT(JIN)
    REWINDINPT1
77 UNLOADINPT1
ENDFILENLIB
REWINDNLIB
UNLOADNLIB
CALLEXIT
END
Name: DFSR2

Purpose: To copy selected records from the library tape onto a requestor tape, and to prepare a list of the requests for distribution.

Language: FORTRAN II

Input: A. The program deck consisting of:
   1. The binary deck DFSR2
   2. A * Data Card
   3. Six or more Input Data Cards (See detail listing following this writeup)
   4. An EØF card

B. Tapes
   1. Input
      a. One to four library tapes NLIBA-NLIBD
      b. Scratch tape NSCR

Output: A. One to four O/P requestor's tapes NUST

B. Listing tape NØUT, containing, for each requestor, the Lead and first Heading Card of each selected Data Record. This list shows both processed and non-processable records.

Method: DFSR2 is a library search and tabulation program. It prepares output tapes and listings for up to four users, each of whom may request up to 2000 Data Records.

A record identification (RID) list is set up for each user, and the library tapes are read and checked against this list. As each request is located, it is written out in packed or unpacked form (as per NPCK) on the designated user's tape. The Lead Card and first Heading Card of the request is also written on the scratch tape
for organization into the appropriate distribution list.

Each user's list contains two sections, REQUESTS PROCESSED and REQUESTS NOT PROCESSED. One output tape is prepared for each requestor, hence any requests occurring after an O/P end-of-file condition will not be processed but will be identified in an OUTPUT TAPE FULL message on NOUT and also in the REQUESTS NOT PROCESSED section of the listing. Records which cannot be found on the library tape will appear in the NOT PROCESSED section.

**Service Routines:**

1. AID
2. RDLIB
3. WRLIB
4. HIC
5. IHC
Input data to copy selected records from the library tape onto a requestor tape.

<table>
<thead>
<tr>
<th>Card</th>
<th>Cols.</th>
<th>Format</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1-6</td>
<td>A6</td>
<td>DATEA</td>
<td>The date in the form JAN 1 21, 1964</td>
</tr>
<tr>
<td></td>
<td>7-12</td>
<td>A6</td>
<td>DATEB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13-15</td>
<td>I3</td>
<td>NUSX</td>
<td>Number of output tapes (requestor's tapes) mounted ≤ 4</td>
</tr>
<tr>
<td>2.</td>
<td>1-10</td>
<td>10X</td>
<td>------</td>
<td>The characters LIBRARY</td>
</tr>
<tr>
<td></td>
<td>11-15</td>
<td>I5</td>
<td>NLIBA</td>
<td>1st library tape number</td>
</tr>
<tr>
<td></td>
<td>16-20</td>
<td>I5</td>
<td>NLIBB</td>
<td>2nd &quot; &quot; &quot;</td>
</tr>
<tr>
<td></td>
<td>21-25</td>
<td>I5</td>
<td>NLIBC</td>
<td>3rd &quot; &quot; &quot;</td>
</tr>
<tr>
<td></td>
<td>26-30</td>
<td>I5</td>
<td>NLIBD</td>
<td>4th &quot; &quot; &quot;</td>
</tr>
<tr>
<td>3.</td>
<td>1-10</td>
<td>10X</td>
<td>------</td>
<td>The characters PRINT</td>
</tr>
<tr>
<td></td>
<td>11-15</td>
<td>I5</td>
<td>NØUT</td>
<td>Output tape number (printing)</td>
</tr>
<tr>
<td>4.</td>
<td>1-10</td>
<td>10X</td>
<td>------</td>
<td>The characters SCRATCH</td>
</tr>
<tr>
<td></td>
<td>11-15</td>
<td>I5</td>
<td>NSCR</td>
<td>Scratch tape number</td>
</tr>
<tr>
<td>5.</td>
<td>1-48</td>
<td>8A6</td>
<td>HUID(K)</td>
<td>Hollerith description of requestor. Name, installation, etc.</td>
</tr>
<tr>
<td></td>
<td>51-55</td>
<td>I5</td>
<td>JUSX</td>
<td>Number of data record indentifications given on the following cards (type 6)</td>
</tr>
<tr>
<td></td>
<td>56-60</td>
<td>I5</td>
<td>NUST</td>
<td>Requestors output tape number</td>
</tr>
<tr>
<td></td>
<td>61-65</td>
<td>I5</td>
<td>NPCK</td>
<td>=0, output unpacked on tape NUST =1, output packed on tape NUST</td>
</tr>
<tr>
<td>6.</td>
<td>1-5</td>
<td>A5</td>
<td>A(1)</td>
<td>Ident of first data record desired</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>A1</td>
<td>B(1)</td>
<td>See note 1 below</td>
</tr>
<tr>
<td></td>
<td>7-11</td>
<td>A5</td>
<td>A(2)</td>
<td>Ident of second data record desired</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>A1</td>
<td>B(2)</td>
<td>See note 1 below</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>etc.</td>
</tr>
<tr>
<td></td>
<td>72</td>
<td>A1</td>
<td>B(12)</td>
<td></td>
</tr>
</tbody>
</table>
Notes:

1. The fields in cols 5, 10, 15, etc. in card 6 are normally blank. If they are not blank, they are to be read as "through".
   For example, card 6 might be:
   A0101 0 A0105 0 A0110 - A0117 0 A0120
   which is interpreted as meaning that data records A0101, A0105, A0110 through A0117, and A0120 are wanted. The total number of records requested by a single user must be no more than 2000.

2. Repeat card types 5-6 for each requestor.
DFSRT - SYMBOLS

110
READ FIRST FOUR INPUT DATA CARDS

120
SET UP RECORD J5 LIST FOR EACH REQUESTER, FILLING IN ENDS (CARDS 5 AND 6)

130
PRINT ALL REQUESTER'S LIST CENTER, EACH, NUMBER OF REQUESTS, AND DATE

140
PRINT TAP ASSIGNMENTS ON HUB

150
READ A LIBRARY TAPE RECORD

160
PRINT ALL HUB RECORDS REQUESTED, LIST FOR EACH REQUESTER, NUMBER OF RECORDS DESIRED, AND END

170
REWIND AND UNLOAD OLD TAPE. INCREASE TO NEXT TAPE NUMBER.

180
YES

190
READ UN澺ER'S TAPE IN UNPROCESSED FORM

200
WRAP TAPE, TO BE PRICE

210
WRITE REQUESTER'S ID, AND NO FULL PREVIOUS ON HUB

220
HAVE ALL USERS LISTS BEEN DISCRIMINATED?

230
YES

240
WRITE IN PICTURE FROM UNTER'S TAPE

250
IS REQUESTER'S TAPE TO BE PROCESSED?

260
YES

270
WRITE LEND CARD AND FIRST TITLE CARD ON SCRATCH TAPE

280
WRITE THIS ID IN LIST

290
SEARCH THROUGH USER'S LIST TO SEE IF THIS RECORD IS LIST

300
YES

310
ARE THERE RECORDS TO BE WRITTEN?

320
YES

330
READ ALL RECORDS FROM SCRATCH TAPE CONTAINING LEND AND TITLE CARDS OF EACH REQUESTED RECORD

340
EXECUTE, REWIND, AND UNLOAD EACH REQUESTOR'S LEND TAPE

350
EXECUTE, REWIND, AND UNLOAD EACH REQUESTOR'S TITLE TAPE

360
LIST ON HUB EACH USER AND ANY REQUESTS NOT PROCESSED. IF ALL DONE, WRITE "DONE"

370
PRINT UNPROCESSED REQUESTS ON HUB

380
REWIND SCRATCH TAPE

390
CALL END
BENDF SERVICE ROUTINE
FORTRAN

LABEL

C RECOPY RECORDS FROM LIBRARY TO REQUESTORS TAPES
DIMENSION H(14), R(14, 100), NLIST(4), JUXT(4), NOST(4), NPCX(4), NJUX(4), NOUT(4)
COMMON K, XL, XX, A, S, RID

SLANK=0, 1, 2, 3
IMAX=20
NIN=5
CALL NEXEML(15, 11, 13, 13)

C===>READ INPUT DATA=========================================
10 READ INPUT TAPEN IN, 110, DATEA, DATEB, NUSX, NLIST(N), N=1, 4, NOST, NSCR
110 FORMAT (A6, 13/10X15/315/10X15/10X15)
NREC=0
REWIND SCR
C===>SET UP RECORd ID LIST FOR EACH REQUESTOR=================
120 DO 150 N=1, NUSR
130 READ INPUT TAPEN IN, 120, (HUID(K, N), K=1, 8), JUSX(N), NOST(N), NPCX(N)
140 FORMAT (A6, 12X15/215)
JX=JUSX(N)
READ INPUT TAPEN IN, 130, (A(J), D(J), J=1, JX)
150 FORMAT (12(A3, 1A1))
I=1
160 DO 190 J=1, JX
170 RId(I, N)=A(J)
180 I=I+1
G IF(QEIM(A(J), SLANK)) 140, 170, 140
C FILL OUT LIST
190 C=A(J)
1910 CALLID(C)
G IF(QEIM(A(J+1)) 160, 170, 160
160 RId(I, N)=C
I=I+1
170 IF(I-1+IMAX) 150, 150, 150
180 IF(I-1+IMAX) 160, 160, 160
190 CONTINUE
190 JUSX(N)=I-1
200 NREC=NREC+JUSX(N)

C===>PRINT INPUT DATA=========================================
WRITE OUTPUT TAPEN OUT, 210, J, NUSR, DATEA, DATEB
210 FORMAT (22H1 THE SIGMA CENTER, 2NL/7/13, 3Hn REQUESTS FROM THE BENDF
1 PROCESSED ON XA6, A6)
WRITE OUTPUT TAPEN OUT, 220, (NLIST(N), N=1, 4), NOST, NSCR
220 FORMAT (17HTAPE ASSIGNMENTS/6H LITERARY: 7, 315/7H OUTPUT/6H SCRATCH
117)
WRITE OUTPUT TAPEN OUT, 230
230 FORMAT (2H THE FOLLOWING RECORDS WERE REQUESTED)
DO 250 N=1, NUSR
240 JX=JUSX(N)
WRITE OUTPUT TAPEN OUT, 240, (HUID(K, N), K=1, 8), JX, (2H D(J), J=1, JX)
250 FORMAT (12(A3, 1A1))

260 CONTINUE
ILT=1
NSC=0
ACID=H1LDLT (1)
C==END FILE, REWIND, AND UNLOAD TAPE==
220 REWIND SCR
UNLOAD SCR
REWINDSCR
DO 240 J=1,NUX
NPUN=XB5F(NUST(N))
ENDFILERUN
REWINDNPUN
UNLOADUNPUN
400 CONTINUE
C==REORGANIZE OUTPUT AND PRINT LISTS TO BE SENT TO REQUESTOR==
DO 250 J=1,NUX
WRITEOUTPUTTAPENOUT,420, (NUID(K,N), K=1,8), DATE, DATEB
420 FORMAT(22H1THE SIGMA CENTER, BNL/12H END R REQUEST FROM A6,7A6,4
1H ON A6,A6)
WRITEOUTPUTTAPENOUT,430
430 FORMAT(19HOREQUESTS PROCESSED)
1=1
DO 460 J=1,NSC
READTAPENSCR,NUT,(E(K),K=1,16)
IF (N-NUT) 460,440,480
440 WRITEOUTPUTTAPENOUT,450,1,(E(K),K=1,16)
450 FORMAT(14,1HM A5,A6,7H CARDS A6,A6,1H A6,A6,1M,A6,11A6)
1=1+1
460 CONTINUE
REWIND SCR
WRITEOUTPUTTAPENOUT,470
470 FORMAT(23HOREQUESTS NOT PROCESSED)
1=JUSX(N)
IF (1) 480,480,500
480 WRITEOUTPUTTAPENOUT,490
490 FORMAT(11H NONE)
GOTO 520
500 WRITEOUTPUTTAPENOUT,510, (RID(J,N),J=1,1)
510 FORMAT(2X9A6,19A6)
520 CONTINUE
C==TERMINATE RUN==
REWINDSCR
CALL EXIT
END
Name: DFSR3

Purpose: To create an updated library tape.

Language: FORTRAN II

Input: A. The program deck consisting of:
   1. The binary deck DFSR3
   2. A * Data Card
   3. Five or more Input Data Cards (see detail listing following this writeup)
   4. An EOF card

Tapes: A. Input
   1. The library tape to be updated (NLIBA)
   2. Tape NCT (used only when replacing a record on the library tape with a record on tape NCT)

B. Output
   1. New library tape NLIBB
   2. Print tape NOUT
   3. Punch tape NPUT

Method: The library tape NLIBA is modified by the deletion, replacement, or correction of as many Data Records as desired. Insertions are made within an existing record (to insert complete records see DFSR1).

   Processing requests are handled by ID number and must be in the same order as the records on the library tape. Each record is requested only once and all alterations to that record must be executed at that time.

   DFSR3 reads a request card (the 5 card in the detail writeup) specifying the record to be corrected (RID) and the operation code (NCT), which has three values.

   1. NCT < 0

      The entire record is deleted and is replaced by a three card record containing the message RECORD DELETED ØN (DATE) and blanks. The Lead card is retained, and a deletion message is written on tape NOUT. After writing the token record on NLIBB the program returns to read another 5 card, if any.

   2. NCT > 0

      The designated record is completely omitted from the new library tape and a new record from tape NCT is written in its place. A replacement message appears on tape NOUT and the program returns to read another 5 card, if any.
3. NCT = 0

The record is to be corrected.

Cards 6 & 7 must appear whenever NCT = 0.
The 6 card specifies the type of correction, i.e. CHANGE, DELETE, or INSERT, and the 7 cards are the correction cards. As many 7 cards as needed may be used with each 6 card, and groups of 6 and 7 cards are repeated for multiple changes within the record. A blank card must follow the last 7 card of the final change to each record so that the program may write the record on the library tape and return to process the next record (read another 5 card).

The sequence number in CHANGE and DELETE cards indicates which card is to be changed, while INSERT correction cards are inserted following the card whose sequence number appears on the first INSERT card. If insertions are to be made in other places in the record, another INSERT card is used.

Records are resequenced and the character check sums are recomputed; error conditions cause the appropriate message to be printed on NOUT and the job to be terminated as an ERROR STOP. Since record processing is controlled by the number of records to be corrected (NCØR) end-of-file conditions also cause ERROR STOP.

Service Routines:

1. RDLIB
2. WRLIB
3. RDIN
4. IHC
5. HIC
6. SEQ
7. DRCCK
8. PUNDR
9. PRDR
10. NTCD
## Input data to correct library tape

<table>
<thead>
<tr>
<th>Card</th>
<th>Cols.</th>
<th>Format</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1-6</td>
<td>A6</td>
<td>DATEA</td>
<td>The date in the form JAN 21, 1964</td>
</tr>
<tr>
<td></td>
<td>7-12</td>
<td>A6</td>
<td>DATEB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13-15</td>
<td>I3</td>
<td>NCØR</td>
<td>Number of records to be corrected</td>
</tr>
<tr>
<td>2.</td>
<td>1-10</td>
<td>10X</td>
<td>------</td>
<td>The characters LIBRARY</td>
</tr>
<tr>
<td></td>
<td>11-15</td>
<td>I5</td>
<td>NLIBA</td>
<td>Library tape number to be corrected</td>
</tr>
<tr>
<td></td>
<td>16-20</td>
<td>I5</td>
<td>NLIBB</td>
<td>New Library tape number</td>
</tr>
<tr>
<td>3.</td>
<td>1-10</td>
<td>10X</td>
<td>------</td>
<td>The characters PRINT</td>
</tr>
<tr>
<td></td>
<td>11-15</td>
<td>I5</td>
<td>NØUT</td>
<td>Main print tape number</td>
</tr>
<tr>
<td>4.</td>
<td>1-10</td>
<td>10X</td>
<td>------</td>
<td>The characters PUNCH</td>
</tr>
<tr>
<td></td>
<td>11-15</td>
<td>I5</td>
<td>NPUN</td>
<td>Punch tape number</td>
</tr>
<tr>
<td></td>
<td>16-20</td>
<td>I5</td>
<td>IPUN</td>
<td>Test for type of punched output</td>
</tr>
<tr>
<td>5.</td>
<td>1-5</td>
<td>A5</td>
<td>RID</td>
<td>Identification of record to be corrected</td>
</tr>
<tr>
<td></td>
<td>6-11</td>
<td>I6</td>
<td>NCT</td>
<td>&lt; 0 delete entire record</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>= 0 correct record</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt; 0 replace record with record on tape NCT</td>
</tr>
<tr>
<td>6.</td>
<td>1-6</td>
<td>A6</td>
<td>CHT</td>
<td>Type of correction. This must be either CHANGE, DELETE, or INSERT. Any other symbol signals the end of the corrections for this Data Record.</td>
</tr>
<tr>
<td></td>
<td>7-10</td>
<td>I4</td>
<td>NCRD</td>
<td>The number of correction cards that follow.</td>
</tr>
<tr>
<td>7.</td>
<td>1-72</td>
<td>12A6</td>
<td></td>
<td>The correction card</td>
</tr>
<tr>
<td></td>
<td>72-77</td>
<td>A5</td>
<td></td>
<td>ignored.</td>
</tr>
<tr>
<td></td>
<td>78-80</td>
<td>A4</td>
<td></td>
<td>The sequence number</td>
</tr>
</tbody>
</table>
* *ENDF* SERVICE ROUTINE
* FORTRAN
* LABEL

CDFS3  CORRECT AND MAKE UP NEW LIBRARY TAPE
DIMENSION(14,1000),RL(14),A(14)
COMMON,RL,KX
B BLANK=6G606060606060
B CHANGE=23021452725
B DELETE=242543256325
B SERT=314562255163
NIN=5
CALL NEXEMI(10,11,13,15)
100 READINPUTPENIN,110,DATEA,DATEB,NCOR,NLIBA,NLIBB,NOUT,NOUTB,NPUN,
1IPUN
110 FORMAT(2A6,13/10X15,15/10X15,15/10X15,15)
C== START LOOP ON RECORDS TO BE CORRECTED==
DO70NC=1,NCOR
    READINPUTPENIN,120,RID,NCT
120 FORMAT(A5,16)
   CALL RDLIB(NLIBA,L,NOUT)
   XX=KX
    IF(L=1)160,140,160
140 WRITEOUTPUTPENOUT,150
150 FORMAT(17HOEOF ON LIBRARY A)
     GOTO800
B 160 IF(BERAF(RL(1),RID))170,200,170
170 CALL WRLIB(NLIBB,L,0)
    IF(L)130,130,160
180 WRITEOUTPUTPENOUT,190
190 FORMAT(17HOEOF ON LIBRARY B)
     GOTO800
200 IF(NCT)210,370,250
C== DELETE ENTIRE RECORD==
B 210 R(1,1)=512523465124
B 220 R(2,1)=602425432963
B 230 R(3,1)=252460464560
    R(4,1)=DATEA
    R(5,1)=DATEB
C THE MESSAGE WRITTEN ABOVE IS RECORD DELETED ON (DATE)
DO220=1,12
    R(1,1)=BLANK
    R(2,1)=BLANK
DO230=1,12
    R(1,3)=BLANK
    R(1,3)=R(1,KX)
     XX=3
WRITEOUTPUTPENOUT,240,RID
240 FORMAT(7HORECORDAD6,8H DELETED)
     GOTO700
C== REPLACE ENTIRE RECORD==
B 250 CALL RDIN(NCT,L,NOUT)
    IF(L=1)1280,260,800
260 WRITEOUTPUTPENOUT,270,RID
270 FORMAT(25HOEOF ON INPUT TAPE RECORDAD6)
     GOTO800
B 280 CALL IHC(RL(2),KX)
    CALL SEQ(L,NOUT)
    IF(L)1305,305,290
290 WRITEOUTPUTPENOUT,300,RID
300 FORMAT(22HOSEQ NO. CHECK, RECORDAD6)
GOTO800
305 CALL ORCCK(L)
310 IF(L<1350,330,310
320 WRITEOUTPUTPENOUT,320,RID
320 FORMAT(2AH0,ILLEGAL CHAR IN RECORDA6)
GOTO800
330 WRITEOUTPUTPENOUT,340,RID
340 FORMAT(2AH0,CHAR CHECK FAILURE RECORDA6)
GOTO800
350 WRITEOUTPUTPENOUT,360,RID
360 FORMAT(7HORECORDA5,9H REPLACED)
GOTO700
C==Correct existing record==============================================
370 READINPUTPENIN,380,CHT,NCRD
380 FORMAT(A6,14)
B IF(BERAF(CHR,CHANGE))460,390,460
C==Cards are to be changed
390 DO450N=1,NCRD
400 READINPUTPENIN,400,(A(I),I=1,14)
410 FORMAT(12A6,A5,A3)
420 DO410K=1,KK
430 KK=K
440 IF(BERAF(R(14,K),A(14)))410,430,410
410 CONTINUE
GOTO415
430 DO440I=1,14
440 R(I,KK)=A(I)
450 CONTINUE
GOTO370
B 460 IF(BERAF(CHR,DELETE))560,470,560
C==Cards are to be deleted
470 DO510N=1,NCRD
480 READINPUTPENIN,400,(A(I),I=1,14)
490 DO480K=1,KK
500 KK=K
B IF(BERAF(R(14,K),A(14)))480,490,480
480 CONTINUE
GOTO415
490 DO500I=1,14
500 R(I,KK)=0.0
510 CONTINUE
C Close up record
520 IF(R(14,K))545,530,545
530 KXX=KXX-1
540 DO540L=KXXKXX
550 DO540I=1,14
560 R(I,L)=R(I,L+1)
GOTO520
545 IF(K<KXX)555,555,550
550 CONTINUE
555 KXX=KXX
GOTO 370
B 560 IF (BERAF (CHT, SERT)) 650, 570, 650
C====CARDS ARE TO BE INSERTED
570 READ INPUTTAPENIN, 400, (A(I), I = 1, 14)
   DO 580 KK = 1, KK
   KK =
B 580 CONTINUE
   GOTO 415
   590 KK = KK + NCRD
C EXPAND RECORD
   KB = KK
   KA = KB - NCRD
   600 DO 610 I = 1, 14
   610 R(I, KB) = R(I, KA)
   KB = KB - 1
   KA = KA - 1
   IF (KA = KK) 620, 620, 600
C INSERT CARDS
   620 DO 630 I = 1, 14
   630 R(I, KK + 1) = A(I)
   NCRD = NCRD - 1
   KK = KK + 2
   KAA = KK + NCRD - 1
   IF (NCRD) 370, 370, 640
   640 READ INPUTTAPENIN, 400, ((R(I, K), I = 1, 14), K = KK, KKA)
   GOTO 370
C====CORRECTIONS COMPLETE, SEQUENCE NO. AND CHAR. CHECK
   650 R(14, I) = BLANK
   DO 660 BK = 2, 9
   660 R(K, KK) = BLANK
   CALL DRCK(L)
   IF (L) 1670, 330, 310
   670 CALL IHC(RL(2), KK)
   CALL SEQIL, NOUT
   WRITE OUTPUTTAPENOUT, 680, RID
   680 FORMAT (7HRECORDA6, 10H CORRECTED)
C==ADD DATE AND WRITE ON NEW LIBRARY
   700 RL(5) = DATEA
   RL(6) = DATEB
   CALL WRLIB(NLIBB, L, 0)
   IF (L) 1710, 710, 180
   710 CALL PUNCH(IPUN, NPUT)
   CALLPRINT(3, NOUTB)
   720 CONTINUE
C==END OF RECORDS LOOP, COMPLETE NEW LIBRARY=========================
   730 CALL RDLIB(NLIBA, L, NOUT)
   IF (L - 1) 740, 750, 740
   740 CALL WRLIB(NLIBB, L, 0)
   IF (L) 730, 730, 180
   750 WRITE OUTPUTTAPENOUT, 760
   760 FORMAT (7HJOB COMPLETED)
   GOTO 820
C==ERROR EXITS==============================================
   415 WRITE OUTPUTTAPENOUT, (A(I), I = 1, 14)
   420 FORMAT (26HWRONG CORRECTION CARD LOC/2H A6, 11A6, A5, A3)
810 WRITEOUTPUTAPENOUT,810
810 FORMAT(27HERROR STOP, JOB TERMINATED)
C==TERMINTATION
820 ENDFILELIB
REWINDLIBB
UNLOADLIBB
REWINDLIBA
UNLOADLIBA
CALL EXIT
END
Name: DFSR4

Purpose: To copy/print/punch the library tape

Language: FORTRAN II

Input: A. The program deck consisting of:

1. The binary deck DFSR4
2. A * Data Card
3. The 5 Input Cards (see detail listing following this writeup)
4. An EOF card

Tapes: A. Input

1. One to four library tapes to be copied.

B. Output

1. One to four copy tapes
2. Print tape NOUTA
3. Punch tape NPUN

Method: DFSR4 copies each specified tape and will print/punch a selected bloc of Data Records at the option of the user. A single bloc of any size may be selected.

After reading a Data Record from the library tape the program checks to see if a copy tape is present. If so, the record is copied. Printing and punching then take place if indicated, and the next record is brought in. Loop processing continues in this manner until an EOF on the I/P library tape is reached, at which point the COPY as well as the LIBRARY tape is terminated. The program then steps to the next set of library and copy tapes to keep a parallel relationship between them.
Since processing hinges upon the presence of a positive tape number the user selects his options by indicating the appropriate tapes. Zero or blank tape numbers cause bypassing. DFSR4 may be used as a listing/punching program without copying.

**Messages:**

TAPE (NCOPY) IS TOO SHORT

**Service Routines:**

- RDLIB
- WRLIB
- PRINT
- PUNCH
- NTCRD
- HIC
### Input data to copy/print/punch library tape

<table>
<thead>
<tr>
<th>Card</th>
<th>Cols.</th>
<th>Format</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1-6</td>
<td>A6</td>
<td>DATEA</td>
<td>The date in the form</td>
</tr>
<tr>
<td></td>
<td>7-12</td>
<td>A6</td>
<td>DATEB</td>
<td>JAN^21, 1964</td>
</tr>
<tr>
<td></td>
<td>13-72</td>
<td>10A6</td>
<td>HGL</td>
<td>Hollerith remarks</td>
</tr>
<tr>
<td>2.</td>
<td>1-10</td>
<td>10X</td>
<td>-------</td>
<td>The characters LIBRARY</td>
</tr>
<tr>
<td></td>
<td>11-15</td>
<td>I5</td>
<td>NLIBT(1)</td>
<td>1st library tape number</td>
</tr>
<tr>
<td></td>
<td>16-20</td>
<td>I5</td>
<td>NLIBT(2)</td>
<td>2nd &quot; &quot; &quot;</td>
</tr>
<tr>
<td></td>
<td>21-25</td>
<td>I5</td>
<td>NLIBT(3)</td>
<td>3rd &quot; &quot; &quot;</td>
</tr>
<tr>
<td></td>
<td>26-30</td>
<td>I5</td>
<td>NLIBT(4)</td>
<td>4th &quot; &quot; &quot;</td>
</tr>
<tr>
<td>3.</td>
<td>1-10</td>
<td>10X</td>
<td>-------</td>
<td>The characters PRINT</td>
</tr>
<tr>
<td></td>
<td>11-15</td>
<td>I5</td>
<td>NOUTA</td>
<td>Print tape number</td>
</tr>
<tr>
<td></td>
<td>16-20</td>
<td>I5</td>
<td>IOUTA</td>
<td>Test for printing (see subroutine PRINT)</td>
</tr>
<tr>
<td></td>
<td>22-26</td>
<td>A5</td>
<td>PRIDA</td>
<td>First record to be printed</td>
</tr>
<tr>
<td></td>
<td>28-32</td>
<td>A5</td>
<td>PRIDB</td>
<td>Last record to be printed</td>
</tr>
<tr>
<td>4.</td>
<td>1-10</td>
<td>10X</td>
<td>-------</td>
<td>The characters PUNCH</td>
</tr>
<tr>
<td></td>
<td>11-15</td>
<td>I5</td>
<td>NPUN</td>
<td>Punch tape number</td>
</tr>
<tr>
<td></td>
<td>16-20</td>
<td>I5</td>
<td>IPUN</td>
<td>Test for punching (see subroutine PUNCH)</td>
</tr>
<tr>
<td></td>
<td>22-26</td>
<td>A5</td>
<td>PUIDA</td>
<td>First record to be punched</td>
</tr>
<tr>
<td></td>
<td>28-32</td>
<td>A5</td>
<td>PUIDB</td>
<td>Last record to be punched</td>
</tr>
<tr>
<td>5.</td>
<td>1-10</td>
<td>10X</td>
<td>-------</td>
<td>The characters COPYTAPE</td>
</tr>
<tr>
<td></td>
<td>11-15</td>
<td>I5</td>
<td>NCPYT(1)</td>
<td>1st copy tape number</td>
</tr>
<tr>
<td></td>
<td>16-20</td>
<td>I5</td>
<td>NCPYT(2)</td>
<td>2nd &quot; &quot; &quot;</td>
</tr>
<tr>
<td></td>
<td>21-25</td>
<td>I5</td>
<td>NCPYT(3)</td>
<td>3rd &quot; &quot; &quot;</td>
</tr>
<tr>
<td></td>
<td>26-30</td>
<td>I5</td>
<td>NCPYT(4)</td>
<td>4th &quot; &quot; &quot;</td>
</tr>
</tbody>
</table>
* ENDF* SERVICE ROUTINE
* FORTRAN
* LABEL
CODSR4 COPY/PRINT/PUNCH LIBRARY TAPES
DIMENSION R(14,1000),RL(14),NLIBT(4),NCPTY(4),HOL(10)
COMMON R,RL,KK
EQUIVALENCE (PRIDA,IPA),(RL,KLC),(PRIDB,IPB),(PUIDA,IPUA),
1(PUIDB,IPUB)
NIN=5
NOUT=6
CALL NESEX1(10,11,13,15)
C=====READ INPUT================================================================
100 READINPTAPE NIN,110,DATEA,DATEB,HOL,(NLIBT(I),I=1,4),NOUTA,IOUTA,
1PRIDA,PRIDB,NPUN,IPUN,PUIDA,PUIDB,(NCPTY(I),I=1,4)
110 FORMAT(12A6/10X15,3I5/10X15,15,1XIA5,1XIA5/10X15,15,1XIA5,1XIA5/10X15,
13I5)
WRITEOUTPUTAPENOUT,12U,DATEA,DATEB,HOL
120 FORMAT(30HL*ENDF* COPY/PRINT/PUNCH JOB A6*11A6///)
C=====INITIALIZE=================================================================
LPRN=0
LPUN=0
ILT=1
IF(NOUTA)130,130,125
125 WRITEOUTPUTAPENOUT,120,DATEA,DATEB,HOL
C=====SET UP LIBRARY AND COPY TAPES===========================================
130 NLIB=NLIBT(IL)
NCPTY=NCPTY(IL)
IF(NLIB)420,420,140
140 WRITEOUTPUTAPENOUT,150,ILT
150 FORMAT(BHOLLIBRARY13)
C=====READ RECORD FROM LIBRARY=================================================
155 CALL RDLIB(NLIB,L,NOUT)
IF(L-1)180,160,180
160 ILT=ILT+1
REWINDNLIB
UNLOADNLIB
IF(NCPTY)130,130,170
170 ENDFILENCY
REWINDNCY
UNLOADNCY
GOTO130
180 WRITEOUTPUTAPENOUT,190,RL(1)
190 FORMAT(3XA5)
C=====COPY RECORD==============================================================
IF(NCPTY)250,250,200
200 CALL WRLIB(NCPTY,L,0)
IF(L)230,230,210
210 WRITEOUTPUTAPENOUT,220,NCPTY
220 FORMAT(9X,9HCOPY TAPE13,13H IS TOO SHORT)
ENDFILENCY
REWINDNCY
UNLOADNCY
NCPTY=0
GOTO250
230 WRITEOUTPUTAPENOUT,240
240 FORMAT(15H+ COPIED)
C========PRINT RECORD==============================================
250 IF(NOUTA)330,300,260
260 IF(LPRN)270,270,290
270 IF(IPA-KLC)330,280,330
280 LPRN=1
290 GOTO310
300 LPRN=0
310 CALL PRINT(IOUTA,NOUTA)
     WRITEOUTPUTPENOUT,320
320 FORMAT(24H+ PRINTED)
C========PUNCH RECORD==============================================
330 IF(NPUN)410,410,340
340 IF(LPUN)350,350,370
350 IF(IPUA-KLC)410,360,410
360 LPUN=1
370 GOTO390
380 LPUN=0
390 CALL PUNCH(IPUN,NPUN)
     WRITEOUTPUTPENOUT,400
400 FORMAT(33H+ PUNCHED)
C========READ NEXT RECORD==========================================
410 GOTO155
C========JOB FINISHED==============================================
420 WRITEOUTPUTPENOUT,430
430 FORMAT(13H0JOB FINISHED)
     CALL EXIT
     END

************0512************
Name: DFSR5

Purpose: To provide a list of the data records on the library in order of increasing:

1. Atomic number (NATOM in Dictionary 1)
2. Atomic weight (MASSN)
3. Reaction type (NREAC in Dictionary 3)
4. Type of data (NDTYP in Dictionary 4)

Input: The program deck consisting of:

1. The binary deck DFSR5
2. a * DATA card
3. The Dictionary input (see subroutine DICT)
4. The 2 input cards (see detail listing following this writeup)

Tapes: A. Input

1. One to four library tapes, NLIBT(N)
2. Systems input NIN=5 (Preset in DFSR5)

B. Output

1. Systems print output NOUT=6 (Preset in DFSR5)

C. Other

1. Scratch NSCT=2 (Preset in DFSR5)

Method:

Each Data Record from the library is read into memory and the first Heading Card is written on the scratch tape. The scratch tape is rewound and read back into memory. As each of the first Heading Cards is read, the numbers NATOM, MASSN, NREAC, NDTYD, and the record identification number (RECID) are stored. The list is then sorted first on increasing NATOM, next on increasing MASSN, next on increasing NREAC, and finally on increasing NDTYD, and a line is printed for each record. This line gives the chemical symbol, mass number, reaction type, data type, and record identification.
Subroutines: DICT - the dictionary subroutine.

Restrictions: The total number of Data Records on the library must not exceed 5000.
## Input Data for DFSR5

<table>
<thead>
<tr>
<th>Card</th>
<th>Columns</th>
<th>Format</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-6</td>
<td>A6</td>
<td>DATEA</td>
<td>Date in the form</td>
</tr>
<tr>
<td></td>
<td>7-12</td>
<td>A6</td>
<td>DATEB</td>
<td>Jan 1, 21, (1) 1964</td>
</tr>
<tr>
<td></td>
<td>13-72</td>
<td>10A6</td>
<td>HØL</td>
<td>Remarks</td>
</tr>
<tr>
<td>2</td>
<td>1-10</td>
<td>10X</td>
<td>-</td>
<td>The characters LIBRARY</td>
</tr>
<tr>
<td>11-15</td>
<td>I5</td>
<td>NLIBT(1)</td>
<td></td>
<td>1st Library tape number</td>
</tr>
<tr>
<td>16-20</td>
<td>I5</td>
<td>NLIBT(2)</td>
<td></td>
<td>2nd   &quot; &quot; &quot;</td>
</tr>
<tr>
<td>21-25</td>
<td>I5</td>
<td>NLIBT(3)</td>
<td></td>
<td>3rd   &quot; &quot; &quot;</td>
</tr>
<tr>
<td>26-30</td>
<td>I5</td>
<td>NLIBT(4)</td>
<td></td>
<td>4th   &quot; &quot; &quot;</td>
</tr>
</tbody>
</table>
*---------ENDF SERVICE ROUTINE 5----------------------------------------

CDFSRT

SORT HEADING CARDS AND PRINT
DIMENSION RL(14),R(14,1800),NAT(5000),MAS(5000),NRE(5000),
INDT(5000),REC(5000),HOL(10),NLIBT(4)
COMMON NIN,NOUT,R
EQUIVALENCE (NIN,NIN),(NOUT,NOUT)
EQUIVALENCE (NAT,R(1)),(MAS,R(5001)),(NRE,R(10001)),
1(NDT,R(15001)),(REC,R(20001))

NIN=5
NOUT=6
NSCT=2
READINPUT PEN,20*DATEA,DATEB,HOL
20 FORMAT(12A6)
READINPUT PEN,30*(NLIBT(N),N=1,4)
30 FORMAT(110X45)
CALL DICT(X=X,X,0,X)
CALL NEXEM1(11)
REWIN DSCT
NX=1
DO 90 NL=1,4
LIB=NLIBT(NL)
IF(LIB)90,90,40
40 REWIN DSCT
50 READTAPELIBKX,(RL(N),N=1,14),(R(N,1),N=1,14)
IF(NEXEM2(11))60,60,80
60 NX=NX+1
WRITEOUTPUTPENSC,T0,(R(N,1),N=1,14)
70 FORMAT(12A6,2A4)
GOTO50
80 REWIN DSCT
90 CONTINUE
END FILE NSCT
REWIN NSCT
DO 110 N=1,NX
READINPUTPENSC,100,CHMS,MASSN,REAC,DTYP,RECID
100 FORMAT(2A13,4XA6,6XA4,47XA4)
CALL DICT(CHMS,NAT(N),1,1,IF)
CALL DICT(REAC,NRE(N),3,1,IF)
CALL DICT(DTYP,NDT(N),4,1,IF)
MAS(N)=MASSN
110 REC(N)=RECID
REWIN NSCT
WRITEOUTPUTPENSCOUT,120*DATEA,DATEB,NX,HOL
120 FORMAT(18H1ENDF LIBRARY SORT,3XA6,A6,16,8H RECORDS/10A6/1H)
DO 200 M=1,NX
NATOM=32767
MASSN=32767
NREAC=32767
NDTYP=32767
DO 180 N=1,NX
130 IF(NAT(N))180,180,130
130 IF(NAT(N)-NATOM)140,160,180
140 IF(MAS(N)-MASSN)150,150,180
150 IF(NRE(N)-NREAC)160,160,180
160 IF(NDT(N)-NDTYP)170,170,180

170 NATOM=NAT(N)
MASSN=MAS(N)
NREAC=NRE(N)
NDTYP=NDT(N)
RECID=REC(N)
NP=N
180 CONTINUE
CALL DICT(CHMS,NATOM,1,2,IF)
CALL DICT(REAC,NREAC,3,2,IF)
CALL DICT(DTYP,NDTYP,4,2,IF)
WRITEOUTPUTPENSCOUT,190,CHMS,MASSN,REAC,DTYP,RECID
190 FORMAT(6XA2,14,3XA6,3XA4,3XA4)
NAT(NP)=0
200 CONTINUE
CALL EXIT
END
Name: RDIN(NINP, L, NOUT)

Purpose: To read the card images of the Data Record on tape NINP and store them in the array R, and determine the number of cards in the Data Record.

Language: FORTRAN II

Arguments:

R(N,K) - The Data Record in core storage (COMMON)

\[ 1 \leq N \leq 14, \quad 1 \leq K \leq KK \]

KK - The number of cards in the Data Record (COMMON)

NINP - The input tape number

L - If L=1, an EOF was encountered. If L=2, reading error occurred.

NOUT - Print output tape number.

Method: Card images (unpacked) are read successively from tape NINP under the Format (12A6,A5, A3).

The Kth card is stored in R(N,K), N=1,14.

Examine R(1,K) to see if the word is ENDbbb.

If it is, then this is the last card of the Data Record and KK=K.

Use subroutine IHC to change KK to Hollerith and store in RL(2). Set L=0 and return to main program.

If an end of file mark is encountered, set L=1, and return to main program.

If a tape reading error occurs, print a message on tape NOUT giving the input tape number, the card number where the error occurred, and the contents of the first card. Set L=2. Continue reading cards until the END card is encountered. Return to main program.

Message:

READ ERROR TAPE NO. (NINP), CARD NO.(SEQ.NO), TITLE (ENTIRE HEADING CARD PRINTED)
Enter

Read a card image and store in array R

Tape error test
  Yes
  Set L = 2
  Print error message and title card

No

Test end of tape
  Yes
  Set L = 1
  Move tape to end card

No

Is record an end card?
  Yes
  Call INC to convert card total to Hollerith

Store total (XX) in RL(2)

No
* *ENDF* SERVICE ROUTINE
* FORTRAN

```
* SUBROUTINE CRDIN(NINP,L,NOUT)
  
  CRDIN READ A DATA RECORD (IN CARD IMAGE FORM)
  DIMENSION R(14), N=1, 14
  COMMON R, L, K

  1 K=0
  L=0
  
  2 IF (L=0) GOTO 201

  3 TEST = 2545246060660
  4 K = K + 1
  5 R(N,K) = N=1, 14
  6 L=0
  7 GOTO 201

  8 FORMAT (12A6,A5,A3)
  9 FORMAT (12A6,A5,A3)

  10 L = 2
```

CREATING ERROR: KEEP PASSING TAPE TO END CARD.

```
  10 IF (NOUT) 103, 103, 102
  102 WOTNOUT = 20001, NINP, R(14,K), (R(N,1), N=1, 14)
  1000 FORMAT (12A6,A5,A3)

  103 L = 0
  104 L = 0
  105 IF (L=0) GOTO 201
```

CLOSE OF FILE INPUT TAPE

```
  200 L = 1
```

RETURN

END
**Name:** RDLIB(NLIB, L, NØUT)

**Purpose:** To read a Data Record from the library tape.

**Language:** FORTRAN II

**Arguments:**
- **R(N,K)** - The Data Record in core storage (COMMON)
  \[ 1 \leq N \leq 14, \quad 1 \leq K \leq KX \]
- **RL(N)** - The Lead Card in core storage (COMMON)
- **KX** - The number of cards in the Data Record (COMMON)
- **NLIB** - The library tape number
- **L** - End of File indicator normally = 0. If L = 1, an EOF was encountered. If L = 2, a reading error occurred.
- **NØUT** - Print output tape number

**Method:** Read a Data Record from the library tape with the instruction:

```fortran
READ TAPE NLIB, (KX, (RL(N), N=1,14),((R(N,K), N=1,14),K=1,KX))
```

If no EOF occurs, or no reading error, set L=0 and return.

If an EOF occurs, set L=1 and position tape in front of EOF mark. If a reading error occurs, print a message on tape NØUT indicating the tape number and the Data Record identification RL(1). Set L=2 and return.

**Error Message:**

```fortran
READ ERROR LIBRARY TAPE (NLIB), DATA RECORD (ID NØ)
```
RDLIB - READ A BINARY DATA FILE FROM LIBRARY TAPE

ENTER

READ BINARY LEAD CARD AND DATA RECORD

TAPE ERROR TEST

YES

PRINT REDUNDANCY MESSAGE

SET L = 2

NO

TEST EOF

YES

SET L = 1.
BACKSPACE.

NO

POSITION TAPE IN FRONT OF EOF MARK

RETURN
* ENDF* SERVICE ROUTINE
* FORTRAN
* LABEL

CRDLIB READ A BINARY DATA FILE FROM LIBRARY TAPE
   SUBROUTINERDLIB(NLIB,L,NOUT)
   DIMENSIONR(14,1000),RL(14)
   COMMONR,RL,KX
   L=C
   READTAPENLIB,(KX,(RL(N),N=1,14),((R(N,K),N=1,14),K=1,KX))
   LTEMP=NEXEM2(10)

C TEST REDUNDANT I/P
   IF(LTEMP)100,5,100

C TEST I/P EOF
   5 LTEMP=NEXEM2(11)
   IF(LTEMP)200,7,200
   7 RETURN

100 IF(NOUT)103,103,101

CPRINT REDUNDANCY MSG
   101 WOTNOUT,102,NLIB,RL(1)
   102 FORMAT(25H READ ERROR LIBRARY TAPE 15,14H DATA RECORD A5)
   103 L=2
   GOTO5

C EOF INPUT TAPE
   200 L=1
   BACKSPACENLIB
   GOTO7

END
Name: WRLIB(NLIB,L,NOUT)

Purpose: To write the Lead card and the Data Record on the Library tape.

Language: FORTRAN II

Arguments:
- R(N,K) - The data Record in core storage (COMMON)
  \[ 1 \leq N \leq 14, 1 \leq K \leq KX \]
- RL(N) - The Lead Card in core storage (COMMON)
- KX - The number of cards in the Data Record (COMMON)
- NLIB - The library tape number
- L - End of tape indicator normally = 0.
  If L=1, the end of tape mark was encountered
- NOUT - Print output tape number

Method: Write the Lead card and the Data Record on the library tape with the instruction:

WRITE TAPE NLIB, (KX, (RL(N), N=1,14), (R(N,K),N=1,14),K=1,KX))

If an end of tape mark is encountered, backspace to the beginning of the last record previously written on the tape. Read the second word of the record into location B (this will be the identification number of the last complete Data Record on this tape). Write an EOF mark and rewind. Read the second word of the first data record on tape into location A (this will be the identification number of the first Data Record). Rewind and unload the tape. Print a message on tape NOUT indicating that the tape is full and that the first and last Data Records are A and B.

Message:

TAPE(NLIB) FULL, FIRST RECORD IS (A), LAST RECORD IS (B)
WRITE LEAD CARD AND DATA RECORD ON LIBRARY TAPE

END OF TAPE?

ERASE THIS DATA RECORD FROM TAPE

OBTAIN I.D. OF FIRST AND LAST RECORDS ON THIS TAPE

PRINT O/P MESSAGE IF DESIRED

REWIND AND UNLOAD TAPE
* ENDF* SERVICE ROUTINE
* FORTRAN
* LABEL
CWRLLIB WRITE A RECORD ON BINARY LIBRARY TAPE
SUBROUTINE WRLIB(NLIB,L,NOUT)
DIMENSION(R(14),1000),RL(14)
COMMON RL,KX
WRITETAPENLIB(KP,RL(N),N=1,14),((R(N,K),N=1,14),K=1,KX)
L=NEXEM2(15)
CTEST FOR END OF TAPE
IF(L)200,3,200
3 RETURN
CEND OF TAPE REACHED
200 BACKSPACENLIB
   IF(NOUT)210,210,201
COBTAIN ID OF FIRST AND LAST RECORDS AND PRINT MSG
201 BACKSPACENLIB
202 READTAPENLIB,Z,B
   ENDFILENLIB
   REWINDNLIB
   READTAPENLIB,Z,A
204 REWINDNLIB
   WTNOUT,1000,NLIB,A,B
1000 FORMAT(6H TAPE IS 23H FULL FIRST RECORD IS A5, 16H LAST RECORD IS A5)
205 UNLOADNLIB
CRETURN TO CHANGE TAPE NO + START NEW TAPE
GOTO 3
CNOUT =0, DO NOT PRINT MSG
210 ENDFILENLIB
   REWINDNLIB
   GOTO 205
END
Name: PRDR(IPRN,NOUT)

Purpose: To print selected portions of the Data Record on tape NOUT.

Language: FORTRAN II

Arguments:

R(N,K) - The Data Record in core storage (COMMON)
        1 \leq N \leq 14, 1 \leq K \leq KX

RL(N) - The Lead card in core storage (COMMON)
        1 \leq N \leq 14

KX - The number of cards in the Data Record (COMMON)

IPRN - Print test
        =0 no printing
        =1 Print Lead card and first heading card.
        =2 " " " " all heading cards.
        =3 " " " " complete Data Record.
        =4
        =5
        =6

NOUT - Output tape number

Note: The subroutine NTCD(LX), is used to determine the number of Heading Cards, LX.
PRDR - PRINT SELECTED PORTIONS OF THE DATA RECORD

ENTER

TEST IPRN

ZERO

RETURN

NON-ZERO

IS AN O/P TAPE PRESENT?

NO

YES

IPRN

PRINT LEAD CARD AND FIRST TITLE CARD

PRINT LEAD CARD AND ALL TITLE CARDS

PRINT LEAD CARD AND DATA RECORD

TO BE ASSIGNED

RETURN
**ENDF** SERVICE ROUTINE
* FORTRAN
* LABEL
CPRDR PRINT SELECTED PORTIONS OF THE DATA RECORD ON TAPE NOUT
SUBROUTINE PRINT(IPRN,NOUT)
DIMENSION R(14), RL(14)
COMMON R, RL, KX
C DECODE IPRN, IF 0, RETURN, IF NOUT=0, RETURN
IF(IPRN), 1, 12, 1
  1 IF(NOUT), 12, 12, 2
  2 GOTO(10,20,30,40,50,60), IPRN
C PRINT LEAD CARD AND FIRST HEADING CARD
  10 WOTNOUT+11, (RL(N), N=1, 6), (R(N), N=1, 12)
  11 FORMAT(1H, A5, A6, 8H CARDS A6, A6, 2XA6, A6, 2XA6, 11A6)
  12 RETURN
C PRINT LEAD CARD AND ALL HEADING CARDS
  20 CALLNTC(D(LX))
  WOTNOUT, 21, (RL(N), N=1, 6), (R(N, L), N=1, 12), L=1; LX
  21 FORMAT(1H0A5, A6, 8H CARDS A6, A6, 2XA6, A6, 2XA6, 11A6/(47XA6, 11A6))
GOTO12
C PRINT LEAD CARD AND COMPLETE DATA RECORD
  30 WOTNOUT+31, (RL(N), N=1, 6), (R(N, L), N=1, 14), L=1, KX
  31 FORMAT(1H1A5, A6, 8H CARDS A6, A6, 2XA6, A6, 2XA6, 11A6, 11A6, 2XA5, A3))
GOTO12
C TO BE FILLED IN
  40 GOTO12
C TO BE FILLED IN
  50 GOTO12
C TO BE FILLED IN
  60 GOTO12
END
Name: PUNDRI PUN, N PUN

Purpose: To write selected portions of the Data Record on tape N PUN in a form suitable for punching.

Language: FORTRAN II

Arguments:

R(N,K) - The Data Record in core storage (COMMON)
        1 ≤ N ≤ 14, 1 ≤ K ≤ KX

RL(N) - The Lead card in core storage (COMMON)
        1 ≤ N ≤ 14

KX - The number of cards in the Data Record (COMMON)

IPUN - Punch test
       = 0 no printing
       = 1 Punch Lead card and first heading card.
       = 2 " " " , all heading cards, and a blank.
       = 3 " " " and complete Data Record.
       = 4
       = 5
       = 6

NPUN - Punch tape number

Note: The subroutine NTCD(LX) is used to determine the number of Heading cards, LX.
PUNDR - PUNCH SELECTED PORTIONS OF A DATA RECORD

ON A PUNCH TAPE

1. ENTER
2. TEST IPUN
3. NON-ZERO
4. IS AN #IP TAPE PRESENT?
   YES
   1. IPUN
   2. PUNCH LEAD AND FIRST TITLE CARDS
   3. TO BE ASSIGNED
5. RETURN
* ENDF* SERVICE ROUTINE
* FORTRAN
* LABEL
CPUNDR WRITE SELECTED PORTIONS OF A DATA RECORD ON A PUNCH TAPE
SUBROUTINE PUNCH(IPUN, NPUN)
DIMENSION IPUN(14, 1000), RL(14)
COMMON RL, KX
C DECODE IPUN, IF ZERO, RETURN, SAME FOR NPUN
IF (IPUN) 1, 12, 1
1 IF (NPUN) 2, 12, 2
2 GOTO (10, 20, 30, 40, 50, 60) IPUN
C LEAD CARD AND FIRST HEADING CARD
10 WOTNPUN, 11, (RL(N), N=1, 6), (R(N), N=1, 14)
11 FORMAT (1H A5, A6, 8H CARDS A6, A6, 2XA6, A6/12A6, A5, A3)
12 RETURN
C LEAD CARD, ALL HEADING CARDS, AND A BLANK
20 CALLNCD(LX)
WOTNPUN, 21, (RL(N), N=1, 6), (R(N, K), N=1, 14), K=1, LX)
21 FORMAT (1H A5, A6, 8H CARDS A6, A6, 2XA6, A6/(12A6, A5, A3))
WOTNPUN, 22
22 FORMAT (1H )
GOTO 12
CLEAD CARD AND COMPLETE DATA RECORD
30 WOTNPUN, 31, (RL(N), N=1, 6), (R(N, K), N=1, 14), K=1, KX)
31 FORMAT (1H A5, A6, 8H CARDS A6, A6, 2XA6, A6/(12A6, A5, A3))
GOTO 12
CTO BE FILLED IN
40 GOTO 12
CTO BE FILLED IN
50 GOTO 12
CTO BE FILLED IN
60 GOTO 12
END
**Name:** SEQ(L,NOUT)

**Purpose:** To check the sequence number of the Data Record and change the identification number.

**Language:** FORTRAN II

**Arguments:**

- **R(N,K)** - The Data Record in core storage. (COMMON)
  
  \[ 1 \leq N \leq 14, \ 1 \leq K \leq KX \]

- **RL(N)** - The Lead Card in core storage. (COMMON)
  
  \[ 1 \leq N \leq 14 \]

- **KX** - The number of cards in the Data Record. (COMMON)

- **L** - Error indicator normally = 0. If sequence numbers don't check, L=1.

- **NOUT** - Print output tape number.

**Method:**

1. Take the identification number in RL(1) and put it in R(13,K), K=1,KX.

2. Test the first sequence number, R(14,1). If it is not blank, the deck has been sequence numbered. Check the sequence numbers on all the cards by comparing R(14,K) with K using subroutine HIC. If they all check, set L=0 and return. Otherwise set L=1, print an error message on NOUT, and return.

3. If R(14,1) is blank, sequence number the card images using subroutine IHC. Set L=0 and return.

**Messages:**

**FOLLOWING DATA RECORD OUT OF SEQUENCE**

This message is followed by a print-out of the error file.
SEQ - CHECK SEQUENCE NUMBER OF DATA RECORD AND CHANGE THE I.D. NUMBER

ENTER

IS RECORD ALREADY SEQUENCED?
YES

SEQUENCE CHECK EACH CARD IMAGE

NO

SEQUENCE EACH CARD IMAGE

ARE CARDS IN ORDER?
YES

PRINT ERROR MESSAGE

NO

INSERT NEW I.D. NUMBER

RETURN
* SERVICE ROUTINE
* FORTRAN
* LABEL
CSEQ CHECK SEQUENCE NO OF DATA RECORD AND CHANGE THE ID NO.
  SUBROUTINE SEQ(L,NOUT)
  DIMENSION R(L,1000),RL(14)
  COMMON RL,KX
  B TEST2=606060606060
  CTEST FOR PRIOR SEQUENCING
  B IF(1>0.06*(R14,1))=50,7,50
  C INSERT SEQ NOS., LEFT ADJUSTED, TRAILING BLANKS
  7 DO8K=1,KX
    CALLHC(A,K-1)
    B A=SHIFT1F(2200000000,A)
    B A=A+606060
    8 R14,K)=A
    9 L=0
  C INSERT NEW IDENTIFICATION NUMBER
  5 DO6K=1,KX
  6 R13,K)=RL(I)
  10 RETURN
C SEQUENCE CHECK, RIGHT ADJUSTED, CONVERTED NOS.
  50 DS1IK=1,KX
  51 CONTINUE
CENTIRE DATA RECORD IN SEQ
  GOTO 0
  75 L=1
    B IF(NOUT)=10,10,76
  76 WTNOUT*2
  77 FORMAT(38H FOLLOWING DATA RECORD OUT OF SEQUENCE)
    WTNOUT,3,(R(N,1),N=1,14)
  78 FORMAT(1H 12A6,A5,A3)
  GOTO 10
END
Name: AID(B)

Purpose: To increase the identification number by one.

Language: FORTRAN II

Arguments:

B - The identification number (5 Hollerith characters),
a blank followed by a letter and four numbers

Method:

Since only the numbers are operated upon,
separate B in half. Convert the right half,
containing the four Hollerith numbers, into an
integer, using subroutine HIC. Add one to the
integer and convert it back to Hollerith, using
IHC. Bring the two halves together again and
return.
AID - INCREASE THE SEQUENCE NUMBER

ENTER

SHIFT FIELD AND SEPARATE INTO ALPHA AND NUMERIC PARTS

CALL HIC AND CONVERT NUMBER TO INTEGER

ADD ONE AND CONVERT BACK TO HOLLERITH

JOIN BOTH PARTS AND SHIFT

RETURN
* ENDF* SERVICE ROUTINE
* FORTRAN
* LABEL
C INCREASE THE IDENTIFICATION NUMBER
  SUBROUTINEAID(B)
C OCCUPIES LEFTMOST 5 POSITIONS OF WORD.
C RIGHT ADJUST FIELD ONE DIGIT.
B  B=SHIFT2F(6000000,0,B)
C SEPARATE B INTO BL(A ZERO AND A HOLLERITH) AND BR(4DIGITS)
B  BR=B*77777777
B  BL=B*777700000000
C CONVERT BR INTO AN INTEGER AND ADD 1
  CALLHIC(BR,I)
I=I+1
C CONVERT BACK TO HOLLERITH
  CALLHIC(BR,I)
C REMOVE BLANKS FROM LEFT END OF BR AND ADD BL
B  BR=BR*77777777
B  B=BL+BR
C LEFT ADJUST WORD
B  B=SHIFT1F(6000000,B)
C RESTORE BLANK AT RIGHT
B  B=B+60
RETURN
END
Name: NTCD(LX)

Purpose: To determine the number of heading cards in the Data Record.

Language: FORTRAN II

Arguments: R(N,K) - The Data Record in core storage (COMMON)
            LX - The number of heading cards

Method: 1. Set LX = 4

          2. Isolate columns 29 and 30 of first heading card.
             If they contain XX, then the first extension card is present and LX = LX + 1.

          3. Test NCDF (format card) in card 3 for 0 (col. 1-5)
             If present LX = LX + 1.

          4. Obtain NCCRD (no. of comment cards) from col. 7-11 of card 3. Convert it to an integer, I, using subroutine HIC and add to LX to establish the total number of heading cards.
Notes: R is shifted right 6 bit places (one BCD character) and stored, via a STØ instruction in Y(I). It is not necessary to use a Boolean Statement since a ARS generates zeroes at the hi-order end of the word.
NTCD - NUMBER OF TITLE CARDS IN THE DATA RECORD

ENTER

SET COUNT
\[ L_X = 4 \]

ARE CHAR.
\[ XX = \text{in cols. 29-30 of first neg. card} \] ?

\[ L_X = L_X + 1 \]

RETURN

ADD INTEGER TO COUNT \( L_X \) FOR NUMBER OF CARDS

CONVERT 4\textsuperscript{th} AND 5\textsuperscript{th} CHARACTERS OF \( R(1,3) \) TO INTEGER

\[ L_X = L_X + 1 \]
*ENDF* SERVICE ROUTINE

FORTRAN

LABEL

CNTCRDNO, OF HEADING CARDS IN THE DATA RECORD

SUBROUTINE NTCD(LX)

DIMENSION R(14,1000)

COMMON R(LX=4)

C TEST COL.29+30 OF CARD 1 FOR XX(EXTENSION CARD)

B TEST=6767
B Y=R(5,1)*7777
B IF(BERA(R(3,Y))7,5,7
B LX=LX+1

C TEST NCDF(COL.1-5) IN CARD 3 FOR ZERO OR BLANK(CARD FORMAT)

B IF(R(1,3))8,9,10
B TEST=60606060606060
B IF(BERA(R(1,3),TEST))10,9,10
B LX=LX+1

C ADD NCCRD TO LX(COL.10+11,NO. OF COMMENT CARDS)

B 10 Y=SHIFT2F(6000000,R(2,3))*7777
C ALLHIC(Y,N)
B LX=LX+N
RETURN
END
Name: HIC(A, I)

Purpose: To convert the Hollerith representation of an integer to a binary representation.

Language: FAP

Arguments:

A - A word containing 6 Hollerith characters each of which is an integer 0-9 or a blank.

I - The binary representation of A in the decrement.

Method: Isolate the six characters in A. Call them $N_1$, $N_2$, ..., $N_6$. Convert blanks to zeros. Since the Hollerith representation for an integer is just the integer itself, I is obtained from

$$I = N_1 + 10N_2 + 100N_3 + 1000N_4 + 10000N_5 + 100000N_6$$
HIC - HOLLERITH TO INTEGER CONVERSION

ENTER

IS IT A ZERO WORD?

YES → SET ARGUMENT TO ZERO

NO → SEPARATE THE SIX BCD CHARACTERS

OBTAIN FIRST NON-ZERO LEADING DIGIT

STORE IN SUM FOR SUCCESSIVE MULTIPLICATION

IS THERE ANOTHER DIGIT?

NO → CONVERSION FINISHED. ALIGN BY SHIFTING.

YES → ADD NEXT RIGHT-HAND DIGIT TO SUM

MULTIPLY SUM BY 10 AND STORE IN SUM

RETURN
FAP
HOLLERITH TO INTEGER CONVERSION
COUNT 30
ENTRY HIC
* NUMBER IS RIGHT ADJUSTED, LEADING ZEROES OR BLANKS
HIC SXA LP3,2
CAL* 1,4
TZE DN+1 TEST ZERO WORD
XCA
AXT 6,2
LP ZAC
LGL 6 SEPARATE 1 BCD CH
TZE *+4 LEADING ZEROES
CAS =060 TEST LEADING BLANKS
TRA *+2 INCORRECT CH-PROCESS AS SUCH
ZAC CONVERT TO ZERO
STO AR+2
TIX LP+2,1 CONTINUE
* WORD UNPACKED, BEGIN CONVERSION
AXT 6,2
TB CLA AR+2 TEST FOR LEADING ZERO
TZE DN
LP1 TIX ADJST+2,1 SIX WORD TEST
XCA
MPY =10 STQ TEMP1
CLA AR+2 CLA TEMP1
ADD TEMP1 NODO NEXT
TRA LP1
ADJST ALS 18 SHIFT INTO DECREMENT
STO* 2,4
LP3 AXT 0+2 RETURN
TRA 3+4
DN TIX TB+2,1
STZ* 2,4 WORD ALL BLANK
TRA LP3
TEMP1
AR BES 6
Name: IHC(A,I)

Purpose: To convert an integer to its Hollerith representation.

Language: FAP

Arguments:

A - A word containing 6 Hollerith characters each of which is an integer 0-9 or a blank.

I - A binary integer in the decrement field ≤ 9999

Method: Determine the numbers $N_1$, $N_2$, $N_3$, $N_4$ by the following procedure. The notation $[ \cdot ]$ means "the integral part of".

\[
N_4 = \left[ \frac{I}{1000} \right]
\]

\[
N = N - 1000 N_4
\]

\[
N_3 = \left[ \frac{N}{100} \right]
\]

\[
N = N - 100 N_3
\]

\[
N_2 = \left[ \frac{N}{10} \right]
\]

\[
N_1 = N - 10 N_2
\]

Pack the Hollerith equivalent of $N_1$, $N_2$, $N_3$, $N_4$ into A so that the 6 characters in A are (bb$N_4N_5N_2N_1$).
IHC - INTEGER TO HOLLERITH CONVERSION

1. Obtain word and position by shifting
2. Divide by 10, remainder is right-adjusted.
3. Shift remainder to appropriate digit position
4. Is the quotient zero? (Yes/No)
5. Fill unused hi-order positions with blanks
6. Use quotient as new dividend
7. Return
* ENDF* SERVICE ROUTINE

* LABEL

* FAP

IHC

INTEGER TO HOLLERITH CONVERSION

COUNT 20
ENTRY IHC

DEVELOPS 4 DIGITS, RIGHT ADJUSTED, 2 LEADING BLANKS

IHC

SX A REST,2
AX T 0,2
LDO* 2,4
RQL 18
STZ TEMP1

LOOP

ZAC
DVP =10
ALS 0,2
ORS TEMP1
XCA
TXI **+1,2,-6
TZE TEST FOR 0 QUOTIENT
FILL

CAL MASK
ORA TEMP1
SLW* 1,4 STORE HOLLERITH WORD

REST

AX T 0,2 RESTORE IR 2
TOV 3,4 TURN OFF AC OVERFLOW
TRA 3,4

TEMP1 PZE

END

MASK OCT 606000000000
Name: DRCCK(L)

Purpose: To compute the frequency (modulo 8) of occurrence of each character type in the Data Record (card columns 1-72) and compare with the frequency given on the last card (the END card) of the Data Record.

Language: FAP

Arguments:

- \( R(N,K) \) - The Data Record in core storage (COMMON)
  
- \( 1 \leq N \leq 14, \ 1 \leq K \leq KX \)

- \( KX \) - Number of cards in the Data Record (COMMON)

- \( L \) - An error indicator normally =0. If the card check fails, \( L=1 \). If an illegal character occurs, \( L=2 \).

Method:

1. Each word of the array \( R(N,K) \), \( 1 \leq N \leq 12, \ 1 \leq K \leq KX-1 \), contains 6 Hollerith characters for a total of \( 72(KX-1) \) characters. For each of these characters, determine the type of character and augment a counter (modulo 8) for that type character. Thus there will be a sum (modulo 8) of the A's, B's, C's, etc. for a total of 48 character types. If an illegal character is found, set \( L=2 \) and return.

2. Convert each sum (an integer \( \leq 7 \)) into its Hollerith equivalent and pack the 47 sums into 8 words. The order is given in the table on the next page.

3. Test the 8 words \( R(N,KX), \ N=2,3, \ldots 9 \) to see if they are blanks. If they are blank, replace them with the 8 words computed in step 2. Set \( L=0 \) and return to main program.
4. If they are not blank, compare them with the 8 words computed in step 2. If they are identical, set $L=0$ and return to main program.

5. If they are not identical, set $L=1$ and return to the main program.

Notes: The array $R$ is a Fortran II array and is stored backward in core storage. The integers $KX$ and $L$ are in the decrement field.
*  *ENDF# SERVICE ROUTINE
*  * LABEL
*  * FAP
  *ORCCK CALCULATE AND COMPARE CHARACTER OCCURENCE SUMS
  COUNT   160
  ENTRY   DRCCCK
  R COMMON 14*1000
  RL COMMON 14
  KX COMMON 1
  DRCCCK SXA REST1,1
          SXA REST2,2
          SXA REST4,4
  CLEAR AXT 61,2
          CLA SUM,2
          TMI ++2
          STZ SUM,2
          TIX CLEAR+1,2,1
          CLA KX
          ARS 18
          SUB =1
          XCA
          MPY =14
          XCA
          PAX ,1
          ADD =9
          STA ENDC
          TXI *+1,1,-2
  LOOP1 AXT 13,2
  LOOP2 TNX BUMP,2,1
          AXT 6,4
          LDG R+1,1
          SXA TEMP2,2
  LOOP3 ZAC
          LGL 6
          PAX ,2
          CLA SUM-1,2
          TMI ILLEG
          ADD =1
          ANA =07
          STO SUM-1,2
          TIX LOOP3,4,1
          LXA TEMP2,2
          TIX LOOP2,1,1
  LOOP4 CLA SUM,1
          TMI TESTW
          LGR 6
          TNX FIN,1,1
          TIX LOOP4,2,1
          STO SUM8,4
          TXI LOOP4-1,4,-1
  TESTW TXI LOOP4,1,-1
  ZER0 SUM COUNTERS
EXCEPT FOR ILLEG. CHAR
WHICH ARE ALL SEVENS
  KX-1, NO OF CARDS TO SCAN
MOVE INTO FOR MPY
14 WDS PER CARD
PRODUCT IN AC
IR1=NO OF WORDS IN RECORD
WORD 9 OF END CARD
BEGIN AT WORD 12 OF LAST DATA CARD
DO 12 WDS PER CARD
MORE IN K, ARE 12 WORDS DONE
NO, PACK 6 CHAR INTO EACH WD
SAVE 12 WORD COUNT
ISOLATE CHAR
USE IT AS FACTOR
REDUCE MODULO 8
ARE 6 CHAR DONE
YES, RESTORE 12 WORD COUNT
YES, IS ARRAY DONE
*  OBTAIN SUM WORD, REDUCE MODULO 8, AND
*  PACK SUMS INTO 8 WORD ARRAY SUMB FROM 63 TO 1
  AXT 61,1
  AXT 8,4
  AXT 6,2
  SCAN 61 COUNTERS
  TEST LEGITIMAVY
  PACK IN MQ
  ANY MORE WORDS IN SUM
  IS WORD FULLY PACKED
  STEP TO NEXT WORD
FIN STQ SUM8,4
LXA ENDC,4
CLA R+8,4
SUB BLANK
TZE INE
* COMPARE DEVELOPED SUMS TO END CARD
* SUMS.
 AXT B,2
 LXA ENDC,4
 COMP5 CAL SUM8,2
 LAS R+1,4
 TRA NG
 TXI *+2,4,-1
 TRA NG
 TIX COMP5,2,1
 SETL L=0
 ZAC
 REST4 AXT 0,4
 STD* 1,4
 REST1 AXT 0,1
 REST2 AXT 0,2
 TRA 2,4
 BUMP TXI LOOP1,1,-2
 NG CLA =01000000
 TRA SETL+1
 ILLEG CLA =02000000
 TRA SETL+1
* PLACE SUMS IN END CARD, FROM WD 9 TO WD2 AND LEAVE
 INE AXT B,2
 LOOP5 CAL SUM8,2
 SLW R+1,4
 TRA 2,4
 TIX LOOP5,2,1
 TRA SETL
 TEMP2 PZE
 ENDC PZE
 BLANK OCT 60606060606060
* CHARACTER FREQUENCY COUNTERS
 SUM8 BES 8
 PZE
 OCT 777777777777 ILLEG CHAR 77
 OCT 777777777777 ILLEG CHAR 76
 OCT 777777777777 ILLEG CHAR 75
 PZE ( 74
 PZE , 73
 OCT 777777777777 ILLEG 72
 PZE Z 71
 PZE Y 70
 PZE X 67
 PZE W 66
 PZE V 62
 PZE U 64
 PZE T 63
 PZE S 64
 PZE / 61
 PZE BLANK 60
 OCT 777777777777 ILLEG 57
Name: DICT(A,N,ND,M,IF)

Purpose: To provide access to dictionaries 1-10 defined in the ENDF specifications.

Language: FORTRAN II

Arguments: A - A 6 character Hollerith word
N - An integer
ND - The dictionary number
M = -1, Load and print dictionaries
  = 0, Load dictionaries
  = 1, Given A, find N in dictionary ND
  = 2, Given A, find A in dictionary ND
IF = 0, normal return
    = 1, Entry not found in dictionary.

Method: Each item in the dictionary is compared with A (or N) until a match is found.

Error Messages:
1. ERRØR, DICTxx Ùut Ùf Ørder (dictionary numbers must be in increasing order)
2. ERRØR, DICTxx Too Long (150 entries maximum)
The above errors lead to a CALL EXIT statement. xx is the dictionary number.
3. ENTRY (yyyyyy) NOT IN DICTIONARY xx
   where yyyyyy is either A or N. Program returns with IF=1.
**Input Data for DICT**

<table>
<thead>
<tr>
<th>Card</th>
<th>Columns</th>
<th>Format</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-3</td>
<td>I3</td>
<td>NDX</td>
<td>Number of dictionaries ≤10</td>
</tr>
<tr>
<td>2</td>
<td>1-11</td>
<td>11x</td>
<td>-</td>
<td>The characters DICTIONARY(1):</td>
</tr>
<tr>
<td></td>
<td>12-13</td>
<td>I2</td>
<td>ND</td>
<td>The dictionary number (note 2)</td>
</tr>
<tr>
<td>16-18</td>
<td>I3</td>
<td>NET(ND)</td>
<td></td>
<td>Number of entries in dictionary ND ≤150</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>8(I3,A6)</td>
<td>(ID(I,ND), D(I,ND), I=1, NET)</td>
<td>The numerical (ID) and Hollerith (D) entries of the dictionary.</td>
</tr>
</tbody>
</table>

**Note 1.** Use as many cards of type 3 as required to complete dictionary. Start each new dictionary with a card type 2.

**Note 2.** The dictionary numbers must be in increasing order starting with 1.
Dictionary Subroutine

100 READ Dictionaries FROM INPUT CARDS
200 M = 0
300 IF X = NET (NO) THEN I = I + 1
400 IF X = NET (NO) THEN I = I + 1
500 IF I > X THEN 100
600 RETURN
700 PRINT ERROR MESSAGE
800 IF I = 0 THEN 200
900 IF I = 1 THEN 200
23. A=D(IP,ND)
24. RETURN
   END
CONVERSION OF THE ALDERMASTON/WINFRITH DATA
of JULY 1, 1964 TO THE ENDF FORMAT

Henry C. Honeck

February 1, 1965
Preface

This report is a very brief description of the conversion of the Aldermaston/Winfrith Data to the ENDF format. A more detailed report, including complete description of the computer code used, will be prepared and distributed later.
The BNL Sigma Center received a magnetic tape containing data on 38 elements from the Aldermaston/Winfirth (A/W) Data File. The tape was sent by Dr. K. Parker of Aldermaston, was dated July 1, 1964, and contained BCD card images for 23,964 cards punched in the A/W format (EANDC Compilation Study Group, ECSG Pl1). A list of the elements, energy ranges, evaluation dates, and references is given in Table I.

A Fortran II program was written to convert this data to the ENDF format. The conversion was entirely tape-to-tape and required about 30 minutes of 7094 time. The effort involved in writing, debugging, and running this conversion program was one man-month plus about four hours of 7094 time.

A summary of the data received is given in Table II. The numbers in the Table are interpreted as follows:

1 - Cross section (GCN = 1) data only.

2 - Cross section (GCN = 1) and angular distribution (GCN = 2) data.

3 - Cross section (GCN = 1), angular distribution (GCN = 2), and energy distribution (GCN = 3) data.

4 - Cross section (GCN = 1), angular distribution (GCN = 2), energy distribution (GCN = 3), and \( v \) (GCN = 4) data.

No data was given for GCN > 4, that is, there were no resonance parameters, thermal scattering laws, or photon data on
the tape. Thus, the conversion program was written to treat only GCN = 1, 2, 3, or 4. The other GCN numbers will be included later, and the program will be documented and distributed.

Several alterations and assumptions were made in the conversion. These and some comments are listed below.

1. **All** energies were converted to electron volts (ev). This includes the Q values.

2. If a cross section had a temperature dependence, the dependence was assumed to be linear with T.

3. If an angular distribution (GCN = 2) is given both rangewise and pointwise within an energy range, the data must be converted by hand. Fortunately, the situation did not occur.

4. Law 7 for neutron secondary energies was not included in the program nor did it occur in the data.

5. The only extensive rearrangement of data occurred for GCN = 2 and 3. The A/W data is arranged in the order:
   a) all laws or partial distributions for one neutron for one energy range;
   b) all neutrons for one energy range;
   c) all energy ranges.

The ENDF format has b) and c) interchanged.
<table>
<thead>
<tr>
<th>Material</th>
<th>NIN</th>
<th>Energy Range</th>
<th>Evaluation Date</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>10</td>
<td>0.0033 ev - 15 Mev</td>
<td>Spring 1963</td>
<td>4</td>
</tr>
<tr>
<td>D</td>
<td>11</td>
<td>0.001 ev - 15 Mev</td>
<td>Spring 1963</td>
<td>4</td>
</tr>
<tr>
<td>T</td>
<td>109</td>
<td>0.025 ev - 15 Mev</td>
<td>November 1957</td>
<td>7</td>
</tr>
<tr>
<td>He-4</td>
<td>31</td>
<td>0.001 ev - 15 Mev</td>
<td>Spring 1963</td>
<td>4</td>
</tr>
<tr>
<td>Be-9</td>
<td>8</td>
<td>0.001 ev - 15 Mev</td>
<td>Spring 1963</td>
<td>4,6</td>
</tr>
<tr>
<td>B</td>
<td>15</td>
<td>0.001 ev - 15 Mev</td>
<td>Spring 1963</td>
<td>4,7</td>
</tr>
<tr>
<td>B-10</td>
<td>13</td>
<td>0.001 ev - 15 Mev</td>
<td>Spring 1963</td>
<td>4,8</td>
</tr>
<tr>
<td>C</td>
<td>6</td>
<td>0.0001 ev - 15 Mev</td>
<td>Spring 1963</td>
<td>4,7</td>
</tr>
<tr>
<td>N</td>
<td>14</td>
<td>0.0001 ev - 15 Mev</td>
<td>January 1964</td>
<td>1</td>
</tr>
<tr>
<td>O</td>
<td>37</td>
<td>0.0001 ev - 15 Mev</td>
<td>Spring 1963</td>
<td>4,7</td>
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This is the first ENDF Newsletter from the ENDF Center at BNL. Newsletters will be sent out periodically to describe new evaluated data received and placed on the ENDF for distribution. There are three parts to the Newsletter. The first will be a few sentences describing the new data and references. The second part is a computer listing of several cards from each Data Record received. The first line gives the Data Record Identification Number by which it will always be referred, the number of cards, and the date included on the ENDF. The second line is the First Heading Card on the Data Record. Remaining lines are the comment cards in the Data Record.

The third part of the report is a cross reference for all data on the ENDF. One line is printed for each Data Record. The order is first by isotope, next by reactor type, and finally by the type of data given.

If you wish any data described in this Newsletter, fill out one of the enclosed request forms and send it along with an IBM magnetic tape to the ENDF Center. Please refer to data by the Data Record Identification Number.
ENDF Request Form

To: ENDF Center
   The Sigma Center
   Brookhaven National Laboratory
   Upton, L. I., New York

From: ________________________________
______________________________
______________________________
______________________________

Data Records Requested: (Limit 2000)

______________________________
______________________________
______________________________
______________________________

Note: Use only the Data Record Identification Number. A typical list is: A0394, A2560-A2573, A0194, etc.

Output Mode (check one):

_____ BCD Cards (not recommended)
_____ BCD Tape, card images
_____ BCD Tape, packed card images (1 Data Record/tape record)
_____ Binary Tape copy of ENDF Library Tape

Magnetic tape sent with this request:

Labeled: ________________________________
______________________________

Density: _____200 bpi _____556 bpi _____800 bpi
A0026---- 15 CARDS, ADDED MAR 1, 1965
U 235 (N,PAIR ) 0,N CR05 CIEI, 1 A/W0026 0/63 0.500-2 1.500+7EV
ALDERMSTøN/WINFRITH DATA FILE, 7/1/64 NIN= 2 GCN= 1 PCN= 16
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-82/63, 12/63, K.PARKER

A0027---- 15 CARDS, ADDED MAR 1, 1965
U 235 (N,PAIR ) 0,N ANGD PICL,CEI, 1 A/W0027 0/63 0.500-2 1.500+7EV
ALDERMSTøN/WINFRITH DATA FILE, 7/1/64 NIN= 2 GCN= 2 PCN= 16
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-82/63, 12/63, K.PARKER

A0028---- 245 CARDS, ADDED MAR 1, 1965
U 235 (N,PAIR ) 0,N ENED PIEI,EF, 1 A/W0028 0/63 0.500-2 1.500+7EV
ALDERMSTøN/WINFRITH DATA FILE, 7/1/64 NIN= 2 GCN= 3 PCN= 16
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-82/63, 12/63, K.PARKER

A0029---- 11 CARDS, ADDED MAR 1, 1965
U 235 (N,TRIPLE ) 0,N CR05 CIEI, 1 A/W0029 0/63 0.500-2 1.500+7EV
ALDERMSTøN/WINFRITH DATA FILE, 7/1/64 NIN= 2 GCN= 1 PCN= 17
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-82/63, 12/63, K.PARKER

A0030---- 19 CARDS, ADDED MAR 1, 1965
U 235 (N,TRIPLE ) 0,N ANGD PICL,CEI, 1 A/W0030 0/63 0.500-2 1.500+7EV
ALDERMSTøN/WINFRITH DATA FILE, 7/1/64 NIN= 2 GCN= 2 PCN= 17
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-82/63, 12/63, K.PARKER

A0031---- 100 CARDS, ADDED MAR 1, 1965
U 235 (N,TRIPLE ) 0,N ENED PIEI,EF, 1 A/W0031 0/63 0.500-2 1.500+7EV
ALDERMSTøN/WINFRITH DATA FILE, 7/1/64 NIN= 2 GCN= 3 PCN= 17
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-82/63, 12/63, K.PARKER

A0032---- 228 CARDS, ADDED MAR 1, 1965
U 235 (N,FISS ) 0,N CR05 CIEI, 1 A/W0032 0/63 0.500-2 1.500+7EV
ALDERMSTøN/WINFRITH DATA FILE, 7/1/64 NIN= 2 GCN= 1 PCN= 18
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-82/63, 12/63, K.PARKER

A0033---- 10 CARDS, ADDED MAR 1, 1965
U 235 (N,FISS ) 0,N ANGD PICL,CEI, 1 A/W0033 0/63 0.500-2 1.500+7EV
ALDERMSTøN/WINFRITH DATA FILE, 7/1/64 NIN= 2 GCN= 2 PCN= 18
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-82/63, 12/63, K.PARKER

A0034---- 36 CARDS, ADDED MAR 1, 1965
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ALDERMSTøN/WINFRITH DATA FILE, 7/1/64 NIN= 2 GCN= 3 PCN= 18
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-82/63, 12/63, K.PARKER

A0035---- 15 CARDS, ADDED MAR 1, 1965
U 235 (N,FISS ) 0,N NU (EI, 1 A/W0035 0/63 0.500-2 1.500+7EV
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AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-82/63, 12/63, K.PARKER

A0036---- 228 CARDS, ADDED MAR 1, 1965
U 235 (N,G ) 0, CR05 CIEI, 1 A/W0036 0/63 0.500-2 1.500+7EV
ALDERMSTøN/WINFRITH DATA FILE, 7/1/64 NIN= 2 GCN= 1 PCN=102
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-82/63, 12/63, K.PARKER

A0037---- 651 CARDS, ADDED MAR 1, 1965
U 23H (N,TOTAL ) 0, CR05 CIEI, 1 A/W0037 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64  NIN= 5  GCN= 1  PCN= 1
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-79/63, 1/64, K.PARKER

AO038----- 651 CARDS, ADDED MAR 1, 1965
U 238 IN,ELAST ) 0,N CRØS CIEI, JBN A/W0038 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64  NIN= 5  GCN= 1  PCN= 2
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-79/63, 1/64, K.PARKER

AO039----- 191 CARDS, ADDED MAR 1, 1965
U 238 IN,ELAST ) 0,N ANGD PICC,E1, JBN A/W0039 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64  NIN= 5  GCN= 2  PCN= 2
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-79/63, 1/64, K.PARKER

AO040----- 651 CARDS, ADDED MAR 1, 1965
U 238 IN,NØNEl ) 0, CRØS CIEI, JBN A/W0040 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64  NIN= 5  GCN= 1  PCN= 3
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-79/63, 1/64, K.PARKER

AO041----- 50 CARDS, ADDED MAR 1, 1965
U 238 IN,NØNEl ) 1,N CRØS CIEI, JBN A/W0041 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64  NIN= 5  GCN= 2  PCN= 5
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-79/63, 1/64, K.PARKER

AO042----- 10 CARDS, ADDED MAR 1, 1965
U 238 IN,NØNEl ) 1,N ANGD PICC,E1, JBN A/W0042 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64  NIN= 5  GCN= 2  PCN= 5
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-79/63, 1/64, K.PARKER

AO043----- 10 CARDS, ADDED MAR 1, 1965
U 238 IN,NØNEl ) 1,N ENED PIEI,EF, JBN A/W0043 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64  NIN= 5  GCN= 3  PCN= 5
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-79/63, 1/64, K.PARKER

AO044----- 46 CARDS, ADDED MAR 1, 1965
U 238 IN,NØNEl ) 2,N CRØS CIEI, JBN A/W0044 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64  NIN= 5  GCN= 1  PCN= 6
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-79/63, 1/64, K.PARKER

AO045----- 10 CARDS, ADDED MAR 1, 1965
U 238 IN,NØNEl ) 2,N ANGD PICC,E1, JBN A/W0045 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64  NIN= 5  GCN= 2  PCN= 6
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-79/63, 1/64, K.PARKER

AO046----- 10 CARDS, ADDED MAR 1, 1965
U 238 IN,NØNEl ) 2,N ENED PIEI,EF, JBN A/W0046 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64  NIN= 5  GCN= 3  PCN= 6
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-79/63, 1/64, K.PARKER

AO047----- 42 CARDS, ADDED MAR 1, 1965
U 238 IN,NØNEl ) 3,N CRØS CIEI, JBN A/W0047 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64  NIN= 5  GCN= 1  PCN= 7
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-79/63, 1/64, K.PARKER

AO048----- 10 CARDS, ADDED MAR 1, 1965
U 238 IN,NØNEl ) 3,N ANGD PICC,E1, JBN A/W0048 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64  NIN= 5  GCN= 2  PCN= 7
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-79/63, 1/64, K.PARKER

AO049----- 10 CARDS, ADDED MAR 1, 1965
U 238 IN,NØNEl ) 3,N ENED PIEI,EF, JBN A/W0049 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64  NIN= 5  GCN= 3  PCN= 7
A0074----- 23 CARDS, ADDED MAR 1, 1965 --------------------------------------
200 (N,E)LAST 0,N CRØS CIEI, , IBN A/W0074 0/63 0.100-2 0.000+2EV
ALDERMÅSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 7 GCN= 1 PCN= 2
AE00 R351, 2/64, BARRINGTON ETAL

A0075----- 10 CARDS, ADDED MAR 1, 1965 --------------------------------------
200 (N,E)LAST 0,N ANGD PICCIEI, ) A/W0075 0/63 0.100-2 0.000+2EV
ALDERMÅSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 7 GCN= 2 PCN= 2
AE00 R351, 2/64, BARRINGTON ETAL

A0076----- 23 CARDS, ADDED MAR 1, 1965 --------------------------------------
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ALDERMÅSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 7 GCN= 1 PCN= 3
AE00 R351, 2/64, BARRINGTON ETAL

A0077----- 23 CARDS, ADDED MAR 1, 1965 --------------------------------------
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ALDERMÅSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 7 GCN= 1 PCN=102
AE00 R351, 2/64, BARRINGTON ETAL

A0078----- 48 CARDS, ADDED MAR 1, 1965 --------------------------------------
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ALDERMÅSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 8 GCN= 1 PCN= 1
AE00 R351, 2/64, BARRINGTON ETAL, AWRE 0-27/60, 9/60, K.PARKER

A0079----- 48 CARDS, ADDED MAR 1, 1965 --------------------------------------
BE 9 (N,E)LAST 0,N CRØS CIEI, , IBN A/W0079 0/63 0.100-2 1.500+7EV
ALDERMÅSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 8 GCN= 1 PCN= 2
AE00 R351, 2/64, BARRINGTON ETAL, AWRE 0-27/60, 9/60, K.PARKER

A0080----- 131 CARDS, ADDED MAR 1, 1965 -------------------------------------
BE 9 (N,E)LAST 0,N CRØS CIEI, , IBN A/W0080 0/63 0.100-2 1.500+7EV
ALDERMÅSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 8 GCN= 2 PCN= 2
AE00 R351, 2/64, BARRINGTON ETAL, AWRE 0-27/60, 9/60, K.PARKER

A0081----- 48 CARDS, ADDED MAR 1, 1965 --------------------------------------
BE 9 (N,N)ETAL 0,N CRØS CIEI, , IBN A/W0081 0/63 0.100-2 1.500+7EV
ALDERMÅSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 8 GCN= 1 PCN= 3
AE00 R351, 2/64, BARRINGTON ETAL, AWRE 0-27/60, 9/60, K.PARKER

A0082----- 23 CARDS, ADDED MAR 1, 1965 --------------------------------------
BE 9 (N,NA) 0,N CRØS CIEI, , IBN A/W0082 0/63 0.100-2 1.500+7EV
ALDERMÅSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 8 GCN= 1 PCN= 24
AE00 R351, 2/64, BARRINGTON ETAL, AWRE 0-27/60, 9/60, K.PARKER

A0083----- 35 CARDS, ADDED MAR 1, 1965 --------------------------------------
BE 9 (N,NA) 0,N CRØS CIEI, , IBN A/W0083 0/63 0.100-2 1.500+7EV
ALDERMÅSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 8 GCN= 2 PCN= 24
AE00 R351, 2/64, BARRINGTON ETAL, AWRE 0-27/60, 9/60, K.PARKER

A0084----- 51 CARDS, ADDED MAR 1, 1965 --------------------------------------
BE 9 (N,NA) 0,N CRØS CIEI, , IBN A/W0084 0/63 0.100-2 1.500+7EV
ALDERMÅSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 8 GCN= 3 PCN= 24
AE00 R351, 2/64, BARRINGTON ETAL, AWRE 0-27/60, 9/60, K.PARKER

A0085----- 19 CARDS, ADDED MAR 1, 1965 --------------------------------------
BE 9 (N,G) 0, CRØS CIEI, , IBN A/W0085 0/63 0.100-2 1.500+7EV
ALDERMÅSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 8 GCN= 1 PCN=102
AE00 R351, 2/64, BARRINGTON ETAL, AWRE 0-27/60, 9/60, K.PARKER

A0086----- 11 CARDS, ADDED MAR 1, 1965 --------------------------------------

BE 9 (N_{s,T,} ) 0, CR\$\$ C(EI, ) )BN A/W0086 0/63 0.100-2 1.500+7EV
ALDERMAST\$\$N/WINFRITH DATA FILE, 7/1/64 NIN= 8 GCN= 1 PCN=105
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-27/60, 9/60, K.PARKER

A0087---- 26 CARDS, ADDED MAR 1, 1965 ________________________________
BE 9 (N_{s,A} ) 0, CR\$\$ C(EI, ) )BN A/W0087 0/63 0.100-2 1.500+7EV
ALDERMAST\$\$N/WINFRITH DATA FILE, 7/1/64 NIN= 8 GCN= 1 PCN=107
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-27/60, 9/60, K.PARKER

A0088---- 31 CARDS, ADDED MAR 1, 1965 ________________________________
H 1 (N_{s,T,\$\$TAL} ) 0, CR\$\$ C(EI, ) )BN A/W0088 0/63 0.330-2 1.500+7EV
ALDERMAST\$\$N/WINFRITH DATA FILE, 7/1/64 NIN= 10 GCN= 1 PCN= 1
AEEW R351, 2/64, BARRINGTON ETAL

A0089---- 31 CARDS, ADDED MAR 1, 1965 ________________________________
H 1 (N_{s,ELAST} ) 0, N CR\$\$ C(EI, ) )BN A/W0089 0/63 0.330-2 1.500+7EV
ALDERMAST\$\$N/WINFRITH DATA FILE, 7/1/64 NIN= 10 GCN= 1 PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL

A0090---- 12 CARDS, ADDED MAR 1, 1965 ________________________________
H 1 (N_{s,ELAST} ) 0, N ANGD P(I$\$C,EI, ) A/W0090 0/63 0.330-2 1.500+7EV
ALDERMAST\$\$N/WINFRITH DATA FILE, 7/1/64 NIN= 10 GCN= 2 PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL

A0091---- 22 CARDS, ADDED MAR 1, 1965 ________________________________
H 1 (N_{s,\$\$} ) 0, CR\$\$ C(EI, ) )BN A/W0091 0/63 0.330-2 1.500+7EV
ALDERMAST\$\$N/WINFRITH DATA FILE, 7/1/64 NIN= 10 GCN= 1 PCN=102
AEEW R351, 2/64, BARRINGTON ETAL

A0092---- 23 CARDS, ADDED MAR 1, 1965 ________________________________
H 2 (N_{s,T,\$\$TAL} ) 0, CR\$\$ C(EI, ) )BN A/W0092 0/63 0.100-2 1.500+7EV
ALDERMAST\$\$N/WINFRITH DATA FILE, 7/1/64 NIN= 11 GCN= 1 PCN= 1
AEEW R351, 2/64, BARRINGTON ETAL

A0093---- 23 CARDS, ADDED MAR 1, 1965 ________________________________
H 2 (N_{s,ELAST} ) 0, N CR\$\$ C(EI, ) )BN A/W0093 0/63 0.100-2 1.500+7EV
ALDERMAST\$\$N/WINFRITH DATA FILE, 7/1/64 NIN= 11 GCN= 1 PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL

A0094---- 50 CARDS, ADDED MAR 1, 1965 ________________________________
H 2 (N_{s,\$\$E\$\$T} ) 0, N ANGD P(I$\$C,EI, ) A/W0094 0/63 0.100-2 1.500+7EV
ALDERMAST\$\$N/WINFRITH DATA FILE, 7/1/64 NIN= 11 GCN= 2 PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL

A0095---- 23 CARDS, ADDED MAR 1, 1965 ________________________________
H 2 (N_{s,N\$\$\$E\$\$L} ) 0, CR\$\$ C(EI, ) )BN A/W0095 0/63 0.100-2 1.500+7EV
ALDERMAST\$\$N/WINFRITH DATA FILE, 7/1/64 NIN= 11 GCN= 1 PCN= 3
AEEW R351, 2/64, BARRINGTON ETAL

A0096---- 18 CARDS, ADDED MAR 1, 1965 ________________________________
H 2 (N_{s,PAIR} ) 0, N CR\$\$ C(EI, ) )BN A/W0096 0/63 0.100-2 1.500+7EV
ALDERMAST\$\$N/WINFRITH DATA FILE, 7/1/64 NIN= 11 GCN= 1 PCN=16
AEEW R351, 2/64, BARRINGTON ETAL

A0097---- 15 CARDS, ADDED MAR 1, 1965 ________________________________
H 2 (N_{s,PAIR} ) 0, N ANGD P(I$\$C,EI, ) A/W0097 0/63 0.100-2 1.500+7EV
ALDERMAST\$\$N/WINFRITH DATA FILE, 7/1/64 NIN= 11 GCN= 2 PCN= 16
AEEW R351, 2/64, BARRINGTON ETAL

A0098---- 15 CARDS, ADDED MAR 1, 1965 ________________________________
H 2 (N_{s,PAIR} ) 0, N ENED P(I$\$E,F, ) A/W0098 0/63 0.100-2 1.500+7EV
HE 4 (N, ELAST ) 0, N CRØS C(EI, , ) BN A/W0147 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFIRTH DATA FILE; 7/1/64 NIN= 31 GCN= 2 PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL

A0148---- 50 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
HE 4 (N, ELAST ) 0, N ANGD P(CIC, EI, ) A/W0148 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFIRTH DATA FILE; 7/1/64 NIN= 31 GCN= 2 PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL

A0149---- 20 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
H 3 (N, TOTAL ) 0, N CRØS C(EI, , ) BN A/W0149 11/57 0.250-1 1.500+7EV
ALDERMASTØN/WINFIRTH DATA FILE; 7/1/64 NIN=109 GCN= 1 PCN= 1
AWE R 0-28/60, 3/61, BUCKINGHAM ETAL

A0150---- 20 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
H 3 (N, ELAST ) 0, N CRØS C(EI, , ) BN A/W0150 11/57 0.250-1 1.500+7EV
ALDERMASTØN/WINFIRTH DATA FILE; 7/1/64 NIN=109 GCN= 1 PCN= 2
AWE R 0-28/60, 3/61, BUCKINGHAM ETAL

A0151---- 50 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
H 3 (N, ELAST ) 0, N ANGD P(CIC, EI, ) A/W0151 11/57 0.250-1 1.500+7EV
ALDERMASTØN/WINFIRTH DATA FILE; 7/1/64 NIN=109 GCN= 2 PCN= 2
AWE R 0-28/60, 3/61, BUCKINGHAM ETAL

A0152---- 13 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
H 3 (N, NØNE , ) 0, N CRØS C(EI, , ) BN A/W0152 11/57 0.250-1 1.500+7EV
ALDERMASTØN/WINFIRTH DATA FILE; 7/1/64 NIN=109 GCN= 1 PCN= 3
AWE R 0-28/60, 3/61, BUCKINGHAM ETAL

A0153---- 13 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
H 3 (N, PAIR ) 0, N CRØS C(EI, , ) BN A/W0153 11/57 0.250-1 1.500+7EV
ALDERMASTØN/WINFIRTH DATA FILE; 7/1/64 NIN=109 GCN= 1 PCN= 16
AWE R 0-28/60, 3/61, BUCKINGHAM ETAL

A0154---- 15 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
H 3 (N, PAIR ) 0, N ANGD P(CIC, EI, ) A/W0154 11/57 0.250-1 1.500+7EV
ALDERMASTØN/WINFIRTH DATA FILE; 7/1/64 NIN=109 GCN= 2 PCN= 16
AWE R 0-28/60, 3/61, BUCKINGHAM ETAL

A0155---- 15 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
H 3 (N, PAIR ) 0, N ENED P(EI, , ) A/W0155 11/57 0.250-1 1.500+7EV
ALDERMASTØN/WINFIRTH DATA FILE; 7/1/64 NIN=109 GCN= 3 PCN= 16
AWE R 0-28/60, 3/61, BUCKINGHAM ETAL

A0156---- 11 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
H 3 (N, TRIPLE ) 0, N CRØS C(EI, , ) BN A/W0156 11/57 0.250-1 1.500+7EV
ALDERMASTØN/WINFIRTH DATA FILE; 7/1/64 NIN=109 GCN= 1 PCN= 17
AWE R 0-28/60, 3/61, BUCKINGHAM ETAL

A0157---- 19 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
H 3 (N, TRIPLE ) 0, N ANGD P(CIC, EI, ) A/W0157 11/57 0.250-1 1.500+7EV
ALDERMASTØN/WINFIRTH DATA FILE; 7/1/64 NIN=109 GCN= 2 PCN= 17
AWE R 0-28/60, 3/61, BUCKINGHAM ETAL

A0158---- 19 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
H 3 (N, TRIPLE ) 0, N ENED P(EI, , ) A/W0158 11/57 0.250-1 1.500+7EV
ALDERMASTØN/WINFIRTH DATA FILE; 7/1/64 NIN=109 GCN= 3 PCN= 17
AWE R 0-28/60, 3/61, BUCKINGHAM ETAL

A0159---- 95 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
U 233 (N, TOTAL ) 0, N CRØS C(EI, , ) BN A/W0159 0/63 0.250-1 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 1 PCN= 1
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0160----- 95 CARDS, ADDED MAR 1, 1965 -------------------------------
U 233 (N,ELAST ) 0,N CRØS C(EI, , ) BN A/W0160 0/63 0.250-1 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 1 PCN= 2
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0161----- 207 CARDS, ADDED MAR 1, 1965 -------------------------------
U 233 (N,ELAST ) 0,N ANGD P(I,CI,EI, ) A/W0161 0/63 0.250-1 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 2 PCN= 2
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0162----- 95 CARDS, ADDED MAR 1, 1965 -------------------------------
U 233 (N,NOBEL ) 0,N CRØS C(EI, , ) BN A/W0162 0/63 0.250-1 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 1 PCN= 3
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0163----- 28 CARDS, ADDED MAR 1, 1965 -------------------------------
U 233 (N,INELAS)98,N CRØS C(EI, , ) BN A/W0163 0/63 0.250-1 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 1 PCN= 15
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0164----- 14 CARDS, ADDED MAR 1, 1965 -------------------------------
U 233 (N,INELAS)98,N ANGD P(I,CI,EI, ) A/W0164 0/63 0.250-1 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 2 PCN= 15
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0165----- 116 CARDS, ADDED MAR 1, 1965 -------------------------------
U 233 (N,INELAS)98,N ENED P(EI,EF, ) A/W0165 0/63 0.250-1 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 2 PCN= 15
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0166----- 15 CARDS, ADDED MAR 1, 1965 -------------------------------
U 233 (N,PAIR ) 0,N CRØS C(EI, , ) BN A/W0166 0/63 0.250-1 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 1 PCN= 15
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0167----- 15 CARDS, ADDED MAR 1, 1965 -------------------------------
U 233 (N,PAIR ) 0,N ANGD P(I,CI,EI, ) A/W0167 0/63 0.250-1 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 2 PCN= 16
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0168----- 15 CARDS, ADDED MAR 1, 1965 -------------------------------
U 233 (N,PAIR ) 0,N ENED P(EI,EF, ) A/W0168 0/63 0.250-1 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 3 PCN= 16
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0169----- 10 CARDS, ADDED MAR 1, 1965 -------------------------------
U 233 (N,TRIPLE ) 0,N CRØS C(EI, , ) BN A/W0169 0/63 0.250-1 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 1 PCN= 17
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0170----- 19 CARDS, ADDED MAR 1, 1965 -------------------------------
U 233 (N,TRIPLE ) 0,N ANGD P(I,CI,EI, ) A/W0170 0/63 0.250-1 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 2 PCN= 17
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0171----- 19 CARDS, ADDED MAR 1, 1965 -------------------------------
U 233 (N,TRIPLE ) 0,N ENED P(EI,EF, ) A/W0171 0/63 0.250-1 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 3 PCN= 17
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

AO172----- 95 CARDS, ADDED MAR 1, 1965
U 233 (N,FISS ) 0,N CR05 CIEI, ) 8BN A/W0172 0/63 0.250-1 1.500+7EV
ALDERMAST0N/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 1 PCN= 18
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

AO173----- 10 CARDS, ADDED MAR 1, 1965
U 233 (N,FISS ) 0,N ANGD P1C1,EF, ) 8BN A/W0173 0/63 0.250-1 1.500+7EV
ALDERMAST0N/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 2 PCN= 18
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

AO174----- 36 CARDS, ADDED MAR 1, 1965
U 233 (N,FISS ) 0,N ENED P1C1,EF, ) 8BN A/W0174 0/63 0.250-1 1.500+7EV
ALDERMAST0N/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 3 PCN= 18
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

AO175----- 15 CARDS, ADDED MAR 1, 1965
U 233 (N,FISS ) 0,N NU (EI, ) 8BN A/W0175 0/63 0.250-1 1.500+7EV
ALDERMAST0N/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 4 PCN= 18
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

AO176----- 95 CARDS, ADDED MAR 1, 1965
U 233 (N,G ) 0,N CR05 CIEI, ) 8BN A/W0176 0/63 0.250-1 1.500+7EV
ALDERMAST0N/WINFRITH DATA FILE, 7/1/64 NIN=122 GCN= 1 PCN=102
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

AO177----- 52 CARDS, ADDED MAR 1, 1965
U 236 (N,ELAST ) 0,N CR05 CIEI, ) 8BN A/W0177 8/62 0.000+2 1.500+7EV
ALDERMAST0N/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 1 PCN= 1
AWRE 0-30/64, 7/64, K.PARKER

AO178----- 52 CARDS, ADDED MAR 1, 1965
U 236 (N,ELAST ) 0,N CR05 CIEI, ) 8BN A/W0178 8/62 0.000+2 1.500+7EV
ALDERMAST0N/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 1 PCN= 2
AWRE 0-30/64, 7/64, K.PARKER

AO179----- 189 CARDS, ADDED MAR 1, 1965
U 236 (N,ELAST ) 0,N ANGD P1C1,EF, ) 8BN A/W0179 8/62 0.000+2 1.500+7EV
ALDERMAST0N/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 2 PCN= 2
AWRE 0-30/64, 7/64, K.PARKER

AO180----- 52 CARDS, ADDED MAR 1, 1965
U 236 (N,N0N0EL ) 0,N CR05 CIEI, ) 8BN A/W0180 8/62 0.000+2 1.500+7EV
ALDERMAST0N/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 1 PCN= 3
AWRE 0-30/64, 7/64, K.PARKER

AO181----- 30 CARDS, ADDED MAR 1, 1965
U 236 (N,INELAS ) 1,N CR05 CIEI, ) 8BN A/W0181 8/62 0.000+2 1.500+7EV
ALDERMAST0N/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 1 PCN= 5
AWRE 0-30/64, 7/64, K.PARKER

AO182----- 10 CARDS, ADDED MAR 1, 1965
U 236 (N,INELAS ) 1,N ANGD P1C1,EF, ) 8BN A/W0182 8/62 0.000+2 1.500+7EV
ALDERMAST0N/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 2 PCN= 5
AWRE 0-30/64, 7/64, K.PARKER

AO183----- 24 CARDS, ADDED MAR 1, 1965
U 236 (N,INELAS ) 2,N CR05 CIEI, ) 8BN A/W0183 8/62 0.000+2 1.500+7EV
ALDERMAST0N/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 1 PCN= 6
AWRE 0-30/64, 7/64, K.PARKER
A0184----- 10 CARDS, ADDED MAR 1, 1965 -------------------------------
U 236 (N,INELAS) 2,N ANGD P(C,EI, ) A/W0184 8/62 0.000+2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 2 PCN= 6
AWRE 0-30/64, 7/64, K.PARKER

A0185----- 22 CARDS, ADDED MAR 1, 1965 -------------------------------
U 236 (N,INELAS) 3,N CRØS C(EI, , )BN A/W0185 8/62 0.000+2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 1 PCN= 7
AWRE 0-30/64, 7/64, K.PARKER

A0186----- 10 CARDS, ADDED MAR 1, 1965 -------------------------------
U 236 (N,INELAS) 3,N ANGD P(C,EI, ) A/W0186 8/62 0.000+2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 2 PCN= 7
AWRE 0-30/64, 7/64, K.PARKER

A0187----- 19 CARDS, ADDED MAR 1, 1965 -------------------------------
U 236 (N,INELAS) 4,N CRØS C(EI, , )BN A/W0187 8/62 0.000+2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 1 PCN= 8
AWRE 0-30/64, 7/64, K.PARKER

A0188----- 10 CARDS, ADDED MAR 1, 1965 -------------------------------
U 236 (N,INELAS) 4,N ANGD P(C,EI, ) A/W0188 8/62 0.000+2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 2 PCN= 8
AWRE 0-30/64, 7/64, K.PARKER

A0189----- 16 CARDS, ADDED MAR 1, 1965 -------------------------------
U 236 (N,INELAS) 5,N CRØS C(EI, , )BN A/W0189 8/62 0.000+2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 1 PCN= 9
AWRE 0-30/64, 7/64, K.PARKER

A0190----- 10 CARDS, ADDED MAR 1, 1965 -------------------------------
U 236 (N,INELAS) 5,N ANGD P(C,EI, ) A/W0190 8/62 0.000+2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 2 PCN= 9
AWRE 0-30/64, 7/64, K.PARKER

A0191----- 15 CARDS, ADDED MAR 1, 1965 -------------------------------
U 236 (N,INELAS) 6,N CRØS C(EI, , )BN A/W0191 8/62 0.000+2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 1 PCN= 10
AWRE 0-30/64, 7/64, K.PARKER

A0192----- 10 CARDS, ADDED MAR 1, 1965 -------------------------------
U 236 (N,INELAS) 6,N ANGD P(C,EI, ) A/W0192 8/62 0.000+2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 2 PCN= 10
AWRE 0-30/64, 7/64, K.PARKER

A0193----- 27 CARDS, ADDED MAR 1, 1965 -------------------------------
U 236 (N,INELAS) 98,N CRØS C(EI, , )BN A/W0193 8/62 0.000+2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 1 PCN= 15
AWRE 0-30/64, 7/64, K.PARKER

A0194----- 28 CARDS, ADDED MAR 1, 1965 -------------------------------
U 236 (N,INELAS) 98,N ANGD P(GL,EI, ) A/W0194 8/62 0.000+2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 2 PCN= 15
AWRE 0-30/64, 7/64, K.PARKER

A0195----- 134 CARDS, ADDED MAR 1, 1965 -------------------------------
U 236 (N,INELAS) 98,N ENED P(EI,EF, ) A/W0195 8/62 0.000+2 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=173 GCN= 3 PCN= 15
AWRE 0-30/64, 7/64, K.PARKER
A0196----- 16 CARDS, ADDED MAR 1, 1965
U 236 (N,PAIR) O,N CRBS C(EI, E), IBN A/W0196 8/62 0.000+2 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64 NIN=173 GCN= 1 PCN= 16
AWRE 0-30/64, 7/64, K.PARKER

A0197----- 15 CARDS, ADDED MAR 1, 1965
U 236 (N,PAIR) O,N ANGD P(EI,E), A/W0197 8/62 0.000+2 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64 NIN=173 GCN= 2 PCN= 16
AWRE 0-30/64, 7/64, K.PARKER

A0198----- 245 CARDS, ADDED MAR 1, 1965
U 236 (N,PAIR) O,N ENED P(EI,EF), A/W0198 8/62 0.000+2 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64 NIN=173 GCN= 3 PCN= 16
AWRE 0-30/64, 7/64, K.PARKER

A0199----- 11 CARDS, ADDED MAR 1, 1965
U 236 (N,TRIPLE) O,N CRBS C(EI, E), IBN A/W0199 8/62 0.000+2 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64 NIN=173 GCN= 1 PCN= 17
AWRE 0-30/64, 7/64, K.PARKER

A0200----- 19 CARDS, ADDED MAR 1, 1965
U 236 (N,TRIPLE) O,N ANGD P(EI,E), A/W0200 8/62 0.000+2 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64 NIN=173 GCN= 2 PCN= 17
AWRE 0-30/64, 7/64, K.PARKER

A0201----- 100 CARDS, ADDED MAR 1, 1965
U 236 (N,TRIPLE) O,N ENED P(EI,EF), A/W0201 8/62 0.000+2 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64 NIN=173 GCN= 3 PCN= 17
AWRE 0-30/64, 7/64, K.PARKER

A0202----- 34 CARDS, ADDED MAR 1, 1965
U 236 (N,FISS) O,N CRBS C(EI, E), IBN A/W0202 8/62 0.000+2 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64 NIN=173 GCN= 1 PCN= 18
AWRE 0-30/64, 7/64, K.PARKER

A0203----- 10 CARDS, ADDED MAR 1, 1965
U 236 (N,FISS) O,N ANGD P(EI,E), A/W0203 8/62 0.000+2 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64 NIN=173 GCN= 2 PCN= 18
AWRE 0-30/64, 7/64, K.PARKER

A0204----- 36 CARDS, ADDED MAR 1, 1965
U 236 (N,FISS) O,N ENED P(EI,EF), A/W0204 8/62 0.000+2 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64 NIN=173 GCN= 3 PCN= 18
AWRE 0-30/64, 7/64, K.PARKER

A0205----- 11 CARDS, ADDED MAR 1, 1965
U 236 (N,FISS) O,N NU (EI, E), A/W0205 8/62 0.000+2 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64 NIN=173 GCN= 4 PCN= 18
AWRE 0-30/64, 7/64, K.PARKER

A0206----- 52 CARDS, ADDED MAR 1, 1965
U 236 (N, G) 0, CRBS C(EI, E), IBN A/W0206 8/62 0.000+2 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64 NIN=173 GCN= 1 PCN=102
AWRE 0-30/64, 7/64, K.PARKER

A0207----- 59 CARDS, ADDED MAR 1, 1965
U 234 (N,TOTAL) 0, CRBS C(EI, E), IBN A/W0207 8/62 0.000+2 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64 NIN=174 GCN= 1 PCN= 1
AWRE 0-37/64, 7/64, K.PARKER

A0208----- 59 CARDS, ADDED MAR 1, 1965
ALDERMASTEN/WINFRITH DATA FILE, 7/1/64  NIN=174  GCN= 2  PCN= 9
AWRE 0-37/64, 7/64, K.PARKER

A0221----- 17 CARDS, ADDED MAR 1, 1965 -------------------------------
U 234 (N,INELAS) 6, N CRØS CIEI,  , IBN A/W0221 8/62 0.000+2 1.500+7EV
ALDERMASTEN/WINFRITH DATA FILE, 7/1/64  NIN=174  GCN= 1  PCN= 10
AWRE 0-37/64, 7/64, K.PARKER

A0222----- 10 CARDS, ADDED MAR 1, 1965 -------------------------------
U 234 (N,INELAS) 6, N ANGD PICL, E1,  , A/W0222 8/62 0.000+2 1.500+7EV
ALDERMASTEN/WINFRITH DATA FILE, 7/1/64  NIN=174  GCN= 2  PCN= 10
AWRE 0-37/64, 7/64, K.PARKER

A0223----- 30 CARDS, ADDED MAR 1, 1965 -------------------------------
U 234 (N,INELAS) 98, N CRØS CIEI,  , IBN A/W0223 8/62 0.000+2 1.500+7EV
ALDERMASTEN/WINFRITH DATA FILE, 7/1/64  NIN=174  GCN= 1  PCN= 15
AWRE 0-37/64, 7/64, K.PARKER

A0224----- 28 CARDS, ADDED MAR 1, 1965 -------------------------------
U 234 (N,INELAS) 98, N ANGD PICL, E1,  , A/W0224 8/62 0.000+2 1.500+7EV
ALDERMASTEN/WINFRITH DATA FILE, 7/1/64  NIN=174  GCN= 2  PCN= 15
AWRE 0-37/64, 7/64, K.PARKER

A0225----- 134 CARDS, ADDED MAR 1, 1965 -------------------------------
U 234 (N,INELAS) 98, N ENED P(EI,EF, )  A/W0225 8/62 0.000+2 1.500+7EV
ALDERMASTEN/WINFRITH DATA FILE, 7/1/64  NIN=174  GCN= 3  PCN= 15
AWRE 0-37/64, 7/64, K.PARKER

A0226----- 17 CARDS, ADDED MAR 1, 1965 -------------------------------
U 234 (N,PAIR ) 0,N CRØS CIEI,  , IBN A/W0226 8/62 0.000+2 1.500+7EV
ALDERMASTEN/WINFRITH DATA FILE, 7/1/64  NIN=174  GCN= 3  PCN= 15
AWRE 0-37/64, 7/64, K.PARKER

A0227----- 15 CARDS, ADDED MAR 1, 1965 -------------------------------
U 234 (N,PAIR ) 0,N ANGD PICL, E1,  , A/W0227 8/62 0.000+2 1.500+7EV
ALDERMASTEN/WINFRITH DATA FILE, 7/1/64  NIN=174  GCN= 2  PCN= 15
AWRE 0-37/64, 7/64, K.PARKER

A0228----- 245 CARDS, ADDED MAR 1, 1965 -------------------------------
U 234 (N,PAIR ) 0,N ENED P(EI,EF, )  A/W0228 8/62 0.000+2 1.500+7EV
ALDERMASTEN/WINFRITH DATA FILE, 7/1/64  NIN=174  GCN= 3  PCN= 15
AWRE 0-37/64, 7/64, K.PARKER

A0229----- 12 CARDS, ADDED MAR 1, 1965 -------------------------------
U 234 (N,TRIPLE ) 0,N CRØS CIEI,  , IBN A/W0229 8/62 0.000+2 1.500+7EV
ALDERMASTEN/WINFRITH DATA FILE, 7/1/64  NIN=174  GCN= 1  PCN= 17
AWRE 0-37/64, 7/64, K.PARKER

A0230----- 19 CARDS, ADDED MAR 1, 1965 -------------------------------
U 234 (N,TRIPLE ) 0,N ANGD PICL, E1,  , A/W0230 8/62 0.000+2 1.500+7EV
ALDERMASTEN/WINFRITH DATA FILE, 7/1/64  NIN=174  GCN= 2  PCN= 17
AWRE 0-37/64, 7/64, K.PARKER

A0231----- 100 CARDS, ADDED MAR 1, 1965 -------------------------------
U 234 (N,TRIPLE ) 0,N ENED P(EI,EF, )  A/W0231 8/62 0.000+2 1.500+7EV
ALDERMASTEN/WINFRITH DATA FILE, 7/1/64  NIN=174  GCN= 3  PCN= 17
AWRE 0-37/64, 7/64, K.PARKER

A0232----- 52 CARDS, ADDED MAR 1, 1965 -------------------------------
U 234 (N,FISS ) 0,N CRØS CIEI,  , IBN A/W0232 8/62 0.000+2 1.500+7EV
ALDERMASTEN/WINFRITH DATA FILE, 7/1/64  NIN=174  GCN= 1  PCN= 18
AC233----- 10 CARDS, ADDED MAR 1, 1965 ------------------------------------------
U 234 (N, FISS ) O, N ANGD P (Cl, EI, ) A/W0233 8/62 0.000+2 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE, 7/1/64 NIN=174 GCM= 2 PCN= 18
AWRE 0-37/64, 7/64, K.PARKER

AC234----- 36 CARDS, ADDED MAR 1, 1965 ----------------------------------------
U 234 (N, FISS ) O, N ENED P (EI, EF, ) A/W0234 8/62 0.000+2 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE, 7/1/64 NIN=174 GCM= 3 PCN= 18
AWRE 0-37/64, 7/64, K.PARKER

AC235----- 13 CARDS, ADDED MAR 1, 1965 ----------------------------------------
U 234 (N, FISS ) O, N NU (EI, , ) A/W0235 8/62 0.000+2 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE, 7/1/64 NIN=174 GCM= 4 PCN= 18
AWRE 0-37/64, 7/64, K.PARKER

AC236----- 59 CARDS, ADDED MAR 1, 1965 ----------------------------------------
U 234 (N, FISS ) O, CRØS C (EI, , ) BN A/W0236 8/62 0.000+2 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE, 7/1/64 NIN=174 GCM= 1 PCN=102
AWRE 0-37/64, 7/64, K.PARKER

AC237----- 292 CARDS, ADDED MAR 1, 1965 ---------------------------------------
PU239 (N, TBTAL ) O, CRØS C (EI, , ) BN A/W0237 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE, 7/1/64 NIN=184 GCM= 1 PCN= 1
AWRE 0-79/64, T/ BE PUBLISHED, A.C.ÒUGLAS

AC238----- 292 CARDS, ADDED MAR 1, 1965 ---------------------------------------
PU239 (N, ELAST ) O, N CRØS C (EI, , ) BN A/W0238 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE, 7/1/64 NIN=184 GCM= 2 PCN= 2
AWRE 0-79/64, T/ BE PUBLISHED, A.C.ÒUGLAS

AC239----- 191 CARDS, ADDED MAR 1, 1965 ---------------------------------------
PU239 (N, ELAST ) O, N ANGD P (CC, EI, ) A/W0239 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE, 7/1/64 NIN=184 GCM= 1 PCN= 2
AWRE 0-79/64, T/ BE PUBLISHED, A.C.ÒUGLAS

AC240----- 292 CARDS, ADDED MAR 1, 1965 ---------------------------------------
PU239 (N, NØNEI ) O, CRØS C (EI, , ) BN A/W0240 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE, 7/1/64 NIN=184 GCM= 1 PCN= 3
AWRE 0-79/64, T/ BE PUBLISHED, A.C.ÒUGLAS

AC241----- 32 CARDS, ADDED MAR 1, 1965 ----------------------------------------
PU239 (N, INELAS ) 1, N CRØS C (EI, , ) BN A/W0241 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE, 7/1/64 NIN=184 GCM= 1 PCN= 5
AWRE 0-79/64, T/ BE PUBLISHED, A.C.ÒUGLAS

AC242----- 10 CARDS, ADDED MAR 1, 1965 ----------------------------------------
PU239 (N, INELAS ) 1, N ANGD P (CC, EI, ) A/W0242 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE, 7/1/64 NIN=184 GCM= 2 PCN= 5
AWRE 0-79/64, T/ BE PUBLISHED, A.C.ÒUGLAS

AC243----- 22 CARDS, ADDED MAR 1, 1965 ----------------------------------------
PU239 (N, INELAS ) 2, N CRØS C (EI, , ) BN A/W0243 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE, 7/1/64 NIN=184 GCM= 1 PCN= 6
AWRE 0-79/64, T/ BE PUBLISHED, A.C.ÒUGLAS

AC244----- 10 CARDS, ADDED MAR 1, 1965 ----------------------------------------
PU239 (N, INELAS ) 2, N ANGD P (CC, EI, ) A/W0244 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE, 7/1/64 NIN=184 GCM= 2 PCN= 6
AWRE 0-79/64, T/ BE PUBLISHED, A.C.ÒUGLAS
A0257----- 51 CARDS, ADDED MAR 1, 1965  
PZ239 (N,INELAS)98<N ENED P(E,E), A/W0257 1/64 0.100-2 1.500+7EV  
ALDERMASTON/WINFRESH DATA FILE, 7/1/64 NIN=184 GCN= 3 PCN= 15  
AWRE 0-79/64, T/ BE PUBLISHED, A.C.DOUGLAS

A0258----- 17 CARDS, ADDED MAR 1, 1965  
PZ239 (N,PAIR ) 0,N CRBS C(EI, , ) B/N A/W0258 1/64 0.100-2 1.500+7EV  
ALDERMASTON/WINFRESH DATA FILE, 7/1/64 NIN=184 GCN= 1 PCN= 16  
AWRE 0-79/64, T/ BE PUBLISHED, A.C.DOUGLAS

A0259----- 15 CARDS, ADDED MAR 1, 1965  
PZ239 (N,PAIR ) 0,N ANGD PICL,EL, ) A/W0259 1/64 0.100-2 1.500+7EV  
ALDERMASTON/WINFRESH DATA FILE, 7/1/64 NIN=184 GCN= 2 PCN= 16  
AWRE 0-79/64, T/ BE PUBLISHED, A.C.DOUGLAS

A0260----- 90 CARDS, ADDED MAR 1, 1965  
PZ239 (N,PAIR ) 0,N ENED P(E,E, , ) A/W0260 1/64 0.100-2 1.500+7EV  
ALDERMASTON/WINFRESH DATA FILE, 7/1/64 NIN=184 GCN= 3 PCN= 16  
AWRE 0-79/64, T/ BE PUBLISHED, A.C.DOUGLAS

A0261----- 11 CARDS, ADDED MAR 1, 1965  
PZ239 (N,TRIPLE) 0,N CRBS CIE, , ) 1/B N A/W0261 1/64 0.100-2 1.500+7EV  
ALDERMASTON/WINFRESH DATA FILE, 7/1/64 NIN=184 GCN= 1 PCN= 17  
AWRE 0-79/64, T/ BE PUBLISHED, A.C.DOUGLAS

A0262----- 19 CARDS, ADDED MAR 1, 1965  
PZ239 (N,TRIPLE) 0,N ANGD PICL,EL, ) A/W0262 1/64 0.100-2 1.500+7EV  
ALDERMASTON/WINFRESH DATA FILE, 7/1/64 NIN=184 GCN= 2 PCN= 17  
AWRE 0-79/64, T/ BE PUBLISHED, A.C.DOUGLAS

A0263----- 19 CARDS, ADDED MAR 1, 1965  
PZ239 (N,TRIPLE) 0,N ENED P(E,E, , ) A/W0263 1/64 0.100-2 1.500+7EV  
ALDERMASTON/WINFRESH DATA FILE, 7/1/64 NIN=184 GCN= 3 PCN= 17  
AWRE 0-79/64, T/ BE PUBLISHED, A.C.DOUGLAS

A0264----- 292 CARDS, ADDED MAR 1, 1965  
PZ239 (N,FISS ) 0,N CRBS CIE, , ) 1/B N A/W0264 1/64 0.100-2 1.500+7EV  
ALDERMASTON/WINFRESH DATA FILE, 7/1/64 NIN=184 GCN= 1 PCN= 18  
AWRE 0-79/64, T/ BE PUBLISHED, A.C.DOUGLAS

A0265----- 10 CARDS, ADDED MAR 1, 1965  
PZ239 (N,FISS ) 0,N ANGD PICL,EL, ) A/W0265 1/64 0.100-2 1.500+7EV  
ALDERMASTON/WINFRESH DATA FILE, 7/1/64 NIN=184 GCN= 2 PCN= 18  
AWRE 0-79/64, T/ BE PUBLISHED, A.C.DOUGLAS

A0266----- 94 CARDS, ADDED MAR 1, 1965  
PZ239 (N,FISS ) 0,N ENED P(E,E, , ) A/W0266 1/64 0.100-2 1.500+7EV  
ALDERMASTON/WINFRESH DATA FILE, 7/1/64 NIN=184 GCN= 3 PCN= 18  
AWRE 0-79/64, T/ BE PUBLISHED, A.C.DOUGLAS

A0267----- 15 CARDS, ADDED MAR 1, 1965  
PZ239 (N,FISS ) 0,N NU (E, , , ) A/W0267 1/64 0.100-2 1.500+7EV  
ALDERMASTON/WINFRESH DATA FILE, 7/1/64 NIN=184 GCN= 4 PCN= 18  
AWRE 0-79/64, T/ BE PUBLISHED, A.C.DOUGLAS

A0268----- 292 CARDS, ADDED MAR 1, 1965  
PZ239 (N,G ) 0,N CRBS CIE, , ) 1/B N A/W0268 1/64 0.100-2 1.500+7EV  
ALDERMASTON/WINFRESH DATA FILE, 7/1/64 NIN=184 GCN= 1 PCN=102  
AWRE 0-79/64, T/ BE PUBLISHED, A.C.DOUGLAS

A0269----- 71 CARDS, ADDED MAR 1, 1965
PU241 (N, TOTAL) 0, CRÖS CIEI, ) IBN A/W0269 0/59 0.250-1 1.500+7EV
ALDERMASTÖN/WINFRITH DATA FILE, 7/1/64 NIN=129 GCN= 1 PCN= 1
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0270----- 71 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N, ELAST ) 0,N CRÖS CIEI, ) IBN A/W0270 0/59 0.250-1 1.500+7EV
ALDERMASTÖN/WINFRITH DATA FILE, 7/1/64 NIN=129 GCN= 1 PCN= 2
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0271----- 207 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N, ELAST ) 0,N ANGD P(IEI,EF, ) A/W0271 0/59 0.250-1 1.500+7EV
ALDERMASTÖN/WINFRITH DATA FILE, 7/1/64 NIN=129 GCN= 2 PCN= 2
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0272----- 71 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N, NÖNEL ) 0, CRÖS CIEI, ) IBN A/W0272 0/59 0.250-1 1.500+7EV
ALDERMASTÖN/WINFRITH DATA FILE, 7/1/64 NIN=129 GCN= 2 PCN= 3
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0273----- 29 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N, INELAS) 98,N CRÖS CIEI, ) IBN A/W0273 0/59 0.250-1 1.500+7EV
ALDERMASTÖN/WINFRITH DATA FILE, 7/1/64 NIN=129 GCN= 1 PCN= 15
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0274----- 14 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N, INELAS) 98,N ANGD P(IEI,EF, ) A/W0274 0/59 0.250-1 1.500+7EV
ALDERMASTÖN/WINFRITH DATA FILE, 7/1/64 NIN=129 GCN= 2 PCN= 15
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0275----- 116 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N, INELAS) 98,N ENED P(IEI,EF, ) A/W0275 0/59 0.250-1 1.500+7EV
ALDERMASTÖN/WINFRITH DATA FILE, 7/1/64 NIN=129 GCN= 3 PCN= 15
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0276----- 15 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N, PAIR ) 0,N CRÖS CIEI, ) IBN A/W0276 0/59 0.250-1 1.500+7EV
ALDERMASTÖN/WINFRITH DATA FILE, 7/1/64 NIN=129 GCN= 1 PCN= 16
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0277----- 15 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N, PAIR ) 0,N ANGD P(IEI,EF, ) A/W0277 0/59 0.250-1 1.500+7EV
ALDERMASTÖN/WINFRITH DATA FILE, 7/1/64 NIN=129 GCN= 2 PCN= 16
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0278----- 15 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N, PAIR ) 0,N ENED P(IEI,EF, ) A/W0278 0/59 0.250-1 1.500+7EV
ALDERMASTÖN/WINFRITH DATA FILE, 7/1/64 NIN=129 GCN= 3 PCN= 16
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0279----- 11 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N, TRIPLE ) 0,N CRÖS CIEI, ) IBN A/W0279 0/59 0.250-1 1.500+7EV
ALDERMASTÖN/WINFRITH DATA FILE, 7/1/64 NIN=129 GCN= 1 PCN= 17
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0280----- 19 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N, TRIPLE ) 0,N ANGD P(IEI,EF, ) A/W0280 0/59 0.250-1 1.500+7EV
ALDERMASTÖN/WINFRITH DATA FILE, 7/1/64 NIN=129 GCN= 2 PCN= 17
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0281----- 19 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N, TRIPLE ) 0,N ENED P(IEI,EF, ) A/W0281 0/59 0.250-1 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64  NIN=129  GCN= 3  PCN= 17
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0282----- 71 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N$_2$FISS ) O$_2$N CR$eta$S CIEI, ,  IBN A/W0282 0/59 0.250-1 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64  NIN=129  GCN= 1  PCN= 18
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0283----- 10 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N$_2$FISS ) O$_2$N ANGD P(IE1,EF, ) A/W0283 0/59 0.250-1 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64  NIN=129  GCN= 2  PCN= 18
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0284----- 36 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N$_2$FISS ) O$_2$N ENED P(IE1,EF, ) A/W0284 0/59 0.250-1 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64  NIN=129  GCN= 3  PCN= 18
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0285----- 15 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N$_2$FISS ) O$_2$N NU (IE1, , ) A/W0285 0/59 0.250-1 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64  NIN=129  GCN= 4  PCN= 18
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0286----- 68 CARDS, ADDED MAR 1, 1965 -----------------------------
PU241 (N$_2$G ) O, CR$eta$S CIEI, ,  IBN A/W0286 0/59 0.250-1 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64  NIN=129  GCN= 1  PCN=102
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0287----- 17 CARDS, ADDED MAR 1, 1965 -----------------------------
NP237 (N$_2$FISS ) O$_2$N CR$eta$S CIEI, ,  IBN A/W0287 0/59 0.000-4 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64  NIN=130  GCN= 1  PCN= 18
UNPUBLISHED.

A0288----- 26 CARDS, ADDED MAR 1, 1965 -----------------------------
XE135 (N$_2$IbTAL ) O, CR$eta$S CIEI, ,  IBN A/W0288 0/52 0.100-1 0.000+2EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64  NIN= 4  GCN= 1  PCN= 1
AEEW R116, 6/62, H.M.SUMNER

A0289----- 26 CARDS, ADDED MAR 1, 1965 -----------------------------
XE135 (N$_2$ELAST ) O,N CR$eta$S CIEI, ,  IBN A/W0289 0/62 0.100-1 0.000+2EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64  NIN= 4  GCN= 1  PCN= 2
AEEW R116, 6/62, H.M.SUMNER

A0290----- 10 CARDS, ADDED MAR 1, 1965 -----------------------------
XE135 (N$_2$ELAST ) O,N ANGD PICC,IE1, ) A/W0290 0/62 0.100-1 0.000+2EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64  NIN= 4  GCN= 2  PCN= 2
AEEW R116, 6/62, H.M.SUMNER

A0291----- 26 CARDS, ADDED MAR 1, 1965 -----------------------------
XE135 (N$_2$G ) O, CR$eta$S CIEI, ,  IBN A/W0291 0/62 0.100-1 0.000+2EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64  NIN= 4  GCN= 1  PCN=102
AEEW R116, 6/62, H.M.SUMNER

A0292----- 81 CARDS, ADDED MAR 1, 1965 -----------------------------
C  O (N$_2$TÖTAL ) O, CR$eta$S CIEI, ,  IBN A/W0292 0/63 0.100-3 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64  NIN= 6  GCN= 1  PCN= 1
AEEW R351, 2/64, BARRINGTON ETAL,  AWRE 0-71/60, 8/61, K. PARKER

A0293----- 81 CARDS, ADDED MAR 1, 1965 -----------------------------
C  O (N$_2$ELAST ) O,N CR$eta$S CIEI, ,  IBN A/W0293 0/63 0.100-3 1.500+7EV
ALDERMaston/WINFIRTH DATA FILE, 7/1/64  NIN= 6  GCN= 1  PCN= 2
AEW R351, 2/64, BARRINGTON ET AL., AWRE 0-71/60, 8/61, K. PARKER

A0294---- 164 CARDS, ADDED MAR 1, 1965 ----------------------------------------
C 0 (N,ELAST) O, N ANGD P(CC, EI,), A/WO294 0/63 0.100-3 1,500+7EV
ALDERMSTañW/INFRITH DATA FILE, 7/1/64 NIN= 6 GCN= 2 PCN= 2
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-71/60, 8/61, K. PARKER

A0295---- 81 CARDS, ADDED MAR 1, 1965 ----------------------------------------
C 0 (N,N,EEL) O, CRØS C(EI,), IBN A/WO295 0/63 0.100-3 1,500+7EV
ALDERMSTañW/INFRITH DATA FILE, 7/1/64 NIN= 6 GCN= 1 PCN= 3
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-71/60, 8/61, K. PARKER

A0296---- 47 CARDS, ADDED MAR 1, 1965 ----------------------------------------
C 0 (N,N,EEL) 98, N CRØS C(EI,), IBN A/WO296 0/63 0.100-3 1,500+7EV
ALDERMSTañW/INFRITH DATA FILE, 7/1/64 NIN= 6 GCN= 1 PCN= 15
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-71/60, 8/61, K. PARKER

A0297---- 10 CARDS, ADDED MAR 1, 1965 ----------------------------------------
C 0 (N,N,EEL) 98, N ANGD P(Cl, EI,), A/WO297 0/63 0.100-3 1,500+7EV
ALDERMSTañW/INFRITH DATA FILE, 7/1/64 NIN= 6 GCN= 2 PCN= 15
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-71/60, 8/61, K. PARKER

A0298---- 10 CARDS, ADDED MAR 1, 1965 ----------------------------------------
C 0 (N,N,EEL) 98, N ENED P(EI,EF,), A/WO298 0/63 0.100-3 1,500+7EV
ALDERMSTañW/INFRITH DATA FILE, 7/1/64 NIN= 6 GCN= 3 PCN= 15
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-71/60, 8/61, K. PARKER

A0299---- 31 CARDS, ADDED MAR 1, 1965 ----------------------------------------
C 0 (N,N,3A) O, N CRØS C(EI,), IBN A/WO299 0/63 0.100-3 1,500+7EV
ALDERMSTañW/INFRITH DATA FILE, 7/1/64 NIN= 6 GCN= 1 PCN= 23
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-71/60, 8/61, K. PARKER

A0300---- 10 CARDS, ADDED MAR 1, 1965 ----------------------------------------
C 0 (N,N,3A) O, N ANGD P(Cl, EI,), A/WO300 0/63 0.100-3 1,500+7EV
ALDERMSTañW/INFRITH DATA FILE, 7/1/64 NIN= 6 GCN= 2 PCN= 23
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-71/60, 8/61, K. PARKER

A0301---- 57 CARDS, ADDED MAR 1, 1965 ----------------------------------------
C 0 (N,N,3A) O, N ENED P(EI,EF,), A/WO301 0/63 0.100-3 1,500+7EV
ALDERMSTañW/INFRITH DATA FILE, 7/1/64 NIN= 6 GCN= 3 PCN= 23
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-71/60, 8/61, K. PARKER

A0302---- 18 CARDS, ADDED MAR 1, 1965 ----------------------------------------
C 0 (N,G) O, CRØS C(EI,), IBN A/WO302 0/63 0.100-3 1,500+7EV
ALDERMSTañW/INFRITH DATA FILE, 7/1/64 NIN= 6 GCN= 1 PCN=102
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-71/60, 8/61, K. PARKER

A0303---- 12 CARDS, ADDED MAR 1, 1965 ----------------------------------------
C 0 (N,P) O, CRØS C(EI,), IBN A/WO303 0/63 0.100-3 1,500+7EV
ALDERMSTañW/INFRITH DATA FILE, 7/1/64 NIN= 6 GCN= 1 PCN=103
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-71/60, 8/61, K. PARKER

A0304---- 37 CARDS, ADDED MAR 1, 1965 ----------------------------------------
C 0 (N,A) O, CRØS C(EI,), IBN A/WO304 0/63 0.100-3 1,500+7EV
ALDERMSTañW/INFRITH DATA FILE, 7/1/64 NIN= 6 GCN= 1 PCN=107
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-71/60, 8/61, K. PARKER

A0305---- 46 CARDS, ADDED MAR 1, 1965 ----------------------------------------
B 10 (N,TOTAL) O, CRØS C(EI,), IBN A/WO305 0/63 0.100-2 1,500+7EV
ALDERMSTañW/INFRITH DATA FILE, 7/1/64 NIN= 13 GCN= 1 PCN= 1
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL
A0306----- 46 CARDS, ADDED MAR 1, 1965
B 10 (N,ELAST) 0,N CRBS CIEI, JBN A/W0306 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRIITH DATA FILE, 7/1/64 NIN= 13 GCN= 1 PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0307----- 34 CARDS, ADDED MAR 1, 1965
B 10 (N,ELAST) 0,N ANGD PICC, CIEI, JBN A/W0307 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRIITH DATA FILE, 7/1/64 NIN= 13 GCN= 2 PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0308----- 46 CARDS, ADDED MAR 1, 1965
B 10 (N,NØNEI) 0, CRBS CIEI, JBN A/W0308 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRIITH DATA FILE, 7/1/64 NIN= 13 GCN= 1 PCN= 3
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0309----- 22 CARDS, ADDED MAR 1, 1965
B 10 (N,INELAS) 98,N CRBS CIEI, JBN A/W0309 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRIITH DATA FILE, 7/1/64 NIN= 13 GCN= 1 PCN= 15
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0310----- 10 CARDS, ADDED MAR 1, 1965
B 10 (N,INELAS) 98,N ANGD PICC, CIEI, JBN A/W0310 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRIITH DATA FILE, 7/1/64 NIN= 13 GCN= 2 PCN= 15
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0311----- 19 CARDS, ADDED MAR 1, 1965
B 10 (N,INELAS) 98,N ENED PIEI, EF, JBN A/W0311 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRIITH DATA FILE, 7/1/64 NIN= 13 GCN= 3 PCN= 15
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0312----- 46 CARDS, ADDED MAR 1, 1965
B 10 (N,PARABS) 0, CRBS CIEI, JBN A/W0312 0/63 0.100-2 1.500+7EV
ALDERMASTØN/WINFRIITH DATA FILE, 7/1/64 NIN= 13 GCN= 1 PCN= 101
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0313----- 65 CARDS, ADDED MAR 1, 1965
N 0 (N,TØTAL) 0, CRBS CIEI, JBN A/W0313 0/63 0.100-3 1.500+7EV
ALDERMASTØN/WINFRIITH DATA FILE, 7/1/64 NIN= 14 GCN= 1 PCN= 1
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0314----- 65 CARDS, ADDED MAR 1, 1965
N 0 (N,ELAST) 0,N CRBS CIEI, JBN A/W0314 0/63 0.100-3 1.500+7EV
ALDERMASTØN/WINFRIITH DATA FILE, 7/1/64 NIN= 14 GCN= 1 PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0315----- 45 CARDS, ADDED MAR 1, 1965
N 0 (N,ELAST) 0,N ANGD PICC, CIEI, JBN A/W0315 0/63 0.100-3 1.500+7EV
ALDERMASTØN/WINFRIITH DATA FILE, 7/1/64 NIN= 14 GCN= 2 PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0316----- 65 CARDS, ADDED MAR 1, 1965
N 0 (N,NØNEHI) 0, CRBS CIEI, JBN A/W0316 0/63 0.100-3 1.500+7EV
ALDERMASTØN/WINFRIITH DATA FILE, 7/1/64 NIN= 14 GCN= 1 PCN= 3
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0317----- 24 CARDS, ADDED MAR 1, 1965
N 0 (N,INELAS) 98,N CRBS CIEI, JBN A/W0317 0/63 0.100-3 1.500+7EV
ALDERMASTØN/WINFRIITH DATA FILE, 7/1/64 NIN= 14 GCN= 1 PCN= 15
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL
ALDERMASTON/WINFRITH DATA FILE; 7/1/64  NIN= 17  GCN= 2  PCN= 15
AEEW R351, 2/64, BARRINGTON ETAL,  AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0343----- 15 CARDS, ADDED MAR 1, 1965 -------------------------------------
CR 0 (N,INELAS)98,N ENED PIEI,EF, ) A/W0343 0/63 0.100-3 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE; 7/1/64  NIN= 17  GCN= 3  PCN= 15
AEEW R351, 2/64, BARRINGTON ETAL,  AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0344----- 88 CARDS, ADDED MAR 1, 1965 -------------------------------------
CR 0 (N,G ) 0, CRØS CIE, , 1BN A/W0344 0/63 0.100-3 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE; 7/1/64  NIN= 17  GCN= 1  PCN=102
AEEW R351, 2/64, BARRINGTON ETAL,  AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0345----- 13 CARDS, ADDED MAR 1, 1965 -------------------------------------
CR 0 (N,P ) 0, CRØS CIE, , 1BN A/W0345 0/63 0.100-3 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE; 7/1/64  NIN= 17  GCN= 1  PCN=103
AEEW R351, 2/64, BARRINGTON ETAL,  AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0346----- 13 CARDS, ADDED MAR 1, 1965 -------------------------------------
CR 0 (N,A ) 0, CRØS CIE, , 1BN A/W0346 0/63 0.100-3 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE; 7/1/64  NIN= 17  GCN= 1  PCN=107
AEEW R351, 2/64, BARRINGTON ETAL,  AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0347----- 78 CARDS, ADDED MAR 1, 1965 -------------------------------------
NI 0 (N,TOTAL ) 0, CRØS CIE, , 1BN A/W0347 0/63 0.100-3 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE; 7/1/64  NIN= 19  GCN= 1  PCN= 1
AEEW R351, 2/64, BARRINGTON ETAL,  AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0348----- 78 CARDS, ADDED MAR 1, 1965 -------------------------------------
NI 0 (N,ELAST ) 0,N CRØS CIE, , 1BN A/W0348 0/63 0.100-3 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE; 7/1/64  NIN= 19  GCN= 1  PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL,  AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0349----- 44 CARDS, ADDED MAR 1, 1965 -------------------------------------
NI 0 (N,ELAST ) 0,N ANGO PICC,EI, ) A/W0349 0/63 0.100-3 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE; 7/1/64  NIN= 19  GCN= 2  PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL,  AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0350----- 78 CARDS, ADDED MAR 1, 1965 -------------------------------------
NI 0 (N,NNNEL ) 0, CRØS CIE, , 1BN A/W0350 0/63 0.100-3 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE; 7/1/64  NIN= 19  GCN= 3  PCN= 3
AEEW R351, 2/64, BARRINGTON ETAL,  AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0351----- 17 CARDS, ADDED MAR 1, 1965 -------------------------------------
NI 0 (N,INELAS)98,N CRØS CIE, , 1BN A/W0351 0/63 0.100-3 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE; 7/1/64  NIN= 19  GCN= 1  PCN= 15
AEEW R351, 2/64, BARRINGTON ETAL,  AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0352----- 10 CARDS, ADDED MAR 1, 1965 -------------------------------------
NI 0 (N,INELAS)98,N ANGD PICL,EI, ) A/W0352 0/63 0.100-3 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE; 7/1/64  NIN= 19  GCN= 2  PCN= 15
AEEW R351, 2/64, BARRINGTON ETAL,  AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0353----- 15 CARDS, ADDED MAR 1, 1965 -------------------------------------
NI 0 (N,INELAS)98,N ENED PIEI,EF, ) A/W0353 0/63 0.100-3 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE; 7/1/64  NIN= 19  GCN= 3  PCN= 15
AEEW R351, 2/64, BARRINGTON ETAL,  AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0354----- 10 CARDS, ADDED MAR 1, 1965 -------------------------------------
NI 0 (N,PAIR ) 0,N CRØS CIE, , 1BN A/W0354 0/63 0.100-3 1.500+7EV
ALDERMASTON/WINFRITH DATA FILE; 7/1/64  NIN= 19  GCN= 1  PCN= 16
AEW R351, 2/64, BARRINGTON ETAL, AWARE 0-28/60, 3/61, BUCKINGHAM ETAL

A0355----- 15 CARDS, ADDED MAR 1, 1965
NI 0 (N,PAIR ) 0, N ANG D P (Cl, C, E1 , ) A/W0355 0/63 0.100-3 1.500+7EV
ALDERMSTN/WINFRITH DATA FILE, 7/1/64 NIN= 19 GCO= 2 PCN= 16
AEW R351, 2/64, BARRINGTON ETAL, AWARE 0-28/60, 3/61, BUCKINGHAM ETAL

A0356----- 15 CARDS, ADDED MAR 1, 1965
NI 0 (N,PAIR ) 0, N ENED P (E, E, ) A/W0356 0/63 0.100-3 1.500+7EV
ALDERMSTN/WINFRITH DATA FILE, 7/1/64 NIN= 19 GCO= 3 PCN= 16
AEW R351, 2/64, BARRINGTON ETAL, AWARE 0-28/60, 3/61, BUCKINGHAM ETAL

A0357----- 78 CARDS, ADDED MAR 1, 1965
NI 0 (N, G) 0, CRDS C (EI, , ) IBN A/W0357 0/63 0.100-3 1.500+7EV
ALDERMSTN/WINFRITH DATA FILE, 7/1/64 NIN= 19 GCO= 1 PCN= 102
AEW R351, 2/64, BARRINGTON ETAL, AWARE 0-28/60, 3/61, BUCKINGHAM ETAL

A0358----- 14 CARDS, ADDED MAR 1, 1965
NI 0 (N, P) 0, CRDS C (EI, , ) IBN A/W0358 0/63 0.100-3 1.500+7EV
ALDERMSTN/WINFRITH DATA FILE, 7/1/64 NIN= 19 GCO= 1 PCN= 103
AEW R351, 2/64, BARRINGTON ETAL, AWARE 0-28/60, 3/61, BUCKINGHAM ETAL

A0359----- 13 CARDS, ADDED MAR 1, 1965
NI 0 (N, A) 0, CRDS C (EI, , ) IBN A/W0359 0/63 0.100-3 1.500+7EV
ALDERMSTN/WINFRITH DATA FILE, 7/1/64 NIN= 19 GCO= 1 PCN= 107
AEW R351, 2/64, BARRINGTON ETAL, AWARE 0-28/60, 3/61, BUCKINGHAM ETAL

A0360----- 49 CARDS, ADDED MAR 1, 1965
F 19 (N, TOTAL ) 0, CRDS C (EI, , ) IBN A/W0360 0/63 0.100-3 1.500+7EV
ALDERMSTN/WINFRITH DATA FILE, 7/1/64 NIN= 23 GCO= 1 PCN= 1
AEW R351, 2/64, BARRINGTON ETAL, AWARE 0-28/60, 3/61, BUCKINGHAM ETAL

A0361----- 49 CARDS, ADDED MAR 1, 1965
F 19 (N, ELAST ) 0, N CRDS C (EI, , ) IBN A/W0361 0/63 0.100-3 1.500+7EV
ALDERMSTN/WINFRITH DATA FILE, 7/1/64 NIN= 23 GCO= 1 PCN= 2
AEW R351, 2/64, BARRINGTON ETAL, AWARE 0-28/60, 3/61, BUCKINGHAM ETAL

A0362----- 44 CARDS, ADDED MAR 1, 1965
F 19 (N, ELAST ) 0, N ANG D P (CC, E, ) A/W0362 0/63 0.100-3 1.500+7EV
ALDERMSTN/WINFRITH DATA FILE, 7/1/64 NIN= 23 GCO= 2 PCN= 2
AEW R351, 2/64, BARRINGTON ETAL, AWARE 0-28/60, 3/61, BUCKINGHAM ETAL

A0363----- 49 CARDS, ADDED MAR 1, 1965
F 19 (N, NONEL ) 0, CRDS C (EI, , ) IBN A/W0363 0/63 0.100-3 1.500+7EV
ALDERMSTN/WINFRITH DATA FILE, 7/1/64 NIN= 23 GCO= 1 PCN= 3
AEW R351, 2/64, BARRINGTON ETAL, AWARE 0-28/60, 3/61, BUCKINGHAM ETAL

A0364----- 31 CARDS, ADDED MAR 1, 1965
F 19 (N, INELAS ) 98, N CRDS C (EI, , ) IBN A/W0364 0/63 0.100-3 1.500+7EV
ALDERMSTN/WINFRITH DATA FILE, 7/1/64 NIN= 23 GCO= 1 PCN= 15
AEW R351, 2/64, BARRINGTON ETAL, AWARE 0-28/60, 3/61, BUCKINGHAM ETAL

A0365----- 10 CARDS, ADDED MAR 1, 1965
F 19 (N, INELAS ) 98, N ANG D P (Cl, E, ) A/W0365 0/63 0.100-3 1.500+7EV
ALDERMSTN/WINFRITH DATA FILE, 7/1/64 NIN= 23 GCO= 2 PCN= 15
AEW R351, 2/64, BARRINGTON ETAL, AWARE 0-28/60, 3/61, BUCKINGHAM ETAL

A0366----- 50 CARDS, ADDED MAR 1, 1965
F 19 (N, INELAS ) 98, N ENED P (E, E, ) A/W0366 0/63 0.100-3 1.500+7EV
ALDERMSTN/WINFRITH DATA FILE, 7/1/64 NIN= 23 GCO= 3 PCN= 15
AEW R351, 2/64, BARRINGTON ETAL, AWARE 0-28/60, 3/61, BUCKINGHAM ETAL
A0367---- 11 CARDS, ADDED MAR 1, 1965
F 19 (N,PAIR ) 0,N CRBS C(EI) , JBN A/W0367 0/63 0.100-3 1.500+7EV
ALDERMUSTIN/FINFRITH DATA FILE, 7/1/64 NIN= 23 GCN= 1 PCN= 16
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0368---- 15 CARDS, ADDED MAR 1, 1965
F 19 (N,PAIR ) 0,N ANGD PIC(C,EI), J/W0368 0/63 0.100-3 1.500+7EV
ALDERMUSTIN/FINFRITH DATA FILE, 7/1/64 NIN= 23 GCN= 2 PCN= 16
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0369---- 15 CARDS, ADDED MAR 1, 1965
F 19 (N,PAIR ) 0,N ENED PIE(EI,EF), J/W0369 0/63 0.100-3 1.500+7EV
ALDERMUSTIN/FINFRITH DATA FILE, 7/1/64 NIN= 23 GCN= 3 PCN= 16
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0370---- 49 CARDS, ADDED MAR 1, 1965
F 19 (N,PARABS) 0, CRBS C(EI) , JBN A/W0370 0/63 0.100-3 1.500+7EV
ALDERMUSTIN/FINFRITH DATA FILE, 7/1/64 NIN= 23 GCN= 1 PCN= 101
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0371---- 82 CARDS, ADDED MAR 1, 1965
C0 (N,TOTAL ) 0, CRBS C(EI) , JBN A/W0371 0/63 0.100-3 1.500+7EV
ALDERMUSTIN/FINFRITH DATA FILE, 7/1/64 NIN= 24 GCN= 1 PCN= 1
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0372---- 82 CARDS, ADDED MAR 1, 1965
C0 (N,ELAST ) 0,N CRBS C(EI) , JBN A/W0372 0/63 0.100-3 1.500+7EV
ALDERMUSTIN/FINFRITH DATA FILE, 7/1/64 NIN= 24 GCN= 1 PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0373---- 44 CARDS, ADDED MAR 1, 1965
C0 (N,ELAST ) 0,N ANGD PICC(EI) , J/W0373 0/63 0.100-3 1.500+7EV
ALDERMUSTIN/FINFRITH DATA FILE, 7/1/64 NIN= 24 GCN= 2 PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0374---- 82 CARDS, ADDED MAR 1, 1965
C0 (N,NBNEEL) 0, CRBS C(EI) , JBN A/W0374 0/63 0.100-3 1.500+7EV
ALDERMUSTIN/FINFRITH DATA FILE, 7/1/64 NIN= 24 GCN= 3 PCN= 3
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0375---- 17 CARDS, ADDED MAR 1, 1965
C0 (N,NELAS) 198,N CRBS C(EI), JBN A/W0375 0/63 0.100-3 1.500+7EV
ALDERMUSTIN/FINFRITH DATA FILE, 7/1/64 NIN= 24 GCN= 1 PCN= 15
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0376---- 10 CARDS, ADDED MAR 1, 1965
C0 (N,NELAS) 198,N ANGD PICL(EI) , J/W0376 0/63 0.100-3 1.500+7EV
ALDERMUSTIN/FINFRITH DATA FILE, 7/1/64 NIN= 24 GCN= 2 PCN= 15
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0377---- 28 CARDS, ADDED MAR 1, 1965
C0 (N,NELAS) 198,N ENED P(EI,EF), J/W0377 0/63 0.100-3 1.500+7EV
ALDERMUSTIN/FINFRITH DATA FILE, 7/1/64 NIN= 24 GCN= 3 PCN= 15
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0378---- 11 CARDS, ADDED MAR 1, 1965
C0 (N,PAIR ) 0,N CRBS C(EI), JBN A/W0378 0/63 0.100-3 1.500+7EV
ALDERMUSTIN/FINFRITH DATA FILE, 7/1/64 NIN= 24 GCN= 1 PCN= 16
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL
A0379----- 15 CARDS, ADDED MAR 1, 1965

CD O (N,PAIR) O, N ANGO PICL, EI, ) A/W0379 0/63 0.100-3 1.500+7EV
ALDERMSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 24 GCN= 2 PCN= 16
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0380----- 15 CARDS, ADDED MAR 1, 1965

CD O (N,PAIR) O, N ENED P(E1,E2), ) A/W0380 0/63 0.100-3 1.500+7EV
ALDERMSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 24 GCN= 3 PCN= 16
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0381----- 82 CARDS, ADDED MAR 1, 1965

CD O (N,PARABS) O, CROS C(E1,E2), ) BN A/W0381 0/63 0.100-3 1.500+7EV
ALDERMSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 24 GCN= 101
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0382----- 69 CARDS, ADDED MAR 1, 1965

SI O (N,TOTAL) O, CROS C(E1), ) BN A/W0382 0/63 0.400-3 1.500+7EV
ALDERMSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 25 GCN= 2 PCN= 1
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0383----- 69 CARDS, ADDED MAR 1, 1965

SI O (N,ELAST) O, CROS C(E1), ) BN A/W0383 0/63 0.400-3 1.500+7EV
ALDERMSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 25 GCN= 1 PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0384----- 45 CARDS, ADDED MAR 1, 1965

SI O (N,ELAST) O, N ANGD PIC(E1,E2), ) A/W0384 0/63 0.400-3 1.500+7EV
ALDERMSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 25 GCN= 2 PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0385----- 69 CARDS, ADDED MAR 1, 1965

SI O (N,NEDEL) O, CROS C(E1), ) BN A/W0385 0/63 0.400-3 1.500+7EV
ALDERMSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 25 GCN= 1 PCN= 3
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0386----- 25 CARDS, ADDED MAR 1, 1965

SI O (N,INELAS) 98,N CROS C(E1), ) BN A/W0386 0/63 0.400-3 1.500+7EV
ALDERMSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 25 GCN= 1 PCN= 2
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0387----- 10 CARDS, ADDED MAR 1, 1965

SI O (N,INELAS) 98,N ANGD PICL,E1, ) A/W0387 0/63 0.400-3 1.500+7EV
ALDERMSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 25 GCN= 2 PCN= 15
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0388----- 15 CARDS, ADDED MAR 1, 1965

SI O (N,INELAS) 98,N ENED P(E1,E2), ) A/W0388 0/63 0.400-3 1.500+7EV
ALDERMSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 25 GCN= 3 PCN= 15
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0389----- 30 CARDS, ADDED MAR 1, 1965

SI O (N,G) O, CROS C(E1), ) BN A/W0389 0/63 0.400-3 1.500+7EV
ALDERMSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 25 GCN= 1 PCN= 102
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0390----- 16 CARDS, ADDED MAR 1, 1965

SI O (N,P) O, CROS C(E1), ) BN A/W0390 0/63 0.400-3 1.500+7EV
ALDERMSTØN/WINFRITH DATA FILE, 7/1/64 NIN= 25 GCN= 1 PCN= 103
AEEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0391----- 16 CARDS, ADDED MAR 1, 1965
SI 0 (N, A) 0, CRØS CIEI, , IBN A/W0391 0/63 0.400-3 1.500+7EV
ALDERMASTØN WINFRITH DATA FILE, 7/1/64 NIN= 25 GCN= 1 PCN= 107
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0392---- 66 CARDS, ADDED MAR 1, 1965
PB 0 (N, TOTAL) 0, CRØS CIEI, , IBN A/W0392 0/63 0.100-3 1.500+7EV
ALDERMASTØN WINFRITH DATA FILE, 7/1/64 NIN= 26 GCN= 1 PCN= 2
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0393---- 66 CARDS, ADDED MAR 1, 1965
PB 0 (N, ELAST) 0, N CRØS CIEI, , IBN A/W0393 0/63 0.100-3 1.500+7EV
ALDERMASTØN WINFRITH DATA FILE, 7/1/64 NIN= 26 GCN= 1 PCN= 2
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0394---- 65 CARDS, ADDED MAR 1, 1965
PB 0 (N, TOTAL) 0, N ANGD PICC, EI, J IBN A/W0394 0/63 0.100-3 1.500+7EV
ALDERMASTØN WINFRITH DATA FILE, 7/1/64 NIN= 26 GCN= 2 PCN= 2
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0395---- 66 CARDS, ADDED MAR 1, 1965
PB 0 (N, NØNØL) 0, CRØS CIEI, , IBN A/W0395 0/63 0.100-3 1.500+7EV
ALDERMASTØN WINFRITH DATA FILE, 7/1/64 NIN= 26 GCN= 1 PCN= 3
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0396---- 26 CARDS, ADDED MAR 1, 1965
PB 0 (N, INELAS) 98, N CRØS CIEI, , IBN A/W0396 0/63 0.100-3 1.500+7EV
ALDERMASTØN WINFRITH DATA FILE, 7/1/64 NIN= 26 GCN= 1 PCN= 15
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0397---- 14 CARDS, ADDED MAR 1, 1965
PB 0 (N, INELAS) 98, N ANGD PICC, EI, J IBN A/W0397 0/63 0.100-3 1.500+7EV
ALDERMASTØN WINFRITH DATA FILE, 7/1/64 NIN= 26 GCN= 2 PCN= 15
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0398---- 229 CARDS, ADDED MAR 1, 1965
PB 0 (N, INELAS) 98, N ENED PIEI, EF, J IBN A/W0398 0/63 0.100-3 1.500+7EV
ALDERMASTØN WINFRITH DATA FILE, 7/1/64 NIN= 26 GCN= 3 PCN= 15
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0399---- 16 CARDS, ADDED MAR 1, 1965
PB 0 (N, PAIR) 0, N CRØS CIEI, , IBN A/W0399 0/63 0.100-3 1.500+7EV
ALDERMASTØN WINFRITH DATA FILE, 7/1/64 NIN= 26 GCN= 1 PCN= 16
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0400---- 15 CARDS, ADDED MAR 1, 1965
PB 0 (N, PAIR) 0, N ANGD PICC, EI, J IBN A/W0400 0/63 0.100-3 1.500+7EV
ALDERMASTØN WINFRITH DATA FILE, 7/1/64 NIN= 26 GCN= 2 PCN= 16
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0401---- 15 CARDS, ADDED MAR 1, 1965
PB 0 (N, PAIR) 0, N ENED PIEI, EF, J IBN A/W0401 0/63 0.100-3 1.500+7EV
ALDERMASTØN WINFRITH DATA FILE, 7/1/64 NIN= 26 GCN= 3 PCN= 16
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0402---- 66 CARDS, ADDED MAR 1, 1965
PB 0 (N, G) 0, CRØS CIEI, , IBN A/W0402 0/63 0.100-3 1.500+7EV
ALDERMASTØN WINFRITH DATA FILE, 7/1/64 NIN= 26 GCN= 1 PCN= 102
AEW R351, 2/64, BARRINGTON ETAL, AWRE 0-28/60, 3/51, BUCKINGHAM ETAL

A0403---- 124 CARDS, ADDED MAR 1, 1965
AL 27 (N, TOT AL) 0, CRØS CIEI, , IBN A/W0403 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFRIITH DATA FILE, 7/1/64  NIN= 35  GCN= 1  PCN= 1
AEWH M445, 7/64, D.C.KING

A0404-----  124 CARDS, ADDED MAR 1, 1965  --------------------------------------
AL 27 (N,ELAST ) O,N CRBS C(EI, , )  IBN A/W0404 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFRIITH DATA FILE, 7/1/64  NIN= 35  GCN= 1  PCN= 2
AEWH M445, 7/64, D.C.KING

A0405-----  222 CARDS, ADDED MAR 1, 1965  --------------------------------------
AL 27 (N,ELAST ) O,N ANGD PICC(,EI, )  A/W0405 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFRIITH DATA FILE, 7/1/64  NIN= 35  GCN= 2  PCN= 2
AEWH M445, 7/64, D.C.KING

A0406-----  33 CARDS, ADDED MAR 1, 1965  --------------------------------------
AL 27 (N,INELAS) 1,N CRBS C(EI, , )  IBN A/W0406 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFRIITH DATA FILE, 7/1/64  NIN= 35  GCN= 1  PCN= 5
AEWH M445, 7/64, D.C.KING

A0407-----  10 CARDS, ADDED MAR 1, 1965  --------------------------------------
AL 27 (N,INELAS) 1,N ANGD PICC(EI, )  A/W0407 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFRIITH DATA FILE, 7/1/64  NIN= 35  GCN= 2  PCN= 5
AEWH M445, 7/64, D.C.KING

A0408-----  33 CARDS, ADDED MAR 1, 1965  --------------------------------------
AL 27 (N,INELAS) 2,N CRBS C(EI, , )  IBN A/W0408 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFRIITH DATA FILE, 7/1/64  NIN= 35  GCN= 1  PCN= 6
AEWH M445, 7/64, D.C.KING

A0409-----  10 CARDS, ADDED MAR 1, 1965  --------------------------------------
AL 27 (N,INELAS) 2,N ANGD PICC(EI, )  A/W0409 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFRIITH DATA FILE, 7/1/64  NIN= 35  GCN= 2  PCN= 6
AEWH M445, 7/64, D.C.KING

A0410-----  23 CARDS, ADDED MAR 1, 1965  --------------------------------------
AL 27 (N,INELAS) 3,N CRBS C(EI, , )  IBN A/W0410 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFRIITH DATA FILE, 7/1/64  NIN= 35  GCN= 1  PCN= 7
AEWH M445, 7/64, D.C.KING

A0411-----  10 CARDS, ADDED MAR 1, 1965  --------------------------------------
AL 27 (N,INELAS) 3,N ANGD PICC(EI, , )  A/W0411 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFRIITH DATA FILE, 7/1/64  NIN= 35  GCN= 2  PCN= 7
AEWH M445, 7/64, D.C.KING

A0412-----  20 CARDS, ADDED MAR 1, 1965  --------------------------------------
AL 27 (N,INELAS) 4,N CRBS C(EI, , )  IBN A/W0412 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFRIITH DATA FILE, 7/1/64  NIN= 35  GCN= 1  PCN= 8
AEWH M445, 7/64, D.C.KING

A0413-----  10 CARDS, ADDED MAR 1, 1965  --------------------------------------
AL 27 (N,INELAS) 4,N ANGD PICC(EI, , )  A/W0413 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFRIITH DATA FILE, 7/1/64  NIN= 35  GCN= 2  PCN= 8
AEWH M445, 7/64, D.C.KING

A0414-----  19 CARDS, ADDED MAR 1, 1965  --------------------------------------
AL 27 (N,INELAS) 5,N CRBS C(EI, , )  IBN A/W0414 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFRIITH DATA FILE, 7/1/64  NIN= 35  GCN= 1  PCN= 9
AEWH M445, 7/64, D.C.KING

A0415-----  10 CARDS, ADDED MAR 1, 1965  --------------------------------------
AL 27 (N,INELAS) 5,N ANGD PICC(EI, , )  A/W0415 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFRIITH DATA FILE, 7/1/64  NIN= 35  GCN= 2  PCN= 9
A0416—— 19 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
AL 27 (N, INELAS) 6,N CRØS C(E1), 7 BN A/W0416 1/64 0.600-3 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN= 35 GCN= 1 PCN= 10
AEEW M445, 7/64, D.C.KING

A0417—— 10 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
AL 27 (N, INELAS) 6,N ANGD P(CC,E1), 7 BN A/W0417 1/64 0.600-3 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN= 35 GCN= 2 PCN= 10
AEEW M445, 7/64, D.C.KING

A0418—— 12 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
AL 27 (N, INELAS) 7,N CRØS C(E1), 7 BN A/W0418 1/64 0.600-3 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN= 35 GCN= 1 PCN= 11
AEEW M445, 7/64, D.C.KING

A0419—— 10 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
AL 27 (N, INELAS) 7,N ANGD P(CC,E1), 7 BN A/W0419 1/64 0.600-3 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN= 35 GCN= 2 PCN= 11
AEEW M445, 7/64, D.C.KING

A0420—— 12 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
AL 27 (N, INELAS) 8,N CRØS C(E1), 7 BN A/W0420 1/64 0.600-3 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN= 35 GCN= 1 PCN= 12
AEEW M445, 7/64, D.C.KING

A0421—— 10 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
AL 27 (N, INELAS) 8,N ANGD P(CC,E1), 7 BN A/W0421 1/64 0.600-3 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN= 35 GCN= 2 PCN= 12
AEEW M445, 7/64, D.C.KING

A0422—— 11 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
AL 27 (N, INELAS) 9,N CRØS C(E1), 7 BN A/W0422 1/64 0.600-3 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN= 35 GCN= 1 PCN= 13
AEEW M445, 7/64, D.C.KING

A0423—— 10 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
AL 27 (N, INELAS) 9,N ANGD P(CC,E1), 7 BN A/W0423 1/64 0.600-3 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN= 35 GCN= 2 PCN= 13
AEEW M445, 7/64, D.C.KING

A0424—— 36 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
AL 27 (N, INELAS) 98,N CRØS C(E1), 7 BN A/W0424 1/64 0.600-3 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN= 35 GCN= 1 PCN= 15
AEEW M445, 7/64, D.C.KING

A0425—— 14 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
AL 27 (N, INELAS) 98,N ANGD PCL,E1), 7 BN A/W0425 1/64 0.600-3 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN= 35 GCN= 2 PCN= 15
AEEW M445, 7/64, D.C.KING

A0426—— 64 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
AL 27 (N, INELAS) 98,N ENED PIE1,E1), 7 BN A/W0426 1/64 0.600-3 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN= 35 GCN= 3 PCN= 15
AEEW M445, 7/64, D.C.KING

A0427—— 9 CARDS, ADDED MAR 1, 1965 ---------------------------------------------
AL 27 (N, PAIR) 0,N CRØS C(E1), 7 BN A/W0427 1/64 0.600-3 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN= 35 GCN= 1 PCN= 16
AEEW M445, 7/64, D.C.KING
AO428----- 15 CARDS, ADDED MAR 1, 1965 ----------------------------------------
AL 27 (N,PAIR ) 0, N ANGD P(CL,EL) , A/W0428 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN= 35 GCN= 2 PCN= 16
AEFW M445, 7/64, D.C.KING

AO429----- 15 CARDS, ADDED MAR 1, 1965 ----------------------------------------
AL 27 (N,PAIR ) 0, N ENED P(EL,EF) , A/W0429 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN= 35 GCN= 3 PCN= 16
AEFW M445, 7/64, D.C.KING

AO430----- 124 CARDS, ADDED MAR 1, 1965 ----------------------------------------
AL 27 (N,G ) 0, CRBS C(EL), , IBN A/W0430 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN= 35 GCN= 1 PCN=102
AEFW M445, 7/64, D.C.KING

AO431----- 48 CARDS, ADDED MAR 1, 1965 ----------------------------------------
AL 27 (N,P ) 0, CRBS C(EL), , IBN A/W0431 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN= 35 GCN= 1 PCN=103
AEFW M445, 7/64, D.C.KING

AO432----- 28 CARDS, ADDED MAR 1, 1965 ----------------------------------------
AL 27 (N,A ) 0, CRBS C(EL), , IBN A/W0432 1/64 0.600-3 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN= 35 GCN= 1 PCN=107
AEFW M445, 7/64, D.C.KING

AO433----- 269 CARDS, ADDED MAR 1, 1965 ----------------------------------------
FE 0 (N,TOTAL ) 0, CRBS C(EL), , IBN A/W0433 1/64 0.100-1 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN= 36 GCN= 1 PCN= 1
AEFW REPORT TO BE PUBLISHED

AO434----- 269 CARDS, ADDED MAR 1, 1965 ----------------------------------------
FE 0 (N,ELAST ) 0,N CRBS C(EL), , IBN A/W0434 1/64 0.100-1 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN= 36 GCN= 1 PCN= 2
AEFW REPORT TO BE PUBLISHED

AO435----- 134 CARDS, ADDED MAR 1, 1965 ----------------------------------------
FE 0 (N,ELAST ) 0,N ANGD P(EL,EL), , A/W0435 1/64 0.100-1 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN= 36 GCN= 2 PCN= 2
AEFW REPORT TO BE PUBLISHED

AO436----- 100 CARDS, ADDED MAR 1, 1965 ----------------------------------------
FE 0 (N,INELAS) 1,N CRBS C(EL), , IBN A/W0436 1/64 0.100-1 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN= 36 GCN= 1 PCN= 5
AEFW REPORT TO BE PUBLISHED

AO437----- 10 CARDS, ADDED MAR 1, 1965 ----------------------------------------
FE 0 (N,INELAS) 1,N ANGD P(EL,EL), , A/W0437 1/64 0.100-1 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN= 36 GCN= 2 PCN= 5
AEFW REPORT TO BE PUBLISHED

AO438----- 50 CARDS, ADDED MAR 1, 1965 ----------------------------------------
FE 0 (N,INELAS) 2,N CRBS C(EL), , IBN A/W0438 1/64 0.100-1 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN= 36 GCN= 1 PCN= 6
AEFW REPORT TO BE PUBLISHED

AO439----- 10 CARDS, ADDED MAR 1, 1965 ----------------------------------------
FE 0 (N,INELAS) 2,N ANGD P(EL,EL), , A/W0439 1/64 0.100-1 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN= 36 GCN= 2 PCN= 6
AEFW REPORT TO BE PUBLISHED
A0453----- 10 CARDS, ADDED MAR 1, 1965 -----------------------------------
FE 0 (N, INELAS) 98, N ENED P(EI, EF, ) A/W0452 1/64 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN= 36 GCN= 3 PCN= 15
AEEW REPRT TØ BE PUBLISHED

A0454----- 15 CARDS, ADDED MAR 1, 1965 -----------------------------------
FE 0 (N,PAIR ) 0,N CRØS C(EI, , )BN A/W0453 1/64 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN= 36 GCN= 1 PCN= 16
AEEW REPRT TØ BE PUBLISHED

A0455----- 15 CARDS, ADDED MAR 1, 1965 -----------------------------------
FE 0 (N,PAIR ) 0,N ENED P(EI, EF, ) A/W0455 1/64 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN= 36 GCN= 3 PCN= 16
AEEW REPRT TØ BE PUBLISHED

A0456----- 269 CARDS, ADDED MAR 1, 1965 -----------------------------------
FE 0 (N, 6 ) 0, CRØS C(EI, , )BN A/W0456 1/64 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN= 36 GCN= 1 PCN=102
AEEW REPRT TØ BE PUBLISHED

A0457----- 20 CARDS, ADDED MAR 1, 1965 -----------------------------------
FE 0 (N,PAIR ) 0, CRØS C(EI, , )BN A/W0457 1/64 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN= 36 GCN= 1 PCN=103
AEEW REPRT TØ BE PUBLISHED

A0458----- 11 CARDS, ADDED MAR 1, 1965 -----------------------------------
FE 0 (N,A ) 0, CRØS C(EI, , )BN A/W0458 1/64 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN= 36 GCN= 1 PCN=107
AEEW REPRT TØ BE PUBLISHED

A0459----- 150 CARDS, ADDED MAR 1, 1965 -----------------------------------
Ø 0 (N,TØTAL ) 0, CRØS C(EI, , )BN A/W0459 1/64 0.100-2 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN= 37 GCN= 1 PCN= 1
AEEW M445, 7/64, D.C.KING

A0460----- 150 CARDS, ADDED MAR 1, 1965 -----------------------------------
Ø 0 (N,EELAST ) 0,N CRØS C(EI, , )BN A/W0460 1/64 0.100-2 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN= 37 GCN= 1 PCN= 2
AEEW M445, 7/64, D.C.KING

A0461----- 1006 CARDS, ADDED MAR 1, 1965 -----------------------------------
Ø 0 (N,EELAST ) 0,N ANGD P(CC,EI, ) A/W0461 1/64 0.100-2 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN= 37 GCN= 2 PCN= 2
AEEW M445, 7/64, D.C.KING

A0462----- 35 CARDS, ADDED MAR 1, 1965 -----------------------------------
Ø 0 (N, INELAS ) 1,N CRØS C(EI, , )BN A/W0462 1/64 0.100-2 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN= 37 GCN= 1 PCN= 5
AEEW M445, 7/64, D.C.KING

A0463----- 10 CARDS, ADDED MAR 1, 1965 -----------------------------------
Ø 0 (N, INELAS ) 1,N ANGD P(CC,EI, ) A/W0463 1/64 0.100-2 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN= 37 GCN= 2 PCN= 5
AEEW M445, 7/64, D.C.KING

A0464----- 36 CARDS, ADDED MAR 1, 1965 -----------------------------------
Ø 0 (N, INELAS ) 2,N CRØS C(EI, , )BN A/W0464 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64  NIN= 37  GCN= 1  PCN= 6
AEEW M445, 7/64, D.C.KING

A0465----- 10 CARDS, ADDED MAR 1, 1965 ----------------------------------------
0 0 (N,INELAS) 2,N ANGD PİCÇ,E1,  ) A/W0465 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64  NIN= 37  GCN= 2  PCN= 6
AEEW M445, 7/64, D.C.KING

A0466----- 26 CARDS, ADDED MAR 1, 1965 ----------------------------------------
0 0 (N,INELAS) 3,N CR0S CIE1,  ) BN A/W0466 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64  NIN= 37  GCN= 1  PCN= 7
AEEW M445, 7/64, D.C.KING

A0467----- 10 CARDS, ADDED MAR 1, 1965 ----------------------------------------
0 0 (N,INELAS) 4,N CR0S CIE1,  ) A/W0467 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64  NIN= 37  GCN= 2  PCN= 7
AEEW M445, 7/64, D.C.KING

A0468----- 23 CARDS, ADDED MAR 1, 1965 ----------------------------------------
0 0 (N,INELAS) 4,N CR0S CIE1,  ) BN A/W0468 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64  NIN= 37  GCN= 1  PCN= 8
AEEW M445, 7/64, D.C.KING

A0469----- 10 CARDS, ADDED MAR 1, 1965 ----------------------------------------
0 0 (N,INELAS) 4,N ANGD PİCÇ,E1,  ) A/W0469 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64  NIN= 37  GCN= 2  PCN= 8
AEEW M445, 7/64, D.C.KING

A0470----- 12 CARDS, ADDED MAR 1, 1965 ----------------------------------------
0 0 (N,INELAS) 98,N CR0S CIE1,  ) BN A/W0470 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64  NIN= 37  GCN= 1  PCN= 15
AEEW M445, 7/64, D.C.KING

A0471----- 10 CARDS, ADDED MAR 1, 1965 ----------------------------------------
0 0 (N,INELAS) 98,N ANGD PİCÇ,E1,  ) A/W0471 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64  NIN= 37  GCN= 2  PCN= 15
AEEW M445, 7/64, D.C.KING

A0472----- 32 CARDS, ADDED MAR 1, 1965 ----------------------------------------
0 0 (N,INELAS) 98,N ENED PİE1,EF,  ) A/W0472 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64  NIN= 37  GCN= 3  PCN= 15
AEEW M445, 7/64, D.C.KING

A0473----- 10 CARDS, ADDED MAR 1, 1965 ----------------------------------------
0 0 (N,PARABS) 0,N CR0S CIE1,  ) BN A/W0473 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64  NIN= 37  GCN= 1  PCN=101
AEEW M445, 7/64, D.C.KING

A0474----- 12 CARDS, ADDED MAR 1, 1965 ----------------------------------------
0 0 (N,P ) 0,N CR0S CIE1,  ) BN A/W0474 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64  NIN= 37  GCN= 1  PCN=103
AEEW M445, 7/64, D.C.KING

A0475----- 11 CARDS, ADDED MAR 1, 1965 ----------------------------------------
0 0 (N,D ) 0,N CR0S CIE1,  ) BN A/W0475 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64  NIN= 37  GCN= 1  PCN=104
AEEW M445, 7/64, D.C.KING

A0476----- 85 CARDS, ADDED MAR 1, 1965 ----------------------------------------
0 0 (N,A ) 0,N CR0S CIE1,  ) BN A/W0476 1/64 0.100-2 1.500+7EV
ALDERMASTON/WINFIRTH DATA FILE, 7/1/64  NIN= 37  GCN= 1  PCN=107
AEW M445; 7/64; D.C. King

A0477----- 18 CARDS, ADDED MAR 1, 1965
           AU197 (N,PAIR ) 0.5 CR850 C1E1, , BNP A/W0477 12/62 0.000+2 1.500+7EV
           ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN=137 GCN= 1 PCN= 16
           NØ REFERENCE GIVEN

A0478----- 17 CARDS, ADDED MAR 1, 1965
           AU197 (N,PAIR ) 1.5 CR850 C1E1, , BNP A/W0478 12/62 0.000+2 1.500+7EV
           ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN=137 GCN= 1 PCN= 26
           NØ REFERENCE GIVEN

A0479----- 32 CARDS, ADDED MAR 1, 1965
           AU197 (N,G ) 0.2 CR850 C1E1, , BNP A/W0479 12/62 0.000+2 1.500+7EV
           ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN=137 GCN= 1 PCN=102
           NØ REFERENCE GIVEN

A0480----- 58 CARDS, ADDED MAR 1, 1965
           CA 0 (N,TOTAL ) 0.5 CR850 C1E1, , BNP A/W0480 10/58 0.250-1 1.500+7EV
           ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN=138 GCN= 1 PCN= 1
           AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0481----- 58 CARDS, ADDED MAR 1, 1965
           CA 0 (N,ELAST ) 0.5 CR850 C1E1, , BNP A/W0481 10/58 0.250-1 1.500+7EV
           ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN=138 GCN= 1 PCN= 2
           AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0482----- 43 CARDS, ADDED MAR 1, 1965
           CA 0 (N,ELAST ) 0.5 ANGD P1C1E1, , A/W0482 10/58 0.250-1 1.500+7EV
           ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN=138 GCN= 2 PCN= 2
           AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0483----- 58 CARDS, ADDED MAR 1, 1965
           CA 0 (N,INEL) 0.5 CR850 C1E1, , BNP A/W0483 10/58 0.250-1 1.500+7EV
           ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN=138 GCN= 1 PCN= 3
           AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0484----- 14 CARDS, ADDED MAR 1, 1965
           CA 0 (N,INELAS) 0.5 CR850 C1E1, , BNP A/W0484 10/58 0.250-1 1.500+7EV
           ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN=138 GCN= 1 PCN= 15
           AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0485----- 10 CARDS, ADDED MAR 1, 1965
           CA 0 (N,INELAS) 0.5 ANGD P1C1E1, , A/W0485 10/58 0.250-1 1.500+7EV
           ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN=138 GCN= 2 PCN= 15
           AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0486----- 19 CARDS, ADDED MAR 1, 1965
           CA 0 (N,ENELAS) 0.5 ENED P1E1E1, , A/W0486 10/58 0.250-1 1.500+7EV
           ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN=138 GCN= 3 PCN= 15
           AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0487----- 27 CARDS, ADDED MAR 1, 1965
           CA 0 (N,G ) 0.5 CR850 C1E1, , BNP A/W0487 10/58 0.250-1 1.500+7EV
           ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN=138 GCN= 1 PCN=102
           AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0488----- 19 CARDS, ADDED MAR 1, 1965
           CA 0 (N,P ) 0.5 CR850 C1E1, , BNP A/W0488 10/58 0.250-1 1.500+7EV
           ALDERMASTON/WINFIRTH DATA FILE, 7/1/64 NIN=138 GCN= 1 PCN=103
           AWRE 0-28/60, 3/61, BUCKINGHAM ETAL
A0489  13 CARDS, ADDED MAR 1, 1965
CA 0 (N,A  ) 0, CRO8S CIEI,  JBN A/W0489 10/58 0.250-1 1.500+7EV
ALDERMAST0N/WINFIRTH DATA FILE, 7/1/64  NIN=138  GCN= 1  PCN=107
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0490  71 CARDS, ADDED MAR 1, 1965
CL 0 (N,TOTAL ) 0, CRO8S CIEI,  JBN A/W0490 2/59 0.250-1 1.500+7EV
ALDERMAST0N/WINFIRTH DATA FILE, 7/1/64  NIN=141  GCN= 1  PCN= 1
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0491  71 CARDS, ADDED MAR 1, 1965
CL 0 (N,ELAST ) 0, N CRO8S CIEI,  JBN A/W0491 2/59 0.250-1 1.500+7EV
ALDERMAST0N/WINFIRTH DATA FILE, 7/1/64  NIN=141  GCN= 1  PCN= 2
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0492  43 CARDS, ADDED MAR 1, 1965
CL 0 (N,ELAST ) 0, N ANGD PICL,EI,  JBN A/W0492 2/59 0.250-1 1.500+7EV
ALDERMAST0N/WINFIRTH DATA FILE, 7/1/64  NIN=141  GCN= 2  PCN= 2
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0493  71 CARDS, ADDED MAR 1, 1965
CL 0 (N,NENEL ) 0, N CRO8S CIEI,  JBN A/W0493 2/59 0.250-1 1.500+7EV
ALDERMAST0N/WINFIRTH DATA FILE, 7/1/64  NIN=141  GCN= 1  PCN= 3
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0494  17 CARDS, ADDED MAR 1, 1965
CL 0 (N,INELAS)98,N CRO8S CIEI,  JBN A/W0494 2/59 0.250-1 1.500+7EV
ALDERMAST0N/WINFIRTH DATA FILE, 7/1/64  NIN=141  GCN= 1  PCN= 15
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0495  10 CARDS, ADDED MAR 1, 1965
CL 0 (N,INELAS)98,N ANGD PICL,EI,  JBN A/W0495 2/59 0.250-1 1.500+7EV
ALDERMAST0N/WINFIRTH DATA FILE, 7/1/64  NIN=141  GCN= 2  PCN= 15
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0496  26 CARDS, ADDED MAR 1, 1965
CL 0 (N,INELAS)98,N ENED P(EI,EF,  JBN A/W0496 2/59 0.250-1 1.500+7EV
ALDERMAST0N/WINFIRTH DATA FILE, 7/1/64  NIN=141  GCN= 3  PCN= 15
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0497  11 CARDS, ADDED MAR 1, 1965
CL 0 (N,PAIR ) 0, N CRO8S CIEI,  JBN A/W0497 2/59 0.250-1 1.500+7EV
ALDERMAST0N/WINFIRTH DATA FILE, 7/1/64  NIN=141  GCN= 1  PCN= 16
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0498  15 CARDS, ADDED MAR 1, 1965
CL 0 (N,PAIR ) 0, N ANGD PICL,EI,  JBN A/W0498 2/59 0.250-1 1.500+7EV
ALDERMAST0N/WINFIRTH DATA FILE, 7/1/64  NIN=141  GCN= 2  PCN= 16
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0499  15 CARDS, ADDED MAR 1, 1965
CL 0 (N,PAIR ) 0, N ENED P(EI,EF,  JBN A/W0499 2/59 0.250-1 1.500+7EV
ALDERMAST0N/WINFIRTH DATA FILE, 7/1/64  NIN=141  GCN= 3  PCN= 16
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL

A0500  60 CARDS, ADDED MAR 1, 1965
CL 0 (N,G  ) 0, CRO8S CIEI,  JBN A/W0500 2/59 0.250-1 1.500+7EV
ALDERMAST0N/WINFIRTH DATA FILE, 7/1/64  NIN=141  GCN= 1  PCN=102
AWRE 0-28/60, 3/61, BUCKINGHAM ETAL
ZR 0 (N,PARABS) 0, CRØS C(EI, , )BN A/W0513 5/63 0.250-1 1.700+7EV ALDERMASTØN/WINFRITH DATA FILE; 7/1/64 NIN=179 GCN= 1 PCN=101 AHS(S)R(62), 1963, P.J. HEMMINGS

A0514----- 234 CARDS, ADDED MAR 1, 1965
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NA 23 (N,TOTAL) 0, CRØS C(EI, , )BN A/W0514 6/63 0.100-1 1.500+7EV ALDERMASTØN/WINFRITH DATA FILE; 7/1/64 NIN=182 GCN= 1 PCN= 1
AEEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0515----- 234 CARDS, ADDED MAR 1, 1965
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NA 23 (N,ELAST) 0, CRØS C(EI, , )BN A/W0515 6/63 0.100-1 1.500+7EV ALDERMASTØN/WINFRITH DATA FILE; 7/1/64 NIN=182 GCN= 1 PCN= 2
AEEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0516----- 149 CARDS, ADDED MAR 1, 1965
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NA 23 (N,ANGD) 0, CRØS C(EI, , )BN A/W0516 6/63 0.100-1 1.500+7EV ALDERMASTØN/WINFRITH DATA FILE; 7/1/64 NIN=182 GCN= 2 PCN= 2
AEEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0517----- 234 CARDS, ADDED MAR 1, 1965
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NA 23 (N,NØNEL) 0, CRØS C(EI, , )BN A/W0517 6/63 0.100-1 1.500+7EV ALDERMASTØN/WINFRITH DATA FILE; 7/1/64 NIN=182 GCN= 1 PCN= 3
AEEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0518----- 128 CARDS, ADDED MAR 1, 1965
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NA 23 (N,INELAS) 1, CRØS C(EI, , )BN A/W0518 6/63 0.100-1 1.500+7EV ALDERMASTØN/WINFRITH DATA FILE; 7/1/64 NIN=182 GCN= 1 PCN= 5
AEEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0519----- 10 CARDS, ADDED MAR 1, 1965
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NA 23 (N,INELAS) 1, CRØS C(EI, , )BN A/W0519 6/63 0.100-1 1.500+7EV ALDERMASTØN/WINFRITH DATA FILE; 7/1/64 NIN=182 GCN= 2 PCN= 5
AEEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0520----- 70 CARDS, ADDED MAR 1, 1965
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NA 23 (N,INELAS) 2, CRØS C(EI, , )BN A/W0520 6/63 0.100-1 1.500+7EV ALDERMASTØN/WINFRITH DATA FILE; 7/1/64 NIN=182 GCN= 1 PCN= 6
AEEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0521----- 10 CARDS, ADDED MAR 1, 1965
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NA 23 (N,INELAS) 2, CRØS C(EI, , )BN A/W0521 6/63 0.100-1 1.500+7EV ALDERMASTØN/WINFRITH DATA FILE; 7/1/64 NIN=182 GCN= 2 PCN= 6
AEEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0522----- 59 CARDS, ADDED MAR 1, 1965
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NA 23 (N,INELAS) 3, CRØS C(EI, , )BN A/W0522 6/63 0.100-1 1.500+7EV ALDERMASTØN/WINFRITH DATA FILE; 7/1/64 NIN=182 GCN= 1 PCN= 7
AEEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0523----- 10 CARDS, ADDED MAR 1, 1965
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NA 23 (N,INELAS) 3, CRØS C(EI, , )BN A/W0523 6/63 0.100-1 1.500+7EV ALDERMASTØN/WINFRITH DATA FILE; 7/1/64 NIN=182 GCN= 2 PCN= 7
AEEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0524----- 49 CARDS, ADDED MAR 1, 1965
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NA 23 (N,INELAS) 4, CRØS C(EI, , )BN A/W0524 6/63 0.100-1 1.500+7EV ALDERMASTØN/WINFRITH DATA FILE; 7/1/64 NIN=182 GCN= 1 PCN= 8
AEEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0525----- 10 CARDS, ADDED MAR 1, 1965
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NA 23 (N,INELAS) 4, CRØS C(EI, , )BN A/W0525 6/63 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN=182 GCN= 2 PCN= 8
AEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0526----- 48 CARDS, ADDED MAR 1, 1965 -----------------------------
NA 23 (N,INELAS) 5f,N CRØS C(E1, , )BN A/W0526 6/63 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN=182 GCN= 1 PCN= 9
AEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0527----- 10 CARDS, ADDED MAR 1, 1965 -----------------------------
NA 23 (N,INELAS) 5f,N ANGD PCC,E1, ) A/W0527 6/63 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN=182 GCN= 2 PCN= 9
AEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0528----- 40 CARDS, ADDED MAR 1, 1965 -----------------------------
NA 23 (N,INELAS) 6f,N CRØS C(E1, , )BN A/W0528 6/63 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN=182 GCN= 1 PCN= 10
AEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0529----- 10 CARDS, ADDED MAR 1, 1965 -----------------------------
NA 23 (N,INELAS) 6f,N ANGD PCC,E1, ) A/W0529 6/63 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN=182 GCN= 2 PCN= 10
AEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0530----- 14 CARDS, ADDED MAR 1, 1965 -----------------------------
NA 23 (N,INELAS) 7f,N CRØS C(E1, , )BN A/W0530 6/63 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN=182 GCN= 1 PCN= 11
AEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0531----- 10 CARDS, ADDED MAR 1, 1965 -----------------------------
NA 23 (N,INELAS) 7f,N ANGD PCC,E1, ) A/W0531 6/63 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN=182 GCN= 2 PCN= 11
AEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0532----- 36 CARDS, ADDED MAR 1, 1965 -----------------------------
NA 23 (N,INELAS)9f,N CRØS C(EI, , )BN A/W0532 6/63 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN=182 GCN= 1 PCN= 15
AEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0533----- 13 CARDS, ADDED MAR 1, 1965 -----------------------------
NA 23 (N,INELAS)9f,N ANGD PCL,E1, ) A/W0533 6/63 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN=182 GCN= 2 PCN= 15
AEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0534----- 38 CARDS, ADDED MAR 1, 1965 -----------------------------
NA 23 (N,INELAS)9f,N ENED P(EI,EF, ) A/W0534 6/63 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN=182 GCN= 3 PCN= 15
AEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0535----- 10 CARDS, ADDED MAR 1, 1965 -----------------------------
NA 23 (N,PAIR ) 0f,N CRØS C(E1, , )BN A/W0535 6/63 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN=182 GCN= 1 PCN= 16
AEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0536----- 15 CARDS, ADDED MAR 1, 1965 -----------------------------
NA 23 (N,PAIR ) 0f,N ANGD PCL,E1, ) A/W0536 6/63 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN=182 GCN= 2 PCN= 16
AEW R254, 4/63, T.P.MØRHEAD ALSO SOME UNPUBLISHED

A0537----- 15 CARDS, ADDED MAR 1, 1965 -----------------------------
NA 23 (N,PAIR ) 0f,N ENED P(EI,EF, ) A/W0537 6/63 0.100-1 1.500+7EV
ALDERMSTON/WINFRITH DATA FILE, 7/1/64 NIN=182 GCN= 3 PCN= 16
AEEW R254, 4/63, T.P. MØRHEAD

ALSO SOME UNPUBLISHED

A0538----- 234 CARDS, ADDED MAR 1, 1965
NA 23 (N,G ) 0, CRØS C(EI, , ), IBN A/W0538 6/63 0.100-1 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=182 GCN=1 PCN=102

A0539----- 36 CARDS, ADDED MAR 1, 1965
NA 23 (N,P ) 0, CRØS C(EI, , ), IBN A/W0539 6/63 0.100-1 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=182 GCN=1 PCN=103

A0540----- 29 CARDS, ADDED MAR 1, 1965
NA 23 (N,A ) 0, CRØS C(EI, , ), IBN A/W0540 6/63 0.100-1 1.500+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=182 GCN=1 PCN=107

A0541----- 35 CARDS, ADDED MAR 1, 1965
CU 0 (N,TOTAL ) 0, CRØS C(EI, , ), IBN A/W0541 1/64 0.250-1 1.460+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=186 GCN=1 PCN=1 UNPUBLISHED

A0542----- 35 CARDS, ADDED MAR 1, 1965
CU 0 (N,ELAST ) 0, CRØS C(EI, , ), IBN A/W0542 1/64 0.250-1 1.460+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=186 GCN=1 PCN=2 UNPUBLISHED

A0543----- 43 CARDS, ADDED MAR 1, 1965
CU 0 (N,ELAST ) 0, N ANGD P(C,EI, , ) A/W0543 1/64 0.250-1 1.460+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=186 GCN=2 PCN=2 UNPUBLISHED

A0544----- 35 CARDS, ADDED MAR 1, 1965
CU 0 (N,NØNEL ) 0, CRØS C(EI, , ), IBN A/W0544 1/64 0.250-1 1.460+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=186 GCN=1 PCN=3 UNPUBLISHED

A0545----- 13 CARDS, ADDED MAR 1, 1965
CU 0 (N,INELAS) 98, N CRØS C(EI, , ), IBN A/W0545 1/64 0.250-1 1.460+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=186 GCN=1 PCN=15 UNPUBLISHED

A0546----- 10 CARDS, ADDED MAR 1, 1965
CU 0 (N,INELAS) 98, N ANGD P(C,EI, , ) A/W0546 1/64 0.250-1 1.460+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=186 GCN=2 PCN=15 UNPUBLISHED

A0547----- 32 CARDS, ADDED MAR 1, 1965
CU 0 (N,INELAS) 98, N ENED P(EI,EF, , ) A/W0547 1/64 0.250-1 1.460+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=186 GCN=3 PCN=15 UNPUBLISHED

A0548----- 10 CARDS, ADDED MAR 1, 1965
CU 0 (N,PAIR ) 0, N CRØS C(EI, , ), IBN A/W0548 1/64 0.250-1 1.460+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=186 GCN=1 PCN=16 UNPUBLISHED

A0549----- 15 CARDS, ADDED MAR 1, 1965
CU 0 (N,PAIR ) 0, N ANGD P(C,EI, , ) A/W0549 1/64 0.250-1 1.460+7EV
ALDERMASTØN/WINFRITH DATA FILE, 7/1/64 NIN=186 GCN=2 PCN=16 UNPUBLISHED
A0550----- 67 CARDS, ADDED MAR 1, 1965 -------------------------------
CU 0 (N,PAIR ) 0, N ENED P(IE1,E1, ) A/W0550 1/64 0.250-1 1.460+7EV
ALDERMASTON/WINFRITH DATA FILE, 7/1/64  NIN=186  GCN= 3  PCN= 16
UNPUBLISHED

A0551----- 35 CARDS, ADDED MAR 1, 1965 -------------------------------
CU 0 (N,G ) 0, CR05 CIEI, , )BN A/W0551 1/54 0.250-1 1.460+7EV
ALDERMASTON/WINFRITH DATA FILE, 7/1/64  NIN=186  GCN= 1  PCN=102
UNPUBLISHED

A0552----- 12 CARDS, ADDED MAR 1, 1965 -------------------------------
CU 0 (N,P ) 0, CR05 CIEI, , )BN A/W0552 1/54 0.250-1 1.460+7EV
ALDERMASTON/WINFRITH DATA FILE, 7/1/64  NIN=186  GCN= 1  PCN=103
UNPUBLISHED
10 (N,TOTAL) CROS A0118
10 (N, ELAST) CROS A0119
10 (N, ELAST) ANGD A0120
10 (N, NONEL) CROS A0121
10 (N, G) CROS A0122
10 (N, TOTAL) CROS A0123
10 (N, ELAST) CROS A0124
10 (N, ELAST) ANGD A0125
10 (N, NONEL) CROS A0126
10 (N, G) CROS A0127
20 (N, TOTAL) CROS A0072
20 (N, ELAST) CROS A0074
20 (N, ELAST) ANGD A0075
20 (N, NONEL) CROS A0076
20 (N, G) CROS A0077
1 1 (N, TOTAL) CROS A0088
1 1 (N, ELAST) CROS A0089
1 1 (N, ELAST) ANGD A0090
1 1 (N, G) CROS A0091
1 2 (N, TOTAL) CROS A0092
1 2 (N, ELAST) CROS A0093
1 2 (N, ELAST) ANGD A0094
1 2 (N, NONEL) CROS A0095
1 2 (N, PAIR) CROS A0096
1 2 (N, PAIR) ANGD A0097
1 2 (N, PAIR) ENED A0098
1 2 (N, G) CROS A0099
1 3 (N, TOTAL) CROS A0100
1 3 (N, ELAST) CROS A0101
1 3 (N, ELAST) ANGD A0102
1 3 (N, NONEL) CROS A0103
1 3 (N, PAIR) CROS A0104
1 3 (N, PAIR) ANGD A0105
1 3 (N, PAIR) ENED A0106
1 3 (N, TRIPLE) CROS A0107
1 3 (N, TRIPLE) ANGD A0108
1 3 (N, TRIPLE) ENED A0109
1 4 (N, TOTAL) CROS A0110
1 4 (N, ELAST) CROS A0111
1 4 (N, ELAST) ANGD A0112
1 4 (N, NONEL) CROS A0113
1 4 (N, PAIR) CROS A0114
1 4 (N, PAIR) ANGD A0115
1 4 (N, PAIR) ENED A0116
1 4 (N, TRIPLE) CROS A0117
1 4 (N, TRIPLE) ANGD A0118
1 4 (N, TRIPLE) ENED A0119
1 5 (N, TOTAL) CROS A0120
1 5 (N, ELAST) CROS A0121
1 5 (N, ELAST) ANGD A0122
1 5 (N, NONEL) CROS A0123
1 5 (N, PAIR) CROS A0124
1 5 (N, PAIR) ANGD A0125
1 5 (N, PAIR) ENED A0126
1 5 (N, TRIPLE) CROS A0127
1 5 (N, TRIPLE) ANGD A0128
1 5 (N, TRIPLE) ENED A0129
1 6 (N, TOTAL) CROS A0130
1 6 (N, ELAST) CROS A0131
1 6 (N, ELAST) ANGD A0132
1 6 (N, NONEL) CROS A0133
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