Human error data retrieval for U.S. commercial nuclear power plants

by

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ABSTRACT

The developed computer package is designed to extract operator related data by the General Classification (GENCLASS) for Licensee Event Reports (LER's) which occurred in commercial light water reactors (LWR) between April, 1960 and December, 1977. The extracted data were classified by the Nuclear Safety Research Group of Iowa State University. The LER data were also reviewed to retrieve hardware and human errors for the components using the Nuclear Safety Information Center (NSIC) keywords system (KS). The computer package written in COBOL consists of two main codes: DATACHECK and LERRET. DATACHEC is designed to provide consistent data for the LERRET as an input source. The DATACHEC provides a capability for data checking and data comparison through three subprograms. The LERRET, which consists of five subprograms, is developed to retrieve information on the documented LER's and numeric data extracted from the LER's. Retrieval of a certain data can be accomplished by submitting keyword index cards. Those keywords of GENCLASS are tabulated. In one process, multiple requests may be presented.

Three commercial power plants are selected to evaluate the code and operator errors that have occurred during operation. These plants are: Hatch 1 (BWR), Oconee 1

(PWR), and Fort St. Vrain (HTGR). The Weibull probability plotting method is applied to operator error data. Estimates of scale and shape parameters are obtained and compared with computer results. The study concludes that the Weibull plotting method is suitable to estimate Weibull parameters for operator errors that have occurred during operation. From the LERRET code, it is possible to make a data bank to provide information to estimate human error rates. LERRET is also useful as an easy access to human reliability studies. However, the LERRET is suitable mainly for numeric data classified using GENCLASS. Getting actual data which are based on tasks performed in U.S. nuclear reactors the analysts can get rid of many of the shortcomings of using data from other industries. In addition, several models on human reliability can be readily developed.

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1. INTRODUCTION

The Weibull distribution model is used to describe human reliability in the operation of the U.S. commercial nuclear power plants. In the first stage, a classification scheme is developed to pull numeric data from the LER (Licensee Event Reports). The scheme is developed to provide appropriate means of encoding and operator error quantification.

The computer codes (DATACHEC & LERRET) are developed to give a facility for storage, handling, updating and retrieval of information. Both codes are written in COBOL language since the use of high level programming languages is easier to read, is suitable for handling structured data hierarchies, and is familiar to most programmers (1). Although there are other commonly used languages; such as PL/1, those languages are not proper for CDC computer systems which are used in the national research laboratories in the United States.

Actual human errors are tabulated for each classified item and are compared with data extracted from the Nuclear Safety Information Center (NSIC) keyword system. The estimates of error rates are calculated by using the model of the hazard plotting for incomplete failure data. In addition, averaged demand probabilities are obtained using data

preclassified by NSIC. The results were compared with averaged demand probabilities in WASH-1400 (2).

In recent years, several attempts have been made to obtain human error rates (2-5), however most of the compiled data are extrapolated from human error rates in other industries. Since prediction of human performance is still somewhat inexact, the need for directly applicable empirical field data is obvious.

The purpose of this study is to predict human reliability and to compile human errors from the LER information on actual operation of 65 commercial nuclear power plants between April, 1960 and December, 1977.

In recent years, the LER's have been reviewed to predict human reliability (4-6). The amount of the reviewed data is limited by time because the review of all LER's needs great amounts of effort and time. Husseiny et al. (7) suggested establishing a data bank to retrieve information from field experience for reliability analysis. Technique included methods to make and to use path diagrams (8). Those methods can save much more computer time than sorting methods. Kindred (1) suggested that the COBOL language is preferable for data base management.

To predict human reliability in WASH-1400 (2) it is assumed that errors can be treated within the same framework

as component failures. Also, the human as a component was introduced to calculate system reliability taking into account human factors (5).

The historical background on the compilation of the human error rate data can be found in reference (9). There are two kinds of sources. One is the AIR data store which has been developed by the American Institute for Research (AIR) to evaluate tasks during operation of electronic equipments (10). Another source is SHERB (Sandia Human Error Rate Bank) which is based on THERP (Technique for Human Error Rate Prediction) (11-14). The SHERB is based on the large numbers of observations. To estimate the effect of human performances on equipment or system reliability and operational procedures, THERP, which is an iterative procedure with five steps, can be used (11). The steps are as follows: (1) define the system or subsystem failure which is to be evaluated, (2) identify and list all the human operations performed and their relationships to system tasks and functions, (3) predict error rates for each human operation or group of operations pertinent to the evaluation, (4) determine the effect of human errors on the system, and (5) recommend changes necessary to reduce the system or subsystem failure rate as a consequence of the estimated effects of the recommended

changes. Steps used to evaluate the system reliability are the same as the previous five steps except substituting hardware for humans. THERP is used as a design tool since it indicates the weak point in the design. In recent years, THERP was used in the analysis of human performance related to the engineered safety features of nuclear power plants (15-16). In that case, THERP was not used as a design tool, but as a method for evaluation of reliability under given system conditions.

Sabri et al. (17) developed a taxonomy of occurrences as a framework for data collection. It includes interfaces for both human and systems. Fort St. Vrain (HGTR) data were reviewed to calculate the MTBF (Mean Time Between Failure).

An exponential operator model identified and integrated in the control and protection systems was developed by Sabri et al. (18). Reliability, availability, and dependability using the error rate for the operator evaluation were introduced during training, operating life, and retirement stages. Husseiny et al. (7) introduced Kalman filter techniques to evaluate the operator performance. The technique was used to predict and update human failure rates. Recently, Joos (5) showed the validity of the proposed exponential failure model using the human error data which have occurred between June 1, 1973 and June 30, 1975. Human errors and error rates with 95% confidence interval were tabulated.

In Chapter 2, background theory on how to make path diagrams using SNOBOL technique to be applied into LERRET (LER Retrieval System) is presented. Then, hazard plotting for incomplete data with Weibull probability distribution is presented to evaluate operator failure rates based on data obtained by NSIC keyword system from the first electricity generation date to the last report date. Finally, some formulae are introduced to estimate the failure rate and the unavailability.

Chapter 3 presents procedures for making input data; such as data handling and management and statistical analysis. It includes a block diagram for those procedures.

Figure 1.1 shows a block diagram of the plan for this study. The events are classified for computer application by GENCLASS. In the second stage, the DATACHEC is used to check and to correct the punched data. The DATACHEC also includes a function of data comparison to product computer group results. In the third step, the printed output from the DATACHEC is reviewed to make a decision to store classified numeric data on a tape or a disk. GENCLASS is introduced in Chapter 4. Such classification provides a useful taxonomy to obtain gross operator errors. In Chapter 5 DATACHEC (Data Checking System) is introduced. Such code includes data checking program which is used to check the

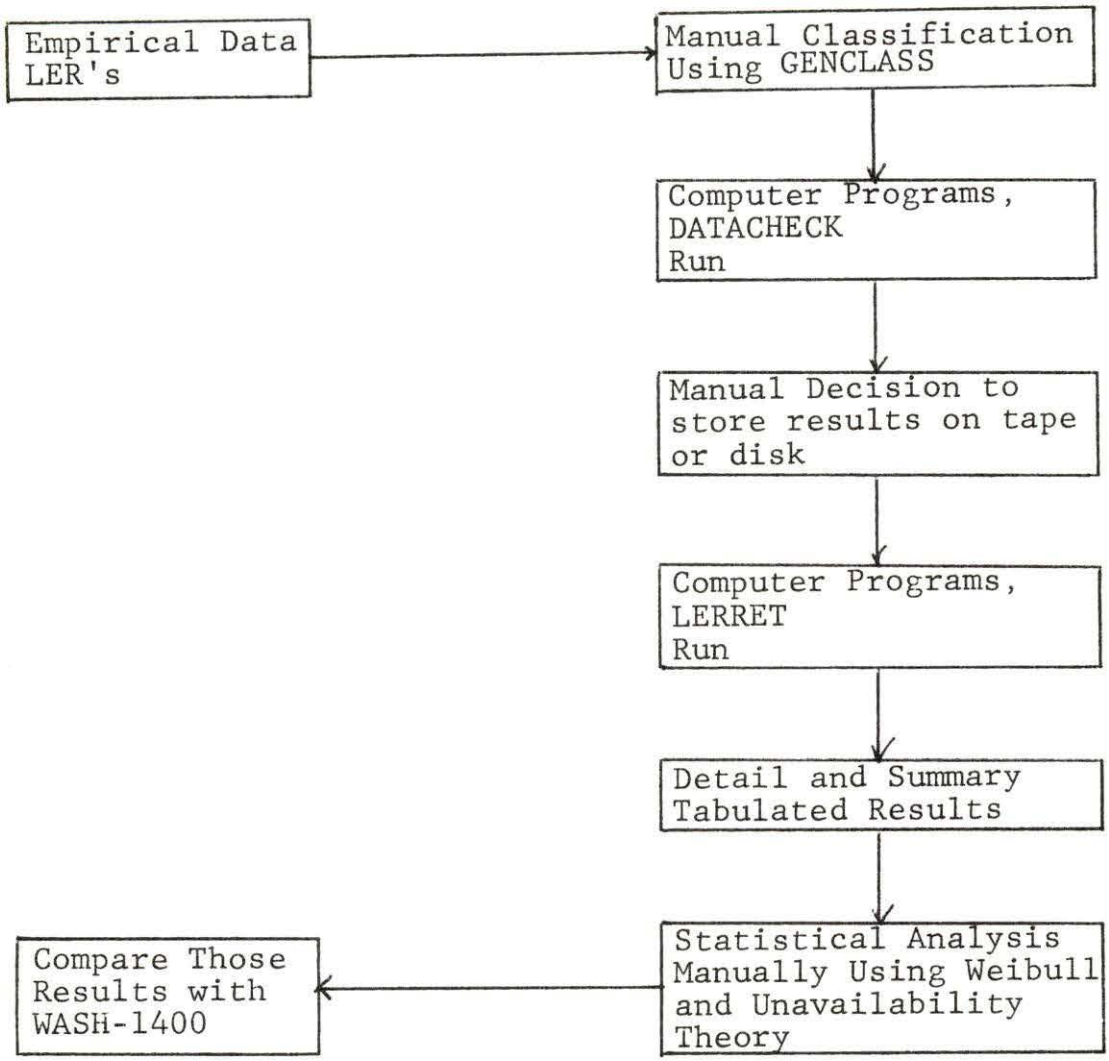

Figure 1.1. A block diagram shows procedures to evaluate LER's of the U.S. commercial nuclear power plants between April, 1960 and December, 1977

range of data obtained by the GENCLASS through manual job, and data comparison program which gives information to make a decision by comparing computer group results with manual group results. The LER Retrieval System (LERRET) is described in Chapter 6. The computer program LERRET can be used to retrieve the classified stored data using the tables given in Chapter 6. Then the results are analyzed by Weibull and unavailability theory. The safety related system unavailability is compared with the results in WASH-1400.

The results of operator failure rates from the three selected power plants, Hatch 1 (BWR), Oconee 1 (PWR), and Fort St. Vrain (HGTR) are presented in Chapter 7. Weibull parameters (for scale and shape) are obtained for three power plants using probability plotting method. Summary and conclusions are given in Chapter 9 and recommendations for further work are also drawn in Chapter 9.

2. THEORY

2.1. SNOBOL4 Techniques and Applications for Retrieval Programs

String Oriented Symbolic Language (SNOBOL) is not concerned with numerical computation, but is used for the manipulation of symbolic expressions. String refers here to an array of character; such as 'ACDEK'. The SNOBOL language has been developed at Bell Telephone Laboratories, Incorporated, in 1962. The SNOBOL4; is an extended version of SNOBOL, which has powerful tools for processing strings. Pattern matching is a large and important part of the SNOBOL4 language. Pattern matching has two distinct components: the construction of patterns (path diagram building using a tree structure), and the matching process where a string is examined to see if it is matched by a pattern.

Gimpel (8) has developed algorithms to formalize a discrete pattern and to implement it in SNOBOL4. The following properties are shown in his work:

1. The patterns of SNOBOL4 can specify any decidable language (symbols and notations).
2. The patterns of SNOBOL4 are not limited to sets of strings, but can represent a selection process.

3. The pattern-building process in SNOBOL4 eliminates the tops of a top-down specification, so it can give a simpler implementation scheme than the classical top-down method.

Tops here refers to current points and addresses. For example, the elements of the array (A+B)*(C+D+E) will be scanned 2x3 = 6 times in top-down method while the pattern method will perform the scanning only 2+3=5 times. Thus, the latter method has a shorter scanning time than the former.

4. The pattern-matching process does not follow most classical left recursive loops in scanning.
5. The scanner can detect at an early stage that a pattern will fail and then exists.

While nodes in binary trees may only have two subtrees, nodes in a tree may have an arbitrary number of subtrees. Considering binary representation of Polish notation, the example (P_1/P_2) & $(P_3/P_4/P_5)$ is shown in Figure 2.1 where "&" denotes the classical "and" and "/" is associated with the "or" for application of the retrieval programs. The pattern described in Figure 2.1 is not suitable for pattern matching. Figure 2.2 shows a path diagram to be converted into Figure 2.1 with notation of successor (solid) and alternate connections (dashed). If P_1 is successful, then

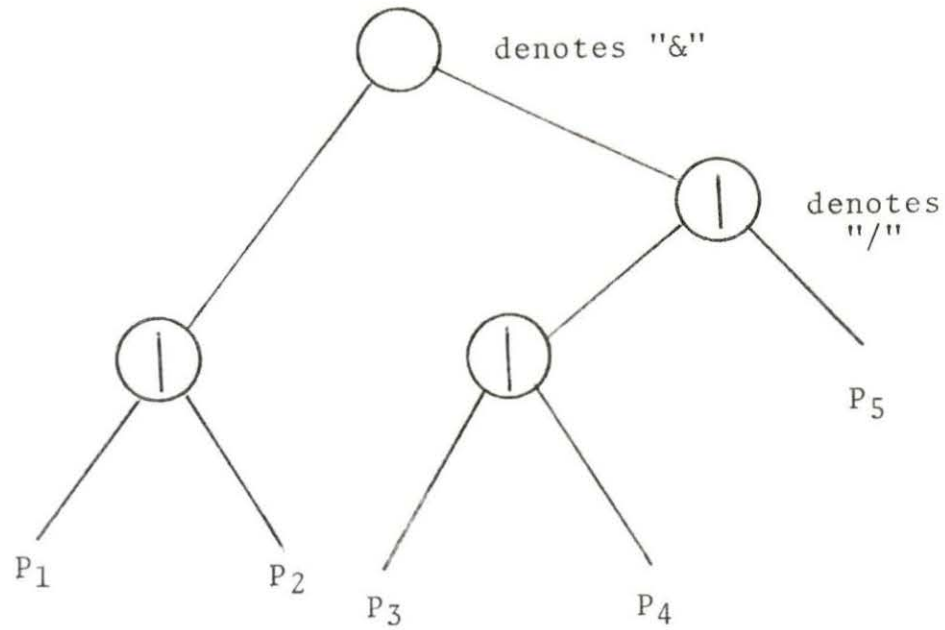

Figure 2.1. A tree corresponding to an expression "(P_1/P_2) & $(P_3/P_4/P_5)$"

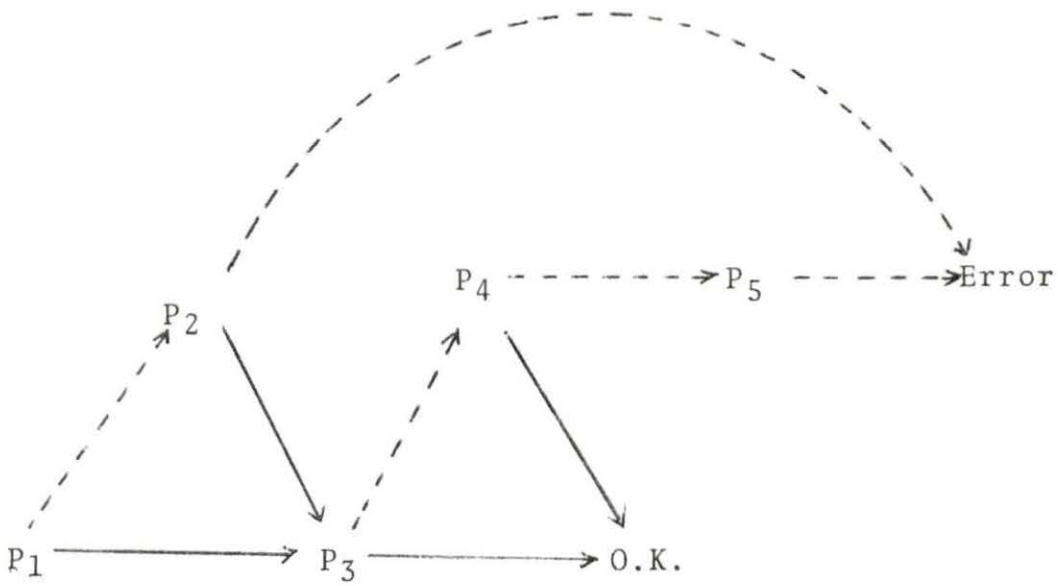

Figure 2.2. A path diagram corresponding to Figure 2.1

go to P_3 for matching, and if P_1 fails P_2 is tested as an alternate of P_1. Table 2.1 describes the same result given in Figure 2.2.

Table 2.1. Results of the path diagram of Figure 2.1

Variable	Successor Pointer	Alternate Pointer
P_1	P_3	P_2
P_2	P_3	Error
P_3	O.K.	P_4
P_4	O.K.	P_5
P_5	O.K.	Error

The stack is used as an information structure. Generally, the stack is characterized by last in-first out lists. This means that objects are put on and taken off a stack from the "top". There are usually two operations that are performed on a stack: "pushing" an object, that is, placing it on the top of the stack, and "popping" an object, that is, removing it from the top of the stack. For nested components, left and right parentheses are paired. A priority table for construction of the path diagram is given in Table 2.2. Normally, the values of the elements in the pattern are pushed onto the stack in pairs. An

algorithm which specifies the pattern construction is given in Table 2.3. The priority table can be used to

Table 2.2. A priority table to make a path diagram

Symbol	Stack	E (Infix Pattern)
)	0	-5
*	-2	-2
+	-3	-3
(	-4	-1
Empty or Zero	-6	0

convert from the infix form (e.g. A*(B+C)) to the postfix form (e.g. ABC+*). The algorithm given in Table 2.4 is employed to retrieve actual data using the built-in path diagram. PATHDGMS(J,1) refers to the successor pointer and PATHDGMS(J,2) refers to the alternate pointer.

The following example is simple, but enough to give information for better understanding of the application of the algorithm PATHDIAM in making a path diagram: Assume that the notation "+" means "OR" and "*" as a notation of "AND". Thus,

1. INFIX PATTERN
   A*(B+C)

2. POSTFIX PATTERN
   ABC+*

Table 2.3. Algorithm PATHDIAM

Step	Description
1	Establish tables, E for an infix pattern, D for a postfix pattern, STACK for a temporary storage, and PATHDGMS for a path diagram. Push 0 to the STACK and the PATHDGMS. Top = 1 and POINTER = 1
2	If E is empty, go to 5
3	If E(POINTER) is an operand, push it onto the D(POINTER) and go to 4 If E(POINTER) is an operator, compare priorities between STACK (TOP) and E(POINTER) according to Table 2.2 If the priority of STACK(TOP) < the priority of E(POINTER), push the operator to STACK(TOP), or else pop STACK(TOP) onto the D(POINTER)
4	POINTER = POINTER + 1 TOP = TOP + 1 Go to 2
5	Pop STACK(TOP) onto D(POINTER) If STACK is empty, go to 6 Else TOP = TOP - 1 and POINTER = POINTER + 1 Then go to 5
6	Push 0 to STACK
7	If D is empty, go to 10
8	If D(POINTER) is an operand, push it onto STACK(TOP) then go to 9 Else construct a pathdiagram 8.1 Calculate the last elements from STACK(TOP) with an operator from D(POINTER) 8.2 Push the result onto PATHDGMS
9	TOP = TOP - 1 POINTER = POINTER + 1 Go to 7
10	Exit

Table 2.4. Algorithm PDMATCH

Step	Description
1	Get the value P(C) for matching. Set J=1
2	If PATHDGMS(J,2) = 0 go to 5 C = PATHDGMS(J,2) J = C Go to 1
3	If PATHDGMS(J,1) = 0 go to 4 C = PATHDGMS(J,1) J = C go to 1
4	Retrieve data by the given C
5	Exit

3. Table 2.5 shows a path diagram developed by the previous algorithm. The table can be converted into Figure 2.3

Table 2.5. A path diagram corresponding to A*(B+C) where addresses 1, 2, and 3 are concerned with A, B and C, respectively

Address	Successor Pointer	Alternate Pointer	Argument for NOT
1	2	0	0
2	0	3	0
3	0	0	0

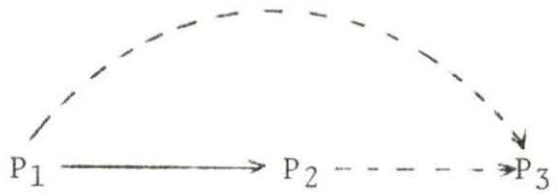

Figure 2.3. A path diagram shows the relation of A*(B+C) where P_1, P_2 and P_3 refer to A, B and C, respectively (the solid links mean the successor and the dotted line indicates the alternator)

The zeros in the successor pointer column indicate that the pattern match succeeds, while those from the alternate column mean failure. The argument column for "NOT" is used for the following condition: zeros indicate no "AND NOT" relation, but one's show that the "AND NOT" relation applies.

2.2. Hazard Plotting for Incomplete Data and Failure Data with Weibull Distribution

The term "hazard function" originated in the statistical analysis of instantaneous failure rate. This is the failure rate of a population at a specified time. The hazard function is defined by

$$h(x) = \frac{f(x)}{1-F(x)} \qquad (2\text{-}1)$$

where

$h(x)$ = hazard function,

$f(x)$ = probability density function,

$F(X)$ = cumulative distribution function, and

$R(x) = 1-F(x)$ = reliability at time X.

When the sample contains all the observations, the data are complete. If the sample consists of mixed phase of failed and unfailed units, the data are incomplete and are called censored. For singly censored data, the data have the same censoring time which is greater than the failure times. However, multiply censored data have different censoring time. Removal of units before loss or failure of units and data collection during operation are classified as multiplied censored data (19-21).

The Weibull distribution is defined by the three parameter function,

$$F(x) = 1-e^{-\left(\frac{x-\gamma}{\alpha}\right)^{\beta}}, \quad \alpha>0, \ \beta>0, \ x\geq\gamma\geq 0 \qquad (2\text{-}2)$$

where

α = scale parameter,

β = shape parameter, and

γ = location parameter.

Since γ is usually assumed to be zero,

$$F(x) = 1-e^{-(x/\alpha)^{\beta}}, \quad x \geq 0, \tag{2-3}$$

and the probability density function is

$$f(x) = \frac{d}{dx} F(x)$$

$$= \frac{\beta}{\alpha^{\beta}} x^{\beta-1} e^{-(x/\alpha)^{\beta}}, \quad x \geq 0. \tag{2-4}$$

The hazard function is obtained from Equation (2-1) and (2-2), that is

$$h(x) = \frac{\beta}{\alpha^{\beta}} x^{\beta-1}, \quad x \geq 0. \tag{2-5}$$

When $\beta=1$, the Weibull distribution becomes the exponential distribution and the failure rate is constant. According to the value of β the distribution is flexible to describe a decreasing or increasing failure-rate function. The Weibull distribution can be derived from the hazard rate concept or as the asymptotic distribution of the smallest order statistic from a specified distribution function.

The cumulative hazard function, H

$$H(x) = \int_0^t h(x)dx$$

$$= \int_0^t [\frac{d}{dx} (\frac{x}{\alpha})^{\beta}]dx = (\frac{x}{\alpha})^{\beta}, \quad x \geq 0. \tag{2-6}$$

The time to failure

$$x = \alpha H^{1/\beta}. \qquad (2\text{-}7)$$

Taking the logarithms of each side

$$\log x = (1/\beta) \log H + \log \alpha \qquad (2\text{-}8)$$

where

β = reciprocal to the slope, and

α = value corresponding to H=1.

2.3. Unavailability Estimation

The point unavailability is the probability that the component or system is down at a particular time, while interval unavailability is the ratio of downtime to some cycle time. The average point unavailability is equal to the interval unavailability when the following conditions prevail (2):

1. periodical testing,
2. random occurrence, and
3. repaired failures.

In the special case when β=1, the Weibull distribution reduces to the exponential distribution that is

$$F(x) = 1-e^{-\lambda x}$$

where

$\lambda = 1/\alpha$,

which applies to random error rates.

In this study, the above conditions are assumed to be applicable and that the probabilities of error and repair are exponentially distributed. The failure rate for a system is thus defined by

$$\lambda = \frac{n}{T} \tag{2-9}$$

where

λ = the system failure rate per hour,

n = the failure count,

T = Nt, (2-10)

N = number of applicable system, and

t = surveyed reactor years.

When the continuity of Poisson equation is considered, the two-sided confidence interval for λ at level $1-\alpha$ is

$$\frac{\lambda^h \chi^2_{\alpha/2(2n)}}{2n} \leq \lambda \leq \frac{\lambda^h \chi^2_{1-\alpha/2(2n+2)}}{2n} \tag{2-11}$$

where λ^h is the failure rate applied by continuity time.

The 90% confidence bounds on λ are

$$\frac{\lambda^h \chi^2_{0.05,2n}}{2n} \leq \lambda \leq \frac{\lambda^h \chi^2_{0.95,2n+2}}{2n} \tag{2-12}$$

The median for χ is

$$\lambda^{median} = \lambda^h \chi^2_{0.5,2n} \tag{2-13}$$

The unavailability q is

$$q = \frac{\text{time when system is bad}}{\text{time when system is bad + time when system is good}} \tag{2-14}$$

The cumulative failure probability Q is the probability that the system is not operated successfully for a time period t, thus

$$Q = 1-e^{-\lambda t} \simeq \lambda t, \ \lambda t < 0.1. \tag{2-15}$$

Usually this approximation is conservative.

From Equations (2-14) and (2-15)

$$q = \frac{<t> \int_0^T Q(t)dt}{\int_0^T t\, dt} = \frac{<t>\lambda T}{T}$$

$$\simeq \lambda <t> \tag{2-16}$$

where

$$<t> = \int_0^T tf(t)dt \tag{2-17}$$

and

$$f(t) = \lambda e^{-\lambda t}. \tag{2-18}$$

Thus,

$$<t> = \frac{T}{2}$$

and

$$q = \frac{\lambda T}{2} \tag{2-19}$$

The 90% confidence bounds on q per demand,

$$\frac{\lambda^h T \chi^2_{0.05,2n}}{4n} \leq q \leq \frac{\lambda^h T \chi^2_{0.95,2n+2}}{4n} \qquad (2\text{-}20)$$

3. PROCEDURE

The LER's that have occurred during the 18 year period from April, 1960 to December, 1977 are reviewed and summarized. The 12,004 events given in the LER's concerning occurrences at 65 commercial nuclear power plants are summarized in Table 3.1. The table summarizes the events in 25 BWR's, 39 PWR's, 64 LWR's and 1 HTGR between April, 1960 and December, 1977. Table 3.2 shows operator error ratio to total errors from GENCLASS and NSIC keyword system.

According to the NSIC keyword system 1,079 events or 9.1% are identified as caused by operator error, while 571 or 4.8% are manually classified as operator error by the GENCLASS. The difference is mainly in the definition of operator. Also, many events are stated as operator errors in the NSIC-LER's while after careful review they are discovered to be system errors.

In the GENCLASS operators include only operations staff: shift supervisor, senior control operator, control operator, equipment operator, and equipment attendant (22). But the NSIC classification includes both operations staff and technical staff. The pre-operation events listed in Table 3.3 occurred during construction and preoperational testing before operation began for the first electricity generation.

Tables 3.4, 3.5, and 3.6 show operator errors from the

Table 3.1. LER events reported between 1960 and 1977

	BWR	PWR	LWR	HTGR	TOTAL
1960-1971	442	286	728	0	728
1972-1977	5,688	5,381	11,069	207	11,276
TOTAL	6,130	5,667	11,797	207	12,004

Table 3.2. Operator errors from GENCLASS and NSIC keywords

Reactor Type	GENCLASS 1960-1971	GENCLASS 1972-1977	GENCLASS 1960-1977	NSIC Keyword 1960-1977
BWR	8 (1.8)[a]	213 (3.7)	240 (3.9)	476 (7.8)
PWR	27 (9.4)	323 (6.0)	331 (5.8)	603 (10.6)
LWR	35 (4.8)	536 (4.8)	571 (4.8)	1,079 (9.1)

[a]Percentage of errors to total events is given in parentheses.

Table 3.3. Operator errors retrieved by NSIC keywords during pre-operation and operation stages between 1960 and 1977

	Pre-operation	Operation	TOTAL
BWR	27	449	476
PWR	68	535	603
LWR	95	984	1,079
HTGR	9	5	14
TOTAL	104	989	1,093

Table 3.4. Operator errors for each plant (BWR)

No.	Facility	Total LERs 1960-1977	LERs 1960-1971	Operator Errors Classified by NSIC
1	Big Rock Point 1	232	40	13
2	Browns Ferry 1	231	0	8
3	Browns Ferry 2	109	0	4
4	Browns Ferry 3	68	0	3
5	Brunswick 1	87	0	6
6	Brunswick 2	431	0	37
7	Cooper Station	251	0	23
8	Dresden 1	189	47	16
9	Dresden 2	420	67	30
10	Dresden 3	301	25	19
11	Duane Arnold	369	0	43
12	Fitzpatrick	260	0	20
13	Hatch 1	306	0	35
14	Humboldt Bay	92	26	16
15	La Crosse	191	93	24
16	Millstone 1	272	47	18
17	Monticello	239	42	19
18	Nine Mile Point 1	183	14	15
19	Oyster Creek 1	275	31	17
20	Peach Bottom 2	352	0	18
21	Peach Bottom 3	297	0	14
22	Pilgrim 1	277	0	15
23	Quad Cities 1	237	4	25
24	Quad Cities 2	238	2	19
25	Vermont Yankee 1	223	4	19

Table 3.5. Operator errors for HTGR

No.	Facility	Total LERs 1960-1977	LERs 1960-1971	Operator Errors Classified by NSIC
1	Fort St. Vrain	207	0	14

Table 3.6. Operator errors for each plant (PWR)

No.	Facility	Total LERs 1960-1977	LERs 1960-1971	Operator Errors Classified by NSIC
1	Arkansas 1	160	0	10
2	Beaver Valley 1	61	0	5
3	Calvert Cliffs 1	261	0	29
4	Calvert Cliffs 2	114	0	8
5	Cook 1	208	0	21
6	Crystal River 3	136	0	19
7	Davis-Besse 1	147	0	17
8	Farley 1	58	0	6
9	Fort Calhoun 1	188	0	13
10	Ginna	141	17	7
11	Haddam Neck	162	64	9
12	Indian Point 1	117	43	13
13	Indian Point 2	173	3	24
14	Indian Point 3	69	0	2
15	Kewaunee	134	0	22
16	Maine Yankee	92	0	11
17	Millstone 2	172	0	10
18	Oconee 1	174	1	31
19	Oconee 2	151	0	29
20	Oconee 3	116	0	10
21	Palisades	234	22	22
22	Point Beach 1	108	11	17
23	Point Beach 2	80	0	9
24	Prairie Island 1	175	0	16
25	Prairie Island 2	120	0	6
26	Rancho Seco 1	96	0	11
27	Robinson 2	186	16	27
28	Salem 1	97	0	12
29	San Onofre 1	109	43	5
30	St. Lucie 1	124	0	10
31	Surry 1	186	1	22
32	Surry 2	130	0	12
33	Three Mile Island 1	241	0	32
34	Trojan	114	0	19
35	Turkey Point 3	91	3	9
36	Turkey Point 4	77	1	6
37	Yankee-Rowe 1	174	61	12
38	Zion 1	261	0	33
39	Zion 2	230	0	27

total reported events of each power plant for BWR's, HTGR, and PWR's, respectively. The averaged failure rates are given in Table 3.7 for pumps, piping, and valves. The results show that the average failure rates during operation by NSIC keyword system are smaller by the order of 10^{-2} than those from WASH-1400.

The averaged failure rate, λ_s, is

$$\lambda_s = \frac{n_f}{N_p N_c T} \qquad (3\text{-}1)$$

where

n_f = number of failures observed

N_p = number of plants

N_c = average number of components per plant

T = observed time period (it is assumed that one year equals to 8,760 hours)

The number N_c was obtained from Table III 3-3, Appendix III, in (2).

Table 3.8 shows the average demand probabilities using the NSIC keyword system. Those have the same order of magnitude as the results obtained in WASH-1400. The demand probabilities, Q_d, can be obtained from

$$Q_d = \frac{n_f}{N_p N_c N_t} \qquad (3\text{-}2)$$

where N_t is the average number of demand performed per

Table 3.7. Averaged failure rates during operation for the data classified by NSIC keywords between 1972 and 1977

Component	PWR			
	T(hr)	$N_p N_c$	n_f	λ_s/hr
Pumps	1.3×10^6	2.0×10^3	84	3.2×10^{-8} (1.0×10^{-6})[a]
Piping[b]	1.3×10^6	1.4×10^6	99	5.4×10^{-11} (1.0×10^{-9})
Valves	1.3×10^6	1.1×10^4	276	1.9×10^{-8} (1.0×10^{-6})

[a] Figures in parentheses are results from Table III 3-3, Appendix III, WASH-1400 (2).

[b] Failure rate given in units of per hour per foot.

BWR				LWR			
T	$N_p N_c$	n_f	λ_s/hr	T	$N_p N_c$	n_f	λ_s/hr
1.0×10^{6}	1.3×10^{3}	48	3.7×10^{-8} (3.0×10^{-6})	1.2×10^{6}	3.3×10^{3}	132	3.3×10^{-8} (3.0×10^{-6})
1.0×10^{6}	8.8×10^{5}	78	8.9×10^{-11} (3.0×10^{-9})	1.2×10^{6}	2.3×10^{6}	117	6.4×10^{-11} (1.0×10^{-9})
1.0×10^{6}	4.1×10^{3}	235	5.7×10^{-8} (3.0×10^{-6})	1.2×10^{6}	1.5×10^{4}	511	2.8×10^{-8} (3.0×10^{-6})

Table 3.8. Averaged demand probabilities for the data classified by NSIC keywords between 1972 and 1977

Component	PWR				BWR				LWR			
	n_f	$N_p N_c$	N_t	Q_d	n_f	$N_p N_c$	N_t	Q_d	n_f	$N_p N_c$	N_t	Q_d
Pumps	84	2.0×10^3	12	3.5×10^{-3} (1.0×10^{-3})[a]	48	1.3×10^3	12	3.1×10^{-3} (3.0×10^{-3})	132	3.3×10^3	12	3.3×10^{-3} (1.0×10^{-3})
Valves	276	1.1×10^4	12	2.1×10^{-3} (1.0×10^{-3})	235	4.1×10^3	12	4.8×10^{-3} (3.0×10^{-3})	511	1.5×10^4	12	2.8×10^{-3} (1.0×10^{-3})

[a]Figures in parentheses are results from Table III 3-4, Appendix III, WASH-1400 (2).

component per year.

Table 3.9 presents the events caused by hardware and human errors, retrieved by the NSIC keyword system, in LWR's during the 6 year period from 1972 to 1977. The abnormal occurrences in the valves, pipes, and pumps caused by human errors represent 49.2% of all events involving those components. Human errors include operator errors, test and maintenance erors, installation errors, administrative errors, and fabrication errors. Sometimes one event is classified by more than two keywords. The double column includes such a situation for human errors. Tables 3.10 and 3.11 present the corresponding data for BWR and PWR, respectively. Human errors correspond to 51.2% for BWR's and 55.7% for PWR's of all events.

The errors related to the systems are ranked by reactor-type in Tables 3.12, 3.13 and 3.14. Events related to the emergency core cooling system (ECCS) are the most frequently reported in both PWR's and BWR's. Tables 3.15, 3.16 and 3.17 present detailed operator errors related to system and component location, classified manually by the GENCLASS between 1960 and 1977, for LWR's, BWR's and PWR's, respectively. The system and component location code can be referred to the detailed GENCLASS description given in Chapter 4.

Table 3.9. Hardware and human errors by the NSIC keywords for the period 1972-1977 for components in LWR

Component	Unknown[a]	Hard-ware	Common Mode	Test & Mainte-nance	Design	Instal-lation	Admin-istra-tive	Fabri-cation	Operator	Double	Human Net Total	TOTAL
Valves	54(56)	191	1	126	48	21(22)	36	24	39	29	265 (266)	511 (514)
Pipes	44	29	0	25	39	35	7	6	5	13	104	177
Pumps	16	44	0	26	23	5(6)	10	7	8	7	72 (73)	132 (133)
Switches	9(10)	31	0	21	7	2	2	3	3	2	36	76 (77)
Relays	2	30(31)	0	27	9(10)	0	5	1	0	2	40 (41)	72 (74)
Welds	16	3	0	3	9	14	2	4(5)	0	5	27 (28)	46 (47)
Motors	6	11	0	3	5	2	1	1	1	1	12	29
Batteries & Changers	0	1	0	9	0	1	7	0	2	6	13	14
Circuit Closers	3	4	0	3	4	1	0	0	0	0	8	15
Solid State Devices	3	1	0	1	1	0	0	0	0	1	1	5
Trans-formers	0	5	0	1	2	0	0	0	1	0	4	9
TOTAL	153 (156)	350 (351)	1	245	147 (148)	81 (83)	70	46 (47)	59	66	582 (586)	1086 (1094)

[a]Between 1972-1977, ( ) for 1960-1977.

Table 3.10. Hardware and human errors by the NSIC keywords for the period 1972-1977 for components in BWR

Component	Unknown[a]	Hard-ware	Common Mode	Test & Mainte-nance	Design	Instal-lation	Admin-istra-tive	Fabri-cation	Operator	Double	Human Net Total	TOTAL
Valves	28(30)	93	1	51	24	12	12	13	10	9	113	235 (237)
Pipes	14	17	0	18	15	14	1	4	3	8	47	78
Pumps	6	17	0	10	6	1	5	3	2	2	25	48
Switches	4(5)	20	0	11	3	2	0	2	3	1	20	44 (45)
Relays	0	6	0	8	3	0	3	0	0	1	13	19
Motors	1	9	0	1	4	2	0	0	1	0	8	18
Welds	3	1	0	3	2	4	0	1	0	3	7	11
Trans-formers	0	4	0	1	1	0	0	0	1	0	3	7
Batteries & Chargers	0	1	0	4	0	0	3	0	1	3	5	6
Circuit Closers	1	1	0	1	2	1	0	0	0	0	4	6
Solid State Devices	0	1	0	0	0	0	0	0	0	0	0	1
TOTAL	57 (60)	170	1	108	60	36	24	23	21	27	245	473 (476)

[a]Between 1972-1977, ( ) for 1960-1977.

Table 3.11. Hardware and human errors by NSIC keywords for the period 1972-1977 for components in PWR

Component	Unknown[a]	Hard-ware	Test & Mainte-nance	Design	Instal-lation	Admin-istra-tive	Fabri-cation	Operator	Double	Human Net Total	TOTAL
Valves	26	98	75	24	9(10)	24	11	29	20	152 (153)	276 (277)
Pipes	30	12	7	24	21	6	2	2	5	57 (48)	99 (85)
Pumps	10	27	16	17	4(5)	5	4	6	5	47 (28)	84 (55)
Relays	2	24(25)	19	6(7)	0	2	1	0	1	27 (21)	53 (36)
Welds	13	2	0	7	10	2	3(4)	0	2	20	35
Switches	5	11	10	4	0	2	1	0	1	16	32
Motors	5	2	2	1	0	1	1	0	1	4	11
Batteries & Chargers	0	0	5	0	1	4	0	1	3	8	8
Circuit Closers	2	3	2	2	0	0	0	0	0	4	9
Solid State Devices	3	0	1	1	0	0	0	0	1	1	4
Trans-formers	0	1	0	1	0	0	0	0	0	1	2
TOTAL	96	180 (181)	137	87 (88)	45 (47)	46	23 (24)	38	39	337 (341)	613 (618)

[a]Between 1972-1977, ( ) for 1960-1977.

Table 3.12. Ranking order for operator errors related with system in LWR for the data classified by GENCLASS between 1960 and 1977

Ranking Order	Classified System Code	Systems (events)
1	036	ECCS (80)
2	002	Reactivity Control Systems (62)
3	101	Liquid Radioactivity Waste Management Systems (56)
4	073	Reactor Containment Systems (31)
5	052	AC Onsite Power System & Controls (30)
6	012	Coolant Recirculation Systems & Controls (24)
7	102	Gaseous Radioactive Waste Management (23)
8	034	Cont. Isolation System & Controls (21)
9	042	Engineered Safety Feature Instrument Systems (18)
10	200	No Specified Systems (17)

Table 3.13. Ranking order for operator errors related to systems in PWR for the data classified by GENCLASS between 1960 and 1977

Ranking Order	Classified System Code	Systems (events)
1	036	Emergency Core Cooling System (36)
2	002	Reactivity Control Systems (32)
3	073	Chemical, Volume Control & Liquid Poison Systems & Controls (27)
4	101	Liquid Radioactive Waste Management Systems (24)
5	052	AC Onsite Power Systems & Controls (20)
6	012	Coolant Recirculation Systems & Controls (14)
7	034	Cont. Isolation Systems & Controls (13)
8	032	Cont. Heat Removal Systems & Controls (13)
9	102	Gaseous Radioactive Waste Management Systems (11)
10	083	Demineralized Water Make-up System and Controls (11)

Table 3.14. Ranking order for operator errors related with system in BWR for the data classified by GENCLASS between 1960 and 1977

Ranking Order	Classified System Code	Systems (events)
1	036	Emergency Core Cooling System (44)
2	101	Liquid Radioactive Waste Management Systems (32)
3	002	Reactivity Controls Systems (30)
4	102	Gaseous Radioactive Waste Management Systems (12)
5	042	Engineered Safety Feature Instrument Systems (11)
6	052	AC Onsite Power Systems & Controls (10)
7	012	Coolant Recirculation Systems & Controls (10)
8	041	Reactor Trip Systems (10)
9	200	No Specified Systems (9)
10	034	Cont. Isolation Systems & Controls (8)

Table 3.15. Operator errors related to system and component location, classified manually by the GENCLASS for LWR between 1960 and 1977

s/c† [a] / year [b]	1960	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	TOTAL
036	0	1	0	1	2	3	6	15	18	20	14	80
002	0	0	0	0	1	0	5	14	16	13	13	62
101	0	0	0	1	5	4	7	9	14	8	8	56
073	0	0	0	0	0	1	6	4	10	3	7	31
052	0	1	0	1	2	0	2	3	5	7	9	30
012	0	0	0	0	0	3	1	6	5	3	6	24
102	0	0	0	1	0	2	2	3	7	2	6	23
034	0	0	0	0	1	0	0	7	3	5	5	21
042	0	0	0	0	1	1	1	5	4	3	3	18
200	0	0	0	1	0	1	1	4	5	3	2	17
041	0	0	0	0	4	1	1	2	2	3	3	16
083	0	0	0	0	0	0	0	3	4	3	4	14
017	0	1	1	0	0	2	1	2	1	2	4	14
015	0	0	0	0	0	0	1	1	2	2	7	13
032	0	0	0	0	0	0	4	2	3	1	3	13
027	0	0	0	0	0	0	1	0	2	4	5	12
047	0	0	0	0	0	0	1	2	1	4	3	11

[a] s/c† System/component location code by the GENCLASS.

[b] Report year.

Table 3.15 (Continued)

s/c† [a] / year [b]	1960	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	TOTAL
056	0	0	0	0	0	0	3	1	0	2	2	8
113	0	0	0	0	0	0	0	3	1	1	3	8
071	0	0	0	0	2	0	0	1	1	1	1	6
016	0	0	0	0	0	1	1	2	1	0	1	6
044	1	0	0	1	0	0	1	1	1	0	0	5
087	0	0	0	0	0	0	1	0	1	0	3	5
035	0	0	0	0	0	0	0	1	3	1	0	5
038	0	0	0	0	0	1	1	0	2	0	1	5
053	0	0	0	0	1	1	1	0	2	0	0	5
028	0	0	0	0	0	1	0	2	1	1	0	5
081	0	0	0	0	0	0	0	0	1	0	4	5
045	0	0	0	0	0	0	0	1	1	2	0	4
014	0	0	0	2	1	0	0	0	0	0	1	4
046	0	0	0	0	0	1	0	1	1	0	1	4
013	0	0	0	0	0	2	0	0	0	2	0	4
082	0	0	0	0	0	0	1	0	0	0	3	4
001	0	0	0	0	0	1	0	1	0	0	1	3
111	0	0	0	0	0	0	0	0	0	0	3	3
103	0	0	0	0	0	0	0	0	0	1	1	2
104	0	0	0	0	0	0	0	0	1	1	0	2
029	0	0	0	0	0	0	0	0	0	0	2	2
021	0	0	0	1	1	0	0	0	0	0	0	2
031	0	0	0	0	0	0	0	1	0	1	0	2
091	0	0	0	0	0	0	0	1	1	0	0	2
064	0	0	0	0	0	0	0	0	1	1	0	2
051	0	0	0	0	0	0	0	0	0	0	2	2
003	0	0	0	0	0	0	0	0	1	0	0	1
023	0	0	0	0	0	0	1	0	0	0	0	1
011	0	0	0	0	0	0	1	0	0	0	0	1
072	0	0	0	0	0	0	0	0	1	0	0	1
018	0	0	0	0	0	0	0	0	1	0	0	1
085	0	0	0	0	0	0	0	0	1	0	0	1
086	0	0	0	0	0	0	0	0	0	1	0	1
063	0	0	0	0	0	0	0	0	0	1	0	1
022	0	0	0	0	0	0	0	0	0	0	1	1
112	0	0	0	0	0	0	0	0	0	0	1	1
109	0	0	0	0	0	0	0	0	0	0	1	1
SUB-TOTAL	1	3	1	9	21	26	51	98	125	102	134	571
											(HTGR) [c]	9
TOTAL												580

[c] LER events for HTGR.

Table 3.16. Operator errors related to system and component location, classified manually by the GENCLASS for BWR between 1960 and 1977

s/c† [a] / year [b]	1960	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	TOTAL
036	0	1	0	1	1	2	2	8	9	14	6	44
101	0	0	0	1	4	2	6	6	5	4	4	32
002	0	0	0	0	0	0	4	10	7	6	3	30
102	0	0	0	1	0	2	1	0	4	1	3	12
042	0	0	0	0	1	1	0	4	1	3	1	11
052	0	0	0	0	2	0	1	1	2	2	2	10
012	0	0	0	0	0	2	1	1	2	1	3	10
041	0	0	0	0	4	1	1	2	0	2	0	10
200	0	0	0	1	0	0	1	3	2	1	1	9
034	0	0	0	0	0	0	0	1	1	2	4	8
047	0	0	0	0	0	0	1	1	0	3	2	7
017	0	1	1	0	0	2	0	0	1	0	1	6
035	0	0	0	0	0	0	0	1	3	1	0	5
073	0	0	0	0	0	0	2	1	0	1	0	4
083	0	0	0	0	0	0	0	0	3	0	0	3
027	0	0	0	0	0	0	1	0	1	1	0	3
044	1	0	0	0	0	0	1	1	0	0	0	3
053	0	0	0	0	0	1	1	0	1	0	0	3
045	0	0	0	0	0	0	0	1	1	1	0	3
014	0	0	0	2	1	0	0	0	0	0	0	3
015	0	0	0	0	0	0	1	0	0	1	0	2
071	0	0	0	0	2	0	0	0	0	0	0	2
038	0	0	0	0	0	1	0	0	0	0	1	2
013	0	0	0	0	0	1	0	0	0	1	0	2
001	0	0	0	0	0	0	0	1	0	0	1	2
111	0	0	0	0	0	0	0	0	0	0	2	2
103	0	0	0	0	0	0	0	0	0	1	1	2
021	0	0	0	1	1	0	0	0	0	0	0	2
056	0	0	0	0	0	0	0	1	0	0	0	1
113	0	0	0	0	0	0	0	0	0	0	1	1
087	0	0	0	0	0	0	1	0	0	0	0	1
016	0	0	0	0	0	1	0	0	0	0	0	1
046	0	0	0	0	0	1	0	0	0	0	0	1
104	0	0	0	0	0	0	0	0	0	1	0	1
003	0	0	0	0	0	0	0	0	1	0	0	1
072	0	0	0	0	0	0	0	0	1	0	0	1
SUB-TOTAL	1	2	1	7	16	17	25	43	45	47	36	240

[a] s/c† System/component location code by the GENCLASS.

[b] Report year.

Table 3.17. Operator errors related to system and component location, classified manually by the GENCLASS for PWR between 1968 and 1977

s/c† [a] / year [b]	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	TOTAL
036	0	0	0	1	1	4	7	9	6	8	36
002	0	0	0	1	0	1	4	9	7	10	32
073	0	0	0	0	1	4	3	10	2	7	27
101	0	0	0	1	2	1	3	9	4	4	24
052	1	0	1	0	0	1	2	3	5	7	20
012	0	0	0	0	1	0	5	3	2	3	14
034	0	0	0	1	0	0	6	2	3	1	13
032	0	0	0	0	0	4	2	3	1	3	13
102	0	0	0	0	0	1	3	3	1	3	11
083	0	0	0	0	0	0	3	1	3	4	11
015	0	0	0	0	0	0	1	2	1	7	11
027	0	0	0	0	0	0	0	1	3	5	9
200	0	0	0	0	1	0	1	3	2	1	8
017	0	0	0	0	0	1	2	0	2	3	8
042	0	0	0	0	0	1	1	3	0	2	7
113	0	0	0	0	0	0	3	1	1	2	7
056	0	0	0	0	0	3	0	0	2	2	7
041	0	0	0	0	0	0	0	2	1	3	6
028	0	0	0	0	1	0	2	1	1	0	5
081	0	0	0	0	0	0	0	1	0	4	5
016	0	0	0	0	0	1	2	1	0	1	5
047	0	0	0	0	0	0	1	1	1	1	4
071	0	0	0	0	0	0	1	1	1	1	4
082	0	0	0	0	0	1	0	0	0	3	4
087	0	0	0	0	0	0	0	1	0	3	4
038	0	0	0	0	0	1	0	2	0	0	3
046	0	0	0	0	0	0	1	1	0	1	3
044	0	0	1	0	0	0	0	1	0	0	2
053	0	0	0	1	0	0	0	1	0	0	2
013	0	0	0	0	1	0	0	0	1	0	2
031	0	0	0	0	0	0	1	0	1	0	2
091	0	0	0	0	0	0	1	1	0	0	2
064	0	0	0	0	0	0	0	1	1	0	2
029	0	0	0	0	0	0	0	0	0	2	2
051	0	0	0	0	0	0	0	0	0	2	2

[a] s/c† System/component location code by the GENCLASS.

[b] Report year.

Table 3.17 (Continued)

s/c† [a] / year [b]	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	TOTAL
045	0	0	0	0	0	0	0	0	1	0	1
014	0	0	0	0	0	0	0	0	0	1	1
001	0	0	0	0	0	0	0	0	0	0	1
111	0	0	0	0	0	0	0	0	0	1	1
104	0	0	0	0	0	0	0	1	0	0	1
011	0	0	0	0	0	1	0	0	0	0	1
018	0	0	0	0	0	0	0	1	0	0	1
022	0	0	0	0	0	0	0	0	0	1	1
063	0	0	0	0	0	0	0	0	1	0	1
085	0	0	0	0	0	0	0	1	0	0	1
086	0	0	0	0	0	0	0	0	1	0	1
109	0	0	0	0	0	0	0	0	0	1	1
112	0	0	0	0	0	0	0	0	0	1	1
SUB-TOTAL	1	0	2	5	9	26	55	80	55	98	331

Table 3.18 lists the outages caused by operators in all nuclear power plants. The events caused by operators show that the most frequent occurrence is during refueling in the scheduled condition. The LER records which are difficult to classify by GENCLASS occupy 79.8% of the total outage events. The difficulty of classification is due to the lack of information. Table 3.19 shows the ratios for the unidentified outages caused by operators. Those are 81.7% for BWR's, 79.5% for PWR's, and 44.4% for HTGR. Table 3.20 presents the outage events during refueling for each reactor-type.

The outage events during testing and which have been caused by operators are shown in Table 3.21. The significant

Table 3.18. Outages caused by operators according to GENCLASS for the period 1960-1977 for all nuclear power plants

Causes	Number of Events Counted				
	BWR	PWR	LWR	HTGR	TOTAL
N/A	196	263	459	4	463
Scheduled					
Refueling	12	16	28	0	28
Testing	11	3	14	0	14
Preventive maintenance	2	2	4	0	4
Inspection	1	0	1	0	1
Forced					
Repair of failed equipment	0	1	1	0	1
Inspection abnormal condition	1	0	1	0	1
Operator (no failures)	0	1	1	0	1
Others	1	1	2	0	2
Idle					
Others	0	1	1	0	1
Outages Others	16	43	59	5	64
SUBTOTAL	240	331	571	9	580

Table 3.19. Unidentified outages caused by operators on GENCLASS for all nuclear power plants between 1960 and 1977

Year	Reactor Type				TOTAL
	BWR	PWR	LWR	HTGR	
1968	2	1	3	0	3
1969	1	0	1	0	1
1970	7	1	8	0	8
1971	14	4	18	0	18
1972	16	8	24	0	24
1973	20	23	43	0	43
1974	34	36	70	1	71

Table 3.19 (Continued)

Year	Reactor Type				TOTAL
	BWR	PWR	LWR	HTGR	
1975	37	71	108	1	109
1976	34	40	74	1	75
1977	31	79	110	1	111
SUBTOTAL	196	263	459	4	463

Table 3.20. Outage events caused by operators during refueling according to GENCLASS for all nuclear power plants between 1960 and 1977

Year	Reactor Type		
	BWR	PWR	LWR
1970	0	0	0
1971	0	0	0
1972	0	0	0
1973	1	1	2
1974	1	1	2
1975	3	2	5
1976	5	5	10
1977	2	7	9
SUBTOTAL	12	16	28

Table 3.21. Outage events caused by operators during testing on GENCLASS for all nuclear power plants between 1960 and 1977

Year	REACTOR TYPE		
	BWR	PWR	LWR
1960	1	0	1
1970	0	0	0
1971	0	0	0
1972	0	0	0
1973	2	0	2
1974	4	1	5
1975	1	0	1
1976	3	1	4
1977	0	1	1
SUBTOTAL	11	3	14

of equipment or system failure and no failure can be observed from Table 3.22.

The ratios of significant failures to all failures caused by operators are as follows: 12.1%, 16.0%, and 14.4% for BWR's, PWR's, and LWR's, respectively. Those ratios are obtained from 140, 331, and 571 events caused by operators between 1960 and 1977 for BWR's, PWR's, and LWR's, respectively (Table 3.23).

Omission events are higher by 11.8% of all errors caused by operators than commission events. Table 3.24 shows a difference of 9.2%, 13.6%, 11.8% and 11.2% between the ratios of omission and commission errors to total human errors, for BWR's, PWR's, LWR's, and HGTR, respectively. In all cases omission ratio is higher than commission ratio.

Table 3.22. Equipment or system failure caused by operator error and significance for all power plants during 1960-1977

Year	Consequent Failure								
	BWR			PWR			LWR		
	Insig.[a]	Pot. Sig.[b]	Sig.[c]	Insig.[a]	Pot. Sig.[b]	Sig.[c]	Insig.[a]	Pot. Sig.[b]	Sig.[c]
1960	0	0	0	0	0	0	0	0	0
1968	0	0	1	0	0	0	0	0	1
1969	0	0	1	0	0	0	0	0	1
1970	0	0	2	0	1	0	0	1	2
1971	0	2	7	0	1	1	0	3	8
1972	0	4	3	0	0	1	0	4	4
1973	0	2	2	0	6	1	0	8	3
1974	0	6	3	0	11	4	0	17	7
1975	0	6	1	0	9	4	0	15	5
1976	0	7	2	2	12	1	2	19	3
1977	0	2	0	0	13	4	0	15	4
SUBTOTAL	0	29	22	2	53	16	2	82	38

[a]Insignificant.

[b]Potentially significant.

[c]Significant.

Consequent No Failure								
BWR			PWR			LWR		
Insig.[a]	Pot. Sig.[b]	Sig.[c]	Insig.[a]	Pot. Sig.[b]	Sig.[c]	Insig.[a]	Pot. Sig.[b]	Sig.[c]
1	0	0	0	0	0	1	0	0
0	0	1	1	0	0	1	0	1
0	0	0	0	0	0	0	0	0
0	5	0	1	0	0	1	5	0
0	7	0	0	3	0	0	10	0
0	10	0	2	6	0	2	16	0
1	20	0	0	17	2	1	37	2
2	31	1	2	36	2	4	67	3
1	37	0	1	63	3	2	100	3
0	37	1	0	40	0	0	77	1
0	30	1	3	80	1	3	110	2
5	177	4	110	245	8	15	422	12

Table 3.23. Human error type according to GENCLASS for all power plants between 1960 and 1977

	Reactor Type				TOTAL
	BWR	PWR	LWR	HTGR	
Omission	131	188	319	5	324
Commission	109	143	252	4	256
SUBTOTAL	240	331	571	9	580

Table 3.24. Ratio of human error type to all human errors according to GENCLASS for all reactor types between 1960 and 1977

	Reactor Type				TOTAL
	BWR	PWR	LWR	HGTR	
Omission	0.546	0.568	0.559	0.556	0.559
Commission	0.454	0.432	0.441	0.444	0.441

4. CLASSIFICATION

A General Event Classification System (GENCLASS) was developed by the Engineering Research Institute Safety Research Group (ERI-SRG) to provide a means for computer quantification of LER records. The LER's were reviewed in (5, 22, 23, 24, and 25) and events were coded using GENCLASS to test the compatibility of the classification system with the reporting system. In fact, GENCLASS has been developed through an iterative process in an attempt to provide a standard format for gathering error population relevant to safety system, availabiltiy as well as plant operation performance. However, a new generic operation problem may surface for which there is no explicit account in GENCLASS. In this case, the classification system may be modified if the problem is expected to occur frequently enough to warrant the change. A special simple classification may be also developed to supplement GENCLASS and to record unanticipated events (25). The comments section in the coding sheet (Figure 4.1) plays a role in recording such events for further consideration. The input data recording sheet is shown on Figure 4.1. The detailed classification in Figure 4.2 includes group numbers, items, and description.

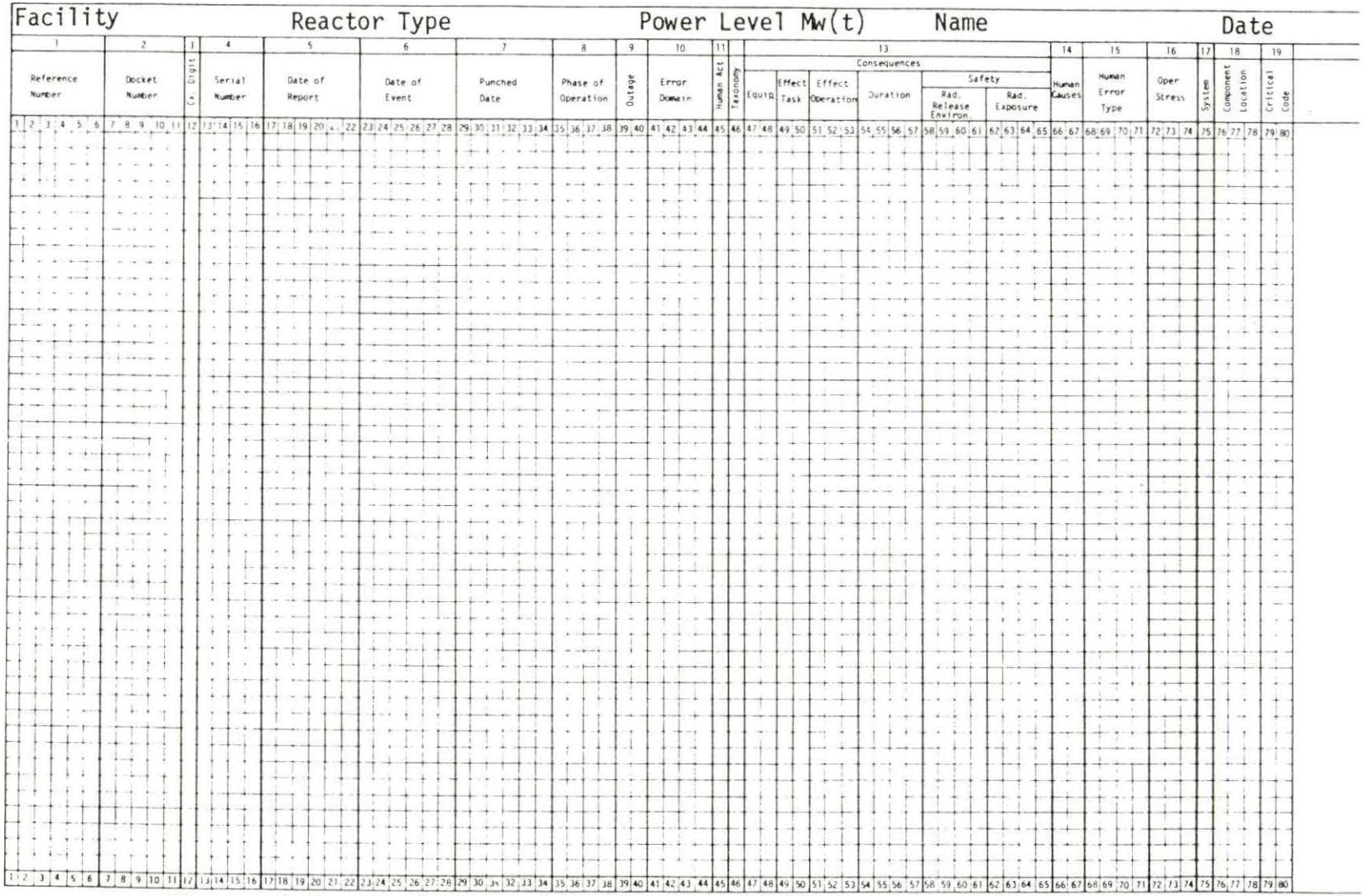

Figure 4.1. Worksheet for recording events for GENCLASS (25)

```
****GENCLASS****

1.REFERENCE NUMBER (6 DIGITS) LER REPORT NUMBER

2.PLANT DOCKET NUMBER (5 DIGITS)

3.CHECK DIGIT (1 DIGIT) ACTS AS A DOUBLE CHECK AGAINST THE
                        DOCKET NUMBER FOR THE RETRIEVAL SYSTEM

4.SERIAL NUMBER (4 DIGITS) IDENTIFICATION NUMBER

5.DATE OF REPORT (6 DIGITS)

6.DATE OF EVENT (6 DIGITS)

7.PUNCHED DATE (6DIGITS) DATE THAT CLASSIFICATION INFORMATION
                         IS INPUT INTO RETRIEVAL SYSTEM

8.PHASE OF OPERATION (4 DIGITS)
   0000-UNSTATED
   1000-NORMAL OPERATION
       1100-RATED(DESIGN ELECTRICAL RATING)
       1200-ALLOWED(MAXIMUM DEPENDABLE CAPACITY)
       1300-DERATED
   2000-CHANGE IN POWER/DYNAMIC OPERATION
       2100-ASCENSION
           2110-RATED
           2120-ALLOWED
           2130-DERATED
       2200-DESCENSION
           2210-DERATING
           2220-SHUTDOWN
               2221-UNSTATED
               2222-MANUAL(NORMAL)
               2223-AUTOMATIC
           2230-EMERGENCY/ABNORMAL
               2231-UNSTATED
               2232-MANUAL SCRAM
               2233-AUTOMATIC SCRAM
   3000-SURVEILLANCE TESTING
       3100-NORMAL
       3200-DYNAMIC
   4000-CONSTRUCTION AND PREOPERATION TESTING
   5000-STANDBY
   6000-REFUELING
   7000-MAINTENANCE
```

Figure 4.2. GENCLASS (25)

```
   8000-INSPECTION
   9000-SURVEILLANCE TESTING


9.OUTAGE (2 DIGITS)
   00-N/A
   10-SCHEDULED
        11-INSPECTION
        12-PREVENTIVE MAINTENANCE
        13-REFUELING
        14-TESTING
        15-OPERATOR TRAINING/LICENSE TESTS
        16-OTHERS
   20-OFF-SCHEDULE/FORCED
        21-NRC REVIEW
        22-REPAIR FAILED EQUIPMENT
        23-INSPECTION ABNORMAL CONDITIONS
        24-OPERATOR (NO FAILURE)
        25-OTHERS
   30-IDLE
        31-ADMINSTRATIVE DECISION
        32-OPERATOR ERROR(NO FAILURE)
        33-NRC DECISION
        34-OTHERS
   40-OUTAGE OTHER


10.ERROR DOMAIN (4 DIGITS)
   0000-UNSTATED/UNKNOWN
   1000-HUMAN ERROR
        1100-DESIGN
        1200-FABRICATION/CONSTRUCTION
        1300-INSTALLATION/WELDING
        1400-INSPECTION
        1500-MAINTENANCE
        1600-ADMINISTRATION
        1700-MONITORING
        1800-OPERATION
        1900-OTHERS
   2000-SYSTEM FAILURE
        2100-DESIGN
        2200-FABRICATION/CONSTRUCTION
        2300-INSTALLATION/WELDING
        2400-INSPECTION
        2500-MAINTENANCE
        2600-PROCEDURE
```

Figure 4.2 (Continued)

```
     2700-OTHERS
3000-HUMAN ERROR COMBINATION
     3100-DESIGN/FABRICATION
          3105-COMMUNICATION
     3110-FABRICATION/INSTALLATION
          3115-COMMUNICATION
     3120-INSPECTION/FABRICATION
          3125-COMMUNICATION
     3130-INSPECTION/INSTALLATION
          3135-COMMUNICATION
     3140-INSPECTION/MAINTENANCE
          3145-COMMUNICATION
     3150-MAINTENANCE/FABRICATION
          3155-COMMUNICATION
     3160-MAINTENANCE/INSTALLATION
          3165-COMMUNICATION
     3170-MAINTENANCE/ADMINISTRATION
          3175-COMMUNICATION
     3180-MAINTENANCE/MONITORING
          3185-COMMUNICATION
     3190-MAINTENANCE/OPERATION
          3195-COMMUNICATION
     3200-ADMINISTRATION/OPERATION
          3205-COMMUNICATION
     3210-OPERATION/INSPECTION
          3215-COMMUNICATION
     3220-OPERATION/MONITORING
          3225-COMMUNICATION


11.MODE OF HUMAN ERROR (1 DIGIT)
   0-UNIDENTIFIED OR N/A
   1-SYSTEMATIC (IMPLIES AN ACT BEING PERFORMED CONSISTENTLY
                 THE SAME, OR METHODICALLY)
   2-RANDOM (PERFORMANCE WITHOUT DELIBERATION, OR THE LACK OF
             A DEFINITE AIM)
   3-SPORADIC (OCCASIONALLY OCCURRING ACT IN SCATTERED
               INSTANCES)
   4-OTHERS


12.TASK TAXONOMY (1 DIGIT)
   0-UNIDENTIFIED
   1-COGNITIVE
   2-VIGILANCE
   3-CONTROL
```

Figure 4.2 (Continued)

```
    4-COMPLEX
    5-EMERGENCY


13.CONSEQUENCES (19 DIGITS)
    0000000000000000000-UNKNOWN/NO CONSEQUENCE
    10-EQUIPMENT/SYSTEM (DIGITS 1-2)
         00-FAILURE/INSIGNIFICANT
         01-FAILURE/POTENTIALLY SIGNIFICANT
         02-FAILURE/SIGNIFICANT
         10-NO FAILURE/INSIGNIFICANT
         11-NO FAILURE/POTENTIALLY SIGNIFICANT
         12-NO FAILURE/SIGNIFICANT
    20-EFFECT ON TASK COMPLETION (DIGITS 3-4)
         21-NOT STATED OR N/A
         22-NON-SIGNIFICANT
         23-SIGNIFICANT
         24-DELAY
    300-EFFECT ON OPERATION (DIGITS 5-11)
         305-N/A
         307-NONE
         310-INSIGNIFICANT
         320-DELAY
              321-DURATION (DAYS)
              0000-NOT AVAILABLE
         330-DERATING
              331-DURATION (DAYS)
              0000-NOT AVAILABLE
         340-SHUTDOWN
              341-DURATION (DAYS)
              0000-NOT AVAILABLE
         350-NRC FINE
              351-AMOUNT (1000'S$)
              0000-NOT AVAILABLE
    4000-RADIATION SAFETY IMPACT (DIGITS 12-19)
         4050-NOT AVAILABLE
         4100-NOT RELATED
         4150-RELATED BUT INFORMATION NOT AVAILABLE
         4200-RADIOACTIVITY RELEASE TO ENVIRONMENT (DIGITS 12-15)
              4210-DIRECTLY SIGNIFICANT (LARGE)
              4220-POTENTIALLY SIGNIFICANT (MODERATE)
              4230-INSIGNIFICANT (NEGLIGIBLE)
              4240-NO RELEASE

                   NRC FINE (DIGIT 15)
                        0-NO FINE
                        1-FINE
```

Figure 4.2 (Continued)

```
        4300-RADIATION EXPOSURE (DIGITS 16-19)
            4305-NOT AVAILABLE
            4310-NO EXPOSURE ABOVE 10CFR20 LIMITS
            4320-NEGLIGIBLE EXPOSURE
            4330-MODERATE EXPOSURE
            4340-LARGE EXPOSURE
                LABOR INJURIES (DIGIT 19)
                    0-NONE
                    1-MINOR
                    2-DISABLING INJURIES
                    4-FATALITY


14.CAUSES OF HUMAN ERROR (2 DIGITS)
   00-UNKNOWN
   10-MOTIVATIONAL
   20-INCAPACITATION
   30-INADEQUATE TRAINING/RETRAINING
        31-UNAWARE OF REQUIREMENTS
        32-MISUNDERSTANDING OF TASKS/PROCEDURES/REQUIREMENTS/
           INSTRUMENTATION
        33-UNFAMILIARITY WITH PLANT
   40-MISINTERPRETATION OF REQUIREMENTS/INSTRUCTIONS
   50-PROCEDURAL CHANGES
        51-INADEQUATE REVIEW OF CHANGES
        52-UNAWARE OF CHANGES
   60-ENVIRONMENTAL STRESS
   70-OTHER


15.HUMAN ERROR TYPE (4 DIGITS)
   0000-UNSTATED/UNIDENTIFIED/ N/A
   1000-OMISSION
        1100-OVERSIGHT
            1110-FAILURE TO PERFORM A TASK
            1120-FAILURE TO PERFORM PART OF A TASK OR STEP
            1130-FAILURE TO COMPLETE A CORRECT PROCEDURE
        1200-SEQUENTIAL
            1210-PERFORMANCE OF A TASK OR STEP OUT OF SEQUENCE
                 LEADING TO OMISSION
            1220-INCORRECT PROCEDURE SEQUENCE LEADING TO
                 OMISSION
        1300-INTENTIONAL OMISSION
            1310-SABOTAGE
            1311-SUICIDE
```

Figure 4.2 (Continued)

```
        1312-DISTURBANCE/PROTEST
        1313-PHYSICAL DISORDER
        1314-PSYCHOLOGICAL DISORDER
    1400-TIME
        1410-FAILURE TO PERFORM TASK WITHIN ALLOTTED TIME
        1420-FAILURE TO PERFORM PART OF A TASK OR STEP
             WITHIN ALLOTTED TIME
        1430-FAILURE TO RESPOND TO ALARM
2000-COMMISSION
    2100-NEGLIGENCE
        2110-INCORRECT PERFORMANCE OF A TASK
        2120-INCORRECT PERFORMANCE OF PART OF A TASK OR STEP
        2130-INCORRECT OR INADVERTENT EQUIPMENT MANIPULATION
        2140-INCORRECT ANALYSIS
        2150-CLERICAL ERROR
        2160-INCORRECT INTERPRETATION OF INSTRUMENT/METER
             READINGS
        2170-DELIBERATE
        2180-OTHERS
    2200-SEQUENTIAL
        2210-PERFORMANCE OF A TASK OR STEP OUT OF SEQUENCE
             WITHOUT SKIPPING A STEP OR PART OF A TASK
        2220-INCORRECT PROCEDURE SEQUENCE
    2300-EXTRANEOUS
        2310-PERFORM UNREQUIRED TASK OR STEP
            2311-UNINTENTIONAL
            2312-INTENTIONAL
        2320-PERFORM ADDITIONAL ISOLATED TASK OR STEP
            2321-SABOTAGE
            2322-SUICIDE
            2323-DISTURBANCE/PROTEST
            2324-PHYSICAL DISORDER
            2325-PSYCHOLOGICAL DISORDER
    2400-TIME
        2410-INADEQUATE SCHEDULING OF OPERATION TASKS
        2420-INCORRECT RESPONSE TO ALARM WITHIN ALLOTTED
             TIME WITHOUT OMISSION OF A STEP


16.OPERATION STRESSES (3 DIGITS)
   000-UNKNOWN
   100-IMPROPER TASK LOAD
        110-OVERLOAD
        120-INSUFFICIENT LOAD
        130-INADEQUATE TIMING OF STEPS
        140-INADEQUATE SPEED
            141-TOO FAST
```

Figure 4.2 (Continued)

```
          142-TOO SLOW
   200-INADEQUATE STEPS
        210-LENGHTHY SEQUENCE
        220-UNCOORDINATED
   300-IMPROPER STIMULI
        310-RAPID
        320-TOO MANY
        330-TOO FREQUENT
        340-ILL-DEFINED
        350-UNDISCRIMINATED
        360-UNEXPECTED
        370-NOISY
             1-INITIAL
             2-FEEDBACK
   400-IMPROPER NUMBER OF OPERATORS
        410-TOO MANY
        420-LESS THAN NEEDED
        430-UNDEFINED RESPONSIBILITY
   500-UNDESIRABLE WORK ENVIRONMENT
   510-FEAR OF FAILURE/CONFUSICN
        520-PHYSICAL DISCOMFORT
             521-IMPROPER VENTILATION
             522-NOISE
             523-DISTRACTIONS
             524-UNCOMFORTABLE TEMPERATURE/HUMIDITY/PRESSURE
        530-PSYCHOLOGICAL DISCOMFORT
             531-MONOTONY
             532-SOCIAL STRAIN
             533-INTERACTION ON-THE-JOB


17.SYSTEM INVOLVED (1 DIGIT)
   0-UNIDENTIFIED
   1-NSSS
   2-SAFETY & PROTECTION SYSTEM
   3-CONTROL & INSTRUMENTATION SYSTEM
   4-RADWASTE
   5-CONTAINMENT & ISOLATION SYSTEMS
   6-SECONDARY, NON-NUCLEAR SYSTEMS
   7-FUEL HANDLING SYSTEMS
   8-AUXILIARY WATER SYSTEMS
   9-OTHERS


18.SYSTEM COMPONENT& LOCATION (3 DIGITS)
    000-REACTOR
```

Figure 4.2 (Continued)

001-REACTOR VESSEL INTERNALS
002-REACTIVITY CONTROL SYSTEMS
003-REACTOR CORE
010-REACTOR COOLANT & CONNECTED SYSTEMS
011-REACTOR VESSELS & APPURTENANCES
012-COOLANT RECIRCULATION SYSTEMS & CONTROLS
013-MAIN STEAM SYSTEMS & CONTROLS
014-MAIN STEAM ISOLATION COOLING SYSTEMS & CONTROLS
015-RESIDUAL HEAT REMOVAL SYSTEMS & CONTROLS
016-REACTOR COOLANT CLEANUP SYSTEMS & CONTROLS
017-FEEDWATER SYSTEMS & CONTROLS
018-REACTOR COOLANT PRESSURE BOUNDARY LEAKAGE DETECTION SYSTEMS
019-OTHER COOLANT SUBSYSTEMS & THEIR CONTROLS
020-STEAM AND POWER CONVERSION SYSTEMS
021-TURBINE-GENERATOR & CONTROLS
022-MAIN STEAM SUPPLY SYSTEM & CONTROLS(OTHER THAN 013)
023-MAIN CONDENSER SYSTEMS & CONTROLS
024-TURBINE GLAND SEALING SYSTEMS & CONTROLS
025-TURBINE BYPASS SYSTEMS & CONTROLS
026-CIRCULATING WATER SYSTEMS & CONTROLS
027-CONDENSATE AND FEEDWATER SYSTEM &CONTROLS(OTHER THAN 017)
028-STEAM GENERATOR BLOWDOWN SYSTEMS & CONTROLS
029-OTHER FEATURES OF STEAM & POWER CONVERSION SYSTEMS (NOT INCLUDED ELSEWHERE)
030-ENGINEERED SAFETY FEATURES
031-REACTOR CONTAINMENT SYSTEMS
032-CONTAINMENT HEAT REMOVAL SYSTEMS & CONTROLS
033-CONTAINMENT AIR PURIFICATION & CLEANUP SYSTEMS & CONTROLS
034-CONTAINMENT ISOLATION SYSTEMS & CONTROLS
035-CONTAINMENT COMBUSTIBLE CONTROL SYSTEMS & CONTROLS
036-EMERGENCY CORE COOLING SYSTEMS & CONTROLS
037-CONTROL ROOM HABITABILITY SYSTEMS & CONTROLS
038-OTHER ENGINEERED SAFETY FEATURE SYSTEMS & THEIR CONTROLS
040-INSTRUMENTATION AND CONTROLS
041-REACTOR TRIP SYSTEMS
042-ENGINEERED SAFETY FEATURE INSTRUMENT SYSTEMS
043-SYSTEMS REQUIRED FOR SAFE SHUTDOWN
044-SAFETY RELATED DISPLAY INSTRUMENTATION
045-OTHER INSTRUMENT SYSTEMS REQUIRED FOR SAFETY
046-OTHER INSTRUMENT SYSTEMS NOT REQUIRED FOR SAFETY
047-INCORE INSTRUMENTATION
050-ELECTRIC POWER SYSTEMS
051-OFFSITE POWER SYSTEMS & CONTROLS
052-AC ONSITE POWER SYSTEMS & CONTROLS

Figure 4.2 (Continued)

053-DC CNSITE POWER SYSTEMS & CONTROLS
054-ONSITE POWER SYSTEMS & CONTROLS(COMPOSITE AC & DC)
055-EMERGENCY LIGHTING SYSTEMS & CCNTROLS
056-SYSTEM POWER SUPPLY CCMPONENTS
060-FUEL STORAGE AND HANDLING SYSTEMS
061-NEW FUEL STORAGE FACILITIES
062-SPENT FUEL STORAGE FACILITIES
063-SPENT FUEL POOL COOLING & CLEANUP SYSTEMS & CONTROLS
064-FUEL HANDLING SYSTEMS
070-AUXILIARY PROCESS SYSTEMS
071-CCMPRESSED AIR SYSTEMS & CCNTROLS
072-PROCESS SAMPLING SYSTEMS
073-CHEMICAL,VOLUME CCNTROL,& LIQUID POISON SYSTEMS & CCNTROLS
074-FAILED FUEL DETECTICN SYSTEMS
075-OTHER AUXILIARY PROCESS SYSTEMS & THEIR CONTROLS
080-AUXILIARY WATER SYSTEMS
081-STATION SERVICE WATER SYSTEMS & CONTROLS
082-COOLING SYSTEMS FOR REACTOR AUXILIARIES & CONTROLS
083-DEMINERALIZED WATER MAKE-UP SYSTEMS & CONTROLS
084-POTABLE & SANITORY WATER SYSTEMS & CONTROLS
085-ULTIMATE HEAT SINK FACILITIES
C86-CONDENSATE STORAGE FACILITIES
087-OTHER AUXILIARY WATER SYSTEMS & THEIR CONTROLS
090-OTHER AUXILIARY SYSTEMS
091-AIR CONDITIONIING,HEATING,COOLING & VENTILATION SYSTEMS & CONTROLS
092-FIRE PROTECTION SYSTEMS & CCNTROLS
093-COMMUNICATION SYSTEMS
094-CTHER AUXILIARY SYSTEMS & THEIR CONTROLS
100-RADIOACTIVE WASTE MANAGEMENT SYSTEMS
101-LIQUID RADIOACTIVE WASTE MANAGEMENT SYSTEMS
102-GASEOUS RADIOACTIVE WASTE MANAGEMENT SYSTEMS
103-PROCESS & EFFLUENT RADIOLOGICAL MONITORING SYSTEMS
104-SOLID RADIOACTIVE WASTE MANAGEMENT SYSTEMS
110-RADIATION PROTECTICN SYSTEMS
111-AREA MONITORING SYSTEMS
112-AIRBORNE RADIOACTIVITY MONITORING SYSTEMS
113-OTHER RADITION MONITORS
200-NO SPECIFIED SYSTEMS

19.COMPCNENT CRITICALITY CODE (2 DIGITS)
0-NOT SAFETY RELATED
5-POTENTIAL SAFETY EFFECT
10-DIRECT SAFETY EFFECT
15-N/A

Figure 4.2 (Continued)

4.1. Phase of Operation

Normal operation, power level, and dynamic operation in power change are considered for phase of operation. According to Nuclear Safety classification, three categories (normal operation, power ascension, and shutdown with either surveillance or no surveillance testing) have been possibly divided for the operation phases. But such categories do not cover dynamic operation which includes power level changes whether normal or abnormal. The design electrical rating which is the nominal net electrical power output of the unit in the utility is used for rated power. The maximum dependable capacity which varies depending on the unit efficiency is employed for allowed power.

4.2. Outage

Outage is a situation in which no electrical power is produced, scheduled, off-scheduled, and idle shutdown are considered as categories of outage. Scheduled outage is the planned outage to remove a unit from service to refuel, inspect, maintain, or train personnel while forced outage is an outage initiated no later than the weekend following discovery of an abnormal condition.

4.3. Error Domain

Error domain includes a range of human activities pertinent to plant design, fabrication, installation, maintenance, operation and administration. Although system failure is included in the error domain, only operator errors are considered for actual classification. Operators are defined here as the personnel who work in the control room proper. Human error combinations are also considered to cover possible overlap between such activities.

4.4. Mode of Human Error

Three modes of human errors: systematic, random, and sporadic are considered. Figure 4.3 shows such variability of human error where the desired norm is defined as the constant error rate. Systematic variability is defined as a small dispersion model from the desired norm which implies that an act performed consistently in the same way. Random variability is defined as a large dispersion model centered about a desirable norm. It results in random errors which are defined as the results of performing an act randomly, namely without deliberation or without aim. Sporadic variability is defined as a small dispersion model centered about a desirable norm.

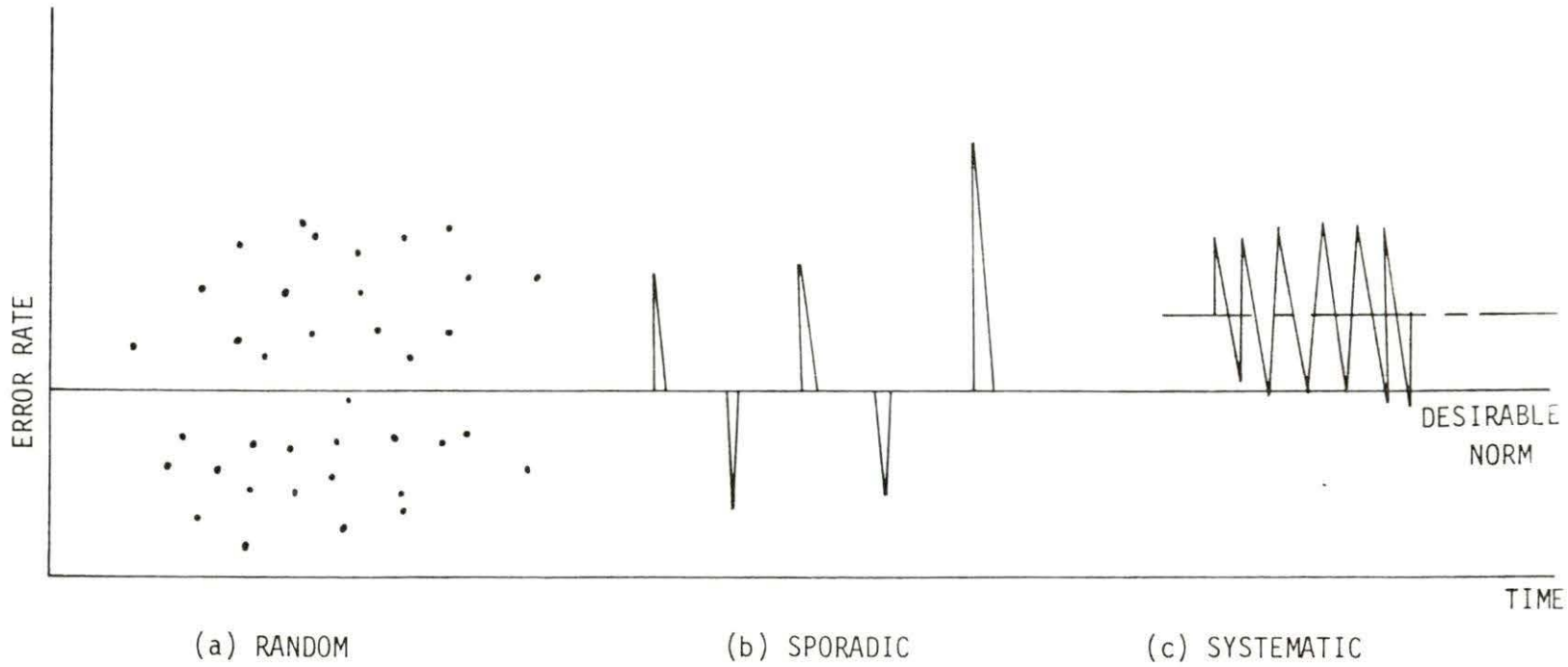

Figure 4.3. Mode of human errors (25)

4.5. Task Taxonomy

Operation tasks are categorized as:

1. Cognitive - those tasks which involve decision-making and monitoring of decisions and in which the operator is familiar with required actions. Examples include tasks in administrative operation (power level modification in a nuclear power plant), tasks in control operation involving probing, gradient, and terminal modes.

2. Vigilance - those tasks which are observed closely by operators. Examples include surveillance testing and power ascension.

3. Control - those tasks which are based on past experience and inference. The tasks involve operator's duty to do proper actions such as control adjustments for a detected malfunction or drift in the reactor dynamic movement.

4. Complex - those tasks which are referred to well-defined sequential operations including a degree of inference and decision-making.

5. Emergency - those tasks which are related to instantaneous action under high-stress conditions.

4.6. Consequences

The main concern here is in the safety impact of operator errors under the effect on equipment or system, impact on safety-related or critical components affected by operator errors are specified as follows:

1. Insignificant, failure/not failure - There is no adverse effect of the human error on plant safety but there is a literal violation of the technical specifications.

2. Potentially significant, failure/no failure - Although there is no failure of the safety-related features, the human error resulted in conditions that involve violation of limiting safety system setpoints.

3. Significant, failure/no failure - Conditions, such as loss of significant engineered safety features during operation or violation of a safety limit in the technical specifications.

The effects on task completion are listed below:

1. Nonsignificant - no delay in operation and no shutdown,

2. Significant - shutdown and delay,

3. Delay - delay in operation, but no shutdown required.

The safety impact on radioactivity release due to operator errors is classified as follows:

1. Directly significant (large) - released radioactivity from the site is more than the limit of technical specifications.

2. Potentially significant (moderate) - when released radioactivity from the site is less than the limit of technical specifications, but the release of radioactivity is unplanned or uncontrolled.

3. Insignificant (negligible) - when the release of radioactivity from the site represents no safety hazard but is associated with literal violation of technical specifications.

For radiation exposure, the following items are specified:

1. Large exposure - significant property damage or personnel injury.

2. Moderate exposure - although no property damage or no personnel injury may result, the radiation exposure is unplanned or uncontrolled in amounts less than those of technical specifications.

3. Negligible exposure - radiation exposure does not affect plant safety but there is a literal violation of technical specifications.

4.7. Causes of Human Error

Human errors are classified according to motivational incapacitation, improper training, and environmental stress. Motivational errors are caused by carelessness and lack of interest. Examples include an inadvertent action to delay or stop the operation for a long period of time. Incapacitation of operators may be induced by heart attack, fainting, stroke, and other conditions beyond human control. Improper training causes misunderstanding of procedures, use of incorrect procedures, ignorance of procedures, or procedural deficiency. Environmental stresses, such as inadequate communication, improper stimuli, displays, or controls, can induce operational errors.

4.8. Human Error Type

Five categories of human errors are considered namely, omission, commission, sequential, time, and extraneous errors. However, sequential, time, and extraneous errors are considered as part of the two more general categories, omission, commission. Oversight is considered as a main part of omission errors, while negligence is treated as commission error.

4.9. Operation Stresses

Operation stresses are characterized below:

1. Improper task load - those tasks which involve inadequate timing of steps and speed.
2. Inadequate steps - those tasks which involve lengthy and uncoordinated sequences.
3. Improper stimuli - those tasks which are performed at high speed and in short time; for example, insertion or withdrawal of a control rod.
4. Improper number of operators - those stresses which are caused by the presence of unnecessarily large or small number of operators.
5. Undesirable work environment.
6. Fear of failure or confusion - those stresses which are caused by physical or psychological discomfort.

4.10. Other Items Classified

The number of errors are obtained for systems affected by the error as well as their constituent components.

5. DATA CHECK AND COMPARISON

In order to obtain accurate results on human error population it is necessary that more than one person review the LER records and code the events in the GENCLASS sheets (Figure 4.1). A group of four persons are involved in data extraction from LER's in the Iowa State Safety group studies. Each person independently reviews a given number of LER reports, then the group meets to check differences in reporting. Unresolved issues are discussed in a meeting of a larger group involving experts in human factors, psychology, statistics and nuclear systems and a final set of results are agreed upon. A computer program can be used to replace the group discussions to accelerate the process especially in the presence of a bulk of raw information. One such program is DATACHEC.

The DATACHEC system is designed to provide reliable data for the LERRET as an input source. The DATACHEC includes function of data checking and comparison. Possible errors during punching input cards, clerical errors in classification and errors due to misunderstanding of the GENCLASS can be filtered through running DATACHEC1 (Figure 5.1). The UP-SEF is used to update (UP) the source event file (SEF). The update program can add records, delete records, or replace records. The DATACOM can provide

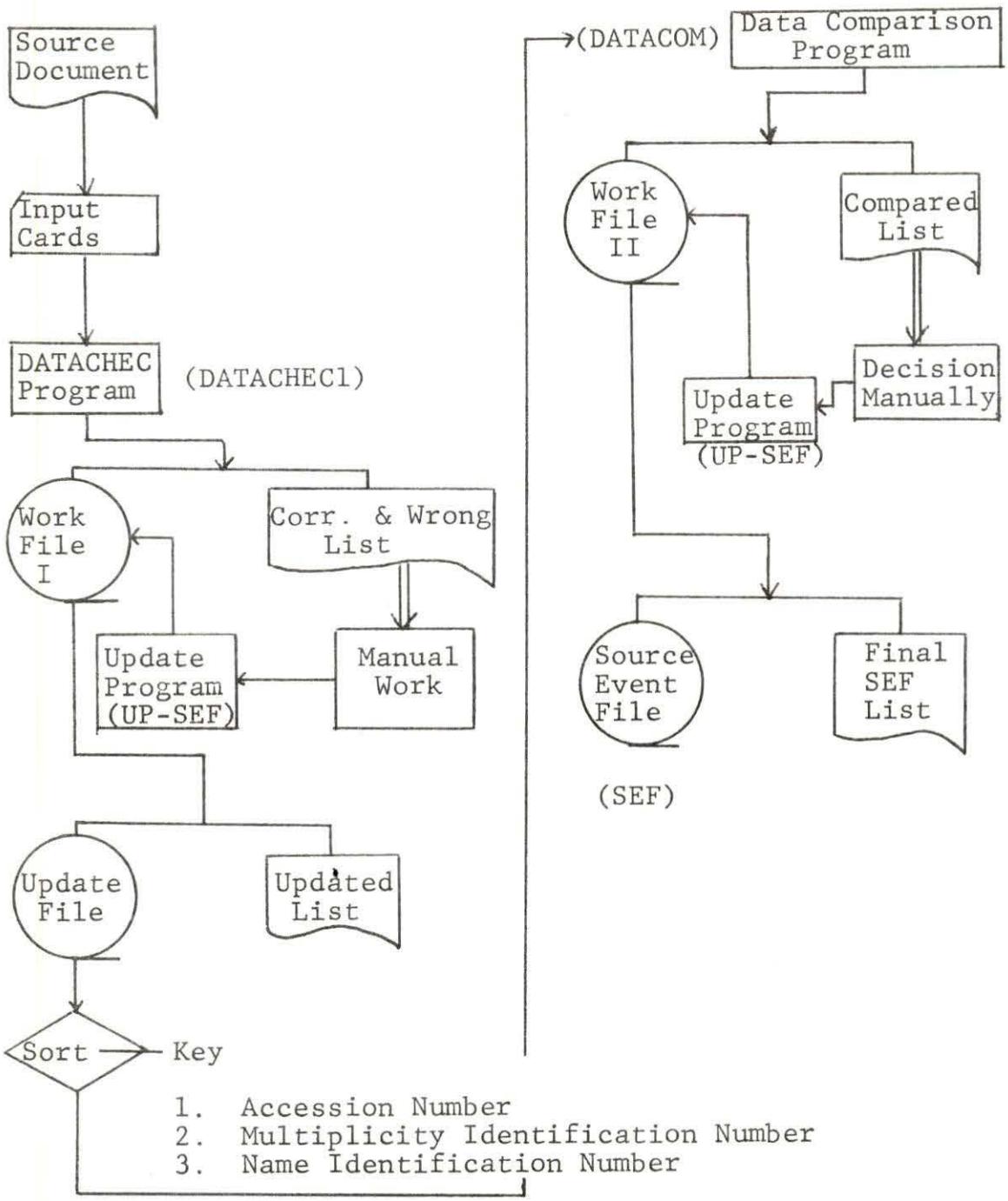

Figure 5.1. Data check and comparison flow chart for source document

output list to be used in decision-making and the computer program generates a single data set after comparing four different data sets.

Four persons review and extract data on human errors from the LER's using the GENCLASS. Then, they review the four sets of results to find group consensus and provide group results item by item. The data comparison program can also provide a function to adjust various individual results into a good group result. The decision can be accomplished after reviewing the difference between computer group results generated and manually selected group results. Finally through the updating program, filtered source event file (SEF) can be obtained. An outline of the program is given in Figure 5.1.

5.1. Status

A. Program Language -COBOL

B. System - IBM 360 or 370 series

C. Number of programs - three

DATACHEC1 - Data checking program (alpha-numeric, range, etc.)

UP-SEF - Updating program (add, delete, and replace records)

DATACOM - Comparison program

D. Input data - one card for LER, punched, according to source doeument in Figure 4.1.

E. Output - one tape and printed list. The list can be used as a reference.

5.2. Method

The range checking, alpha-numeric checking, and updating methods are conservative. To compare individual data in DATACOM, each event recorded in the LER's corresponds to four individually coded sets of data which are inputed for consensus evaluation. If for a given event more than two of the corresponding data sets agree the coded data are accepted otherwise the four sets are rejected and the event is denoted by a zero. Thus, items formed with zeros must be checked again through reviewing of the original LER's.

5.3. Sample

5.3.1. DATACHEC1

In this example, a card-input, sequential data set is written on a 9-track tape (GEN01). The example follows:

```
//DATACHEC 1  JOB Accnt-No,'CHO'
/*JOBPARM  L=60,COPIES=5
//S1  EXEC  COBUCLG,TIME.GO=(3,30)
//COB.SYSIN  DD  *
(DATACHEC1 program)
//GO.SF  DD  DSN=GEN01,UNIT=TAPE,DCB=DEN=3,VOL=SER=X009,
//DISP=(NEW,KEEP),LABEL=(1,SL)
//GO.SYSPRINT  DD  SYSOUT=A
```

```
//GO.SYSIN  DD  *
(Figure 5.2)
1
(input card data set on Figure 5.3)
/*
```

The control statements are discussed below:

a) JOBPARM defined the line limit and number of copies. To save time for comparing lists with original lists by four persons and reserve one. Five copies required.

b) Though there is no linkage editor, COBUCLG is used to decrease core usage.

5.3.2. UP-SEF

a) Input - a card-input (transaction file), blocked fixed-length records on one 9-track labeled tape (old file) - GEN01.

b) Output - blocked fixed-length records on one 9-track labeled tape (new file) - GEN02, a print-output, sequential data set.

c) Intermediate storage - six 3330 areas for sorting.

```
//UP-SEF  JOB  Accnt-No,'CHO'
/*JOBPARM  L=20,COPIES=5
//S1  EXEC  COBUCLG,TIME.GO=(3,30),REGION.GO=150K
//COB.SYSIN  DD  *
(UP-SEF program)
//GO.SF1  DD  DSN=GEN01,UNIT=TAPE,DCB=DEN=3,VOL=SER=
  X0001,
//  DISP=(OLD,KEEP),LABEL=(1,SL)
//GO.SF2  DD  DSN=GEN02,UNIT=TAPE,DCB=DEN=3,VOL=SER=
  X0002,
//  DISP=(NEW,KEEP),LABEL=(1,SL)
//GO.SORTT  DD  DSN=&TRANSF,UNIT=SCRTCH,SPACE=(TRK,200),
//  DISP=(NEW,DELETE)
//GO.SORTLIB  DD  DSN=SYS1.SORTLIB,DISP=SHR
//GO.SORTWK01  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK02  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK03  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK04  DD  UNIT=SCRTCH,SPACE=(TRK,100)
```

Docket No.	Facility	First Electric Generation Date	Reactor Type	Power Level (MWT)
003	Indian Point 1	091662	PWR	0615
010	Dresden 1	041560	BWR	0700
029	Yankee-Rowe 1	111060	PWR	0600
133	Humboldt Bay	041863	BWR	0220
155	Big Rock Point 1	120862	BWR	0240
206	San Onofre 1	071667	PWR	1347
213	Haddam Neck	080767	PWR	1825
219	Oyster Creek 1	092369	BWR	1930
220	Nine Mile Point 1	110969	BWR	1850
237	Dresden 2	041370	BWR	2527
244	Ginna	120269	PWR	1520
245	Millstone 1	112970	BWR	2011
247	Indian Point 2	062673	PWR	2758
249	Dresden 3	072271	BWR	2527
250	Turkey Point 3	110272	PWR	2200
251	Turkey Point 4	062173	PWR	2200
254	Quad Cities 1	041272	BWR	2511
255	Palisades	123171	PWR	2530
259	Browns Ferry 1	101573	BWR	3293
260	Browns Ferry 2	082874	BWR	3293
261	Robinson 2	092670	PWR	2200
263	Monticello	030571	BWR	1670
265	Quad Cities 2	052372	BWR	2511
266	Point Beach 1	110670	PWR	1518
267	Fort St. Vrain	121176	HTGR	0842
269	Oconee 1	050673	PWR	2568
270	Oconee 2	120573	PWR	2568
271	Vermont Yankee 1	092072	BWR	1593
272	Salem 1	122576	PWR	3338
277	Peach Bottom 2	021874	BWR	3293
278	Peach Bottom 3	090174	BWR	3293
280	Surry 1	070472	PWR	2441
281	Surry 2	031073	PWR	2441
282	Prairie Island 1	120473	PWR	1650
285	Fort Calhoun 1	082573	PWR	1420
286	Indian Point 3	042776	PWR	2760
287	Oconee 3	090074	PWR	2568
289	Three Mile Island 1	061974	PWR	2535

Figure 5.2. Summary of facility

Docket No.	Facility	First Electric Generation Date	Reactor Type	Power Level (MWT)
293	Pilgrim 1	071972	BWR	1998
295	Zion 1	062873	PWR	3250
296	Browns Ferry 3	091276	BWR	3293
298	Cooper Station	051074	BWR	2381
301	Point Beach 2	080272	PWR	1518
302	Crystal River 3	013077	PWR	2452
304	Zion 2	122673	PWR	3250
305	Kewaunee	040874	PWR	1650
306	Prairie Island 2	122174	PWR	1650
309	Maine Yankee	110872	PWR	2440
312	Rancho Secc 1	101374	PWR	2772
313	Arkansas 1	080074	PWR	2568
315	Cook 1	021075	PWR	3250
316	Cook 2	000000	PWR	3391
317	Calvert Cliffs 1	010375	PWR	2700
318	Calvert Cliffs 2	120776	PWR	2700
320	Three Mile Island 2	000000	PWR	2772
321	Hatch 1	111174	BWR	2436
324	Brunswick 2	042975	BWR	2436
325	Brunswick 1	120476	BWR	2436
331	Duane Arnold	051974	BWR	1593
333	Fitzpatrick	020175	BWR	2436
334	Beaver Vally 1	061476	PWR	2652
335	St. Lucie 1	050776	PWR	2560
336	Millstone 2	110975	PWR	2560
338	North Anna 1	000000	PWR	0000
344	Trojan	122375	PWR	3411
346	Davis-Eesse 1	082877	PWR	2772
348	Farley 1	081877	PWR	2652
409	La Crosse	042668	BWR	0165

Figure 5.2 (Continued)

```
Col. 1          12  17          28    39    45  47  54          65 60    75
     ↓          ↓   ↓           ↓     ↓     ↓   ↓   ↓           ↓  ↓     ↓
     09424350260     070174000000      1418001   10  000041004305   2000  608700
     11572450260     070276000000      1418001   11  000041004305   1000  300205
     11706750026     091776000000      1418001   10  000041004305   2000  300205
     12856350317 1   082577000000      0018003   10  000041004305   2000  307300
     12856350317 2   082577000000      0018003   10  000041004305   2000  307300
```

Figure 5.3. Human failure data as an input data set for DATACHEC1 (data are just a sample)

```
R1067438050249072271080371080371111800001100000000041004305002000000404105000515
D0000000000000000000000000000000000000000000000000000000000000000000000000000538
 1060298050409042668011571011571001800001100000000041004305002000000204105002553
 1064300050409042668062171062171001800001100000000041004305002000000101705002554
```

Figure 5.4. Input data set for UP-SEF

```
//GO.SORTWK05  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK06  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SYSPRINT  DD  SYSOUT=A
//GO.SYSIN  DD  *
(input card data set on Figure 5.4)
/*
```

The control statements on JOBPARM and COBUCLG, are the same as those of the DATACHEC1 program.

5.3.3. DATACOM

a) Input - fixed-length blocked records on a 9-track tape (GEN02).

b) Output - fixed-length blocked records on a 9-track tape (GEN03).

c) Intermediate storage - six 3330 areas for sorting.

```
//DATACOM  JOB  Accnt-No,'CHO'
/*JOBPARM  L=90,COPIES=5
//S1  EXEC  COBUCLG,TIME.GO=(3,30)
//COB.SYSIN  DD  *
(DATACOM program)
//GO.SEF1  DD  DSN=GEN02,UNIT=TAPE,VOL=SER=X0002,
//  DCB=(RECFM=FB,LRECL=94,BLKSIZE=7238,DEN=3),
    LABEL=(1,SL)
//  DISP=(OLD,KEEP)
//GO.SORTN  DD  DSN=&SEF01,UNIT=SCRTCH,SPACE=(TRK,400),
//  DISP=(NEW,PASS)
//GO.SEF2  DD  DSN=GEN03,UNIT=TAPE,VOL=SER=X0003,
//  DCB=DEN=3,LABEL=(1,SL),DISP=(NEW,KEEP)
//GO.SORTLIB  DD  DSN=SYS1.SORTLIB,DISP=SHR
//GO.SORTWK01  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK02  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK03  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK04  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK05  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK05  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SYSPRINT  DD  SYSOUT=A
/*
```

The control statements on JOBPARM and COBUCLG are the same as those of the DATACHEC1 program.

5.4. Input

5.4.1. DATACHEC1

This section describes the required input data cards for the DATACHEC1 program. The detailed input list is provided below:

Card	1-68	SUMMARY OF FACILITY (refer to Figure 5.2)
col.	1	a blank
col.	2-4	docket-number (the last three digits)
col.	5	a blank
col.	6-25	facility name
col.	26-29	blanks
col.	30-35	the first electricity generation date
col.	36-37	blanks
col.	38-42	reactor-type
col.	43-46	power-level (MWT)

(Note: the number of cards shall be increased with the number of commercial nuclear power plants in operation)

The summary of facility is used to check docket-number range in the computer. Also, the output of the summary is used to verify the LER's list (numeric terms) according to docket-number, reactor-type, and the first electricity generation date. (For example, the first electricity generation date identifies the construction stage and the operation stage.) The first electricity generation date is moved to each numeric LER data.

Card	69		Data identification card
col.	1		"1"

(Note: if the number of facility was increased by 80, the 81th card contains "1")

Card	70		LER input
col.	1-6	CR-ACC	Reference number
	7-11	CR-DOCKET	Docket number
	12	CR-RECID	Identifies the card (comment "C" or not)
	13	CR-DUPLICATE	Identifies cards with the same reference number
	14-16	CR-SERIAL	Serial number provided by classifiers for identification
	17-22	CR-REPORT	Date of report (month/day/year)
	23-28	CR-EVENT	Date of event (month/day/year). If no event date, the report date is used as an event date
	29-34	CR-PUNCHED	Date of data punched, (month/day/year)
	35-38	CR-OP-PHASE	Operation status is power plant when event occurred
	39-40	CR-OUTAGE	Causes of outage
	41-44	CR-ERR-DOMAIN	Indicates human errors distinguished by the domain of human involvement in design, maintenance, installation, operation, and administration
	45	CR-NAME-ID	Identifies name who classifies such an event
	46	CR-TAXONOMY	Describes task performed
	47-48	CR-EQUIP	Describes impact on equipment
	49-50	CR-EFF-TASK	Indicates the effect on task completion
	51-53	CR-EFF-OP	Describes effect on operation
	54-57	CR-DURATION	Duration time in hours

Card col.	58-61	CR-RAD-RELEASE	Radiation release to environment
	62-65	CR-RAD-EXPOSURE	Radiation exposure to the public and the personnel
	66-67	CR-HUMAN	Describes the cause of human errors
	68-71	CR-HET	Indicates human error type as being one of omission or commission
	72-74	CR-OPER-STRESS	Identifies operational stress which affects human error
	75	CR-SYSTEM	Indicates to general system involved in the error
	76-78	CR-COMP-LOC	Identifies the location of the occurrences
	79-80	CR-CRIT-CODE	Specifies the criticality of the error according to the safety effect

5.4.2. UP-SEF

The required input data cards for a transaction file is provided below:

Card col.	1	STR-RECID	Determines an input card to delete, replace, and add records: ' ' Add record 'D'. Delete record-All zeroes except serial number generated by the computer. 'R' Replace record. The STR-RECID is one of the most important items for updating, process, since the mistake of description on a data causes a lot of trouble

Card col.			
	2	STR-NAMEID	Specifies classifiers
	3-8	STR-REFERENCE	Reference number
	9	STR-DUPLICATE	Identifies records with the same reference number
	10-14	STR-DOCKET	Identifies plant own number, docket-number
	15-20	STR-INIT-DATE	Identifies the first electricity generation date
	21-26	STR-REPORT	Date of report
	27-32	STR-EVENT	Date of event
	33-34	STR-OUTAGE	Causes of outage
	35-38	STR-ERR-D	Indicates error-domain
	39	STR-FILL1	A blank
	40-74	STR-FILL2	Has the same content as the input data for DATACHEC1 (from CR-TAXONOMY to CR-CRIT-CODE)
	75-78	STR-ACC	Specifies the serial number generated by the DATACHEC1

Thus, the STR-ACC can be found out in the output list from the DATACHEC1. The STR-ACC is one of the most significant items in UP-SEF program. So it needs careful confirmation with the list from the DATACHEC1.

Figure 5.4 shows the input data set for UP-SEF when the serial number (the last six digits in Figure 5.4) meets the same number of the old master file, the first card will be replaced for the record in the old master file. The record with the serial number 000538 of the old master file will be deleted. The last two records in the transaction will be added into the old master file. Actually, the current

sequential master file is read one record at a time and the transaction file is processed against it to produce the updated sequential master file. The old master file is provided by the DATACHEC1. The output for a tape storage provided through DATACHEC1 has the same format as that of input tape in the old master file.

5.4.3. DATACOM

The input data format for DATACOM includes the same format of the output for the tape storage (MASTER 2) provided by UP-SEF. Figure 5.5 shows the flow of the sequence of the formats from DATACHEC1 through UP-SEF to DATACOM.

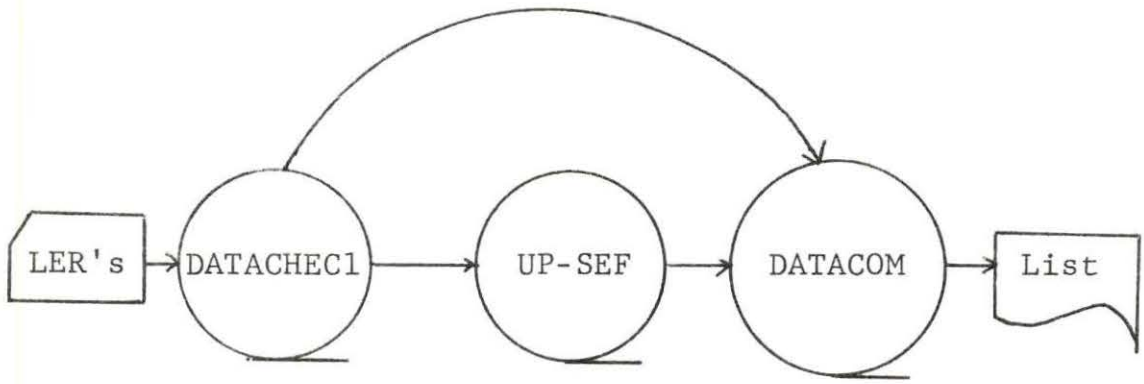

Figure 5.5. The flow of the sequence for the input or output formats used by DATACHEC1, UP-SEF and DATACOM programs

The output data format for a mass storage from DATACHEC1 is modified, since the GENCLASS is not enough to store data as a card form onto a mass storage. If the data is almost purified by the DATACHEC1, it can be processed directly to the DATACOM. This is because usually DATACHEC1 needs to be run again after reviewing the output list from the DATACOM.

5.5. Output

5.5.1. DATACHEC1

The output list includes Figure 5.2 and the detailed classified LER's (Figure 5.3). The order of the listed content is the same as that of the input format. The asterisk below the item indicates error. This error message describes mismatch of ranges in the GENCLASS.

Figure 5.6 indicates that the docket number (50026) is out of range. After reviewing the original sheet (Figure 4.1) or LER's by the accession-number (called by reference-number), the docket-number can be corrected to the number 50260. The puncher error or clerical error might induce such a result. If the date is nonnumeric, "DATA ON CARD NOT NUMERIC", such a message will come out in the list.

The other output for a tape storage is followed below:

col.	
1	SER-RECID
2	SER-NAMEID
3-8	SER-REFERENCE
9	SER-DUPLICATE
10-14	SER-DOCKET
15-20	SER-INIT-DATE

ACC-NC	DOC	D	SL	D-R	D-E	D-P	OUT	E-R	N	EQUIP	DRN	REN	RXP	HET	S	CL	C
09424350260				070174000000			1418001	10			000041004305			2000		608700	
11572450260				070276000000			1418001	11			000041004305			1000		300205	
11796750026				091776000000			1418001	10			000041004305			2000		300205	
11572450260				070276000000			1418002	11			000041004305			1000		300205	
11796750260				091776000000			1418002	10			000041004305			2000		300205	
09424350260				071074000000			0018003	02			000040504305			2000		101300	
09499950260				071674000000			0018003	02			000040504305			2000		706405	
11572450260				070276000000			1418003	02			000041004305			1000		300200	
11796750260				091776000000			1418003	10			000040504305			2000		300205	
09424350260				071074000000			1418004	02			000041004305			2000		101305	

Figure 5.6. The output list for DATACHEC1

21-26	SER-REPORT	
27-32	SER-EVENT	
33-42	SER-FILL1	Includes OP-PHASE, OUTAGE, and ERR-DOMAIN
43	SER-FILLER	A blank
44-78	SER-FILL2	Includes items from TAXONOMY to CRIT-CODE
79-84	SER-PUNCHED	
85-88	SER-SERIAL	
89-94	SER-COUNT	Indicates the serial number generated by the DATACHEC1 program

5.5.2. UP-SEF

The output list from UP-SEF is used to check whether the updated data are processed or not processed. Figure 5.7 describes how it works in the program of UP-SEF.

The notice "NO MATCHING MREC*" means there is no such serial number in the old master file. The other first four records were processed except the last one.

1	Column	75 80	113
D		000538	DELETED RECORD
R		000730	REPLACED MASTER
R	Input contents for UP-SEF	000876	REPLACED MASTER
		000894	ADDED MASTER
		000929	ADDED MASTER
R		003001	NO MATCHING MREC*

Figure 5.7. Output format provided by UP-SEF

5.5.3. DATACOM

The DATACOM plays an important role at the final stage for the checking of the classified data individually by the GENCLASS. It compares four different data sets with the same reference number. However, it can also compare less than four data sets. There are several cases wherein less than four data are available, for example:

1. One of the classifiers did not classify such an event. (He understood the event, but he did not agree with the classification of the data. He did not understand the event, so he could not classify it. He omitted the event, so he could not classify it.)

2. The classifier classified an event, but somebody (including classifier) omitted such an event by mistake.

3. The classifier classified an event, but somebody recorded it or punched it wrongly.

The results from the DATACOM are shown in Figure 5.8. The R-ID is the identification of each classifier (1, 2, 3, and 4). The DATE-F indicates the first electricity generation date. If the classifier did not classify such items (DRN-duration in hours, PUNCH-punched date, and SER-serial number given by classifiers), they remain as zeros.

The COUNT (a number generated by the computer) is used to search the original data. The SUB-COUNT describes the number of agreements. When the agreement is a split, two to two, the sub-count will be zero. If the number of agreements

between a four data sets is more than two, the contents corresponding to those agreements represent the group result. In the first sample, the agreement between the content under equipment was a split, so the group result is zero. The contents under the R-EXP are the same for three sets, while the fourth is different, so the result is 4305. The zero under R-ID is the group result from each reference number. The third sample with the reference number 0276270 has only one data set thus, in that case no group comparison is made. After careful review of the results from the DATACOM, the checked data might be used for statistical analysis. Chapter 6 will describe how to retrieve such data.

R-ID	REF-NO	DOCKET	DATE-F	DATE-R	DATE-E	OUT	ERR-D	EQ	DRN
1	0093450	50010	041560	041560	121259	14	1800	10	0000
2	0093450	50010	041560	041560	121259	14	1800	10	0000
3	0093450	50010	041560	041560	121259	14	1800	02	0000
4	0093450	50010	041560	041560	121259	14	1800	02	0000
0	0093450	50010	041560	041560	121259	14	1800	00	0000
					SUB-COUNT	4	4	0	4
1	0164040	50029	111060	052467	052467	00	1800	10	0000
2	0164040	50029	111060	052467	052467	00	1800	10	0000
3	0164040	50029	111060	052467	052467	00	1800	11	0000
0	0164040	50029	111060	052467	052467	00	1800	10	0000
					SUB-COUNT	3	3	2	3
2	0276270	50029	111060	012268	120667	00	1800	10	0000

Figure 5.8. Output format on the data comparison for human-error taxonomy, listed by the DATACOM program

R-ENV	R-EXP	HET	S	COMP	CC	PUNCH	SER	COUNT
4100	4310	2000	2	044	00	000000	000	000204
4100	4305	2000	2	044	00	000000	000	000217
4100	4305	2000	3	045	05	000000	000	000227
4100	4305	2000	2	041	10	000000	000	000243
4100	4305	2000	2	044	00	000000	000	000243
4	3	4	3	2	2			
4200	4305	1000	6	022	10	000000	000	000096
4210	4305	1000	6	022	10	000000	000	000083
4200	4305	1000	6	022	15	000000	000	000090
4200	4305	1000	6	022	10	000000	000	000090
2	3	3	3	3	2			
4210	4305	2000	5	102	10	000000	000	000084

6. LER RETRIEVAL SYSTEMS

The Licensee Event Report's Retrieval (LERRET) system is a computerized retrieval system designed to retrieve quantified LER data and results. LERRET is developed to store prepared data on a disk and several tapes, and to use provided keywords to retrieve selected information. The retrieval program comprises three phases.

Phase I is the process which separates the citation and keyword files from the sequential source LER's. Those LER's have already been checked and verified by the National Safety Information Center (NSIC) and hence the current sequential master file from NSIC can be used directly as an updated LER file. However, for independent LER compilation the updating loop shown in Figure 6.1 may be used before making conversion program. Since the volume of source LER's is big enough to overflow the current available private disk, the citation file is stored on a tape. It requires two computer programs separated by a utility sort package.

Phase II (Figure 6.2) is the process using a keyword index, and the citation files along with the user request to select specific documents. Multiple requests may be submitted in one process. In this phase classification of LER's in numeric term is included. The NSIC keywords are

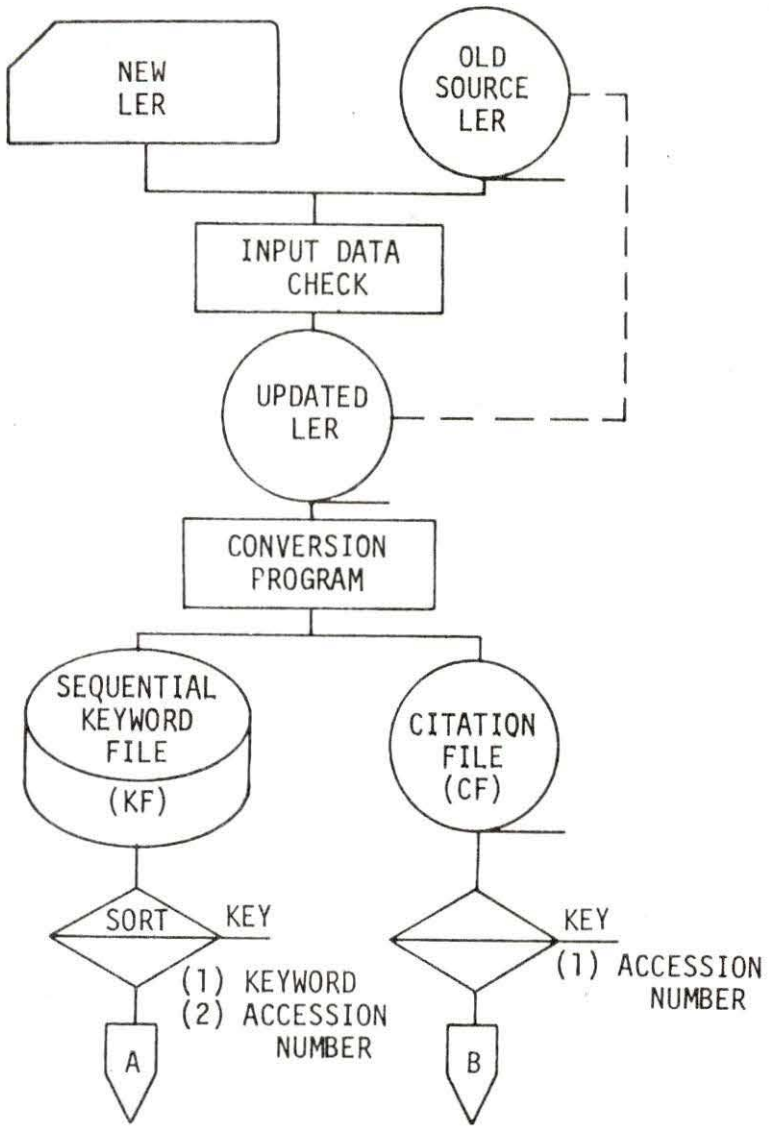

Figure 6.1. Phase I of data retrieval system

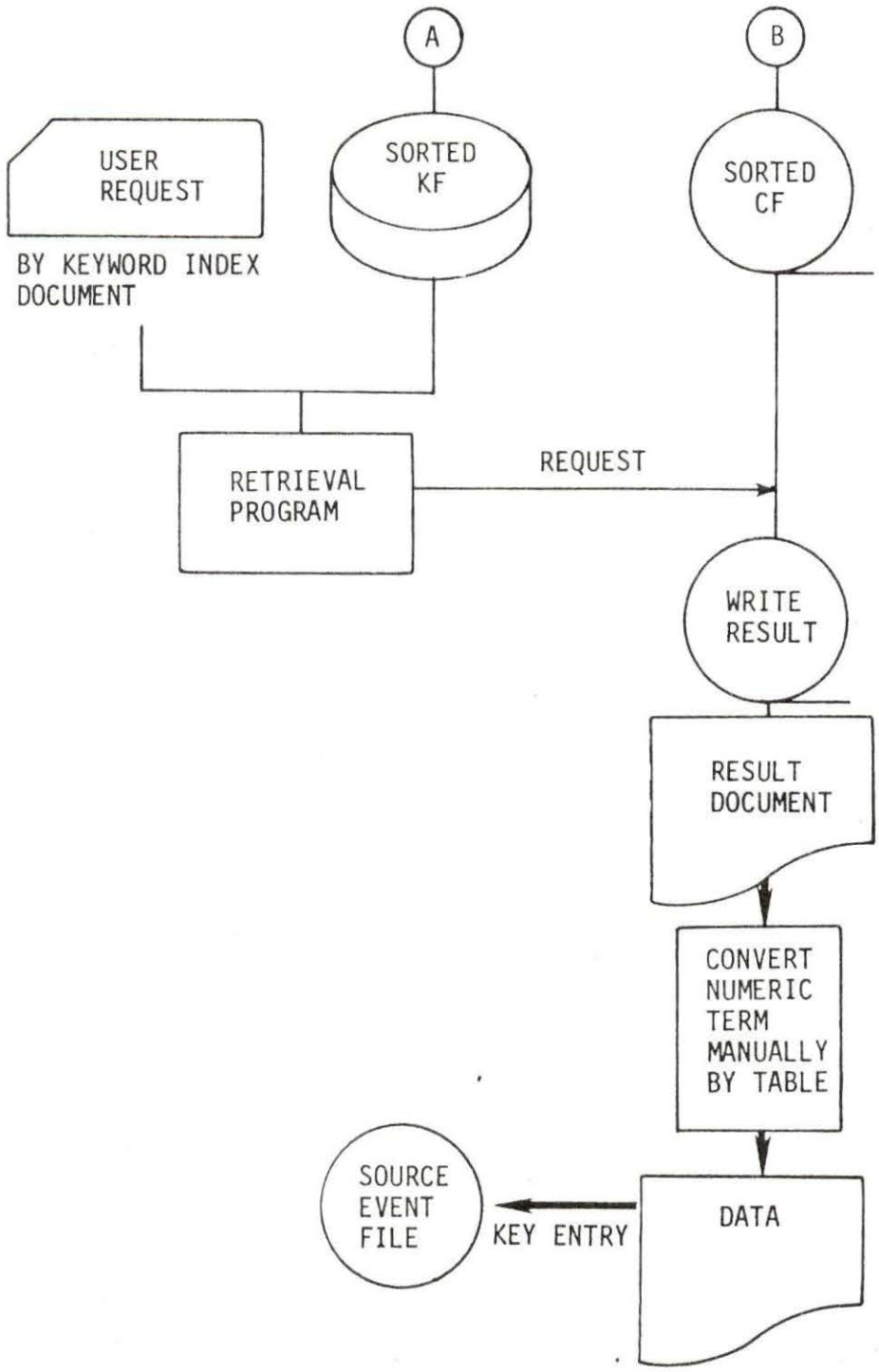

Figure 6.2. Phase II of the data retrieval system

used here, nevertheless other keywords may be used according to specific interests. Although programs for phase I and II are developed, the program from NSIC is used to print out the LER source list. The reasons are:

1. All the LER's should be printed out, since the keyword system used for classification by NSIC is different from GENCLASS. The keyword system made by the NSIC is used to check the results obtained by GENCLASS.
2. Initially all the LER's were printed out and hence there is not much demand to retrieve source LER's.

Phase III is the process which stores machine readable data from the numerical classification of the master file (MF), and the accumulated moved file in Figure 6.3. The dotted lines mean updating of old data. The provided computer programs can add, delete or replace records. Two copies of the sequential master file (MF), the source LER's and the accumulated moved file are retained for backup and convenience of updating. The MF is read one record at a time and the sorted SEF (Source Event File) is processed against it to produce new matched SEF. The MATCHING program is used to perform the previous steps. The MF includes information on plants which operate currently for

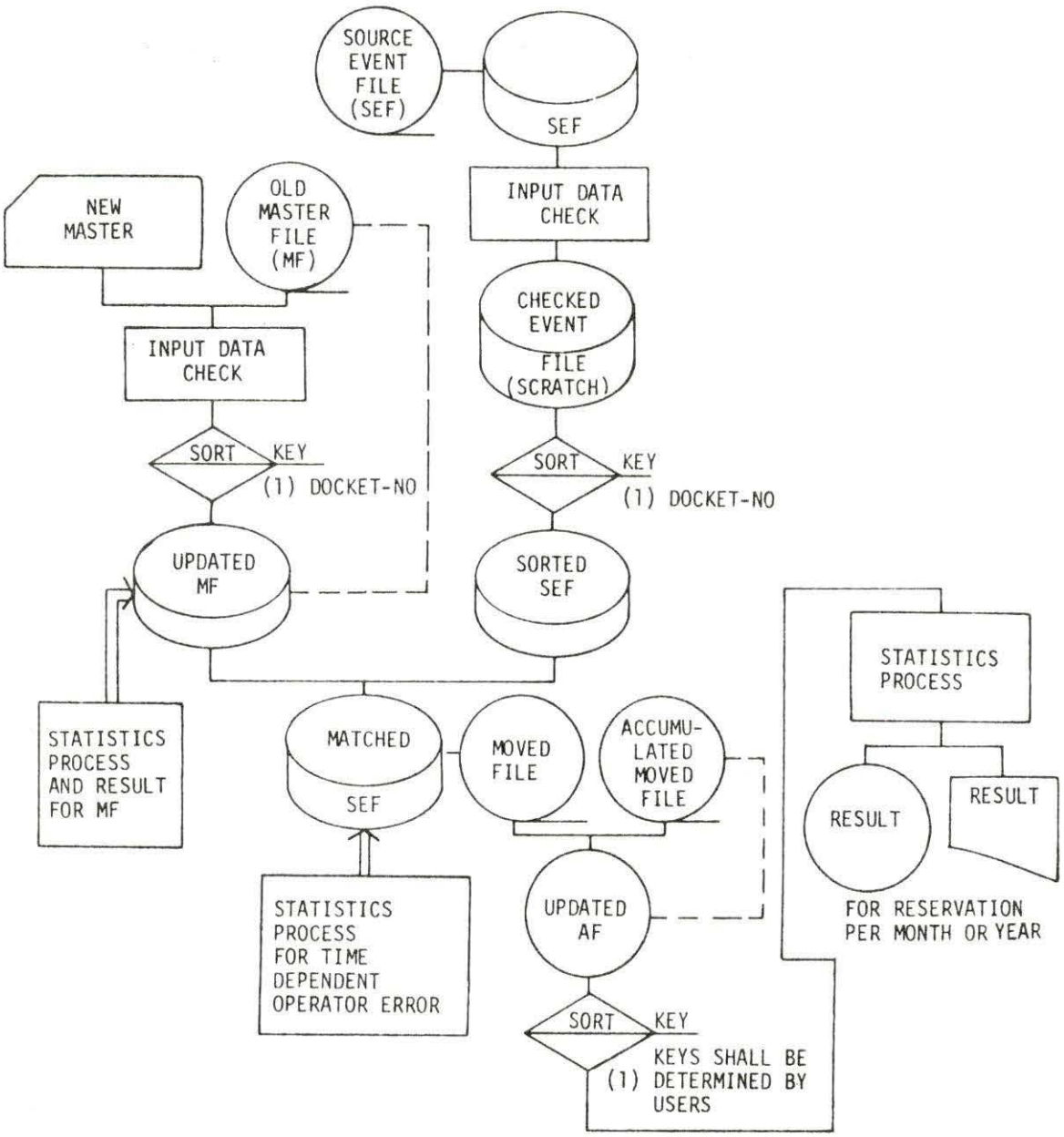

Figure 6.3. Phase III of data retrieval system

commercial electricity generation in the United States.

The RETRIEVAL-GEN program performs the process to retrieve specific information from the AF (Accumulated Moved File) and is available for multiple requests. The data checking and comparison of SEF (Source Event File) are discussed in Chapter 5. If the SEF is not required to update, the SEF is sorted by the key of docket-number in ascending order. After the matching process, the matched SEF is produced and copied on the moved file. The updated accumulated moved file is retained through updating process, and retrieved by the user submitted keys. The following is a description of the LERRET facility.

6.1. Status

A. Program language - COBOL

B. System - IBM 360 or 370 series

C. Number of programs - five

DIRECTF - Generating program for a citation file and a sequential keyword file

RETRIEVAL-LER - Retrieval program for LER documents

MAKE-MF - Generating program for a master file which included the information of plants

MATCHING - Matching program between a sorted SEF and an updated master file

RETRIEVAL-GEN - Retrieval program for LER's in terms of numeric classified by the GENCLASS

6.2. Method

The SNOBOL techniques are introduced to develop retrieval programs. PATHDIAM is an algorithm used to build up a path diagram and PDMATCH is used to match real data using the built-in path diagram. Both algorithms are employed in the retrieval programs (RETRIEVAL-LER and RETRIEVAL-GEN). When keywords are referenced, tables can be drawn up and can be requested by the RETRIEVAL-GEN.

6.3. Required Resources

OLD SOURCE LER - The accumulated LER master file from April, 1960 to December, 1977 (available from NRC or NSIC)

NEW LER - A monthly published report from NRC ("Computer Listings of LER sorted by Facility")

OLD MASTER FILE - The accumulated data on operating units status (available from NRC or NSIC)

NEW MASTER FILE - A monthly published report from NRC ("Operating Units Status Report")

ACCUMULATED MOVED FILE - The accumulated numeric LER provided by the computer

MOVED FILE - A monthly file for the numeric LER provided by the computer

6.4. Sample

6.4.1. DIRECTF

In this example, a tape-input provided by the NSIC is divided into two 9-track tapes. A card-input is used to insert abbreviation forms on power plants. The example follows:

```
//DIRECTF  JOB  Accnt-No'CHO'
/*JOBPARM  L=99,COPIES=1
//S1  EXEC  COBUCLG,REGION.COB=128K,PARM.COB=1SIZE=
//  TIME.GO=(2,30),REGION.GO=280K
//COB.SYSIN  DD  *
(DIRECTF program)
//KLED.SYSIN  DD  *
(SORTREAC binary object deck provided by the NSIC)
//GO.MF  DD  DSN=ROGD6186.NSICSRCH,UNIT=TAPE,VOL=SER=
   X9999,
//  DCB=DEN=3,DISP=(OLD,KEEP)
//GO.KF  DD  DSN=KEYF,UNIT=TAPE,VOL=SER=X0005,
//  DCB=DEN=3,DISP=(NEW,KEEP)
//CO.OF  DD  DSN=CITGF,UNIT=TAPE,VOL=SER=X0004,
//  DCB=DEN=3,DISP=(NEW,KEEP)
//GO.SYSPRINT  DD  SYSOUT=A
//GO.SYSIN  DD  *
(input card data set on Figure 6.4)
/*
```

6.4.2. RETRIEVAL-LER

a. Input - A card-input (requested keywords provided by the NSIC) - maximum five cards

A variable-length blocked records on a 9-tract tape (LER-MASTER file)

Blocked fixed-length records on two 9-tract tapes (KEY file and CITATION file)

Those two tapes are produced by the DIRECTF program

Column	Keyword[a] 1 ↓	5 ↓	Abbreviation form[b] 10 ↓	Description
			INPUT DATA	
	1675		PARK1	Arkansas 1 (PWR)
	1787		PBEV1	Beaver Valley 1 (PWR)
	0022		BBIP1	Big Rock Point (BWR)
	2021		BBRF1	Browns Ferry 1 (BWR)
	1517		BBRF2	Browns Ferry 2 (BWR)
	1764		BBRF3	Browns Ferry 3 (BWR)
	1758		BBRU1	Brunswick 1 (BWR)
	1772		BBRU2	Brunswick 2 (BWR)
	1729		PCAC1	Calvert Cliffs 1 (PWR)
	1773		PCAC2	Calvert Cliffs 2 (PWR)
	1662		PCOO1	Cook 1 (PWR)
	1723		BCOS1	Cooper Station (BWR)
	1561		PCRR3	Crystal River 3 (PWR)
	1412		BDAB1	David Besse 1 (PWR)
	0109		BDRE1	Dresden 1 (BWR)
	0860		BDRE2	Dresden 2 (BWR)
	0515		BDRE3	Dresden 3 (BWR)
	1770		BDUA1	Duane Arnold (BWR)
	1942		PFAR1	Farley 1 (PWR)
	0389		BFIT1	Fitzpatrick (BWR)
	1333		PFOC1	Fort Calhoun 1 (PWR)
	1334		HFOV	Fort St. Vrain (HGTR)
	1851		PGIN1	Ginna (PWR)
	0493		PHAN1	Haddem Neck (PWR)
	1734		BHAT1	Hatch 1 (BWR)
	0192		BHUB1	Humboldt Bay (BWR)
	0201		PINP1	Indian Point 1 (PWR)
	1255		PINP2	Indian Point 2 (PWR)
	1639		PINP3	Indian Point 3 (PWR)
	1728		PKEW1	Kewaunee (PWR)

[a]Keywords were provided by NSIC.

[b]In abbreviation form the first character is the reactor type (BWR-'B', PWR-'P', and HTGR-'H').

Figure 6.4. Summary of plant keywords and abbreviation forms

Column	Keyword[a] 1 ↓	5 ↓	Abbreviation form[b] 10 ↓	Description
		INPUT DATA		
	1163		BLAC1	La Crosse (BWR)
	1737		PMAY1	Maine Yankee (PWR)
	1861		BMIL1	Millstone 1 (BWR)
	1842		PMIL2	Millstone 2 (PWR)
	1339		BMON1	Monticello (BWR)
	0266		BNIP1	Nine Mile Point 1 (BWR)
	1855		POCO1	Oconee 1 (PWR)
	3021		POCO2	Oconee 2 (PWR)
	3012		POCO3	Oconee 3 (PWR)
	0283		BOYC1	Oyster Creek 1 (BWR)
	1341		PPAL1	Palisades (PWR)
	1551		BPEB2	Peach Bottom 2 (BWR)
	2016		BPEB3	Peach Bottom 3 (BWR)
	1419		BOIL1	Pilgrim 1 (BWR)
	1343		PBOB1	Point Beach 1 (PWR)
	3000		PPOB2	Point Beach 2 (PWR)
	1618		PPRI1	Prairie Island 1 (PWR)
	1775		PPRI2	Prairie Island 2 (PWR)
	1344		BQUC1	Quad Cities 1 (BWR)
	1797		BQUC2	Quad Cities 2 (BWR)
	1674		PRAS1	Rancho Seco 1 (PWR)
	1347		PROB2	Robinson 2 (PWR)
	1676		PSAL1	Salem 1 (PWR)
	0569		PSAO1	San Onofre 1 (PWR)
	2581		PSTL1	St. Lucie 1 (PWR)
	1562		PSUR1	Surry 1 (PWR)
	1800		PSUR2	Surry 2 (PWR)
	1631		PTHI1	Three Mile Island (PWR)
	1874		PTRO1	Trojan (PWR)
	1350		PTUP3	Turkey Point 3 (PWR)
	1804		PTUP4	Turkey Point 4 (PWR)
	1352		BVEY1	Vermont Yankee 1 (PWR)
	0451		PYAR1	Yankee Rowe 1 (PWR)
	1692		PZIO1	Zion 1 (PWR)
	1778		PZIO2	Zion 2 (PWR)

Figure 6.4 (Continued)

b. Output - Blocked fixed-length records on a 9-track labeled tape (EDITED file)

A print-output, sequential data set

c. Intermediate storage - six 3330 areas for sorting
four 3330 areas for temporary use

```
//RETRIEVAL-LER  JOB  Accnt-No,'CHO'
/*JOBPARM  L=2
//S1  EXEC  COBUCLG,REGION.COB=128K,PARM.COB='SIZE=
    108544',
//  TIME.GO=(2,30),REGION.GO=150K
//COB.SYSIN  DD  *
(RETRIEVAL-LER program)
//LKED.SYSIN  DD  *
//GP.MF  DD  DSN=ROGD6186.NSICSRCH,UNIT=TAPE,VOL=SER=
    X9999,
//  DCB=DEN=3,DISP=(OLD,KEEP),LABEL=(1,SL)
//GO.KF1  DD  DSN=KEYF,UNIT=TAPE,VOL=SER=X0005,
//  DCB=DEN=3,LABEL=(1,SL),DISP=(OLD,KEEP)
//GO.KF2  DD  DSN=&&KF02,UNIT=SCRTCH,SPACE=(TRK,300),
//  DISP=(NEW,DELETE)
//GO.KF3  DD  DSN=&&KF03,UNIT=SCRTCH,SPACE=(TRK,300),
//  DISP=(NEW,DELETE)
//GO.CF  DD  DSN=CITEF,UNIT=TAPE,VOL=SER=X0004,
//  DISP=(OLD,KEEP),LABEL=(1,SL),DCB=DEN=3
//GO.SORTLIB  DD  DSN=SYS1.SORTLIB,DISP=SHR
//GO.SORTWK01  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK02  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK03  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK04  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK05  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK06  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SKF2  DD  DSN=&&SKF02,UNIT=SCRTCH,SPACE=(TRK,300),
//  DISP=(NEW,PASS)
//GO.EF  DD  DSN=EDITEDF,UNIT=TAPE,VOL=SER=X0006,
//  DISP=(NEW,KEEP)LABEL=(1,SL),DCB=DEN=3
//GO.SYSIN  DD  *
0191*(0191+1674)
@                              ) (Input card data set,
/*                                provided by NSIC)
```

6.4.3. MAKE-MF

a. Input - A card-input, sequential data set (four cards for one power plant)

b. Output - A print-output, sequential data set
A punched data set

c. Intermediate storage - Six 3330 areas for sorting
two 3330 areas for temporary usage

```
//MAKE-MF  JOB  Accnt-No,'CHO'
/*JOBPARM  L=7
//S1  EXEC  COBUCLG,TIME.GO=(2,30)
//COB.SYSIN  DD  *
(MAKE-MF program)
//GO.MF  DD  DSN=&&MASTER,UNIT=SCRTCH,SPACE=(TRK,100),
//  DISP(NEW,PASS)
//GO.SORTN  DD  DSN=&&MASTER1,UNIT=SCRTCH,SPACE=(TRK,200),
//  DISP=(NEW,DELETE)
//GO.SORTLIB  DD  DSN=SYS1.SORTLIB,DISP=SHR
//GO.SORTWK01  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK02  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK03  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK04  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK05  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK06  DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SYSPUNCH  DD  SYSOUT=B
//GO.SYSPRINT  DD  SYSOUT=A
//GO.SYSIN  DD  *
(input card data set, the data format is described in
INPUT section of MAKE-MF)
/*
```

6.4.4. MATCHING

a. Input - A card-input, sequential data set for the plant's information

Blocked fixed-length records on a 9-track tape (SEF - Source Event File)

b. Output - Blocked fixed-length records on a 9-track tape (MEF - Matched Event File)

c. Intermediate storage - Six 3330 areas for sorting

```
//MATCHING  JOB  Accnt-No,'CHO'
/*JOBPARM  L=30
//S1  EXEC  COLBUCLG,TIME.GO=(2,30),REGION.GO=150K
//COB.SYSIN  DD  *
(MATCHING program)
//GO.SEF  DD  DSN=GEN03,UNIT=TAPE,VOL-SER=X0003,
    DCB=DEN=3,
//  LABEL=(1,SL),DISP=(OLD,KEEP)
//GO.MEF  DD  DSN=GEN04,UNIT=TAPE,VOL=SER=X0007,DCB=
    DEN=3,
//  LABEL=(1,SL),DISP=(OLD,KEEP)
//GO.SORTN  DD  DSN=&&SEF01,UNIT=SCRTCH,SPACE=(TRK,600),
//  DISP=(NEW,DELETE)
//GO.SORTLIB  DD  DSN=SYS1.SORTLIB,DISP-SHR
//GO.SORTWK01  DD  UNIT=SCRTCH,SPACE=(TRK,200)
//GO.SORTWK02  DD  UNIT=SCRTCH,SPACE=(TRK,200)
//GO.SORTWK03  DD  UNIT=SCRTCH,SPACE=(TRK,200)
//GO.SORTWK04  DD  UNIT=SCRTCH,SPACE=(TRK,200)
//GO.SORTWK05  DD  UNIT=SCRTCH,SPACE=(TRK,200)
//GO.SORTWK06  DD  UNIT=SCRTCH,SPACE=(TRK,200)
//GO.SYSPRINT  DD  SYSOUT=A
//GO.SYSIN  DD  *
(Input data set on Figure 6.5)
/*
```

The control statement on COBUCLG is used to decrease core usage, but there is not a linkage editor in the MATCHING program.

6.4.5. RETRIEVAL-GEN

In this example, blocked fixed-length records on a 9-track tape (GEN04) is retrieved by user's keywords submitted as a card-input form. The results are printed out and punched for reservation. The example follows:

```
//RETRIEVAL-GEN  JOB  Accnt-No,'CHO'
/*JOBPARM  L=80
//S1  EXEC  COBUCLG, REGION.COB=128K,PARM.COB='SIZE=
    108544',
//  TIME.GO=(0,30),REGION.GO=150K
//COB.SYSIN  DD  *
```

```
Column  1                          26
        ↓                          ↓
        ---------------------------
        00300132200615200702802028
        01000213100700200600205002
        02900321200600204202506025
        13300405100220102900205002
        15500522100240100800205002
        20600605201347303400206002
        21300707201825401002506025
        21900830101930401900405016
        22000932101850402302805025
        23701013102527600602305027
        24401132201520403301106002
        24501207102011502200905009
        24701332202758600702706017
        24901413102527600602305027
        25001509202200501500206002
        25101609202200501500206002
        25401713102511600602305027
        25501822202530600800203002
        25901901103293703702605026
        26002001103293703702605026
        26102140202200500900906009
        26302223101670402500205002
        26502313102511600602305027
        26602449201518404000206002
        26702506300842203102304010
        26902640202568601300702008
        27002740202568601300702008
```

Figure 6.5. Sample as an input data set for the MATCHING program

```
(RETRIEVAL-GEN program)
//GO.MEF   DD  DSN=GEN04,UNIT=TAPE,VOL=SER=X0007, DCB=
     DEN=3,
//   DISP=(OLD,KEEP),LABEL=(1,SL)
//GO.SORTN   DD  DSN=&&MEF01,UNIT=SCRTCH,SPACE=(TRK,300),
//   DISP=(NEW,PASS)
//GO.SORTLIB   DD  DSN=SYS1.SORTLIB,DISP=SHR
//GO.SORTWK01   DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK02   DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK03   DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK04   DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK05   DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SORTWK06   DD  UNIT=SCRTCH,SPACE=(TRK,100)
//GO.SYSPUNCH   DD  SYSOUT=B
//GO.SYSPRINT   DD  SYSOUT=A
//GO.SYSIN   DD  *
1110*(0801+0814)
@
/*                  )-input card data set, those key-
                      words are provided by the Tables
                      6.2-6.20
```

6.5. Input

6.5.1. DIRECTF

The required input cards are described on Figure 6.4. The first four digits are used as keywords during searching for master file. Each keyword code represents a power plant. The LER document record consists of the following items in MASTERFILE*:

1. Authority records - 56 bytes

   a) Record Identification - value '2' - 1 byte

   b) A one-byte filler - 1 byte

   c) Variable Count - number of bytes used for the keyword code field and the term - 2 bytes

   d) Keyword Code - 5-digit code - 2 bytes

e) Keyword Term - maximum of 48 bytes

2. LER record - variable length, maximum 1970 bytes

a) Record Identification - value '3' - 1 byte

b) Evaluation - 1 byte

c) Variable Count - number of characters in the variable portion plus 76 - 2 bytes

d) Accession number - 4 bytes

e) Significant Date - 4 bytes (stored YYMMDD)

f) Corporate Author Codes - 9 bytes

g) Document Type - 3 bytes

h) Language - 1 byte

i) Country - 1 byte

j) Categories - 6 two-byte fields

k) Subject number - 6 bytes

l) Journal Abbreviations - 4 bytes

m) Edition number - 2 bytes

n) Keyword Count - 2 bytes

o) Author Count - 2 bytes

p) Title Count - 2 bytes

q) Corporate Author Count - 2 bytes

r) Memoranda Count - 2 bytes

s) Abstract Count - 2 bytes

t) Availability Count - 2 bytes

u) Abstract Format - 1 byte

v) Bibliography Flag - 1 byte

w) Report Flag - 1 byte

x) Filler - 1 byte

y) Proprietary Flag - 2 bytes

z) Filler - 10 bytes

zz) Variable Portion - 1890 bytes maximum

The portion consists of the keywords code numbers, authors, titles, corporate authors, memoranda, abstract, and availability, respectively.

The previous formats for the MASTERFILE have been developed by the NSIC (Nuclear Safety Information Center).

6.5.2. RETRIEVAL-LER

1. Card - Input - Each keyword consists of four digits. If it needs to pull operator errors (0191) occurrence in Dresden 1 (0109) and Rancho Seco (1674), the card-input is below:

The first card, 0109*(0109+1674)
The second card, @

Any two single conditional expressions may be connected by a logical operator, AND or OR to form a compound conditional expression. The letters * and + indicate AND and OR, respectively.

Parentheses indicate the order in which conditions in an expression are to be evaluated. Parentheses must always be paired. When the order of evaluation is not specified by parentheses, the expression is evaluated

Table 6.1. The rules for symbol pairs allowed in compound conditional expressions

		Second Symbol					
		C[c]	OR	AND	AND NOT	(	)
First Symbol	C[a]	-	P	P	P	-	P
	OR	P	-	-	-	P	-
	AND	P	-	-	-	P	-
	AND NOT	P	-	-	-	P	-
	(	P	-	-	-	P	-
	)	-	P	P	P	-	P

[a]The letter C indicates a conditional expression. P indicates permissible pairs, and the dash indicates pairs not permitted.

according to the logical operators AND and OR as follows: beginning at the left of the entire expression, each AND expression is evaluated and each OR expression is evaluated.

For example, the conditional expression A AND B OR C AND D is considered as (AND B) OR (C AND D). (A AND B) is evaluated first, followed by (C AND D) (Table 6.1).

2. MASTERFILE - The formats are the same as the LER record in the DIRECTF program

3. KEYWORDFILE - The same file as the output from the DIRECTF

4. CITATIONFILE - The same file as an output from the DIRECTF

6.5.3. MAKE-MF

1. Card-Input - A sequential data set
   The information of one power plant consists of four cards

The first card is formed by 80 bytes

a) Facility Name - 23 bytes

b) Location - 25 bytes

c) Reactor Type - 5 bytes

d) Power Level - 5 bytes

e) Filler - 1 byte

f) Design Electrical Rating (MWE Net) - 5 bytes

g) Filler - 1 byte

h) Date of initial criticality - 6 bytes (Mo/Dy/Yr)

i) Filler - 2 bytes

j) Date of commercial operation - 6 bytes (Mo/Dy/Yr)

k) Filler - 1 byte

The second card has 80 bytes

a) Licensee - 50 bytes

b) Architect/Engineer - 30 bytes

The third card consists of 23 bytes

a) Docket Code - 3 bytes (Table 6.14)

b) Location Code - 2 bytes (Table 6.15)

c) Reactor Type Code - 1 byte (Table 6.16)

d) Power Level - 5 bytes (the same content as the power level in the first card)

e) Power Code - 1 byte (Table 6.17)

f) Licensee Code - 3 byte (Table 6.18)

g) Architect Code - 3 bytes (Table 6.19)

h) Nuclear Steam Supply System (NSSS) Code - 2 bytes (Table 6.20)

i) Constructor Code - 3 bytes (Table 6.19)

The fourth card with 80 bytes is formed as follows:

a) NSSS - 5 bytes

b) Constructor - 30 bytes

c) Docket Number - 5 bytes

d) Filler - 2 bytes

e) License Number - 6 bytes

f) Filler - 2 bytes

g) Issue Date for License Number - 6 bytes (Mo/Dy/Yr)

h) Filler - 5 bytes

i) Punch Date - 6 bytes (Mo/Dy/Yr)

j) Serial Number (for each four-cards data set) - 3 bytes

k) Filler - 5 bytes

6.5.4. MATCHING

1. Card-Input - The punched output items from the MAKE-MF can be used as an input data set. Figure 6.5 shows the part of punched output from the MAKE-MF. The formats are described in the OUTPUT section of the MAKE-MF.

2. Source Event File - 94 bytes - The items have been described in OUTPUT section of the DATACHEC1 program.

6.5.5. RETRIEVAL-GEN

1. Card-Input - Each keyword consists of four-digit code in which the first two digits are one of the search keys in Table 6.2 and the last two digits include any key code described from Table 6.3 to Table 6.20. For example, 1110*(0801+0814). In the code of 1110, search key of Error-Domain=11 (Table 6.2).

Operation/operator in Error-Domain Code=10 (Table 6.5). For 0801 and 0814 the search key 08 means Date of Event and the key codes for 01 and 14 indicate 1960 and 1973, respectively. Thus, the above example is to retrieve data for operator errors occurred in 1960 or in 1973. The

Table 6.2. Final output format for retrieval program

Search Key	Contents
01[a]	Record-Identification ("R"; Replacement data "D"; Delete data " "; Add data) - 1 digit
02[a]	Name-Identification - (1,2,3,&4 for four classifiers) - 1 digit
03[a]	Reference-Number - 6 digits
04[a]	Duplicate - (Identification for the same reference-number) - 1 digit
05[a]	Docket-Number - 5 digits
06[a]	Date of the first electric generation - (Mo/DY/YR) - 6 digits
07[b]	Date of report - (MO/DY/YR) - 6 digits
08[b]	Date of event - (MO/DY/YR) - 6 digits
09[a]	Phase of operation - 4 digits
10[b]	Outage - 2 digits
11[b]	Error-Domain - 4 digits
12[a]	Human-Act - 1 digit
13[a]	Taxonomy - 1 digit
14[b]	Equipment - 2 digits
15[a]	Effect task - 2 digits
16[a]	Effect operation - 3 digits

[a]Classified but unavailable as a search code.

[b]Classified as a search code. To pull out data, use these two numbers as a search key-code for retrieval program.

Table 6.2 (Continued)

Search Key	Contents
17[b]	Duration-(hr.) - 4 digits
18[b]	Radioactivity-Release-to-Environment - 4 digits
19[b]	Radiation exposure - 4 digits
20[a]	Human causes - 2 digits
21[b]	Human error type - 4 digits
22[a]	Operation stresses - 3 digits
23[b]	System - 1 digit
24[b]	Component location - 3 digits
25[b]	Critical code - 2 digits
26[a]	Punched-Date-(MO/DY/YR) - 6 digits
27[a]	Serial-(For Data) - 4 digits
28[a]	Count-(Computer Generated) - 6 digits
29[b]	Docket-Code - 3 digits
30[b]	Location-Code - 2 digits
31[b]	Reactor-Type-Code - 1 digit
32[a]	Power level-(MWT) - 5 digits
33[b]	Power level range code - 1 digit
34[b]	Licensee-Code - 3 digits
35[b]	Architect-Code - 3 digits
36[b]	NSSS-Code - 2 digits
37[b]	Constructor-Code - 3 digits

Table 6.3. Event year code (Search-Key = 08)

Code	Contents
00	All Year
01	1960
02	1961
03	1962
04	1963
05	1964
06	1965
07	1966
08	1967
09	1968
10	1969
11	1970
12	1971
13	1972
14	1973
15	1974
16	1975
17	1976
18	1977
19	1978
20	1979
21	1980
22	1981
23	1982
24	1983
25	1984 - Maximum Year

Table 6.4. Outage code (Search-Key = 10)

Code	Contents
00	All Outage
01	N/A (00)[a]
02	Scheduled (10)
03	Scheduled Inspection (11)
04	Scheduled Preventive Maintenance (12)
05	Scheduled Refueling (13)
06	Scheduled Testing (14)
07	Scheduled Operator Training/License Tests (15)
08	Scheduled Others (16)
09	Off-Scheduled/Forced (20)
10	Off-Scheduled/Forced NRC-Review (21)
11	Off-Scheduled/Forced Repair Failed Equipment (22)
12	Off-Scheduled/Forced Inspection Abnormal Conditions (23)
13	Off-Scheduled/Forced Operator (No Failure) (24)
14	Off-Scheduled/Forced Others (25)
15	Idle (30)
16	Idle Administrative Decision (31)
17	Idle Operator Error (32)
18	Idle NRC Decision (33)
19	Idle Others (34)
20	Outage Other (40) - Maximum Outage Code[b]

[a]GENCLASS classified code.

[b]Maximum Key-Code number for outage is 25.

Table 6.5. Error-Domain code (Search-Key = 11)

Code	Contents
00	All
01	Unstated/Unknown (0000)[a]
02	Human Error (1000)
03	Design (1100)
04	Fabrication/Construction (1200)
05	Installation/Welding (1300)
06	Inspection (1400)
07	Maintenance (1500)
08	Administration (1600)
09	Monitoring (1700)
10	Operation/Operator (1800)
11	Others (1900)
12	System Failure (2000)
13	Design (2100)
14	Fabrication/Construction (2200)
15	Installation/Welding (2300)
16	Inspection (2400)
17	Maintenance (2500)
18	Procedure (2600)
19	Others (2700)
20	Human Error Combination (3000)
21	Design/Fabrication (3100)
22	Communication (3105)
23	Fabrication/Installation (3110)
24	Communication (3115)
25	Inspection/Fabrication (3120)
26	Communication (3125)
27	Inspection/Installation (3130)
28	Communication (3135)
29	Inspection/Maintenance (3140)
30	Communication (3145)
31	Maintenance/Fabrication (3150)
32	Communication (3155)
33	Maintenance/Installation (3160)
34	Communication (3165)
35	Maintenance/Administration (3170)
36	Communication (3175)
37	Maintenance/Monitoring (3180)
38	Communication (3185)

[a]GENCLASS classified code.

Table 6.5 (Continued)

Code	Contents
39	Maintenance/Operation (3190)
40	Communication (3195)
41	Administration/Operation (3200)
42	Communication (3205)
43	Operation/Inspection (3210)
44	Communication (3215)
45	Operation/Monitoring (3220)
46	Communication (3225)

Table 6.6. Equipment code (Search-Key = 14)

Code	Contents
00	All
01	Insignificant Equip./System Failure (00)[a]
02	Potent Equip./System Failure (01)
03	Significant Equip./System Failure (02)
04	No Failure to Equip./System: Insig. (10)
05	No Failure to Equip./System: Potent (11)
06	No Failure to Equip./System: Significant (12) - Maximum Equipment Code

[a]GENCLASS classified code.

Table 6.7. Duration code (Search-Key = 17)

Code	Contents
00	All
01	<1 hrs.
02	1 ≃ 24 hrs.
03	25 ≃ 48 hrs.
04	49 ≃ 72 hrs.
05	73 ≃ 96 hrs.
06	97 ≃ 120 hrs.
07	14 ≃ 144 hrs.
08	145 ≃ 168 hrs.
09	>169 hrs. - Maximum Key-Code

Table 6.8. RAD. - ENV. Code (Search-Key = 18)

Code	Contents
00	All
01	N/A (4050)[a]
02	Not related (4100)
03	Related but information not available (4150)
04	Radioactivity release to environment (4200) NO NRC Fine
05	Radioactivity release to environment (4201) Fine
06	Radioactivity release to environment Directly Sign. (4210) No NRC Fine
07	Radioactivity release to environment Directly Sign. (4211) Fine
08	Radioactivity release to environment Potentially Sign. (4220) No NRC Fine
09	Radioactivity release to environment Potentially Sign. (4221) Fine
10	Radioactivity release to environment Insign. (4230) No NRC Fine
11	Radioactivity release to environment Insign. (4231) Fine
12	Radioactivity release to environment No. release (4240) Max. Key-Code

[a]GENCLASS classified code.

Table 6.9. RAD. - EXP. code (Search-Key = 19)

Code	Contents
00	All
01	N/A (4305)[a]
02	No exposure above 10 CFR 20 limits (4310)
03	Negligible exposure None (4320)
04	Negligible exposure Minor (4321)
05	Negligible exposure Disabling injuries (4322)
06	Nelgigible exposure Fatality (4324)
07	Moderate exposure None (4330)
08	Moderate exposure Minor (4331)
09	Moderate exposure Disabling injuries (4332)
10	Moderate exposure Fatality (4334)
11	Large exposure None (4340)
12	Large exposure Minor (4341)
13	Large exposure Disabling injuries (4342)
14	Large exposure Fatality (4344) - Max. Key-Code

[a]GENCLASS classified code.

Table 6.10. Human error type code (Search-Key = 21)

Code	Contents
00	All
01	N/A (0000)[a]
02	Omission (1000)
03	Omission oversight (1100)
04	Omission oversight failure to perform a task (1110)
05	Omission oversight failure to perform a part of a task or stop (1120)
06	Omission oversight failure to complete a correct procedure (1130)
07	Omission sequential (1200)
08	Omission sequential (performance of a task or step out of sequence leading to omission) (1210)
09	Omission sequential incorrect procedure sequence leadup to omission (1220)
10	Omission intentional omission (1300)

[a]GENCLASS classified code.

Table 6.10 (Continued)

Code	Contents
11	Omission intentional sabotage (1310)
12	Omission intentional suicide (1311)
13	Omission intentional disturbance/protest (1312)
14	Omission intentional physical disorder (1313)
15	Omission intentional psychological disorder (1314)
16	Omission time (1400)
17	Omission time failure to perform a task within allotted time (1410)
18	Omission time failure (part of a task or step within allotted time) (1420)
19	Omission time failure to respond to alarm (1430)
20	Commission (2000)
21	Negligence (2100)
22	Negligence incorrect performance of a task (2110)
23	Negligence incorrect performance of part of a task or step (2120)
24	Negligence incorrect or inadvertent equip. manipulation (2130)
25	Negligence incorrect analysis (2140)
26	Negligence clerical error (2150)
27	Negligence incorrect interpretation of instrument/meter reading (2160)
28	Negligence deliberate (2170)
29	Negligence others (2180)
30	Sequential (2200)
31	(performance of a task or step out of sequence without skipping a step or part of a task) (2210)
32	Incorrect procedure sequence (2220)
33	Extraneous (2300)
34	Extraneous perform unrequired task or step (2310)
35	Extraneous unintentional (2311)
36	Extraneous intentional (2312)
37	Extraneous perform additional isolated task or step (2320)
38	Extraneous sabotage (2321)

Table 6.10 (Continued)

Code	Contents
39	Extraneous suicide (2322)
40	Extraneous disturbance/protest (2323)
41	Extraneous physical disorder (2324)
42	Extraneous physiological disorder (2325)
43	Time (2400)
44	Time inadequate scheduling of operation task (2410)
45	Time incorrect response to alarm within allotted time without omission of a step (2420) - Max. Key-Code

Table 6.11. System involved code (Search-Key = 23)

Code	Contents
00	All
01	Unidentified
02	NSSS
03	Safety & Protection System
04	Control & Instrumentation System
05	Radwaste
06	Containment & Isolation System
07	Secondary, Nonnuclear system
08	Fuel Handling System
09	Auxiliary Water System
10	Others - Max. Key-Code

Table 6.12. System component code (Search-Key = 24)

Code	Contents
00	All
01	Reactor (000)[a]
02	Reactor Vessel Internals (001)
03	Reactivity Control Systems (002)
04	Reactor Core (003)
05	Reactor Coolant & Connected Systems (010)
06	Reactor Vessels & Appurtenances (011)
07	Coolant Recirculation Systems & Controls (012)
08	Main Steam Systems & Controls (013)
09	Main Staem Isolation Cooling Systems Controls (014)
10	Residual Heat Removal Systems & Controls (015)
11	Reactor Coolant Cleanup Systems & Controls (016)
12	Feedwater Systems & Controls (017)
13	Reactor Coolant Pressure Boundary Leakage Detection Systems (018)
14	Other Coolant Subsystems & Their Controls (019)
15	Steam and Power Conversion Systems (020)
16	Turbine-Generator & Controls (021)
17	Main Steam Supply System & Controls (other than 013) (022)
18	Main Condenser Systems & Controls (023)
19	Turbine Gland Sealing Systems & Controls (024)
20	Turbine Bypass Systems & Controls (025)
21	Circulating Water Systems & Controls (026)
22	Condensate and Feedwater System & Controls (other than 017) (027)
23	Steam Generator Blowdown Systems & Controls (028)
24	Other Features of Steam & Power Conversion Systems (not included elsewhere) (029)
25	Engineered Safety Features (030)
26	Reactor Containment Systems (031)
27	Containment Heat Removal Systems & Controls (032)
28	Containment Air Purification & Cleanup Systems & Controls (033)

[a]GENCLASS classified code.

Table 6.12 (Continued)

Code	Contents
29	Containment Isolation Systems & Controls (034)
30	Containment Combustible Control Systems & Controls (035)
31	Emergency Core Cooling Systems & Controls (036)
32	Control Room Habitability Systems & Controls (037)
33	Other Engineered Safety Feature Systems & Their Controls (038)
34	Instrumentation and Controls (040)
35	Reactor Trip Systems (041)
36	Engineered Safety Feature Instrument Systems (042)
37	Systems Required For Safe Shutdown (043)
38	Safety Related Display Instrumentation (044)
39	Other Instrument Systems Required for Safety (045)
40	Other Instrument Systems Not Required for Safety (046)
41	In Core Instrumentation (047)
42	Electric Power Systems (050)
43	Offsite Power Systems & Controls (051)
44	AC Onsite Power Systems & Controls (052)
45	DC Onsite Power Systems & Controls (053)
46	Onsite Power Systems & Controls (Composite AC & DC) (054)
47	Emergency Lighting Systems & Controls (055)
48	System Power Supply Components (056)
49	Fuel Storage and Handling Systems (060)
50	New Fuel Storage Facilities (061)
51	Spent Fuel Storage Facilities (062)
52	Spent Fuel Pool Cooling & Clean-up Systems & Controls (063)
53	Fuel Handling Systems (064)
54	Auxiliary Process Systems (070)
55	Compressed Air Systems & Controls (071)
56	Process Sampling Systems (072)
57	Chemical, Volume Control & Liquid Poison Systems & Controls (073)
58	Failed Fuel Detection Systems (074)
59	Other Auxiliary Process Systems & Their Controls (075)
60	Auxiliary Water Systems (080)
61	Station Service Water Systems & Controls (081)

Table 6.12 (Continued)

Code	Contents
62	Cooling Systems for Reactor Auxiliaries & Controls (082)
63	Demineralized Water Make-up Systems & Controls (083)
64	Potable & Sanitary Water Systems & Controls (084)
65	Ultimate Heat Sink Facilities (085)
66	Condensate Storage Facilities (086)
67	Other Auxiliary Water Systems & Their Controls (087)
68	Other Auxiliary Systems (090)
69	Air Conditioning, Heating, Cooling & Ventilation Systems & Controls (091)
70	Fire Protection Systems & Controls (092)
71	Communication Systems (093)
72	Other Auxiliary Systems & Their Controls (094)
73	Radioactive Waste Management Systems (100)
74	Liquid Radioactive Waste Management Systems (101)
75	Gaseous Radioactive Waste Management Systems (102)
76	Process & Effluent Radiological Monitoring Systems (103)
77	Solid Radioactive Waste Management Systems (104)
78	Radiation Protection Systems (110)
79	Area Monitoring Systems (111)
80	Airborne Radioactivity Monitoring Systems (112)
81	Other Radiation Monitors (113)
82	No Specified Systems (200) - Max. Key-Code

Table 6.13. Critical code (Search-Key = 25)

Code	Contents
00	All
01	Not Safety Related (00)[a]
02	Potential Safety Effect (05)
03	Direct Safety Effect (10)
04	N/A (15) - Max. Key-Code

[a]GENCLASS classified code.

Table 6.14. Docket-number code (Search-Key = 29)

Code	Contents	Code	Contents
00	A11	35	285
01	003	36	286
02	010	37	287
03	029	38	289
04	133	39	293
05	155	40	295
06	206	41	296
07	213	42	298
08	219	43	301
09	220	44	302
10	237	45	304
11	244	46	305
12	245	47	306
13	247	48	309
14	249	49	312
15	250	50	313
16	251	51	315
17	254	52	316
18	255	53	317
19	259	54	318
20	260	55	320
21	261	56	321
22	263	57	324
23	265	58	325
24	266	59	331
25	267	60	333
26	269	61	334
27	270	62	335
28	271	63	336
29	272	64	338
30	277	65	344
31	278	66	346
32	280	67	348
33	281	68	409 - Max. Key-Code
34	282		

Table 6.15. State code (Search Key = 30)[a]

Code	Contents
00	All
01	Alabama (ALA)
02	Alaska (ALAS)
03	Arizona (ARIZ)
04	Arkansas (ARK)
05	California (CA)
06	Colorado (COL)
07	Connecticut (CONN)
08	Delaware (DEL)
09	Florida (FLA)
10	Georgia (GA)
11	Hawaii (HA)
12	Idaho (ID)
13	Illinois (ILL)
14	Indiana (IND)
15	Iowa (IA)
16	Kansas (KAN)
17	Kentucky (KY)
18	Louisiana (LA)
19	Maine (ME)
20	Maryland (MD)
21	Massachusetts (MASS)
22	Michigan (MICH)
23	Minnesota (MN)
24	Mississippi (MISS)
25	Missouri (MO)
26	Montana (MONT)
27	Nebraska (NEB)
28	Nevada (NEV)
29	New Hampshire (NH)
30	New Jersey (NJ)
31	New Mexico (NM)
32	New York (NY)
33	North Carolina (NC)
34	North Dakoka (ND)
35	Ohio (OH)
36	Oklahoma (OKLA)
37	Oregon (OREG)
38	Pennsylvania (PENN)
39	Rhode Island (RI)
40	South Carolina (SC)
41	South Dakota (SD)
42	Tennessee (TENN)
43	Texas (TX)
44	Utah (UT)
45	Vermont (VT)
46	Virginia (VA)
47	Washington (WA)
48	West Virginia (WV)
49	Wisconsin (WIS)
50	Wyoming (WY) - Max. Key-Code

[a]Abbreviation form of the 50 states in United States given in parentheses.

Table 6.16. R-type code (Search-Key = 31)

Code	Contents
00	All
01	BWR
02	PWR
03	HTGR
04	LMFBR - Max. Key-Code

Table 6.17. Power-level code (Search-Key = 33)

Code	Contents
00	All
01	$0 \leq x < 500$
02	$500 < x < 1000$
03	$1000 < x < 1500$
04	$1500 < x < 2000$
05	$2000 < x < 2500$
06	$2500 < x < 3000$
07	$3000 < x < 3500$
08	$3500 < x < 4000$
09	$4500 < x$ Max. Key-Code

Table 6.18. Licensee code (Search-Key = 34)

Code	Abbr.	Description
00	All	
01	AEP1	AEP Corporation (50315)[a]
02	AP1	Alabama Power Company (50348)
03	APL1	Arkansas Power and Light Company (50313)
04	BE1	Boston Edison Company (50293)
05	BGE1	Baltimore Gas and Electric Company (50317, 50318)
06	CE1	Commonwealth Edison Co. (50010, 50237, 50249, 50254, 50265, 50295, 50304)
07	CE2	Consolidated Edison Company (50003, 50247)
08	CP1	Consumer Power Company (50155, 50255)
09	CPL1	Carolina Power and Light Company (50325, 50261, 50324)
10	CYAP	Connecticut Yankee Atomic Power Co. (50213)
11	DL1	Duquesne Light Company (50334)
12	DP1	Dairyland Power Cooperative (50409)
13	DP2	Duke Power Company (50269, 50270, 50287)
14	FP1	Florida Power Corporation (50302)
15	FPL1	Florida Power & Light Co. (50335, 50250, 50251)
16	GP1	Georgia Power Company (50321)
17	IELP	Iowa Electric Light and Power (50331)
18	IMPE	Indiana & Michigan Power and Electric Co. (50316)
19	JCPL	Jersey Central Power & Light Co. (50219)
20	ME1	Metropolitan Edison Company (50289, 50320)
21	MYAP	Maine Yankee Atomic Power Co. (50309)
22	NNE1	Northeast Nuclear Energy Company (50245, 50336)
23	NMP1	Niagara Mohawk Power Corporation (50220)
24	NPPD	Nebraska Public Power District (50298)
25	NSP1	Northern States Power Co. (50263, 50282, 50306)

[a]Docket number.

Table 6.18 (Continued)

Code	Abbr.	Description
26	OPPD	Omaha Public Power District (50285)
27	PANY	Power Authority of the State of New York (50333, 50286)
28	PE1	Philadelphia Electric Company (50277, 50278)
29	PGE1	Pacific Gas & Electric Co. (50133)
30	PGE2	Portland General Electric Co. (50344)
31	PSCC	Public Service Company of Colorado (50267)
32	PSEG	Public Service Electric & Gas Co. (50272)
33	RGE1	Rochester Gas & Electric Corporation (50244)
34	SCE1	Southern California Edison Co. (50206)
35	SMUD	Sacramento Municipal Utility District (50312)
36	TE1	Toledo Edison Co. (50346)
37	TVA1	Tennessee Valley Authority (50259, 50260, 50296)
38	VEP1	Virginia Electric & Power Co. (50338, 50280, 50281)
39	VYNP	Vermont Yankee Nuclear Power Corp. (50291)
40	WEP1	Wisconsin Electric Power Co. (50266, 50301)
41	WPS1	Wisconsin Public Service Corp. (50305)
42	YAE1	Yankee Atomic Electric Company (50029) - Max. Key-Code

Table 6.19. Architect/constructor code (Search-Key = 35)

Code	Abbr.	Description
00	All	
01	AEP1	AEP
02	BE1	Bechtel
03	BRI1	Brown & Root, Inc.
04	BRI2	Burns and Roe, Inc.
05	BSI1	Bechtel/SSI
06	DAN1	Daniel
07	DB1	DPC and Bechtel
08	DPC1	DPC
09	EB1	EBASCO
10	GA1	General Atomic
11	GAI1	Gilbert Associates, Inc.
12	DG1	Gibbs & Hill, Durham & Richardson, Inc.
13	GHI1	Gibbs & Hill, Inc.
14	GP1	Georgia Power Company
15	IMP1	Indiana & Michigan Power Co.
16	JC1	J.A. Jones Construction Co.
17	JU1	J.A. Jones/UE & C
18	MC1	Maxson Construction
19	MUL1	Multiple
20	NSP1	Northern States Power Co.
21	PSE1	Pioneer Services & Eng. Co.
22	PSE2	PSE & G
23	SL1	Sargent & Lundy
24	SSI1	Southern Services, Inc.
25	SW1	Stone & Webster
26	TVA1	TVA
27	UEC1	United Engineers & Constructors, Inc.
28	UT1	Utility
29	WED1	WEDCO - Max. Key-Code

Table 6.20. NSSC code (Search-Key = 36)

Code	Abbr.	Description	Docket Number
00	All		
01	AC	Allis-Chalmers	409
02	B&W	Bob & Wilcox Company	313,302,346,003,269, 270,287,312,289,320 (10R)[a]
03	CE	Combustion Engineering	317,318,285,309,336, 255,335,(7R)
04	GA	General Atomic Co.	267,(1R)
05	GE	General Electric Co.	155,259,260,296,325, 324,298,010,237,249, 331,333,321,133,245, 263,220,219,277,278, 293,254,265,271, (24 Reactors)
06	W	Westinghouse	334,315,316,348,244, 213,247,286,305,338, 266,301,282,306,261, 206,280,281,344,250, 251,029,295,304,272, (25 Reactors)

[a]Number of reactors sold by NSSC's.

retrieval results are shown in Figure 6.8.

2. Matched Event File (MEF) - 117 bytes or digits. The items are included in one-record of MEF in Table 6.2.

6.6. Output

6.6.1. DIRECTF

1. KEYWORDFILE - 24 bytes written on a 9-track tape
   a) Record Identification - valve '2' - 1 byte
   b) Reference Number or Accession Number - 6 bytes

c) Language and Country - 2 bytes

d) Reactor Type and Facility Name - 5 bytes

e) Keyword Code - 4 bytes

2. CITATIONFILE - Variable length, maximum 3339 bytes

a) Record Identification - valve '3' - 1 byte

b) Reference Number or Accession number - 6 bytes

c) Edited Content Count - maximum 30 - 2 bytes

d) Variable Portion - 3330 bytes maximum
The portion consists of the contents edited in 111-bytes form

6.6.2. RETRIEVAL-LER

The EDITEDF has the same portion as the variable edited area in CITATIONFILE, but the EDITEDF has blocked fixed-length records where one record consists of 111-bytes.

6.6.3. MAKE-MF

Figure 6.6 shows facility data from the MAKE-MF and Figure 6.7 shows code table sample. The two output results can be used as an input data verification and a reference table to retrieve numeric LER's from the RETRIEVAL-GEN. Another output from the MAKE-MF is a punched data set. This data is used as an input data set for the matching program. The punched data set (Figure 6.5) consists of items below:

F A C I L I T Y	L O C A T I O N	R-T	POWER	D E L
LICENSE-NO	ISSUE-D	L I C E N S E E		
ARKANSAS 1	ARKANSAS/POPE	PWR	2,568	850
DPR-51	052174	ARKANSAS POWER & LIGHT COMPANY		
BEAVER VALLEY 1	PENNSYLVANIA/BEAVER	PWR	2,562	852
DPR-66	013076	DUQUESNE LIGHT COMPANY		

Figure 6.6. Facility data sample as an output data set from the MAKE-MF program

DOCKET	DOC-CODE	LOC-CODE	R-TYPE	POWER-L	POWER-CODE	LICENSEE-CODE
50003	001	32	2	00615	2	007
50010	002	13	1	00700	2	006

Figure 6.7. Code table sample as an output data set from the MAKE-MF program

CRIT-D	COMM-D	NSSS	C O N S T R U C T O R	DOCK
A R C H I T E C T		PUNCH-D	SERIAL	
080674	121974	B&W	BECHTEL	50313
BECHTEL		021878	001	
051076	100176	W	STONE & WEBSTER	50334
STONE & WEBSTER		021878	002	

ARCH-CODE	NSSS-CODE	CONST-CODE	SERIAL
028	02	028	028
002	05	002	016

Figure 6.8. Retrievals results using RETRIEVAL-GEN program for operator errors during operation in 1960 and 1973

REF-NO	D	DOCKET	DATE-F	DATE-R	DATE-E	OUT	ERR-D	EQ	DRN	R-ENV	R-EXP
077916		50219	092369	011173	011173	00	1800	02	0000	4100	4305
077914		50249	072271	010973	010973	00	1800	11	0000	4100	4305
077914		50249	072271	010973	010973	00	1800	11	0000	4100	4305
077909		50265	052372	010573	010573	40	1800	11	0000	4100	4305
078512		50133	041863	021373	021373	00	1800	11	0000	4100	4305
078512		50133	041863	020273	020273	00	1800	11	0000	4200	4305
079313		50010	041560	030373	030373	12	1800	10	0000	4100	4305
079469		50133	041863	031273	031273	00	1800	11	0000	4210	4305
080121		50271	092072	030973	030973	14	1800	11	0000	4100	4305
080275		50245	112970	041373	041373	00	1800	01	0000	4100	4305
080134		50254	041272	050673	050673	00	1800	11	0000	4200	4305
081868		50254	041272	071173	071173	00	1800	11	0000	4100	4305
083163		50249	072271	081073	081073	00	1800	11	0024	4100	4305
083221		50254	041272	082073	082073	00	1800	02	0000	4100	4305
083607		50220	110969	090773	090773	00	1800	11	0000	4100	4305
084883		50219	092369	101673	101673	00	1800	11	0000	4100	4305
085302		50259	101573	102973	102973	00	1800	11	0000	4230	4305
084544		50265	052372	100173	100173	00	1800	11	0005	4100	4305
085590		50155	120862	111373	111373	00	1800	11	5760	4150	4305
085573		50155	120862	111473	111473	14	1800	11	0000	4100	4305
085751		50263	030571	112173	112173	00	1800	11	0024	4100	4305
085594		50271	092072	111473	111473	13	1800	11	0000	4100	4305
087035		50237	041370	121273	121273	00	1800	11	0000	4100	4305
087002		50265	052372	120473	120473	00	1800	01	0000	4100	4305
087289		50293	071972	122273	122273	00	1800	11	0000	4100	4305
080130		50003	091662	040573	040573	00	1800	11	0000	4100	4305
074364		50280	070472	041873	041873	00	1800	11	0000	4100	4305
080744		50247	062673	052973	052973	40	1800	01	0000	4100	4305
074820		50261	092670	050173	050173	00	1800	11	0000	4200	4305
080750		50269	050673	051873	051873	00	1800	01	0082	4100	4305
074359		50269	050673	050473	050473	00	1800	11	0000	4100	4305
091178		50280	070472	050373	050373	00	1800	01	0000	4100	4305
074800		50295	062873	050273	050273	13	1800	11	0000	4100	4305
081588		50295	062873	062973	062973	00	1800	02	0000	4100	4305
081866		50213	080767	070373	070373	00	1800	01	0000	4050	4305
082676		50250	110272	072073	072073	00	1800	11	0000	4100	4305
082205		50261	092670	071773	071773	00	1800	11	0000	4100	4305
082205		50261	092670	071773	071773	00	1800	11	0000	4100	4305
083024		50269	050673	073173	073173	00	1800	11	0000	4100	4305
082958		50255	123171	080273	080273	00	1800	11	0000	4100	4305
083602		50261	092670	082973	082973	00	1800	11	0000	4150	4305
082959		50295	062873	081073	081073	00	1800	01	0000	4100	4305
087016		50206	071667	102273	102273	00	1800	12	0000	4100	4305
084872		50269	050673	101673	101673	00	1800	11	0000	4100	4305
085563		50269	050673	111673	111673	00	1800	11	0000	4100	4305
085563		50269	050673	111673	111673	00	1800	11	0000	4100	4305
085563		50269	050673	111673	111673	00	1800	11	0000	4100	4305
087230		50280	070472	112873	112873	00	1800	11	0000	4200	4305
087228		50281	031073	112373	112373	40	1800	01	0000	4100	4305
087010		50269	050673	122073	122073	00	1800	11	0000	4100	4305

Figure 6.8 (Continued)

REF-NO	HET	S	COMP	CC	LOC	R	POWER	P	LCNS	ARCH	NS	CON	SER
077916	2000	2	041	05	30	1	01930	4	019	004	05	016	00001
077914	2000	4	101	05	13	1	02527	6	006	023	05	027	00002
077914	2000	2	073	05	13	1	02527	6	006	023	05	027	00003
077909	1000	6	027	05	13	1	02511	6	006	023	05	027	00004
078512	1000	2	036	05	05	1	00220	1	029	002	05	002	00005
078512	1000	4	101	10	05	1	00220	1	029	002	05	002	00006
079313	1000	6	087	00	13	1	00700	2	006	002	05	002	00007
079469	1000	4	101	10	05	1	00220	1	029	002	05	002	00008
080121	1000	3	002	05	45	1	01593	4	039	009	05	009	00009
080275	2000	2	052	05	07	1	02011	5	022	009	05	009	00010
080134	2000	4	101	10	13	1	02511	6	006	023	05	027	00011
081868	2000	2	073	05	13	1	02511	6	006	023	05	027	00012
083163	2000	4	101	05	13	1	02527	6	006	023	05	027	00013
083221	2000	2	015	05	13	1	02511	6	006	023	05	027	00014
083607	2000	3	002	05	32	1	01850	4	023	028	05	025	00015
084883	2000	3	047	05	30	1	01930	4	019	004	05	016	00016
085302	2000	4	101	05	01	1	03293	7	037	026	05	026	00017
084544	2000	3	002	05	13	1	02511	6	006	023	05	027	00018
085590	1000	4	102	05	22	1	00240	1	008	002	05	002	00019
085573	1000	3	044	05	22	1	00240	1	008	002	05	002	00020
085751	1000	0	200	05	23	1	01670	4	025	002	05	002	00021
085594	1000	3	002	05	45	1	01593	4	039	009	05	009	00022
087035	1000	2	036	05	13	1	02527	6	006	023	05	027	00023
087002	1000	1	012	05	13	1	02511	6	006	023	05	027	00024
087289	2000	2	053	05	21	1	01998	4	004	002	05	002	00025
080130	1000	2	073	05	32	2	00615	2	007	028	02	028	00026
074364	2000	2	073	00	46	2	02441	5	038	025	06	025	00027
080744	1000	2	036	05	32	2	02758	6	007	027	06	017	00028
074820	2000	2	023	05	40	2	02200	5	009	009	06	009	00029
080750	1000	2	038	05	40	2	02568	6	013	007	02	008	00030
074359	2000	2	036	05	40	2	02568	6	013	007	02	008	00031
091178	1000	2	052	05	46	2	02441	5	038	025	06	025	00032
074800	1000	2	056	05	13	2	03250	7	006	023	06	019	00033
081588	1000	2	042	05	13	2	03250	7	006	023	06	019	00034
081866	2000	8	016	05	07	2	01825	4	010	025	06	025	00035
082676	2000	2	036	05	09	2	02200	5	015	002	06	002	00036
082205	1000	2	056	05	40	2	02200	5	009	009	06	009	00037
082205	1000	2	056	05	40	2	02200	5	009	009	06	009	00038
083024	1000	8	082	05	40	2	02568	6	013	007	02	008	00039
082958	2000	3	073	05	22	2	02530	6	008	002	03	002	00040
083602	1000	4	101	05	40	2	02200	5	009	009	06	009	00041
082959	2000	1	011	05	13	2	03250	7	006	023	06	019	00042
087016	1000	1	017	05	05	2	01347	3	034	002	06	002	00043
084872	2000	3	002	05	40	2	02568	6	013	007	02	008	00044
085563	1000	5	032	05	40	2	02568	6	013	007	02	008	00045
085563	1000	5	032	05	40	2	02568	6	013	007	02	008	00046
085563	1000	2	032	05	40	2	02568	6	013	007	02	008	00047
087230	1000	3	073	00	46	2	02441	5	038	025	06	025	00048
087228	1000	2	036	05	46	2	02441	5	038	025	06	025	00049
087010	2000	5	032	05	40	2	02568	6	013	007	02	008	00050

a) Docket Number (the last three digits) - 3 bytes

b) Docket Code - 3 bytes

c) Location Code - 2 bytes

d) Reactor Type Code - 1 byte

e) Power Level - 5 bytes

f) Power Code - 1 byte

g) Licensee Code - 3 bytes

h) Architect Code - 3 bytes

i) NSSS Code - 2 bytes

j) Constructor Code - 3 bytes

6.6.4. MATCHING

The MEF (Matched Event File) consists of 117-bytes records. The first 94-bytes portion is from the items of the Source Event File, and the last 23-bytes portion is from the part of punched data set described above (From Docket Code to Constructor Code).

6.6.5. RETRIEVAL-GEN

Figure 6.8 shows the retrieval results for operator errors during operation in the LWR's in 1960 and 1973. According to the results, there is no LER occurring in 1960. Table 6.2 describes the items in Figure 6.8. The serial numbers (SER) generated by computer can be used as a reference number to identify each "REF-NO".

7. MODELING OF OPERATOR ERRORS

The purpose of this part of the study is to synthesize an operator reliability model from field data retrieved by the LERRET program. Although the model is intended for general representation of the human error, the data collected from the operation history of three commercial nuclear power plants are used. The plants are: Hatch 1 (BWR), Oconee 1 (PWR), and Fort St. Vrain (HTGR). The selected plants are assumed to represent each type of reactor, although the number of operator errors is not necessary to be the same for each plant of the same type. The information retrieved from the Licensee Event Reports (LER) is used to give the time to failure data which are analyzed via probability plots (21).

Each event recorded in the LER is assumed to have randomly occurred and is considered as one unit. Since some LER's are missing for operator classification and life tests on operator in each plant are not run for equal times on all LER's in a sample, thus those LER's are incomplete data. The observed data are times to failure from the first electricity generation date to the date when failure happened, during operation.

It is assumed that the performance of a given operator can be treated within the same framework as a component performance (2).

To estimate σ and β using Weibull probability papers provided by General Electric Company (26), the following procedures are prepared.

A. To get a table on plotting positions, order from smallest to largest and label with a rank i and calculate a plotting position by the equation of 100 (i/(n+1)), where n is the total number of observations (Table 7.1).

B. On the Weibull probability paper plot the failure time versus percent failure as in Figure 7.1.

C. After drawing a straight line, make a parallel line initiated from the "origin" mark to the straightly drawn line.

D. The shape parameter β is the intersection of the shape parameter scale, while scale parameter α is the x-axis value at the 63.2% failure point.

The total operator errors that have occurred in Hatch 1 (BWR) from the first electric generation date to September 22, 1977, are 33 among 281 reported events. The Weibull probability paper (Figure 7.1) can be used with Table 7.1 of the operator error data and the plotting

Table 7.1. Operator error data and calculations of plotting positions in Hatch 1

Rank i	Failure in Days	Plotting 100 (i/(n+1)) Position
1	16	2.9
2	46	5.9
3	150	8.8
4	270	11.8
5	270	14.7
6	270	17.6
7	270	20.6
8	297	23.5
9	379	26.5
10	380	29.4
11	399	32.4
12	438	35.3
13	480	38.2
14	480	41.2
15	480	44.1
16	480	47.1
17	487	50.0
18	525	52.9
19	531	55.9
20	560	58.8
21	564	61.8
22	574	64.7
23	635	67.6
24	650	70.6
25	657	73.5
26	678	76.5
27	867	79.4
28	907	82.4
29	908	85.3
30	938	88.2
31	946	91.2
32	973	94.1
33	1042	97.1

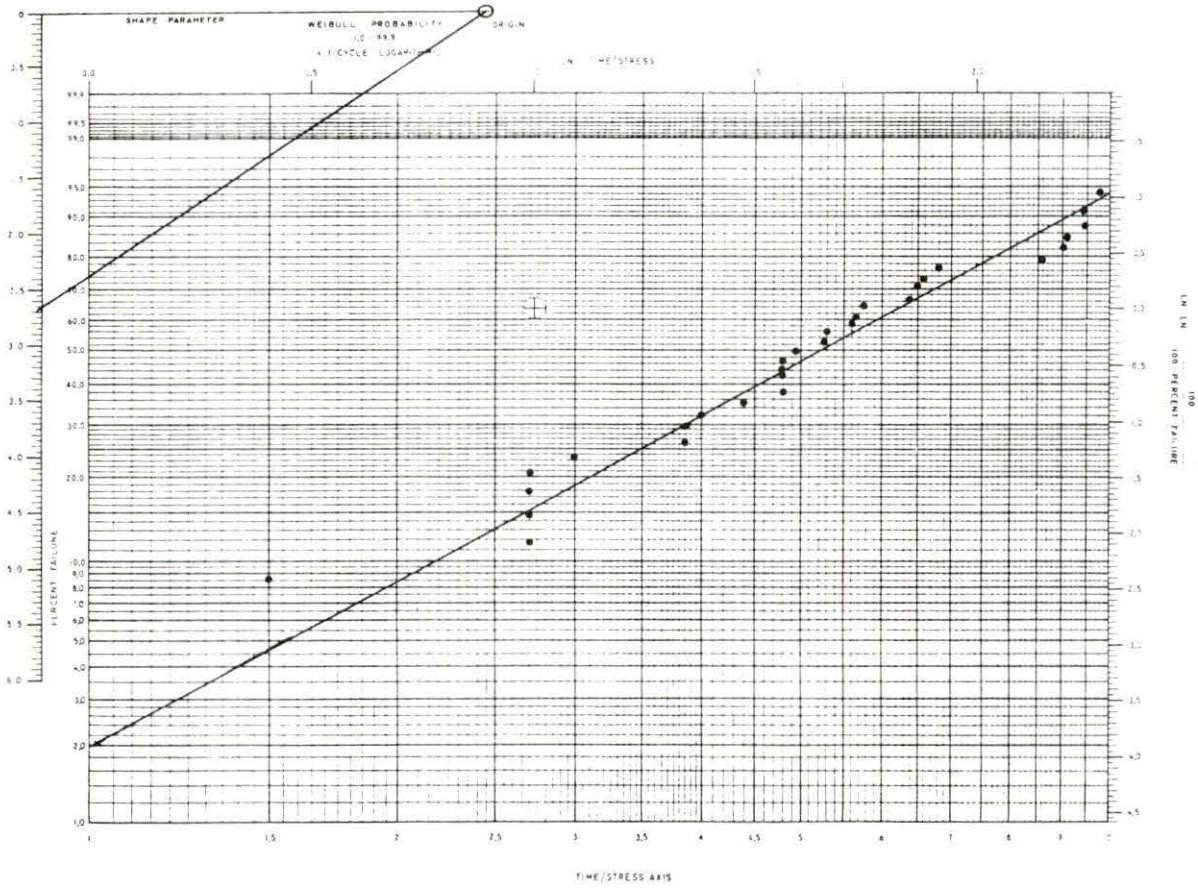

Figure 7.1. Weibull probability plot of operator errors from Hatch 1 between November 11, 1974 and September 22, 1977 (x-axis unit - 100 days)

positions from the first electric generation date to September 22, 1977 to provide the Weibull probability. From Figure 7.1 an estimated 15% of operator errors have 265 days interval from the first electric generation date (November 11, 1974).

Observed operator error data in Oconee 1 (PWR) from the first electricity generation date (May 6, 1973) are shown in Table 7.2 and Figure 7.2. For Fort St. Vrain, Table 7.3 and Figure 7.3 show operator error data.

The error data on the probability plots follow reasonably straight lines for those three commercial nuclear power plants, though the number of errors in Fort St. Vrain is five among 64 LER events reviewed since Fort St. Vrain has only generated electricity for a short time.

Table 7.4 indicates good subjective estimated parameters by comparing objective values which were calculated by a program provided by Dr. W. Q. Meeker from the Department of Statistics, Iowa State University. The program has been written by FORTRAN language and can be used to get approximate confidence intervals when a Weibull distribution is fitted by Maximum Likelihood (ML) to singly censored data. The ML analyses of Weibull data has been accomplished using the smallest extreme value distribution. The relation between Weibull and ML distributions are as follows:

Table 7.2. Operator error data and calculations of plotting positions in Oconee 1

Rank i	Failure in Days	Plotting 100(i/(n+1)) Position
1	13	3.4
2	87	6.9
3	125	10.3
4	164	13.8
5	195	17.2
6	229	20.7
7	279	24.1
8	305	27.6
9	327	31.0
10	366	34.5
11	383	37.9
12	482	41.4
13	521	44.8
14	521	48.3
15	535	51.7
16	538	55.2
17	578	58.6
18	676	62.1
19	762	65.5
20	768	69.0
21	804	72.4
22	899	75.9
23	950	79.3
24	997	82.8
25	1053	86.2
26	1306	89.7
27	1535	93.1
28	1535	96.6

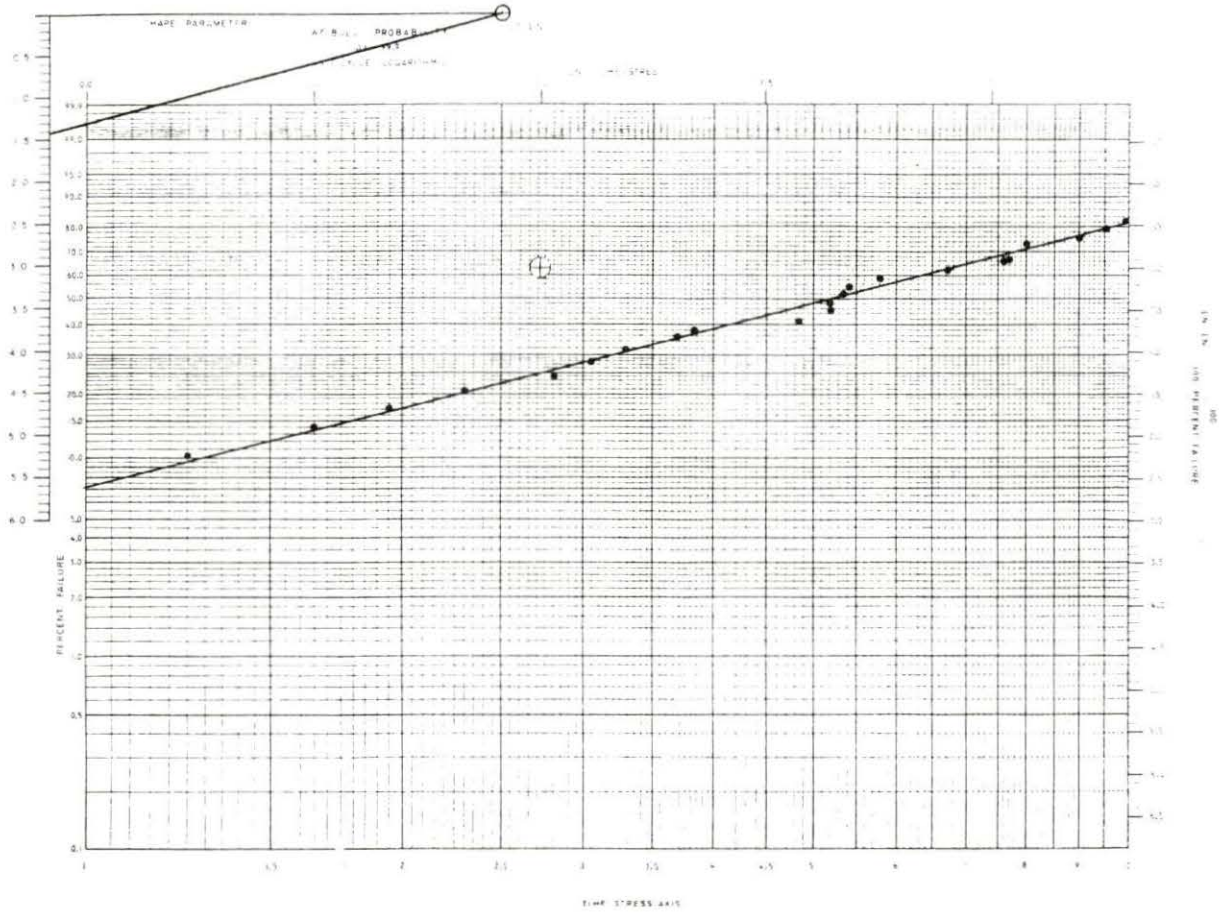

Figure 7.2. Plot of operator errors from Oconee 1 between May 6, 1973 and November 10, 1977

Table 7.3. Operator error data and calculations of plotting positions in Ft. St. Vrain

Rank i	Failure in Days	Plotting 100(i/(n+1)) Position
1	27	16.7
2	62	33.3
3	215	50.0
4	297	66.7
5	360	83.3

The cumulative Distribution Function (cdf) on Weibull, F(t) for time t to failure

$$F(t) = 1-\exp[-(t/\alpha)^{\beta}], \quad t>0,$$

where

α = scale parameter, and

β = shape parameter.

Both parameters should be positive. When the natural logarithm, $y = \ln(t)$ has the smallest extreme value distribution, its cdf is

$$G(y) = 1-\exp\{-\exp[(y-\mu)/\sigma]\}, \quad -\infty<y<\infty,$$

where

$\mu = \ln(\alpha)$ is the location parameter and

$\sigma = 1/\beta$ the scale parameter.

From the Table 7.4, Fort St. Vrain is in learning phase ($\beta<1$) for subjective value. The other two power plants, Hatch 1 and Oconee 1 are in wear-out stage ($\beta>1$).

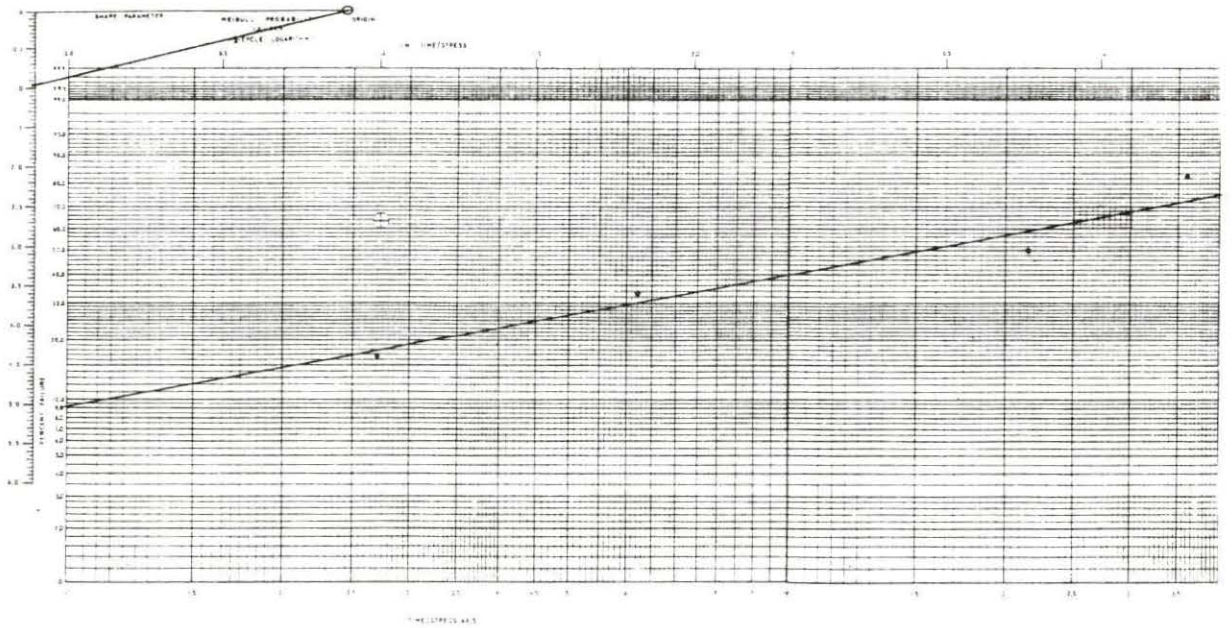

Figure 7.3. Weibull probability plot of the operator errors from Fort St. Vrain between December 11, 1976 and December 14, 1977 (x-axis unit - 100 days)

Table 7.4. Estimated Weibull parameters on operator error data

Power plant	Subjective[a]		Objective[b]		S.S.[d]
	α[c]	β	α	β	
Hatch 1 (BWR)	620	2.15	580	1.90	33
Oconee 1 (PWR)	660	1.40	665	1.45	28
Fort St. Vrain (HTGR)	260	0.90	207	1.36	5

[a]Results from Weibull probability paper.

[b]Results from the Maximum Likelihood computer program provided by Dr. W. Q. Meeker.

[c]Unit in days.

[d]Sample size.

This means the number of operator errors will increase with time. However, reviewing the LER's, one can detect that several events have not been reported during the first several months because they may not have been identified or understood. Therefore, the Weibull plotting method can be used to evaluate series of events reported from each power plant through finding Weibull parameters.

8. IMPACT ON SAFETY SYSTEMS

Human error counts classified according to their effect on safety systems are retrieved using the keywords provided by NSIC. The error counts are based on gross estimates without close reviewing of LER's. There are some limitations to retrieve such safety system related data because the available keywords are restricted to certain safety systems.

The error counts for BWR's are summarized in Table 8.1 for the period from April, 1960 to January, 1978. Surveyed reactor years are 156.83 or 1,373,830.8 hours. The failure counts for 39 PWR's are shown in Table 8.2 for the period from November, 1960 to January, 1978 which encompasses total reactor years surveyed of 178.26 years or 1,561,557.6 hours.

Tables 8.1 and 8.2 include major contributors to system unavailabilities in addition to human errors; such as hardware, test and maintenance, and common modes in BWR and PWR systems, respectively. The failure rates and unavailabilities can be computed using the equations given in Chapter II. However, the nature of the event must be accurately investigated first since the corresponding event in the LER may refer to failure of a procedure related to the given system or to only a component

Table 8.1. Failure count, BWR

System	TOTAL	Hard-ware (0124 & 0058)	Tests (0926)[a] and maintenance (0235)	Operator (0191)	Common mode (3049)
Electrical power (0118)	2	1	1	-	-
Reactor protection (0332)	3	-	2	1	-
Emergency coolant (3023)	4	2	1	1	-
Emergency coolant injection					
Low pressure coolant injection (3118)	2	2	-	-	-
Core spray injection (0088)	2	-	1	1	-
High pressure coolant injection (3119)	14	8	5	1	-
Reactor core isolation cooling (2856)	13	11	2	-	1
Containment leakage (1431)	1	1	-	-	-
Service water (2961)	2	1	-	-	-
Containment isolation (2897)	10	8	2	-	-
Containment atmosphere (0078 & 1360)	8	1	1	6	-
Containment pressure suppression (0079)	1	-	-	1	-

[a]( ) Keywords provided by NSIC.

Table 8.2. Failure count, PWR

System	TOTAL	Hard-ware (0124 & 0058)	Test (0926)[a] and maintenance (1095 & 0235)	Operator (0191)	Common mode (3049)
Electrical power (0118)	11	4	4	3	-
Reactor protection (0332)	4	1	2	1	-
Containment spray injection (0072)	6	1	-	4	1
Consequence limiting control (0078, 0080 & 1360)	5	1	2	2	-
Emergency coolant (1838)	4	1	-	2	1
Emergency coolant injection					
Accumulators (3143)	1	-	-	1	-
Low pressure injection (3118)	1	-	-	1	-
Safety injection control (0567)	19	1	5	12	1
Containment heat removal (0603)	2	2	-	-	-
Containment leakage (1431)	3	1	2	-	-
Sodium hydroxide addition (0358)	6	2	1	-	3
LOCA (0230)	2	1	-	-	1
Containment isolation (2897)	2	-	-	1	1

[a]( ) Keywords provided by NSIC.

when a keyword implies failure of a specific safety system. Such keywords are consequently often misleading. Thus, the keywords may only be used to compile events related to specific systems and those events are then carefully classified to locate the impact of the errors. However, many of the compiled events may not include accurate failure information. Unavailabilities may be accurately calculated for safety systems by counting component failures and then using fault trees to combine those failure probabilities to obtain system failure rates. This is also important since component probabilities of failures are not independent and there are redundancies which must be accounted for.

9. CONCLUSIONS AND RECOMMENDATIONS

A computer system is developed to retrieve historical and current field data from Licensee Event Reports (LER) for U.S. Commercial nuclear power plants. The LER retrieval system (LERRET) is intended to aid LER analysts in classification of human errors and system failures. To provide the LERRET with a high degree of flexibility and to assure that the program can be easily adopted in various types of computers the COBOL language is found to be most useful. The SNOBOL techniques are introduced because of their versatility in retrieving information in forms of symbols and notations. In the LERRET system, path diagrams (PD) are constructed for the requested keywords which are processed through pattern matching methods to minimize computer time. The PD is a form of logical process trees. The LERRET has the capabilities to retrieve documented information; such as LER records, to get information on numerical classification of LER's, and to store compiled information.

Since the LERRET is developed to use specific classification of operator errors, a General Classification scheme developed by the author jointly with the Engineering Research Institute Reactor Safety Research Group called GENCLASS is adopted. The LER information retrieval sub-

programs of LERRET are tested in conjunction with GENCLASS. A sample of the data is processed manually to assist in the development of the other LERRET subprograms, and to examine the utility of keywords in providing data for GENCLASS. The National Safety Information Center (NSIC) keywords are found unsatisfactory to provide definite data points and hence the LER records have to be carefully reviewed by analysists to assure accurate interpretation of events and their causes. To assure the accuracy of LER reviews, several analysts must review each event. This would result in disagreements. Also, some of the events may be overlooked. Consequently a DATACHEC computer module is developed to check the data compiled by the LER reviewers for consistency. The program is also used to check clerical errors, punching errors, classification errors, and reviewer errors. The DATACHEC encompasses three subprograms for data checking, comparison, and updating.

New keywords system compatible with GENCLASS is developed for use in the LERRET package. The LERRET system includes five programs for handling information from LER's on a tape provided by NSIC, and for retrieval of numeric data classified by GENCLASS. The keywords may be used to retrieve numerical data on a specific safety

system for a particular power plant. The processing of requests can be conveniently handled by the user. The LERRET is designed to operate at a reduced core size and computer time. The main requirement for using LERRET is the availability of appropriate keywords to the user.

A Weibull model is used to fit operator error rates and failure data. The model is found satisfactory for getting gross estimates for scale or shape parameters.

Error or failure counts using the NSIC keyword system are found misleading since the retrieved events may not involve failures explicitly. Also, several LER events may be missed during the surveyed reactor years. It is recommended that system unavailabilities be derived from fault tree analysis using components data. The difficulty in calculating component's unavailabilities is because the LER's do not include detailed description of component location within safety systems or relation to safety functions. In addition, a safety related system consists of different number of each component for each power plant.

There are several recommendations for further work in the areas addressed here. The first is to apply suitable statistical analysis for datachecking, this may be integrated in the DATACHEC capability. Although most of the LERRET package programs and the techniques used can be

employed in different classification schemes, some modifications are necessary for using systems other than GENCLASS. This classification system may be expanded to include human errors other than operator errors.

Available event information reports are vague and often specific keywords can not be used to describe the events. The standardization of such reports will facilitate the application of retrieval systems. In addition, other programs may be developed for human error analysis and component or system availability analysis. Such programs may be integrated with the LERRET and DATACHEC to provide a complete computer package for reactor safety analysis.

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11. APPENDIX A: DATA CHECK AND COMPARISON PROGRAMS (DATACHEC)

11.1. Data Checking Program (DATACHEC1)

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IDENTIFICATION DIVISION.                                    DATACHEC 0001
PROGRAM-ID. DATACHEC1.                                      DATACHEC 0002
AUTHOR. H Y CHO.                                            DATACHEC 0003
DATE-WRITTEN. JULY, 1978.                                   DATACHEC 0004
REMARKS. DATACHEC1 IS INTENDED TO CHECK INPUT               DATACHEC 0005
         DATA WHICH MADE NUMERICALLY FROM LER.              DATACHEC 0006
ENVIRONMENT DIVISION.                                       DATACHEC 0007
CONFIGURATION SECTION.                                      DATACHEC 0008
SOURCE-COMPUTER. IBM-360-165.                               DATACHEC 0009
OBJECT-COMPUTER. IBM-360-165.                               DATACHEC 0010
INPUT-OUTPUT SECTION.                                       DATACHEC 0011
FILE-CONTROL.                                               DATACHEC 0012
    SELECT CARDF ASSIGN UT-S-SYSIN.                         DATACHEC 0013
    SELECT SEF ASSIGN UT-S-SF.                              DATACHEC 0014
    SELECT PRINTF ASSIGN UT-S-SYSPRINT.                     DATACHEC 0015
DATA DIVISION.                                              DATACHEC 0016
FILE SECTION.                                               DATACHEC 0017
FD CARDF LABEL RECORD OMITTED RECORDING F                   DATACHEC 0018
    DATA RECORD C-R.                                        DATACHEC 0019
01  C-R SYNC.                                              DATACHEC 0020
    02  CR-ACC PIC 9(6).                                   DATACHEC 0021
    02  CR-DOCKET.                                         DATACHEC 0022
        03  FILLER PIC X(2).                               DATACHEC 0023
        03  CR-DOCK PIC 9(3).                              DATACHEC 0024
    02  CR-RECID PIC X.                                    DATACHEC 0025
    02  CR-DUPLICATE PIC 9.                                DATACHEC 0026
    02  CR-SERIAL PIC 9(3).                                DATACHEC 0027
    02  CR-REPORT PIC 9(6).                                DATACHEC 0028
    02  CR-DATE-R REDEFINES CR-REPORT.                     DATACHEC 0029
        03  CR-R-MO PIC 9(2).                              DATACHEC 0030
        03  CR-R-DY PIC 9(2).                              DATACHEC 0031
        03  CR-R-YR PIC 9(2).                              DATACHEC 0032
    02  CR-EVENT PIC 9(6).                                 DATACHEC 0033
    02  CR-DATE-E REDEFINES CR-EVENT.                      DATACHEC 0034
        03  CR-E-MO PIC 9(2).                              DATACHEC 0035
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    03  CR-E-DY PIC 9(2).                                          DATACHEC0036
    03  CR-E-YR PIC 9(2).                                          DATACHEC0037
02  CR-PUNCHED PIC 9(6).                                           DATACHEC0038
02  CR-OP-PHASE.                                                   DATACHEC0039
    03  CR-OP-PHASE1 PIC 9.                                        DATACHEC0040
    03  CR-OP-PHASE2 PIC 9.                                        DATACHEC0041
    03  CR-OP-PHASE3 PIC 9.                                        DATACHEC0042
    03  CR-OP-PHASE4 PIC 9.                                        DATACHEC0043
02  CR-OUTAGE PIC 9(2).                                            DATACHEC0044
    88 TRUE-OUTAGE VALUES 0 10 THRU 16 20 THRU 25 30 THRU 34       DATACHEC0045
    40.                                                           DATACHEC0046
02  CR-ERR-DOMAIN.                                                 DATACHEC0047
    03  CR-ED1 PIC 9.                                              DATACHEC0048
    03  CR-ED2 PIC 9.                                              DATACHEC0049
    03  CR-ED3 PIC 9.                                              DATACHEC0050
    03  CR-ED4 PIC 9.                                              DATACHEC0051
02  CR-NAME-ID PIC 9.                                              DATACHEC0052
02  CR-TAXONOMY PIC 9.                                             DATACHEC0053
02  CR-EQUIP PIC 9(2).                                             DATACHEC0054
    88 TRUE-EQUIP VALUES 0 1 2 10 THRU 12.                        DATACHEC0055
02  CR-EFF-TASK PIC 9(2).                                          DATACHEC0056
    88 TRUE-EFF-TASK VALUES 0 20 THRU 24.                         DATACHEC0057
02  CR-EFF-OP PIC 9(3).                                            DATACHEC0058
    88 TRUE-EFF-OP VALUES 0 305 310 320 321 330 331 340 341       DATACHEC0059
    350 351.                                                      DATACHEC0060
02  CR-DURATION PIC 9(4).                                          DATACHEC0061
02  CR-RAD-RELEASE PIC 9(4).                                       DATACHEC0062
    88 TRUE-RAD-RELEASE VALUES 4000 4050 4100 4150 4200 4210      DATACHEC0063
    4220 4230 4240.                                               DATACHEC0064
02  CR-RAD-EXPOSURE PIC 9(4).                                      DATACHEC0065
    88 TRUE-RAD-EXPOSURE VALUES 4300 4305 4310 4320 4330          DATACHEC0066
    4340.                                                         DATACHEC0067
02  CR-HUMAN.                                                      DATACHEC0068
    03  CR-HUMAN1 PIC 9.                                           DATACHEC0069
    03  CR-HUMAN2 PIC 9.                                           DATACHEC0070
02  CR-HET.                                                        DATACHEC0071
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           03  CR-HET1 PIC S.                                    DATACHEC 0072
           03  CR-HET2 PIC S.                                    DATACHEC 0073
           03  CR-HET3 PIC S.                                    DATACHEC 0074
           03  CR-HET4 PIC S.                                    DATACHEC 0075
       02  CR-OPER-STRESS.                                       DATACHEC 0076
           03  CR-OS1 PIC 9.                                     DATACHEC 0077
           03  CR-OS2 PIC 9.                                     DATACHEC 0078
           03  CR-OS3 PIC 9.                                     DATACHEC 0079
       02  CR-SYSTEM PIC 9.                                      DATACHEC 0080
       02  CR-COMP-LOC.                                          DATACHEC 0081
           03  CR-CL1 PIC 9.                                     DATACHEC 0082
           03  CR-CL2 PIC 9.                                     DATACHEC 0083
           03  CR-CL3 PIC 9.                                     DATACHEC 0084
       02  CR-CRIT-CODE PIC 9(2).                                DATACHEC 0085
           88 TRUE-CRIT VALUES 0 5 10 15.                        DATACHEC 0086
   01  C-R2 REDEFINES C-R.                                       DATACHEC 0087
       02  CR2-RECID PIC X.                                      DATACHEC 0088
       02  CR2-DOC PIC 9(3).                                     DATACHEC 0089
       02  FILLER PIC X.                                         DATACHEC 0090
       02  CR2-FACILITY PIC X(20).                               DATACHEC 0091
       02  FILLER PIC X(4).                                      DATACHEC 0092
       02  CR2-INIT-DATE PIC 9(6).                               DATACHEC 0093
       02  FILLER PIC X(2).                                      DATACHEC 0094
       02  CR2-REACTOR PIC X(5).                                 DATACHEC 0095
       02  CR2-POWER PIC 9(4).                                   DATACHEC 0096
       02  FILLER PIC X(34).                                     DATACHEC 0097
   01  CR REDEFINES C-R.                                         DATACHEC 0098
       02  CR-1 PIC 9(11).                                       DATACHEC 0099
       02  CR-REC PIC X.                                         DATACHEC 0100
       02  CR-2 PIC 9(16).                                       DATACHEC 0101
       02  CR-3 PIC 9(17).                                       DATACHEC 0102
       02  CR-4 PIC 9(16).                                       DATACHEC 0103
       02  CR-5 PIC 9(17).                                       DATACHEC 0104
       02  CR-6 PIC 9(2).                                        DATACHEC 0105
   01  SER REDEFINES C-R.                                        DATACHEC 0106
       02  SER-REFERENCE PIC 9(6).                               DATACHEC 0107
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    02  SER-DOCKET PIC 9(5).                                    DATACHEC 0108
    02  SER-RECID PIC X.                                        DATACHEC 0109
    02  SER-DUPLICATE PIC 9.                                    DATACHEC 0110
    02  SER-SERIAL PIC 9(3).                                    DATACHEC 0111
    02  SER-REPORT PIC 9(6).                                    DATACHEC 0112
    02  SER-EVENT PIC 9(6).                                     DATACHEC 0113
    02  SER-PUNCHED PIC 9(6).                                   DATACHEC 0114
    02  SER-FILL1 PIC 9(10).                                    DATACHEC 0115
    02  SER-NAMEID PIC 9.                                       DATACHEC 0116
    02  SER-FILL2 PIC X(35).                                    DATACHEC 0117
FD  SEF LABEL RECORD OMITTED RECORDING F                         DATACHEC 0118
    BLOCK CONTAINS 7238 CHARACTERS                               DATACHEC 0119
    DATA RECORD SEREC.                                           DATACHEC 0120
01  SEREC SYNC.                                                 DATACHEC 0121
    02  SER-RECID PIC X.                                        DATACHEC 0122
    02  SER-NAMEID PIC 9.                                       DATACHEC 0123
    02  SER-REFERENCE PIC 9(6).                                 DATACHEC 0124
    02  SER-DUPLICATE PIC 9.                                    DATACHEC 0125
    02  SER-DOCKET PIC 9(5).                                    DATACHEC 0126
    02  SER-INIT-DATE PIC 9(6).                                 DATACHEC 0127
    02  SER-REPORT PIC 9(6).                                    DATACHEC 0128
    02  SER-EVENT PIC 9(6).                                     DATACHEC 0129
    02  SER-FILL1 PIC X(10).                                    DATACHEC 0130
    02  SER-FILLER PIC X.                                       DATACHEC 0131
    02  SER-FILL2 PIC X(35).                                    DATACHEC 0132
    02  SER-PUNCHED PIC 9(6).                                   DATACHEC 0133
    02  SER-SERIAL PIC 9(4).                                    DATACHEC 0134
    02  SER-COUNT PIC 9(6).                                     DATACHEC 0135
FD  PRINTF LABEL RECORD OMITTED RECORDING F                      DATACHEC 0136
    DATA RECORD P-R.                                             DATACHEC 0137
01  P-R PIC X(133) SYNC.                                        DATACHEC 0138
WORKING-STORAGE SECTION.                                         DATACHEC 0139
77  C PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                     DATACHEC 0140
77  SR-COUNT PIC 9(6) VALUE 0 SYNC.                             DATACHEC 0141
01  DOCTABLE SYNC.                                              DATACHEC 0142
    02  DOCT OCCURS 500 PIC 9.                                  DATACHEC 0143
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01  MSG-REC SYNC.                                          DATACHEC 0144
    02  FILLER PIC X VALUE SPACE.                          DATACHEC 0145
    02  FIRST-80 PIC X(80).                                DATACHEC 0146
    02  LAST-40 PIC X(40).                                 DATACHEC 0147
    02  FILLER PIC X(4) VALUE SPACE.                       DATACHEC 0148
    02  CARD-COUNT PIC 9(6).                               DATACHEC 0149
    02  FILLER PIC X(2) VALUE SPACE.                       DATACHEC 0150
01  INITABLE SYNC.                                         DATACHEC 0151
    02  INITD OCCURS 500 PIC 9(6).                         DATACHEC 0152
01  ERROR-TABLE SYNC.                                      DATACHEC 0153
    02  FILLER PIC X VALUE SPACE.                          DATACHEC 0154
    02  FILLER PIC X(8) VALUE SPACE.                       DATACHEC 0155
    02  ER-DECK PIC X(3).                                  DATACHEC 0156
    02  ER-RECID PIC X.                                    DATACHEC 0157
    02  FILLER PIC X(4) VALUE SPACE.                       DATACHEC 0158
    02  ER-R-MO PIC X(2).                                  DATACHEC 0159
    02  ER-R-DY PIC X(2).                                  DATACHEC 0160
    02  ER-R-YR PIC X(2).                                  DATACHEC 0161
    02  ER-E-MO PIC X(2).                                  DATACHEC 0162
    02  ER-E-DY PIC X(2).                                  DATACHEC 0163
    02  ER-E-YR PIC X(2).                                  DATACHEC 0164
    02  FILLER PIC X(10) VALUE SPACE.                      DATACHEC 0165
    02  ER-OUTAGE PIC X(2).                                DATACHEC 0166
    02  ER-ERR-D PIC X(4).                                 DATACHEC 0167
    02  ER-NAMEID PIC X.                                   DATACHEC 0168
    02  FILLER PIC X VALUE SPACE.                          DATACHEC 0169
    02  ER-EQUIP PIC X(2).                                 DATACHEC 0170
    02  FILLER PIC X(5) VALUE SPACE.                       DATACHEC 0171
    02  ER-DURATION PIC X(4).                              DATACHEC 0172
    02  ER-R-ENV PIC X(4).                                 DATACHEC 0173
    02  ER-R-EXP PIC X(4).                                 DATACHEC 0174
    02  FILLER PIC X(2) VALUE SPACE.                       DATACHEC 0175
    02  ER-HET PIC X(4).                                   DATACHEC 0176
    02  FILLER PIC X(3) VALUE SPACE.                       DATACHEC 0177
    02  ER-SYSTEM PIC X.                                   DATACHEC 0178
    02  ER-COMP PIC X(3).                                  DATACHEC 0179
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    02  ER-CRIT PIC X(2).                                                DATACHEC 0180
    02  FILLER PIC X(52) VALUE SPACE.                                    DATACHEC 0181
PROCEDURE DIVISION.                                                      DATACHEC 0182
    OPEN INPUT CARDF OUTPUT SEF PRINTF.                                  DATACHEC 0183
    MOVE 0 TO CARD-COUNT.                                                DATACHEC 0184
    MOVE SPACES TO LAST-40.                                              DATACHEC 0185
    MOVE SPACES TO ERROR-TABLE.                                          DATACHEC 0186
    MOVE 0 TO C.                                                         DATACHEC 0187
    MOVE '*DOCK***FACILITY***********MO/DY/YR*R-TYPE*P-LEVEL-****       DATACHEC 0188
    '**' TO FIRST-80.                                                    DATACHEC 0189
    WRITE P-R FROM MSG-REC AFTER POSITIONING C LINES.                    DATACHEC 0190
FILL-ZEROS.                                                              DATACHEC 0191
    ADD 1 TO C.                                                          DATACHEC 0192
    IF C > 500 MOVE 0 TO C GO TO READ-DOCKET.                            DATACHEC 0193
    MOVE 0 TO INITD (C).                                                 DATACHEC 0194
    MOVE 0 TO DOCT (C).                                                  DATACHEC 0195
    GO TO FILL-ZEROS.                                                    DATACHEC 0196
READ-DOCKET.                                                             DATACHEC 0197
    READ CARDF END GO TO EOC.                                            DATACHEC 0198
    MOVE C-R2 TO FIRST-80.                                               DATACHEC 0199
    ADD 1 TO CARD-COUNT.                                                 DATACHEC 0200
    IF CR2-RECID NOT = ' ' GO TO WRT-HEAD.                               DATACHEC 0201
    IF CR2-DOC < 0 OR > 499                                              DATACHEC 0202
        MOVE ' DOCKET NUMBER ON CARD OUT OF RANGE*' TO LAST-40           DATACHEC 0203
    WRITE P-R FROM MSG-REC AFTER POSITIONING 1 LINES                     DATACHEC 0204
        GO TO EOC.                                                       DATACHEC 0205
    MOVE CR2-INIT-DATE TO INITD (CR2-DOC).                               DATACHEC 0206
    MOVE 1 TO DOCT (CR2-DOC).                                            DATACHEC 0207
    WRITE P-R FROM MSG-REC AFTER POSITIONING 1 LINES                     DATACHEC 0208
    GO TO READ-DOCKET.                                                   DATACHEC 0209
WRT-HEAD.                                                                DATACHEC 0210
    MOVE 0 TO CARD-COUNT.                                                DATACHEC 0211
    MOVE 'ACC-NO  DOC D SL  D-R   D-E   D-P   OUT E-R N EQUIP   D       DATACHEC 0212
    'RN REN EXP   HET   S CL C' TO FIRST-80.                             DATACHEC 0213
    WRITE P-R FROM MSG-REC AFTER POSITIONING 0 LINES.                    DATACHEC 0214
    MOVE '********** ********************************** *********       DATACHEC 0215
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    '**********************' TO FIRST-80.                                DATACHEC 0216
    WRITE P-R FROM MSG-REC AFTER POSITIONING 1 LINES.                   DATACHEC 0217
RD-SOURCE.                                                              DATACHEC 0218
    READ CARDF END GO TO EOC.                                           DATACHEC 0219
    MOVE C-R TO FIRST-80.                                               DATACHEC 0220
    EXAMINE C-R REPLACING ALL ' ' BY 0.                                 DATACHEC 0221
CK-SOURCE.                                                              DATACHEC 0222
    IF CR-RECID = 'C'                                                   DATACHEC 0223
    WRITE P-R FROM MSG-REC AFTER POSITIONING 1 LINES                    DATACHEC 0224
    GO TO RD-SOURCE.                                                    DATACHEC 0225
    ADD 1 TO CARD-COUNT.                                                DATACHEC 0226
    IF CR-1 NOT NUMERIC GO TO NOT-NUMERIC.                              DATACHEC 0227
    IF CR-2 NOT NUMERIC GO TO NOT-NUMERIC.                              DATACHEC 0228
    IF CR-3 NOT NUMERIC GO TO NOT-NUMERIC.                              DATACHEC 0229
    IF CR-4 NOT NUMERIC GO TO NOT-NUMERIC.                              DATACHEC 0230
    IF CR-5 NOT NUMERIC GO TO NOT-NUMERIC.                              DATACHEC 0231
    IF CR-6 NOT NUMERIC GO TO NOT-NUMERIC.                              DATACHEC 0232
    IF DCCT (CR-DOCK) NOT = 1                                           DATACHEC 0233
    MOVE '***' TO ER-DOCK.                                              DATACHEC 0234
    IF CR-RECID = 'R' OR 'D' OR '0' OR 'C' GO TO CK-R-MO.               DATACHEC 0235
    MOVE '*' TO ER-RECID.                                               DATACHEC 0236
CK-R-MO.                                                                DATACHEC 0237
    IF CR-R-MO > 12 OR < 0                                              DATACHEC 0238
    MOVE '**' TO ER-R-MO.                                               DATACHEC 0239
    IF CR-R-DY > 31 OR < 0                                              DATACHEC 0240
    MOVE '**' TO ER-R-DY.                                               DATACHEC 0241
    IF CR-R-YR < 59 OR > 77                                             DATACHEC 0242
    MOVE '**' TO ER-R-YR.                                               DATACHEC 0243
    IF CR-EVENT = 0 MOVE CR-REPORT TO CR-EVENT                          DATACHEC 0244
    GO TO CK-OUTAGE.                                                    DATACHEC 0245
    IF CR-E-MO > 12 OR < 0                                              DATACHEC 0246
    MOVE '**' TO ER-E-MO.                                               DATACHEC 0247
    IF CR-E-DY > 31 OR < 0                                              DATACHEC 0248
    MOVE '**' TO ER-E-DY.                                               DATACHEC 0249
    IF CR-E-YR < 59 OR > 77                                             DATACHEC 0250
    MOVE '**' TO ER-E-YR.                                               DATACHEC 0251
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CK-OUTAGE.                                                      DATACHEC 0252
    IF NCT TRUE-OUTAGE                                          DATACHEC 0253
    MCVE '**' TO ER-OUTAGE.                                     DATACHEC 0254
    IF CR-ED1 < 0 OR > 3 GO TO OUT-ERR-D.                       DATACHEC 0255
    IF CR-ED2 < 0  GO TO OUT-ERR-D.                             DATACHEC 0256
    IF CR-ED3 < 0  GO TO OUT-ERR-D.                             DATACHEC 0257
    IF CR-ED4 < 0 OR > 5 GO TO OUT-ERR-D.                       DATACHEC 0258
    GO TO IN-ERR-D.                                             DATACHEC 0259
OUT-ERR-D.                                                      DATACHEC 0260
    MCVE '****' TO ER-ERR-D.                                    DATACHEC 0261
IN-ERR-D.                                                       DATACHEC 0262
    IF CR-NAME-ID < 1 OR > 4                                    DATACHEC 0263
    MOVE '*' TO ER-NAMEID.                                      DATACHEC 0264
    IF NOT TRUE-EQUIP                                           DATACHEC 0265
    MOVE '**' TO ER-EQUIP.                                      DATACHEC 0266
    IF NCT TRUE-RAD-RELEASE                                     DATACHEC 0267
    MOVE '****' TO ER-R-ENV.                                    DATACHEC 0268
    IF NCT TRJE-RAD-EXPCSURE                                    DATACHEC 0269
    MOVE '****' TO ER-R-EXP.                                    DATACHEC 0270
    IF CR-HET1 < 0 OR > 2  GO TO OUT-HET.                       DATACHEC 0271
    IF CR-HET2 < 0 OR > 4  GO TO OUT-HET.                       DATACHEC 0272
    IF CR-HET3 < 0 OR > 8  GO TO OUT-HET.                       DATACHEC 0273
    IF CR-HET4 < 0 OR > 5  GO TO OUT-HET.                       DATACHEC 0274
    GO TO IN-HET.                                               DATACHEC 0275
OUT-HET.                                                        DATACHEC 0276
    MOVE '****' TO ER-HET.                                      DATACHEC 0277
IN-HET.                                                         DATACHEC 0278
    IF CR-SYSTEM < 0                                            DATACHEC 0279
    MOVE '*' TO ER-SYSTEM.                                      DATACHEC 0280
    IF CR-CL1 < 0 OR > 2  GO TO OUT-CL.                         DATACHEC 0281
    IF CR-CL2 < 0 GO TO OUT-CL.                                 DATACHEC 0282
    IF CR-CL3 < 0 GO TO OUT-CL.                                 DATACHEC 0283
    GO TO IN-CL.                                                DATACHEC 0284
OUT-CL.                                                         DATACHEC 0285
    MOVE '***' TO ER-COMP.                                      DATACHEC 0286
IN-CL.                                                          DATACHEC 0287
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    IF NOT TRUE-CRIT                                                    DATACHEC 0288
    MOVE '**' TO ER-CRIT.                                               DATACHEC 0289
WRT-ACCEPT.                                                             DATACHEC 0290
    MOVE ' ' TO LAST-40.                                                DATACHEC 0291
    WRITE P-R FROM MSG-REC AFTER POSITIONING 1 LINES.                   DATACHEC 0292
    WRITE P-R FROM ERROR-TABLE AFTER POSITIONING 2 LINES.               DATACHEC 0293
    MOVE SPACES TO ERROR-TABLE.                                         DATACHEC 0294
    MOVE CARD-COUNT TO SER-COUNT.                                       DATACHEC 0295
    MOVE INITD (CR-DOCK) TO SER-INIT-DATE.                              DATACHEC 0296
    MOVE CORR SER TO SEREC.                                             DATACHEC 0297
    MOVE 0 TO SER-FILLER.                                               DATACHEC 0298
    WRITE SEREC.                                                        DATACHEC 0299
    GO TO RD-SOURCE.                                                    DATACHEC 0300
NOT-NUMERIC.                                                            DATACHEC 0301
    MOVE '  DATA ON CARD NOT NUMERIC**' TO LAST-40.                    DATACHEC 0302
    WRITE P-R FROM MSG-REC AFTER POSITIONING 1 LINES                    DATACHEC 0303
    GO TO RD-SOURCE.                                                    DATACHEC 0304
EOC.                                                                    DATACHEC 0305
    CLOSE CARDF SEF PRINTF.                                             DATACHEC 0306
    DISPLAY 'TOTAL NUMBER OF RECORDS WRITTEN ON SEF= ' SR-COUNT.        DATACHEC 0307
    DISPLAY 'TOTAL NUMBER OF CARDS READ= ' CARD-COUNT.                  DATACHEC 0308
    DISPLAY 'STOP RUN'.                                                 DATACHEC 0309
    STOP RUN.                                                           DATACHEC 0310
```

11.2. Updating Program (UP-SEF)

```
IDENTIFICATION DIVISION.                                                UP-SEF   0001
PROGRAM-ID. UP-SEF.                                                     UP-SEF   0002
AUTHOR. H Y CHO.                                                        UP-SEF   0003
DATE-WRITTEN. JULY, 1978.                                               UP-SEF   0004
REMARKS. UP-SEF IS INTENDED TO UPDATE SOURCE EVENT FILE.                UP-SEF   0005
ENVIRONMENT DIVISION.                                                   UP-SEF   0006
CONFIGURATION SECTION.                                                  UP-SEF   0007
SOURCE-COMPUTER. IBM-360-165.                                           UP-SEF   0008
OBJECT-COMPUTER. IBM-360-165.                                           UP-SEF   0009
INPUT-OUTPUT SECTION.                                                   UP-SEF   0010
FILE-CONTROL.                                                           UP-SEF   0011
    SELECT TRANSF ASSIGN TO UT-S-SYSIN.                                 UP-SEF   0012
    SELECT MASTER1 ASSIGN TO UT-S-SF1.                                  UP-SEF   0013
    SELECT MASTER2 ASSIGN TO UT-S-SF2.                                  UP-SEF   0014
    SELECT STRANF ASSIGN TO UT-S-SORTT.                                 UP-SEF   0015
    SELECT PRINTF ASSIGN TO UT-S-SYSPRINT.                              UP-SEF   0016
DATA DIVISION.                                                          UP-SEF   0017
FILE SECTION.                                                           UP-SEF   0018
  MASTER1 WAS PREVIOUSLY SORTED BY THE COMPUTER GIVEN COUNT *****       UP-SEF   0019
  AS THE TAPE SORTING, THUS THE RELATED MASTER FILE ITEMS********       UP-SEF   0020
  ARE NAMED AS THE SORT FORM.************************************       UP-SEF   0021
  FOR EXAMPLE, SMREC INSTEAD OF MREC1.***************************       UP-SEF   0022
FD  TRANSF LABEL RECORD OMITTED RECORDING F                             UP-SEF   0023
    DATA RECORD TREC.                                                   UP-SEF   0024
01  TREC PIC X(80) SYNC.                                               UP-SEF   0025
FD  MASTER1 LABEL RECORD OMITTED RECORDING F                            UP-SEF   0026
    BLOCK CONTAINS 7238 CHARACTERS DATA RECORD SMREC.                   UP-SEF   0027
01  SMREC SYNC.                                                        UP-SEF   0028
    02  SMR-FILL1 PIC X(88).                                           UP-SEF   0029
    02  SMR-ACC PIC 9(6).                                              UP-SEF   0030
FD  MASTER2 LABEL RECORD OMITTED RECORDING F                            UP-SEF   0031
    BLOCK CONTAINS 7238 CHARACTERS DATA RECORD MREC2.                   UP-SEF   0032
01  MREC2 PIC X(94) SYNC.                                              UP-SEF   0033
SD  STRANF  LABEL RECORD OMITTED RECORDING F                            UP-SEF   0034
    BLOCK CONTAINS 3520 CHARACTERS DATA RECORD STREC.                   UP-SEF   0035
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01  STREC  SYNC.                                                    UP-SEF  0036
    02  STR-RECID PIC X.                                            UP-SEF  0037
    02  STR-NAMEID PIC 9.                                           UP-SEF  0038
    02  STR-REFERENCE PIC 9(6).                                     UP-SEF  0039
    02  STR-DUPLICATE PIC 9.                                        UP-SEF  0040
    02  STR-DOCKET PIC 9(5).                                        UP-SEF  0041
    02  STR-INIT-DATE PIC 9(6).                                     UP-SEF  0042
    02  STR-REPORT PIC 9(6).                                        UP-SEF  0043
    02  STR-EVENT PIC 9(6).                                         UP-SEF  0044
    02  STR-OUTAGE PIC 9(2).                                        UP-SEF  0045
    02  STR-ERR-D PIC 9(4).                                         UP-SEF  0046
    02  STR-FILL1 PIC X(36).                                        UP-SEF  0047
    02  STR-ACC PIC 9(6).                                           UP-SEF  0048
01  ST-R REDEFINES STREC SYNC.                                      UP-SEF  0049
    02  ST-FILL1 PIC X(32).                                         UP-SEF  0050
    02  ST-FILL2 PIC X(42).                                         UP-SEF  0051
    02  ST-FILL3 PIC X(6).                                          UP-SEF  0052
FD  PRINTF LABEL RECORD OMITTED RECORDING F                         UP-SEF  0053
    BLOCK CONTAINS 133 CHARACTERS DATA RECORD P-R.                  UP-SEF  0054
01  P-R PIC X(133) SYNC.                                           UP-SEF  0055
WORKING-STORAGE SECTION.                                            UP-SEF  0056
77  A PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                        UP-SEF  0057
77  BAD PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                      UP-SEF  0058
77  D PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                        UP-SEF  0059
77  DUP PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                      UP-SEF  0060
77  HIGH9 PIC S9(8) COMPUTATIONAL VALUE 999999 SYNC.               UP-SEF  0061
77  M PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                        UP-SEF  0062
77  N PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                        UP-SEF  0063
77  NOM PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                      UP-SEF  0064
77  R PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                        UP-SEF  0065
77  T PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                        UP-SEF  0066
77  SM-ACC PIC 9(6) VALUE 0 SYNC.                                  UP-SEF  0067
77  ST-ACC PIC 9(6) VALUE 0 SYNC.                                  UP-SEF  0068
77  T-S-ACC PIC 9(6) VALUE 0 SYNC.                                 UP-SEF  0069
01  MASTREC SYNC.                                                  UP-SEF  0070
    02  MAST-FILL1 PIC X(32).                                       UP-SEF  0071
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    02  MAST-PHASE-OP PIC X(4) VALUE '0000'.                          UP-SEF   0072
    02  MAST-FILL2 PIC X(42).                                         UP-SEF   0073
    02  MAST-DUMMY PIC X(10) VALUE 'CCCCCCCCCC'.                      UP-SEF   0074
    02  MAST-FILL3 PIC X(6).                                          UP-SEF   0075
01  MSG-REC SYNC.                                                     UP-SEF   0076
    02  FILLER PIC X VALUE SPACE.                                     UP-SEF   0077
    02  FIRST-112 PIC X(112).                                         UP-SEF   0078
    02  LAST-20 PIC X(20).                                            UP-SEF   0079
PROCEDURE DIVISION.                                                    UP-SEF   0080
    SORT STRANF ON ASCENDING KEY STR-ACC                               UP-SEF   0081
    USING TRANSF OUTPUT PROCEDURE UPDATE-PROG.                         UP-SEF   0082
    DISPLAY 'STOP RUN'.                                                UP-SEF   0083
    STOP RUN.                                                          UP-SEF   0084
UPDATE-PROG SECTION.                                                   UP-SEF   0085
START1.                                                                UP-SEF   0086
    OPEN INPUT MASTER1 OUTPUT PRINTF MASTER2.                          UP-SEF   0087
    READ MASTER1 AT END GO TO EOF-MASTER1.                             UP-SEF   0088
    ADD 1 TO M.                                                        UP-SEF   0089
    MOVE SMR-ACC TO SM-ACC.                                            UP-SEF   0090
    MOVE '********** TRANSACTION UPDATE OF MOVED FILE **********'     UP-SEF   0091
      TO FIRST-112.                                                    UP-SEF   0092
    MOVE ' ' TO LAST-20.                                               UP-SEF   0093
    WRITE P-R FROM MSG-REC AFTER POSITIONING 2 LINES.                  UP-SEF   0094
RETURN-STF.                                                            UP-SEF   0095
    RETURN STRANF AT END GO TO EOF-STRANF.                             UP-SEF   0096
    ADD 1 TO T.                                                        UP-SEF   0097
    MOVE STR-ACC TO ST-ACC.                                            UP-SEF   0098
    MOVE STREC TO FIRST-112.                                           UP-SEF   0099
    IF ST-ACC = T-S-ACC                                                UP-SEF   0100
       MOVE 'DUPLICATE TRANS-ACC*' TO LAST-20                          UP-SEF   0101
       ADD 1 TO DUP                                                    UP-SEF   0102
    WRITE P-R FROM MSG-REC AFTER POSITIONING 1 LINES                   UP-SEF   0103
    GO TO RETURN-STF.                                                  UP-SEF   0104
    MOVE ST-ACC TO T-S-ACC.                                            UP-SEF   0105
COMPARE-ACC.                                                           UP-SEF   0106
    IF ST-ACC > SM-ACC                                                 UP-SEF   0107
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      WRITE MREC2 FROM SMREC                                          UP-SEF   0108
      ADD 1 TO N GO TO RET-SMF.                                       UP-SEF   0109
    IF ST-ACC = SM-ACC                                                UP-SEF   0110
      IF STR-RECID = 'R' GO TO REPLACE-R                              UP-SEF   0111
         ELSE GO TO NXT-CK.                                           UP-SEF   0112
    IF STR-RECID = ' '                                                UP-SEF   0113
      ADD 1 TO A MOVE 'ADDED MASTER' TO LAST-20                       UP-SEF   0114
      WRITE P-R FROM MSG-REC AFTER POSITIONING 1 LINES                UP-SEF   0115
      MOVE 'C' TO STR-RECID                                           UP-SEF   0116
    MOVE ST-FILL1 TO MAST-FILL1                                       UP-SEF   0117
    MOVE ST-FILL2 TO MAST-FILL2                                       UP-SEF   0118
    MOVE ST-FILL3 TO MAST-FILL3                                       UP-SEF   0119
      WRITE MREC2 FROM MASTREC ADD 1 TO N                             UP-SEF   0120
      GO TO RETURN-STF.                                               UP-SEF   0121
    ADD 1 TO NOM.                                                     UP-SEF   0122
    MOVE 'NO MATCHING MREC*' TO LAST-20.                              UP-SEF   0123
    WRITE P-R FROM MSG-REC AFTER POSITIONING 1 LINES.                 UP-SEF   0124
    GO TO RETURN-STF.                                                 UP-SEF   0125
REPLACE-R.                                                            UP-SEF   0126
    ADD 1 TO R.                                                       UP-SEF   0127
    MOVE 'REPLACED MASTER' TO LAST-20.                                UP-SEF   0128
    WRITE P-R FROM MSG-REC AFTER POSITIONING 1 LINES.                 UP-SEF   0129
    MOVE ST-FILL1 TO MAST-FILL1.                                      UP-SEF   0130
    MOVE ST-FILL2 TO MAST-FILL2.                                      UP-SEF   0131
    MOVE ST-FILL3 TO MAST-FILL3.                                      UP-SEF   0132
    WRITE MREC2 FROM MASTREC.                                         UP-SEF   0133
    ADD 1 TO N.                                                       UP-SEF   0134
RETURN-SMF.                                                           UP-SEF   0135
    READ MASTER1 AT END GO TO EOF-MASTER1.                            UP-SEF   0136
    ADD 1 TO M.                                                       UP-SEF   0137
    MOVE SMR-ACC TO SM-ACC.                                           UP-SEF   0138
    GO TO RETURN-STF.                                                 UP-SEF   0139
RET-SMF.                                                              UP-SEF   0140
    READ MASTER1 AT END GO TO EOF-MASTER1.                            UP-SEF   0141
    MOVE SMR-ACC TO SM-ACC.                                           UP-SEF   0142
      ADD 1 TO M GO TO COMPARE-ACC.                                   UP-SEF   0143
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NXT-CK.                                                          UP-SEF   0144
    IF STR-RECID = 'D'                                           UP-SEF   0145
      ADD 1 TO D                                                 UP-SEF   0146
      MOVE 'DELETED RECORD' TO LAST-20                           UP-SEF   0147
      WRITE P-R FROM MSG-REC AFTER POSITIONING 1 LINES           UP-SEF   0148
      GO TO RETURN-SMF.                                          UP-SEF   0149
    ADD 1 TO BAD.                                                UP-SEF   0150
    MOVE 'BAD TRANS-CODE**' TO LAST-20.                          UP-SEF   0151
    WRITE P-R FROM MSG-REC AFTER POSITIONING 1 LINES.            UP-SEF   0152
     GO TO RETURN-STF.                                           UP-SEF   0153
EOF-MASTER1.                                                     UP-SEF   0154
    IF ST-ACC = HIGH9 GO TO EOJ.                                 UP-SEF   0155
    MOVE HIGH9 TO SM-ACC.                                        UP-SEF   0156
    IF N = 0 GO TO RETURN-STF.                                   UP-SEF   0157
    IF STR-RECID = 'D' OR 'R' GO TO RETURN-STF.                  UP-SEF   0158
    GO TO COMPARE-ACC.                                           UP-SEF   0159
EOF-STRANF.                                                      UP-SEF   0160
    IF SM-ACC = HIGH9 GO TO EOJ.                                 UP-SEF   0161
    MOVE HIGH9 TO ST-ACC.                                        UP-SEF   0162
    GO TO COMPARE-ACC.                                           UP-SEF   0163
EOJ.                                                             UP-SEF   0164
    CLOSE MASTER1 MASTER2 PRINTF.                                UP-SEF   0165
    DISPLAY 'NUMBER OF MASTER2 RECORDS WRITTEN= ' N.             UP-SEF   0166
    DISPLAY 'NUMBER OF MASTER1 RECORDS READ= ' M.                UP-SEF   0167
    DISPLAY 'NUMBER OF TRANS RECORDS READ= ' T.                  UP-SEF   0168
    DISPLAY 'NUMBER OF TRANS RECORDS ADDED= ' A.                 UP-SEF   0169
    DISPLAY 'NUMBER OF MASTER1 RECORDS REPLACED= ' R.            UP-SEF   0170
    DISPLAY 'NUMBER OF MASTER1 RECORDS DELETED= ' D.             UP-SEF   0171
    DISPLAY 'NUMBER OF TRANS RECORDS DUPLICATED= ' DUP.          UP-SEF   0172
    DISPLAY 'NUMBER OF BAD TRANS RECORDS READ= ' BAD.            UP-SEF   0173
    DISPLAY 'NUMBER OF NO MATCHING RECORDS READ= ' NOM.          UP-SEF   0174
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11.3. Data Comparison Program (DATACOM)

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IDENTIFICATION DIVISION.                                                DATACOM  0001
PROGRAM-ID. DATACOM.                                                    DATACOM  0002
AUTHOR. H Y CHO.                                                        DATACOM  0003
DATE-WRITTEN. JULY,1978                                                 DATACOM  0004
REMARKS. DATACOM IS INTENDED TO COMPARE FOUR DIFFERENT DATA SETS        DATACOM  0005
         AND TO GET THE GROUP DICISION.                                 DATACOM  0006
ENVIRONMENT DIVISION.                                                   DATACOM  0007
CONFIGURATION SECTION.                                                  DATACOM  0008
SOURCE-COMPUTER. IBM-360-165.                                           DATACOM  0009
OBJECT-COMPUTER. IBM-360-165.                                           DATACOM  0010
INPUT-OUTPUT SECTION.                                                   DATACOM  0011
    SELECT SEF ASSIGN TO UT-S-SEF1.                                     DATACOM  0012
    SELECT SD-SEF ASSIGN TO UT-S-SORTN.                                 DATACOM  0013
    SELECT GDEF ASSIGN TO UT-S-SEF2.                                    DATACOM  0014
    SELECT PRINTF ASSIGN UT-S-SYSPRINT                                  DATACOM  0015
DATA DIVISION.                                                          DATACOM  0016
FILE SECTION.                                                           DATACOM  0017
FD  SEF LABEL RECORD OMITTED RECORDING F                                DATACOM  0018
    BLOCK CONTAINS 7238 CHARACTERS DATA RECORD SEREC.                   DATACOM  0019
01  SEREC SYNC.                                                        DATACOM  0020
    02  FILLER PIC X.                                                  DATACOM  0021
    02  SER-NAMEID PIC 9.                                              DATACOM  0022
    02  SER-REFERENCE PIC 9(7).                                        DATACOM  0023
    02  FILLER PIC X(85).                                              DATACOM  0024
SD  SD-SEF LABEL RECORD OMITTED RECORDING F                             DATACOM  0025
    BLOCK CONTAINS 7238 CHARACTERS DATA RECORD SDR-SEREC.               DATACOM  0026
01  SDR-SEREC SYNC.                                                    DATACOM  0027
    02  FILLER PIC X.                                                  DATACOM  0028
    02  SDR-NAMEID PIC 9.                                              DATACOM  0029
    02  SDR-REFERENCE PIC 9(7).                                        DATACOM  0030
    02  FILLER PIC X(85).                                              DATACOM  0031
FD  GDEF LABEL RECORD OMITTED RECORDING F                               DATACOM  0032
    BLOCK CONTAINS 7238 CHARACTERS DATA RECORD GEREC.                   DATACOM  0033
01  GEREC SYNC.                                                        DATACOM  0034
    02  GR-FILL1 PIC X(32).                                            DATACOM  0035
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    02  GR-FILL6 PIC 9(4).                                          DATACOM  0036
    02  GR-OUTAGE PIC 9(2).                                         DATACOM  0037
    02  GR-ERR-D PIC 9(4).                                          DATACOM  0038
    02  GR-FILL7 PIC 9(2).                                          DATACOM  0039
    02  GR-EQUIP PIC 9(2).                                          DATACOM  0040
    02  GR-FILL8 PIC 9(5).                                          DATACOM  0041
    02  GR-DURATION PIC 9(4).                                       DATACOM  0042
    02  GR-R-ENV PIC 9(4).                                          DATACOM  0043
    02  GR-R-EXP PIC 9(4).                                          DATACOM  0044
    02  GR-FILL9 PIC 9(2).                                          DATACOM  0045
    02  GR-HET PIC 9(4).                                            DATACOM  0046
    02  GR-FILL10 PIC 9(3).                                         DATACOM  0047
    02  GR-SYSTEM PIC 9.                                            DATACOM  0048
    02  GR-COMP-LOC PIC 9(3).                                       DATACOM  0049
    02  GR-CRIT PIC 9(2).                                           DATACOM  0050
    02  GR-FILL2 PIC X(16).                                         DATACOM  0051
FD PRINTF LABEL RECORD OMITTED RECORDING F                         DATACOM  0052
    DATA RECORD P-R.                                               DATACOM  0053
01  P-R PIC X(133) SYNC.                                          DATACOM  0054
WORKING-STORAGE SECTION.                                           DATACOM  0055
77  J PIC 9(2) VALUE 0 SYNC.                                      DATACOM  0056
77  K PIC 9(2) VALUE 0 SYNC.                                      DATACOM  0057
77  LINE-COUNT PIC 9(2) VALUE 0 SYNC.                             DATACOM  0058
77  END-FLAG PIC 9 VALUE 0 SYNC.                                  DATACOM  0059
77  DUP PIC 9(2) VALUE 0 SYNC.                                    DATACOM  0060
77  T-NAMEID PIC 9 VALUE 0 SYNC.                                  DATACOM  0061
77  T-REF PIC 9(7) VALUE 0 SYNC.                                  DATACOM  0062
77  SD-COUNT PIC 9(6) VALUE 0 SYNC.                               DATACOM  0063
77  FLAG-WRT PIC 9(2) VALUE 0 SYNC.                               DATACOM  0064
77  GR-COUNT PIC 9(6) VALUE 0 SYNC.                               DATACOM  0065
01  SIX-FILLER PIC X(70) VALUE '66666666666666666666666666666666 DATACOM  0066
    '66666666666666666666666666666666' SYNC.                       DATACOM  0067
01  SEVEN-FILLER PIC X(70) VALUE '77777777777777777777777777777 DATACOM  0068
    '77777777777777777777777777777777' SYNC.                       DATACOM  0069
01  EIGHT-FILLER PIC X(70) VALUE '88888888888888888888888888888888 DATACOM  0070
    '88888888888888888888888888888888' SYNC.                       DATACOM  0071
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01  NINE-FILLER PIC X(70) VALUE '99999999999999999999999999999999 DATACOM  0072
    '99999999999999999999999999999999' SYNC.                       DATACOM  0073
01  SD-SEREC SYNC.                                                 DATACOM  0074
    02  FILLER PIC X.                                              DATACOM  0075
    02  SD-NAMEID PIC 9.                                           DATACOM  0076
    02  SD-REFERENCE PIC 9(7).                                     DATACOM  0077
    02  FILLER PIC X(85).                                          DATACOM  0078
01  SDREC REDEFINES SD-SEREC SYNC.                                 DATACOM  0079
    02  SD-FILL1 PIC X(32).                                        DATACOM  0080
    02  SD-FILL2.                                                  DATACOM  0081
        03  FILLER PIC X(4).                                       DATACOM  0082
        03  SD-OUTAGE PIC 9(2).                                    DATACOM  0083
        03  SD-ERR-D PIC 9(4).                                     DATACOM  0084
        03  FILLER PIC X(2).                                       DATACOM  0085
        03  SD-EQUIP PIC 9(2).                                     DATACOM  0086
        03  FILLER PIC X(5).                                       DATACOM  0087
        03  SD-DURATION PIC 9(4).                                  DATACOM  0088
        03  SD-R-ENV PIC 9(4).                                     DATACOM  0089
        03  SD-R-EXP PIC 9(4).                                     DATACOM  0090
        03  FILLER PIC X(2).                                       DATACOM  0091
        03  SD-HET PIC 9(4).                                       DATACOM  0092
        03  FILLER PIC X(3).                                       DATACOM  0093
        03  SD-SYSTEM PIC 9.                                       DATACOM  0094
        03  SD-COMP-LOC PIC 9(3).                                  DATACOM  0095
        03  SD-CRIT PIC 9(2).                                      DATACOM  0096
    02  SD-FILL3 PIC X(16).                                        DATACOM  0097
01  COMPARISON-TABLE SYNC.                                         DATACOM  0098
    02  COMP-TAB OCCURS 6.                                         DATACOM  0099
        03  COMP-T PIC 9(7) OCCURS 10.                             DATACOM  0100
01  CONTENT-TABLE SYNC.                                            DATACOM  0101
    02  CONT-TAB OCCURS 5.                                         DATACOM  0102
        03  C-FILLER PIC X.                                        DATACOM  0103
        03  C-NAMEID PIC 9.                                        DATACOM  0104
        03  C-REFERENCE PIC 9(7).                                  DATACOM  0105
        03  C-DOCKET PIC 9(5).                                     DATACOM  0106
        03  C-INIT-DATE PIC 9(6).                                  DATACOM  0107
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      03  C-REPORT PIC 9(6).                                          DATACOM  0108
      03  C-EVENT PIC 9(6).                                           DATACOM  0109
01  TAIL-TABLE SYNC.                                                 DATACOM  0110
    02  TAIL-TAB  OCCURS 5.                                          DATACOM  0111
      03  T-PUNCH-DATE PIC 9(6).                                      DATACOM  0112
      03  T-SERIAL PIC 9(4).                                          DATACOM  0113
      03  T-COUNT PIC 9(6).                                           DATACOM  0114
01  HEAD1 SYNC.                                                      DATACOM  0115
    02  FILLER PIC X VALUE SPACE.                                    DATACOM  0116
    02  FILLER PIC X(45) VALUE '********************************** DATACOM  0117
    '************'.                                                  DATACOM  0118
    02  FILLER PIC X(42) VALUE ' DATA COMPARISON FOR HUMAN-ERROR     DATACOM  0119
    'TAXONOMY '.                                                    DATACOM  0120
    02  FILLER PIC X(45) VALUE '********************************** DATACOM  0121
    '************'.                                                  DATACOM  0122
01  TITLE1 SYNC.                                                     DATACOM  0123
    02  FILLER PIC X VALUE SPACE.                                    DATACOM  0124
    02  FILLER PIC X(22) VALUE '  R-ID   REF-NO DOCKET'.             DATACOM  0125
    02  FILLER PIC X(28) VALUE '  DATE-F  DATE-R  DATE-E OUT'.       DATACOM  0126
    02  FILLER PIC X(28) VALUE ' ERR-D  EQ   DRN R-ENV R-EXP'.       DATACOM  0127
    02  FILLER PIC X(32) VALUE '  HET   S COMP  CC   PUNCH  SER'.    DATACOM  0128
    02  FILLER PIC X(8) VALUE '  COUNT'.                             DATACOM  0129
    02  FILLER PIC X(14) VALUE SPACE.                                DATACOM  0130
01  DETAIL-LINE SYNC.                                                DATACOM  0131
    02  FILLER PIC X VALUE SPACE.                                    DATACOM  0132
    02  FILLER PIC X(5) VALUE SPACE.                                 DATACOM  0133
    02  NAME-ID PIC 9.                                               DATACOM  0134
    02  FILLER PIC X(2) VALUE SPACE.                                 DATACOM  0135
    02  REFERENCE PIC 9(7).                                          DATACOM  0136
    02  FILLER PIC X(2) VALUE SPACE.                                 DATACOM  0137
    02  DOCKET PIC 9(5).                                             DATACOM  0138
    02  FILLER PIC X(2) VALUE SPACE.                                 DATACOM  0139
    02  DATE-F PIC 9(6).                                             DATACOM  0140
    02  FILLER PIC X(2) VALUE SPACE.                                 DATACOM  0141
    02  DATE-R PIC 9(6).                                             DATACOM  0142
    02  FILLER PIC X(2) VALUE SPACE.                                 DATACOM  0143
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    02  DATE-E PIC 9(6).                                          DATACOM  0144
    02  FILLER PIC X(2) VALUE SPACE.                              DATACOM  0145
    02  OUTAGE PIC 9(2).                                          DATACOM  0146
    02  FILLER PIC X(2) VALUE SPACE.                              DATACOM  0147
    02  ERR-D PIC 9(4).                                           DATACOM  0148
    02  FILLER PIC X(2) VALUE SPACE.                              DATACOM  0149
    02  EQUIP PIC 9(2).                                           DATACOM  0150
    02  FILLER PIC X(2) VALUE SPACE.                              DATACOM  0151
    02  DURATION PIC 9(4).                                        DATACOM  0152
    02  FILLER PIC X(2) VALUE SPACE.                              DATACOM  0153
    02  R-ENV PIC 9(4).                                           DATACOM  0154
    02  FILLER PIC X(2) VALUE SPACE.                              DATACOM  0155
    02  R-EXP PIC 9(4).                                           DATACOM  0156
    02  FILLER PIC X(2) VALUE SPACE.                              DATACOM  0157
    02  FET PIC 9(4).                                             DATACOM  0158
    02  FILLER PIC X(2) VALUE SPACE.                              DATACOM  0159
    02  SYSTEM PIC 9.                                             DATACOM  0160
    02  FILLER PIC X(2) VALUE SPACE.                              DATACOM  0161
    02  COMP-LOC PIC 9(3).                                        DATACOM  0162
    02  FILLER PIC X(2) VALUE SPACE.                              DATACOM  0163
    02  CRIT PIC 9(2).                                            DATACOM  0164
    02  FILLER PIC X(2) VALUE SPACE.                              DATACOM  0165
    02  DATE-P PIC 9(6).                                          DATACOM  0166
    02  FILLER PIC X(2) VALUE SPACE.                              DATACOM  0167
    02  COUNT PIC 9(6).                                           DATACOM  0168
    02  FILLER PIC X(15) VALUE SPACE.                             DATACOM  0169
    02  SER PIC 9(3).                                             DATACOM  0170
    02  FILLER PIC X(2) VALUE SPACE.                              DATACOM  0171
01  SUB-COUNT-LINE SYNC.                                          DATACOM  0172
    02  FILLER PIC X VALUE SPACE.                                 DATACOM  0173
    02  FILLER PIC X(37) VALUE SPACE.                             DATACOM  0174
    02  FILLER PIC X(11) VALUE 'SUB-COUNT  '.                     DATACOM  0175
    02  SC-OUTAGE PIC Z9.                                         DATACOM  0176
    02  FILLER PIC X(4) VALUE SPACE.                              DATACOM  0177
    02  SC-ERR-D PIC Z9.                                          DATACOM  0178
    02  FILLER PIC X(2) VALUE SPACE.                              DATACOM  0179
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    02  SC-EQUIP PIC Z9.                                                    DATACOM  0180
    02  FILLER PIC X(4) VALUE SPACE.                                        DATACOM  0181
    02  SC-DURATION PIC Z9.                                                 DATACOM  0182
    02  FILLER PIC X(4) VALUE SPACE.                                        DATACOM  0183
    02  SC-R-ENV PIC Z9.                                                    DATACOM  0184
    02  FILLER PIC X(4) VALUE SPACE.                                        DATACOM  0185
    02  SC-R-EXP PIC Z9.                                                    DATACOM  0186
    02  FILLER PIC X(4) VALUE SPACE.                                        DATACOM  0187
    02  SC-HET PIC Z9.                                                      DATACOM  0188
    02  FILLER PIC X(2) VALUE SPACE.                                        DATACOM  0189
    02  SC-SYSTEM PIC 9.                                                    DATACOM  0190
    02  FILLER PIC X(3) VALUE SPACE.                                        DATACOM  0191
    02  SC-COMP-LOC PIC Z9.                                                 DATACOM  0192
    02  FILLER PIC X(2) VALUE SPACE.                                        DATACOM  0193
    02  SC-CRIT PIC Z9.                                                     DATACOM  0194
    02  FILLER PIC X(2) VALUE SPACE.                                        DATACOM  0195
01  DASH-L SYNC.                                                            DATACOM  0196
    02  FILLER PIC X VALUE SPACE.                                           DATACOM  0197
    02  DASH-SIGN PIC X(132) VALUE ALL '-' SYNC.                            DATACOM  0198
PROCEDURE DIVISION.                                                         DATACOM  0199
    SORT SD-SEF ON ASCENDING KEY SDR-REFERENCE SDR-NAMEID                   DATACOM  0200
    USING SEF OUTPUT PROCEDURE COMPARE-PROG.                                DATACOM  0201
EOJ.                                                                        DATACOM  0202
    CLOSE PRINTF GDEF.                                                      DATACOM  0203
    DISPLAY 'NUMBER OF RECORDS READ ON SD-SEF = ' SD-COUNT.                 DATACOM  0204
    DISPLAY 'NUMBER OF RECORDS WRITTEN ON SD-SEF = ' GR-COUNT.              DATACOM  0205
    DISPLAY 'STOP RUN'.                                                     DATACOM  0206
    STOP RUN.                                                               DATACOM  0207
COMPARE-PROG SECTION.                                                       DATACOM  0208
    OPEN OUTPUT PRINTF GDEF.                                                DATACOM  0209
    MOVE 0 TO C-REFERENCE (1).                                              DATACOM  0210
    MOVE 0 TO C-REFERENCE (2).                                              DATACOM  0211
    MOVE 0 TO C-REFERENCE (3).                                              DATACOM  0212
    MOVE 0 TO C-REFERENCE (4).                                              DATACOM  0213
    MOVE 0 TO C-REFERENCE (5).                                              DATACOM  0214
    MOVE 0 TO DUP.                                                          DATACOM  0215
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    PERFORM WRT-TITLE.                                                  DATACOM  0216
INIT-SEF.                                                               DATACOM  0217
    RETURN SD-SEF INTO SD-SEREC  AT END GO TO EOF-SEF.                  DATACOM  0218
    ADD 1 TO SD-COUNT.                                                  DATACOM  0219
    MOVE SD-REFERENCE TO T-REF.                                         DATACOM  0220
    IF SD-NAMEID > 4 OR < 0                                             DATACOM  0221
       DISPLAY SD-SEREC ' NAMEID > 4 OR < 0 ***'                        DATACOM  0222
       GO TO INIT-SEF.                                                  DATACOM  0223
    GO TO ADD-DUP.                                                      DATACOM  0224
RETURN-SEF.                                                             DATACOM  0225
    RETURN SD-SEF INTO SD-SEREC  AT END GO TO EOF-SEF.                  DATACOM  0226
    ADD 1 TO SD-COUNT.                                                  DATACOM  0227
    IF SD-NAMEID > 4 OR < 0                                             DATACOM  0228
       DISPLAY SD-SEREC ' NAMEID > 4 OR < 0 ***'                        DATACOM  0229
       GO TO RETURN-SEF.                                                DATACOM  0230
    IF SD-REFERENCE = T-REF GO TO ADD-DUP.                              DATACOM  0231
    IF DUP < 2 GO TO WRT-CHECK.                                         DATACOM  0232
    GO TO MOVE-COMP-TS.                                                 DATACOM  0233
ADD-DUP.                                                                DATACOM  0234
    IF SD-NAMEID = T-NAMEID                                             DATACOM  0235
       DISPLAY SD-SEREC ' SAME NAMEID > 1 ***'                          DATACOM  0236
      GO TO RETURN-SEF.                                                 DATACOM  0237
    MOVE SD-NAMEID TO T-NAMEID.                                         DATACOM  0238
    ADD 1 TO DUP.                                                       DATACOM  0239
    IF DUP > 4                                                          DATACOM  0240
       DISPLAY SD-SEREC ' SAME REF-NO > 4 ***'                          DATACOM  0241
       GO TO RETURN-SEF.                                                DATACOM  0242
MOVE-SD-SEF.                                                            DATACOM  0243
    MOVE SD-FILL1 TO CONT-TAB (SD-NAMEID).                              DATACOM  0244
    MOVE SD-FILL3 TO TAIL-TAB (SD-NAMEID).                              DATACOM  0245
    MOVE SD-OUTAGE TO COMP-T (SD-NAMEID,1).                             DATACOM  0246
    MOVE SD-ERR-D TO COMP-T (SD-NAMEID,2).                              DATACOM  0247
    MOVE SD-EQUIP TO COMP-T (SD-NAMEID,3).                              DATACOM  0248
    MOVE SD-DURATION TO COMP-T (SD-NAMEID,4).                           DATACOM  0249
    MOVE SD-R-ENV TO COMP-T (SD-NAMEID,5).                              DATACOM  0250
    MOVE SD-R-EXP TO COMP-T (SD-NAMEID,6).                              DATACOM  0251
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    MOVE SD-NET TO COMP-T (SD-NAMEID,7).                    DATACOM  0252
    MOVE SD-SYSTEM TO COMP-T (SD-NAMEID,8).                 DATACOM  0253
    MOVE SD-COMP-LOC TO COMP-T (SD-NAMEID,9).               DATACOM  0254
    MOVE SD-CRIT TO COMP-T (SD-NAMEID,10).                  DATACOM  0255
    GO TO RETURN-SEF.                                       DATACOM  0256
MOVE-COMP-T5.                                               DATACOM  0257
    MOVE CONT-TAB (T-NAMEID) TO CONT-TAB (5).               DATACOM  0258
    MOVE 0 TO C-NAMEID (5).                                 DATACOM  0259
    MOVE TAIL-TAB (T-NAMEID) TO TAIL-TAB (5).               DATACOM  0260
COMPARE-RT.                                                 DATACOM  0261
    MOVE 0 TO J.                                            DATACOM  0262
REPEAT-COMPARE.                                             DATACOM  0263
    ADD 1 TO J.                                             DATACOM  0264
    IF J > 10 GO TO WRT-CHECK.                              DATACOM  0265
    IF COMP-T (1,J) = COMP-T (2,J)                          DATACOM  0266
    IF COMP-T (2,J) = COMP-T (3,J)                          DATACOM  0267
      IF COMP-T (3,J) = COMP-T (4,J)                        DATACOM  0268
       MOVE 4 TO COMP-T (6,J) GO TO MOVE-1ST                DATACOM  0269
    ELSE MOVE 3 TO COMP-T (6,J) GO TO MOVE-1ST              DATACOM  0270
    ELSE GO TO COMPARE-6.                                   DATACOM  0271
COMPARE-1.                                                  DATACOM  0272
    IF COMP-T (1,J) = COMP-T (3,J)                          DATACOM  0273
      IF COMP-T (3,J) = COMP-T (4,J)                        DATACOM  0274
        MOVE 3 TO COMP-T (6,J) GO TO MOVE-1ST               DATACOM  0275
      ELSE GO TO COMPARE-8.                                 DATACOM  0276
COMPARE-2.                                                  DATACOM  0277
    IF COMP-T (2,J) = COMP-T (3,J)                          DATACOM  0278
      IF COMP-T (3,J) = COMP-T (4,J)                        DATACOM  0279
        MOVE 3 TO COMP-T (6,J) GO TO MOVE-2ND               DATACOM  0280
      ELSE GO TO COMPARE-9.                                 DATACOM  0281
COMPARE-3.                                                  DATACOM  0282
    IF COMP-T (1,J) = COMP-T (4,J)                          DATACOM  0283
      MOVE 2 TO COMP-T (6,J) GO TO MOVE-1ST.                DATACOM  0284
COMPARE-4.                                                  DATACOM  0285
    IF COMP-T (2,J) = COMP-T (4,J)                          DATACOM  0286
      MOVE 2 TO COMP-T (6,J) GO TO MOVE-2ND.                DATACOM  0287
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COMPARE-5.                                                      DATACOM  0288
    IF COMP-T (3,J) = COMP-T (4,J)                              DATACOM  0289
      MOVE 2 TO COMP-T (6,J) GO TO MOVE-3RD                     DATACOM  0290
    ELSE MOVE 0 TO COMP-T (6,J) GO TO MOVE-4TH.                 DATACOM  0291
COMPARE-6.                                                      DATACOM  0292
    IF COMP-T (2,J) = COMP-T (4,J)                              DATACOM  0293
      MOVE 3 TO COMP-T (6,J) GO TO MOVE-1ST.                    DATACOM  0294
COMPARE-7.                                                      DATACOM  0295
    IF COMP-T (3,J) NOT = COMP-T (4,J)                          DATACOM  0296
    MOVE 2 TO COMP-T (6,J) GO TO MOVE-1ST                       DATACOM  0297
    ELSE MOVE 0 TO COMP-T (6,J) GO TO MOVE-4TH.                 DATACOM  0298
COMPARE-8.                                                      DATACOM  0299
    IF COMP-T (2,J) NOT = COMP-T (4,J)                          DATACOM  0300
      MOVE 2 TO COMP-T (6,J) GO TO MOVE-1ST                     DATACOM  0301
    ELSE MOVE 0 TO COMP-T (6,J) GO TO MOVE-4TH.                 DATACOM  0302
COMPARE-9.                                                      DATACOM  0303
    IF COMP-T (1,J) NOT = COMP-T (4,J)                          DATACOM  0304
      MOVE 2 TO COMP-T (6,J) GO TO MOVE-2ND                     DATACOM  0305
    ELSE MOVE 0 TO COMP-T (6,J) GO TO MOVE-4TH.                 DATACOM  0306
    IF END-FLAG = 1                                             DATACOM  0307
      DISPLAY 'DATA OUT OF RANGE***' GO TO WTT.                 DATACOM  0308
    DISPLAY SD-SEREC ' DATA OUT OF RANGE ***'                   DATACOM  0309
    GO TO WTT.                                                  DATACOM  0310
MOVE-1ST.                                                       DATACOM  0311
    MOVE COMP-T (1,J) TO COMP-T (5,J) ADD 1 TO FLAG-WRT.        DATACOM  0312
    GO TO REPEAT-COMPARE.                                       DATACOM  0313
MOVE-2ND.                                                       DATACOM  0314
    MOVE COMP-T (2,J) TO COMP-T (5,J) ADD 1 TO FLAG-WRT.        DATACOM  0315
    GO TO REPEAT-COMPARE.                                       DATACOM  0316
MOVE-3RD.                                                       DATACOM  0317
    MOVE COMP-T (3,J) TO COMP-T (5,J) ADD 1 TO FLAG-WRT.        DATACOM  0318
    GO TO REPEAT-COMPARE.                                       DATACOM  0319
MOVE-4TH.                                                       DATACOM  0320
    MOVE 0 TO COMP-T (5,J) GO TO REPEAT-COMPARE.                DATACOM  0321
WRT-CHECK.                                                      DATACOM  0322
    IF LINE-COUNT > 50 PERFORM WRT-TITLE.                       DATACOM  0323
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    MOVE ZERO TO C-FILLER (5).                                          DATACOM  0324
    MOVE 1 TO K.                                                        DATACOM  0325
WRT-PRINT.                                                              DATACOM  0326
    IF K > 5 GO TO WRT-SUB-COUNT.                                       DATACOM  0327
    IF C-REFERENCE (K) = 0 ADD 1 TO K GO TO WRT-PRINT.                  DATACOM  0328
    MOVE C-NAMEID (K) TO NAME-ID.                                       DATACOM  0329
    MOVE C-REFERENCE (K) TO REFERENCE.                                  DATACOM  0330
    MOVE C-DOCKET (K) TO DOCKET.                                        DATACOM  0331
    MOVE C-INIT-DATE (K) TO DATE-F.                                     DATACOM  0332
    MOVE C-REPORT (K) TO DATE-R.                                        DATACOM  0333
    MOVE C-EVENT (K) TO DATE-E.                                         DATACOM  0334
    MOVE T-PUNCH-DATE (K) TO DATE-P.                                    DATACOM  0335
    MOVE T-SERIAL (K) TO SER.                                           DATACOM  0336
    MOVE T-COUNT (K) TO COUNT.                                          DATACOM  0337
    MOVE COMP-T (K,1) TO OUTAGE.                                        DATACOM  0338
    MOVE COMP-T (K,2) TO ERR-D.                                         DATACOM  0339
    MOVE COMP-T (K,3) TO EQUIP.                                         DATACOM  0340
    MOVE COMP-T (K,4) TO DURATION.                                      DATACOM  0341
    MOVE COMP-T (K,5) TO R-ENV.                                         DATACOM  0342
    MOVE COMP-T (K,6) TO R-EXP.                                         DATACOM  0343
    MOVE COMP-T (K,7) TO FET.                                           DATACOM  0344
    MOVE COMP-T (K,8) TO SYSTEM.                                        DATACOM  0345
    MOVE COMP-T (K,9) TO COMP-LOC.                                      DATACOM  0346
    MOVE COMP-T (K,10) TO CRIT.                                         DATACOM  0347
    WRITE P-R FROM DETAIL-LINE AFTER POSITIONING 1 LINES.               DATACOM  0348
    ADD 1 TO LINE-COUNT.                                                DATACOM  0349
    ADD 1 TO K.                                                         DATACOM  0350
    GO TO WRT-PRINT.                                                    DATACOM  0351
WRT-SUB-COUNT.                                                          DATACOM  0352
    IF C-REFERENCE (5) = 0                                              DATACOM  0353
       WRITE P-R FROM DASH-L AFTER POSITIONING 1 LINES                  DATACOM  0354
       ADD 1 TO LINE-COUNT                                              DATACOM  0355
       GO TO READY-SEF.                                                 DATACOM  0356
    MOVE COMP-T (6,1) TO SC-OUTAGE.                                     DATACOM  0357
    MOVE COMP-T (6,2) TO SC-ERR-D.                                      DATACOM  0358
    MOVE COMP-T (6,3) TO SC-EQUIP.                                      DATACOM  0359
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    MOVE COMP-T (6,4) TO SC-DURATION.                                DATACOM  0360
    MOVE COMP-T (6,5) TO SC-R-ENV.                                   DATACOM  0361
    MOVE COMP-T (6,6) TO SC-R-EXP.                                   DATACOM  0362
    MOVE COMP-T (6,7) TO SC-HET.                                     DATACOM  0363
    MOVE COMP-T (6,8) TO SC-SYSTEM.                                  DATACOM  0364
    MOVE COMP-T (6,9) TO SC-COMP-LOC.                                DATACOM  0365
    MOVE COMP-T (6,10) TO SC-CRIT.                                   DATACOM  0366
    WRITE P-R FROM DASH-L AFTER POSITIONING 1 LINES.                 DATACOM  0367
    WRITE P-R FROM SUB-COUNT-LINE AFTER POSITIONING 2 LINES.         DATACOM  0368
    WRITE P-R FROM DASH-L AFTER POSITIONING 1 LINES.                 DATACOM  0369
    ADD 4 TO LINE-COUNT.                                             DATACOM  0370
    IF FLAG-WRT < 1 GO TO READY-SEF.                                 DATACOM  0371
    MOVE CONT-TAB (5) TO GR-FILL1.                                   DATACOM  0372
    MOVE TAIL-TAB (5) TO GR-FILL2.                                   DATACOM  0373
    MOVE COMP-T (5,1) TO GR-OUTAGE.                                  DATACOM  0374
    MOVE COMP-T (5,2) TO GR-ERR-D.                                   DATACOM  0375
    MOVE COMP-T (5,3) TO GR-EQUIP.                                   DATACOM  0376
    MOVE COMP-T (5,4) TO GR-DURATION.                                DATACOM  0377
    MOVE COMP-T (5,5) TO GR-R-ENV.                                   DATACOM  0378
    MOVE COMP-T (5,6) TO GR-R-EXP.                                   DATACOM  0379
    MOVE COMP-T (5,7) TO GR-HET.                                     DATACOM  0380
    MOVE COMP-T (5,8) TO GR-SYSTEM.                                  DATACOM  0381
    MOVE COMP-T (5,9) TO GR-COMP-LOC.                                DATACOM  0382
    MOVE COMP-T (5,10) TO GR-CRIT.                                   DATACOM  0383
    MOVE 0 TO GR-FILL6.                                              DATACOM  0384
    MOVE 0 TO GR-FILL7.                                              DATACOM  0385
    MOVE 0 TO GR-FILL8.                                              DATACOM  0386
    MOVE 0 TO GR-FILL9.                                              DATACOM  0387
    MOVE 0 TO GR-FILL10.                                             DATACOM  0388
    WRITE GEREC.                                                     DATACOM  0389
    ADD 1 TO GR-COUNT.                                               DATACOM  0390
READY-SEF.                                                           DATACOM  0391
    IF END-FLAG = 1 GO TO WTT.                                       DATACOM  0392
    MOVE SIX-FILLER TO COMP-TAB (1).                                 DATACOM  0393
    MOVE SEVEN-FILLER TO COMP-TAB (2).                               DATACOM  0394
    MOVE EIGHT-FILLER TO COMP-TAB (3).                               DATACOM  0395
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    MOVE NINE-FILLER TO COMP-TAB (4).                                DATACOM  0396
    MOVE 0 TO C-REFERENCE (1).                                       DATACOM  0397
    MOVE 0 TO C-REFERENCE (2).                                       DATACOM  0398
    MOVE 0 TO C-REFERENCE (3).                                       DATACOM  0399
    MOVE 0 TO C-REFERENCE (4).                                       DATACOM  0400
    MOVE 0 TO C-REFERENCE (5).                                       DATACOM  0401
    MOVE 0 TO FLAG-WRT.                                              DATACOM  0402
    MOVE 1 TO DUP.                                                   DATACOM  0403
    MOVE SD-REFERENCE TO T-REF.                                      DATACOM  0404
    MOVE SD-NAMEID TO T-NAMEID.                                      DATACOM  0405
    IF T-NAMEID > 4 OR < 0                                           DATACOM  0406
      DISPLAY SD-SEREC ' NAMEID > 4 OR < 0 ***'                      DATACOM  0407
      GO TO RETURN-SEF.                                              DATACOM  0408
    GO TO MOVE-SD-SEF.                                               DATACOM  0409
EOF-SEF.                                                             DATACOM  0410
    MOVE 1 TO END-FLAG.                                              DATACOM  0411
    IF DUP < 2 GO TO WRT-CHECK.                                      DATACOM  0412
    IF DUP > 4                                                       DATACOM  0413
      DISPLAY 'SAME REF-NO > 4 ***' GO TO WTT.                       DATACOM  0414
    GO TO MOVE-COMP-T5.                                              DATACOM  0415
WRT-TITLE.                                                           DATACOM  0416
    WRITE P-R FROM HEAD1 AFTER POSITIONING 0 LINES.                  DATACOM  0417
    WRITE P-R FROM TITLE1 AFTER POSITIONING 3 LINES.                 DATACOM  0418
    WRITE P-R FROM DASH-L AFTER POSITIONING 1 LINES.                 DATACOM  0419
    MOVE 5 TO LINE-COUNT.                                            DATACOM  0420
WT.  EXIT.                                                           DATACOM  0421
WTT.                                                                 DATACOM  0422
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12. APPENDIX B: RETRIEVAL PROGRAMS (LERRET)

12.1. LER Separation Program (DIRECTF)

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IDENTIFICATION DIVISION.                                          DIRECTF  0001
PROGRAM-ID. DIRECTF.                                              DIRECTF  0002
AUTHOR.  H Y CHO.                                                 DIRECTF  0003
DATE-WRITTEN. APRIL, 1978                                         DIRECTF  0004
REMARKS. DIRECTF IS INTENDED TO SEPARATE MASTERFILE FROM NSIC     DIRECTF  0005
         INTO KEYWORDFILE AND EDITEDFILE.                         DIRECTF  0006
ENVIRONMENT DIVISION.                                             DIRECTF  0007
CONFIGURATION SECTION.                                            DIRECTF  0008
SOURCE-COMPUTER. IBM-360-165.                                     DIRECTF  0009
OBJECT-COMPUTER. IBM-360-165.                                     DIRECTF  0010
INPUT-OUTPUT SECTION.                                             DIRECTF  0011
    SELECT CARDFILE ASSIGN UR-S-SYSIN.                            DIRECTF  0012
    SELECT MASTERFILE ASSIGN UT-S-MF.                             DIRECTF  0013
    SELECT KEYWORDFILE ASSIGN UT-S-KF.                            DIRECTF  0014
    SELECT CITATIONFILE ASSIGN UT-S-CF.                           DIRECTF  0015
    SELECT PRINTFILE ASSIGN UT-S-SYSPRINT.                        DIRECTF  0016
DATA DIVISION.                                                    DIRECTF  0017
FILE SECTION.                                                     DIRECTF  0018
FD  MASTERFILE LABEL RECORD OMITTED RECORDING V                   DIRECTF  0019
    BLOCK 10004 CHARACTERS DATA RECORD MASTER-RECORD.             DIRECTF  0020
01  MASTER-RECORD SYNC.                                          DIRECTF  0021
    02 FILLER PIC X(2).                                           DIRECTF  0022
    02 MST-CNT PIC S9(4) COMPUTATIONAL.                           DIRECTF  0023
    02 MR PIC X OCCURS 1966 DEPENDING ON MST-CNT.                 DIRECTF  0024
FD CARDFILE RECORDING F LABEL RECORD OMITTED                      DIRECTF  0025
    DATA RECORD CARD-RECORD.                                      DIRECTF  0026
01  CARD-RECORD SYNC.                                            DIRECTF  0027
    02  KEY-NO PIC 9(4).                                         DIRECTF  0028
    02  FILLER PIC X(5).                                         DIRECTF  0029
    02 RTYPE-NAME PIC X(5).                                       DIRECTF  0030
FD  KEYWORDFILE RECORDING F LABEL RECORD OMITTED                  DIRECTF  0031
    BLOCK 7272 CHARACTERS DATA RECORD KDREC.                      DIRECTF  0032
01  KDREC SYNC.                                                  DIRECTF  0033
    02  KD-ID PIC X.                                             DIRECTF  0034
    02  KD-ACC PIC 9(6).                                         DIRECTF  0035
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    02  KD-LC PIC X(2).                                                    DIRECTF  0036
    02  KD-RTYPE-NAME PIC X(5).                                            DIRECTF  0037
    02  KD-SIGDAT PIC 9(6).                                                DIRECTF  0038
    02  KD-KEYWORD PIC 9(4).                                               DIRECTF  0039
FD  CITATIONFILE LABEL RECORD OMITTED RECORDING V BLOCK CONTAINS            DIRECTF  0040
    7298 CHARACTERS DATA RECORD CNREC.                                      DIRECTF  0041
01  CNREC SYNC.                                                            DIRECTF  0042
    02  CN-ID PIC X.                                                       DIRECTF  0043
    02  CN-ACC PIC 9(6).                                                   DIRECTF  0044
    02  CN-CONTENT-CNT PIC 9(2).                                           DIRECTF  0045
    02  CN-EDITED-AREA.                                                    DIRECTF  0046
        03  CN-CONTENT PIC X(111) OCCURS 30 DEPENDING ON                   DIRECTF  0047
            CN-CONTENT-CNT.                                                 DIRECTF  0048
FD  PRINTFILE RECORDING F LABEL RECORD OMITTED                              DIRECTF  0049
    BLOCK 133  CHARACTERS DATA RECORD P-R.                                  DIRECTF  0050
01  P-R PIC X(133) SYNC.                                                   DIRECTF  0051
WORKING-STORAGE SECTION.                                                    DIRECTF  0052
77  CHOCNT PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                           DIRECTF  0053
77  A PIC S9(8) COMPUTATIONAL SYNC.                                        DIRECTF  0054
77  B PIC S9(8) COMPUTATIONAL SYNC.                                        DIRECTF  0055
77  BEGIN-PRINT PIC S9(8) COMPUTATIONAL SYNC.                              DIRECTF  0056
77  C PIC S9(8) COMPUTATIONAL SYNC.                                        DIRECTF  0057
77  CARD-COUNT PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                       DIRECTF  0058
77  CF-OPEN PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                          DIRECTF  0059
77  CN-CNT PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                           DIRECTF  0060
77  CNF-OPEN PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                         DIRECTF  0061
77  CNREC-COUNT PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                      DIRECTF  0062
77  D PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                                DIRECTF  0063
77  E PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                                DIRECTF  0064
77  EMP-FLAG PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                         DIRECTF  0065
77  END-PRINT PIC S9(8) COMPUTATIONAL SYNC.                                DIRECTF  0066
77  F PIC S9(8) COMPUTATIONAL SYNC.                                        DIRECTF  0067
77  FOUND-CNT PIC S9(4) COMP SYNC VALUE 0.                                 DIRECTF  0068
77  J PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                                DIRECTF  0069
77  K PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                                DIRECTF  0070
77  KDF-OPEN PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                         DIRECTF  0071
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77  KDREC-COUNT PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                DIRECTF  0072
77  KEYWORD-COUNT PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.              DIRECTF  0073
77  LAST-LINE PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                  DIRECTF  0074
77  LEFT-ALIGN PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                 DIRECTF  0075
77  LINE-CNT PIC S9(4) COMPUTATIONAL VALUE 2 SYNC.                   DIRECTF  0076
77  MF-OPEN PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.                DIRECTF  0077
77  MR-COUNT PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.               DIRECTF  0078
77  NDEX PICTURE S9(4) COMPUTATIONAL VALUE 0 SYNC.                   DIRECTF  0079
77  PF-OPEN PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                    DIRECTF  0080
01  CPOWER PIC X VALUE SPACE.                                       DIRECTF  0081
01  EC-REC SYNC.                                                    DIRECTF  0082
    02  ECR.                                                        DIRECTF  0083
        03  ECC-CC PIC X.                                           DIRECTF  0084
        03  FILLER.                                                 DIRECTF  0085
            04  ECRR PIC X OCCURS 110.                              DIRECTF  0086
01  KEYWORDS-TABLE SYNC.                                            DIRECTF  0087
    02  KT OCCURS 3500 PIC X(48).                                   DIRECTF  0088
01  RTYPENAME-TABLE SYNC.                                           DIRECTF  0089
        02  KPP OCCURS 3500 PIC X(5).                               DIRECTF  0090
01  KEYRECORD SYNC.                                                 DIRECTF  0091
    02  KR-ID PIC X.                                                DIRECTF  0092
    02  KR-ACC PIC 9(6).                                            DIRECTF  0093
    02  KR-LC PIC X(2).                                             DIRECTF  0094
    02  KR-RTYPE-NAME PIC X(5).                                     DIRECTF  0095
    02  KR-SIGDAT PIC 9(6).                                         DIRECTF  0096
    02  KR-KEYWORD PIC 9(4).                                        DIRECTF  0097
01  MAST-REC SYNC.                                                  DIRECTF  0098
    02 HDRDTA.                                                      DIRECTF  0099
       03 REC-ID      PICTURE X.                                    DIRECTF  0100
       03 EVALU       PICTURE X.                                    DIRECTF  0101
       03 TOTL-CHAR   PICTURE S9(4) COMPUTATIONAL.                  DIRECTF  0102
       03 ACC-NO      PICTURE S9(6) COMPUTATIONAL.                  DIRECTF  0103
       03 SIGDAT      PICTURE S9(6) COMPUTATIONAL.                  DIRECTF  0104
       03 C-ATHR      PICTURE X(9).                                 DIRECTF  0105
       03 TYP         PICTURE X(3).                                 DIRECTF  0106
       03 LANG-COUNTRY PICTURE X(2).                                DIRECTF  0107
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           03 CTEGORY.                                                    DIRECTF  0108
              04 CTG      PICTURE 99 OCCURS 6.                           DIRECTF  0109
           03 SUBNO       PICTURE 9(6).                                  DIRECTF  0110
           03 J-ABRV      PICTURE X(4).                                  DIRECTF  0111
           03 EDITN       PICTURE S9(4) COMPUTATIONAL.                   DIRECTF  0112
           03 SELNUM-CNT  PICTURE S9(4) COMPUTATIONAL.                   DIRECTF  0113
           03 AUTH-CHAR   PICTURE S9(4) COMPUTATIONAL.                   DIRECTF  0114
           03 TITLE-CHAR  PICTURE S9(4) COMPUTATIONAL.                   DIRECTF  0115
           03 CAUTH-CHAR  PICTURE S9(4) COMPUTATIONAL.                   DIRECTF  0116
           03 MEMO-CHAR   PICTURE S9(4) COMPUTATIONAL.                   DIRECTF  0117
           03 ABS-CHAR    PICTURE S9(4) COMPUTATIONAL.                   DIRECTF  0118
           03 AVL-CHAR PICTURE S9(4) COMPUTATIONAL.                      DIRECTF  0119
           03 ABS-FMAT    PICTURE S9 COMPUTATIONAL-3.                    DIRECTF  0120
           03 BIB-FLG     PICTURE S9 COMPUTATIONAL-3.                    DIRECTF  0121
           03 DOC-FLG     PICTURE S9 COMPUTATIONAL-3.                    DIRECTF  0122
           03 OPN-FLG     PICTURE S9 COMPUTATIONAL-3.                    DIRECTF  0123
           03 PROP-FLG    PICTURE S99 COMPUTATIONAL.                     DIRECTF  0124
           03 NEW-MASK    PICTURE X(10).                                 DIRECTF  0125
        02 MAST-AREA      PICTURE X(1890).                               DIRECTF  0126
        02 FOR-ABS REDEFINES MAST-AREA.                                  DIRECTF  0127
           03 MA  PICTURE  X OCCURS 1890.                                DIRECTF  0128
        02 KWDS-YAK REDEFINES MAST-AREA.                                 DIRECTF  0129
          03 KWD-NTRY PICTURE S9(4) COMPUTATIONAL OCCURS 48 TIMES.       DIRECTF  0130
    01  MASTR-KWC REDEFINES MAST-REC SYNC.                              DIRECTF  0131
        02 KWD-ID     PICTURE X.                                         DIRECTF  0132
        02 FILLER     PICTURE X.                                         DIRECTF  0133
        02 SEL-VRB    PICTURE S9(4) COMPUTATIONAL.                       DIRECTF  0134
        02 SEL-NO     PICTURE S9(4) COMPUTATIONAL.                       DIRECTF  0135
        02 TRM        PICTURE X(48).                                     DIRECTF  0136
    01  BIB-CAT-HEAD SYNC.                                              DIRECTF  0137
        02  FILLER PIC X(4) VALUE '-'.                                  DIRECTF  0138
        02  BC-ACC PIC 9(6).                                            DIRECTF  0139
        02  BCH.                                                        DIRECTF  0140
            03  FILLER PIC X(5) VALUE SPACE.                            DIRECTF  0141
            03 BC-CTG OCCURS 6.                                         DIRECTF  0142
              04  BC-DASH PIC X.                                        DIRECTF  0143
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           04  BC-CAT PIC Z99.                                          DIRECTF  0144
       02  FILLER PIC X(15) VALUE SPACE.                                DIRECTF  0145
       02  FILLER PIC X(18) VALUE ' DATED(MO/DY/YR)  '.                 DIRECTF  0146
       02  FILL-MONTH PIC 9(2).                                         DIRECTF  0147
       02 FILLER PIC X VALUE '/'.                                      DIRECTF  0148
       02  FILL-DAY PIC 9(2).                                           DIRECTF  0149
       02 FILLER PIC X VALUE '/'.                                      DIRECTF  0150
       02  FILL-YR PIC 9(2).                                            DIRECTF  0151
       02  FILLER PIC X(31) VALUE SPACE.                                DIRECTF  0152
01   KEYWORD-NINE PIC S9(4) COMPUTATIONAL SYNC.                         DIRECTF  0153
01   KEYWORDS-OUT SYNC.                                                DIRECTF  0154
           02  KEYS PIC S9(4) COMPUTATIONAL  OCCURS 48 TIMES.          DIRECTF  0155
01   KEYWORD-PULL SYNC.                                                DIRECTF  0156
           02  KP PIC X OCCURS 1000.                                    DIRECTF  0157
01   SIGDATE PIC 9(6) SYNC.                                            DIRECTF  0158
01   SIGDT REDEFINES SIGDATE SYNC.                                     DIRECTF  0159
       02  SIGYR PIC  9(2).                                             DIRECTF  0160
       02  SIGMO PIC  9(2).                                             DIRECTF  0161
       02  SIGDY PIC  9(2).                                             DIRECTF  0162
PROCEDURE DIVISION.                                                    DIRECTF  0163
START1.                                                                DIRECTF  0164
       OPEN INPUT CARDFILE.                                            DIRECTF  0165
       MOVE 1 TO CF-OPEN.                                              DIRECTF  0166
                                                                       DIRECTF  0167
       READ CARDFILE END DISPLAY 'NO KEYWORD GIVEN'                    DIRECTF  0168
          GO TO CLOSE-OPEN-FILES.                                      DIRECTF  0169
       DISPLAY CARD-RECORD.                                            DIRECTF  0170
       MOVE SPACES TO P-R.                                             DIRECTF  0171
       MOVE SPACES TO ECR.                                             DIRECTF  0172
       MOVE 0 TO C.                                                    DIRECTF  0173
FILL-SPACES.                                                           DIRECTF  0174
       ADD 1 TO C.                                                     DIRECTF  0175
       IF C > 3500 MOVE 0 TO C GO TO RD-CARD.                          DIRECTF  0176
       MOVE ' ' TO KT (C).                                             DIRECTF  0177
       MOVE ' ' TO KPP (C).                                            DIRECTF  0178
       GO TO FILL-SPACES.                                              DIRECTF  0179
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RD-CARD.                                                                DIRECTF  0180
    READ CARDFILE END MOVE 0 TO CF-OPEN PF-OPEN                         DIRECTF  0181
    DISPLAY 'CARD KEYWORD MEMBERS FOR POWER PLANTS=' CARD-COUNT         DIRECTF  0182
    CLOSE CARDFILE GO TO RD-HD1.                                        DIRECTF  0183
    ADD 1 TO CARD-COUNT.                                                DIRECTF  0184
    ADD 1 TO C.                                                         DIRECTF  0185
FILL-TABLE1.                                                            DIRECTF  0186
    IF KEY-NO < 0 OR > 3499                                             DIRECTF  0187
    DISPLAY ' KEYWORD ON CARD OUT OF RANGE=' KEY-NO                     DIRECTF  0188
    GO TO CLOSE-OPEN-FILES.                                             DIRECTF  0189
    ADD 1 TO KEY-NO.                                                    DIRECTF  0190
    MOVE RTYPE-NAME TO KPP (KEY-NO).                                    DIRECTF  0191
    DISPLAY 'KEY ' KEY-NO ' RTYPE ' KPP (KEY-NO) ' ' C.                 DIRECTF  0192
    GO TO RD-CARD.                                                      DIRECTF  0193
RD-HD1.                                                                 DIRECTF  0194
    MOVE 0 TO C.                                                        DIRECTF  0195
    OPEN INPUT MASTERFILE.                                              DIRECTF  0196
    MOVE 1 TO MF-OPEN.                                                  DIRECTF  0197
    MOVE SPACES TO BCH.                                                 DIRECTF  0198
    READ MASTERFILE INTO MAST-REC END GO TO CLOSE-OPEN-FILES.           DIRECTF  0199
    ADD 1 TO CHOCNT.                                                    DIRECTF  0200
    ADD 1 TO MR-COUNT.                                                  DIRECTF  0201
    IF REC-ID NOT = 2 GO TO RD-HD1.                                     DIRECTF  0202
    PERFORM FILL-TABLE2.                                                DIRECTF  0203
RD-SELS.                                                                DIRECTF  0204
    READ MASTERFILE INTO MAST-REC END GO TO CLOSE-OPEN-FILES.           DIRECTF  0205
    ADD 1 TO CHOCNT.                                                    DIRECTF  0206
    IF REC-ID NOT = 2 GO TO ALL-SELS.                                   DIRECTF  0207
    ADD 1 TO MR-COUNT.                                                  DIRECTF  0208
    ADD 1 TO KEYWORD-COUNT.                                             DIRECTF  0209
FILL-TABLE2.                                                            DIRECTF  0210
    ADD 1 TO C.                                                         DIRECTF  0211
    IF C > 3500 DISPLAY ' TOO MANY KEYWORDS ' C                         DIRECTF  0212
    GO TO CLOSE-OPEN-FILES.                                             DIRECTF  0213
    IF SEL-NO < 0 OR > 3499 DISPLAY 'KEYWORD ON MASTER OUT OF           DIRECTF  0214
    'RANGE ' SEL-NO GO TO ALL-SELS.                                     DIRECTF  0215
```

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    ADD 1 TO SEL-NO.                                                    DIRECTF  0216
    MOVE TRM TO KT (SEL-NO).                                            DIRECTF  0217
FT.  EXIT.                                                              DIRECTF  0218
RD-CONTINUE.                                                            DIRECTF  0219
    GO TO RD-SELS.                                                      DIRECTF  0220
ALL-SELS.                                                               DIRECTF  0221
    DISPLAY 'TABLE MEMBERS =' C.                                        DIRECTF  0222
    OPEN OUTPUT CITATIONFILE KEYWORDFILE.                               DIRECTF  0223
    MOVE SPACES TO CNREC.                                               DIRECTF  0224
    OPEN OUTPUT PRINTFILE.                                              DIRECTF  0225
    MOVE 1 TO PF-OPEN.                                                  DIRECTF  0226
    MOVE 1 TO CNF-OPEN.                                                 DIRECTF  0227
    MOVE 1 TO KDF-OPEN.                                                 DIRECTF  0228
    GO TO START-TESTING.                                                DIRECTF  0229
RD-MAST.                                                                DIRECTF  0230
    READ MASTERFILE INTO MAST-REC END GO TO CLOSE-OPEN-FILES.           DIRECTF  0231
    ADD 1 TO MR-COUNT.                                                  DIRECTF  0232
    ADD 1 TO CHOCNT.                                                    DIRECTF  0233
    IF CHOCNT > 3500 GO TO CLOSE-OPEN-FILES.                            DIRECTF  0234
    MOVE 0 TO FOUND-CNT.                                                DIRECTF  0235
    MOVE SPACES TO BCH.                                                 DIRECTF  0236
START-TESTING.                                                          DIRECTF  0237
    MOVE 1 TO C.                                                        DIRECTF  0238
    COMPUTE TOTL-CHAR = TOTL-CHAR - 76.                                 DIRECTF  0239
    IF TOTL-CHAR = 0 DISPLAY ACC-NO ' RECORD HAS TOTAL CHARACTER        DIRECTF  0240
     'COUNT OF ZERO' GO TO RD-MAST.                                     DIRECTF  0241
    IF PROP-FLG NOT = 0 GO TO RD-MAST.                                  DIRECTF  0242
      IF YOU DO NOT WANT TO CHECK ON KEYWORDS, JUST BRANCH TO           DIRECTF  0243
      MOVE-CATEGORIES AT THIS POINT.                                    DIRECTF  0244
NEW-KEYWORD-CHECK1.                                                     DIRECTF  0245
    IF C > SELNUM-CNT GO TO CHECK-SECOND.                               DIRECTF  0246
    IF KWD-NTRY (C) NOT < 0 AND NOT = 9999                              DIRECTF  0247
    MOVE KWD-NTRY (C) TO KEYS (C).                                      DIRECTF  0248
    IF KWD-NTRY (C) < 0 COMPUTE KEYS (C) = KWD-NTRY (C) * -1.           DIRECTF  0249
    IF KWD-NTRY (C) = 9999 MOVE 0 TO KEYS (C).                          DIRECTF  0250
    MOVE KEYS (C) TO KEYWORD-NINE.                                      DIRECTF  0251
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    ADD 1 TO KEYWORD-NINE.                                          DIRECTF  0252
    MOVE KPP (KEYWORD-NINE) TO CPOWER.                              DIRECTF  0253
    IF CPOWER = 'B' OR 'F' OR 'P' OR 'L'                            DIRECTF  0254
    MOVE KPP (KEYWORD-NINE) TO KR-RTYPE-NAME                        DIRECTF  0255
    MOVE 1 TO FOUND-CNT.                                            DIRECTF  0256
    ADD 1 TO C.                                                     DIRECTF  0257
    GO TO NEW-KEYWORD-CHECK1.                                       DIRECTF  0258
CHECK-SECOND.                                                       DIRECTF  0259
    IF FOUND-CNT NOT = 1 GO TO RD-MAST.                             DIRECTF  0260
MOVE-KEYWORDS.                                                      DIRECTF  0261
    MOVE '2' TO KR-ID.                                              DIRECTF  0262
    MOVE ACC-NO TO KR-ACC.                                          DIRECTF  0263
    MOVE LANG-COUNTRY TO KR-LC.                                     DIRECTF  0264
    MOVE SIGDAT TO KR-SIGDAT.                                       DIRECTF  0265
    MOVE SIGDAT TO SIGDATE.                                         DIRECTF  0266
    MOVE 1 TO C.                                                    DIRECTF  0267
NEW-KEYWORD-CHECK2.                                                 DIRECTF  0268
    IF C > SELNUM-CNT MOVE ' ' TO KEYRECORD                         DIRECTF  0269
    GO TO MOVE-CATEGORIES.                                          DIRECTF  0270
    MOVE KEYS (C) TO KR-KEYWORD.                                    DIRECTF  0271
    WRITE KDREC FROM KEYRECORD.                                     DIRECTF  0272
    ADD 1 TO KDREC-COUNT.                                           DIRECTF  0273
    ADD 1 TO C.                                                     DIRECTF  0274
    GO TO NEW-KEYWORD-CHECK2.                                       DIRECTF  0275
MOVE-CATEGORIES.                                                    DIRECTF  0276
MC1.                                                                DIRECTF  0277
    MOVE 6 TO C.                                                    DIRECTF  0278
    MOVE 0 TO CN-CNT.                                               DIRECTF  0279
SORT-CATEGORIES.                                                    DIRECTF  0280
    MOVE 2 TO B.                                                    DIRECTF  0281
    CALL 'SORTREAC' USING CTG (1) B C.                              DIRECTF  0282
    NOTE SORTREAC SORTS THE CATEGORY LIST.                          DIRECTF  0283
    NOTE B IS LENGTH OF MEMBERS, C IS NUMBER OF MEMBERS.            DIRECTF  0284
    MOVE 7 TO A.                                                    DIRECTF  0285
NEXT-CATEGORY.                                                      DIRECTF  0286
    SUBTRACT 1 FROM A.                                              DIRECTF  0287
```

```
    IF A NOT > 0 ADD 1 TC A MOVE ' ' TC BC-DASH (A)                    DIRECTF  0288
    GO TO MOVE-HEAD.                                                   DIRECTF  0289
    IF CTG (A) = 0 ADD 1 TO A MOVE ' ' TO BC-DASH (A)                  DIRECTF  0290
    GO TO MOVE-HEAD.                                                   DIRECTF  0291
    IF CTG (A) > 25 OR < 0 DISPLAY ' CATEGORY BAD ' ACC-NO ' '         DIRECTF  0292
       CTG (A) GO TO NEXT-CATEGORY.                                    DIRECTF  0293
    MOVE CTG (A) TO BC-CAT (A).                                        DIRECTF  0294
    MOVE '-' TO BC-DASH (A).                                           DIRECTF  0295
    GO TO NEXT-CATEGORY.                                               DIRECTF  0296
MOVE-HEAD.                                                             DIRECTF  0297
    MOVE ACC-NC TO BC-ACC.                                             DIRECTF  0298
    MOVE '3' TU CN-ID.                                                 DIRECTF  0299
    MCVE ACC-NO TO CN-ACC.                                             DIRECTF  0300
    ADD 1 TO CN-CNT.                                                   DIRECTF  0301
    MOVE SIGYR TO FILL-YR.                                             DIRECTF  0302
    MOVE SIGMO TO FILL-MONTH.                                          DIRECTF  0303
    MOVE SIGDY TO FILL-DAY.                                            DIRECTF  0304
    MOVE BIB-CAT-HEAD TO CN-CONTENT (CN-CNT).                          DIRECTF  0305
    COMPUTE A = 1 + SELNUM-CNT * 2.                                    DIRECTF  0306
    COMPUTE B = A + AUTH-CHAR.                                         DIRECTF  0307
    MCVE 111 TO END-PRINT.                                             DIRECTF  0308
    MOVE 2 TO BEGIN-PRINT.                                             DIRECTF  0309
    PERFORM MOVE-LINES THRU ML.                                        DIRECTF  0310
    MCVE B TO A.                                                       DIRECTF  0311
    MCVE B TC NDEX.                                                    DIRECTF  0312
    ADD TITLE-CHAR TO B.                                               DIRECTF  0313
    PERFORM MOVE-LINES THRU ML.                                        DIRECTF  0314
    IF LINE-CNT = 2 GO TC WRT-ONE.                                     DIRECTF  0315
    MOVE NDEX TO A.                                                    DIRECTF  0316
    IF LEFT-ALIGN = 0 ADD 1 TO BEGIN-PRINT MOVE 1 TO LEFT-ALIGN        DIRECTF  0317
    GO TC SKP-ONE.                                                     DIRECTF  0318
WRT-ONE.                                                               DIRECTF  0319
    MOVE NDEX TO A.                                                    DIRECTF  0320
    COMPUTE B = NDEX + TITLE-CHAR.                                     DIRECTF  0321
SKP-ONE.                                                               DIRECTF  0322
    MOVE 0 TO NDEX.                                                    DIRECTF  0323
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      COMPUTE LINE-CNT = 2.                                                    DIRECTF  0324
      MOVE B TO A.                                                             DIRECTF  0325
      ADD CAUTH-CHAR TO B.                                                     DIRECTF  0326
      PERFORM MOVE-LINES THRU ML.                                              DIRECTF  0327
      MOVE B TO A.                                                             DIRECTF  0328
      ADD MEMO-CHAR TO B.                                                      DIRECTF  0329
      PERFORM MOVE-LINES THRU ML.                                              DIRECTF  0330
      MOVE '0' TO ECC-CC.                                                      DIRECTF  0331
      ADD 6 TO BEGIN-PRINT.                                                    DIRECTF  0332
      SUBTRACT 6 FROM END-PRINT.                                               DIRECTF  0333
      IF ABS-FMAT NOT = 0                                                      DIRECTF  0334
          MOVE 1 TO LEFT-ALIGN                                                 DIRECTF  0335
          MOVE 26 TO BEGIN-PRINT MOVE 90 TO END-PRINT.                         DIRECTF  0336
      MOVE B TO A.                                                             DIRECTF  0337
      ADD ABS-CHAR TO B.                                                       DIRECTF  0338
      PERFORM MOVE-LINES THRU ML.                                              DIRECTF  0339
      MOVE '0' TO ECC-CC.                                                      DIRECTF  0340
      MOVE B TO A.                                                             DIRECTF  0341
      ADD AVL-CHAR TO B.                                                       DIRECTF  0342
      PERFORM MOVE-LINES THRU ML.                                              DIRECTF  0343
      IF SELNUM-CNT = 0 GO TO WRITE-CNREC.                                     DIRECTF  0344
      MOVE '0' TO ECC-CC.                                                      DIRECTF  0345
      MOVE SPACES TO KEYWORD-PULL.                                             DIRECTF  0346
      MOVE 1 TO E.                                                             DIRECTF  0347
      MOVE 0 TO B.                                                             DIRECTF  0348
AK.                                                                            DIRECTF  0349
      ADD 1 TO B.                                                              DIRECTF  0350
      IF SELNUM-CNT < B GO TO ALL-KEYWORDS.                                    DIRECTF  0351
      IF KWD-NTRY (B) < 0 COMPUTE D = KWD-NTRY (B) * -1                        DIRECTF  0352
      MOVE 1 TO EMP-FLAG.                                                      DIRECTF  0353
      IF KWD-NTRY (B) NOT < 0 AND NOT = 9999 MOVE KWD-NTRY (B)                 DIRECTF  0354
      TO D.                                                                    DIRECTF  0355
      IF KWD-NTRY (B) =9999 MOVE 0 TO D MOVE 1 TO EMP-FLAG.                    DIRECTF  0356
      ADD 1 TO D.                                                              DIRECTF  0357
      IF D > 3500 OR < 1 DISPLAY 'KEYWORD OUT OF 0 TO 3499 RANGE'              DIRECTF  0358
        ' ' BC-ACC ' ' D GO TO AK.                                             DIRECTF  0359
```

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     IF KT (D) = SPACES DISPLAY 'NO KEYWORD IN TABLE FOR '          DIRECTF  0360
       BC-ACC ' ' D ADD 6 TO A GO TO AK.                            DIRECTF  0361
     IF EMP-FLAG =1 MOVE '*' TO KP (E) ADD 1 TO E                   DIRECTF  0362
     MOVE 0 TO EMP-FLAG.                                            DIRECTF  0363
     IF E > 950 DISPLAY 'KEYWORDS EXCEEDED TABLE ' D' ' BC-ACC      DIRECTF  0364
     GO TO ALL-KEYWORDS.                                            DIRECTF  0365
     MOVE 48 TO C.                                                  DIRECTF  0366
     CALL 'MOVEIT' USING KT (D) KP (E) C.                           DIRECTF  0367
     ADD 47 TO E.                                                   DIRECTF  0368
LIMIT-KEYWORD.                                                      DIRECTF  0369
     IF E < 2 GO TO NEW-KEYWORD.                                    DIRECTF  0370
     IF KP (E) = ' ' SUBTRACT 1 FROM E GO TO LIMIT-KEYWORD.         DIRECTF  0371
NEW-KEYWORD.                                                        DIRECTF  0372
     ADD 2 TO E.                                                    DIRECTF  0373
     MOVE '+' TO KP (E).                                            DIRECTF  0374
     ADD 2 TO E.                                                    DIRECTF  0375
     GO TO AK.                                                      DIRECTF  0376
ALL-KEYWORDS.                                                       DIRECTF  0377
     IF E < 2 GO TO AKC.                                            DIRECTF  0378
     IF KP (E) = '+' OR ' '                                         DIRECTF  0379
         MOVE ' ' TO KP (E)                                         DIRECTF  0380
         SUBTRACT 1 FROM E                                          DIRECTF  0381
         GO TO ALL-KEYWORDS.                                        DIRECTF  0382
AKC.                                                                DIRECTF  0383
     MOVE KEYWORD-PULL TO MAST-AREA.                                DIRECTF  0384
     MOVE 1 TO A.                                                   DIRECTF  0385
     COMPUTE B = E + 1.                                             DIRECTF  0386
     MOVE '0' TO ECC-CC.                                            DIRECTF  0387
     PERFORM MOVE-LINES THRU ML.                                    DIRECTF  0388
WRITE-CNREC.                                                        DIRECTF  0389
     MOVE CN-CNT TO CN-CONTENT-CNT.                                 DIRECTF  0390
     WRITE CNREC.                                                   DIRECTF  0391
     ADD 1 TO CNREC-COUNT.                                          DIRECTF  0392
     GO TO RD-MAST.                                                 DIRECTF  0393
MOVE-LINES.                                                         DIRECTF  0394
     IF A = B GO TO SET-FORM.                                       DIRECTF  0395
```

```
ANOTHER-LINE.                                                          DIRECTF  0396
    COMPUTE C = A + END-PRINT - BEGIN-PRINT - 1.                       DIRECTF  0397
    IF C NOT < B MOVE B TO C MOVE 1 TO LAST-LINE                       DIRECTF  0398
          ELSE MOVE 0 TO LAST-LINE.                                    DIRECTF  0399
    COMPUTE D = BEGIN-PRINT - 2.                                       DIRECTF  0400
    PERFORM MOVE-CHAR VARYING A FROM A BY 1 UNTIL A NOT < C.           DIRECTF  0401
CHECK-SPACE.                                                           DIRECTF  0402
    IF ECRR (D) = (SPACE OR '-') OR LAST-LINE = 1                      DIRECTF  0403
        GO TO MOVE-LINE.                                               DIRECTF  0404
    MOVE SPACES TO ECRR (D).                                           DIRECTF  0405
    SUBTRACT 1 FROM D.                                                 DIRECTF  0406
    SUBTRACT 1 FROM A.                                                 DIRECTF  0407
    IF A = 50 GO TO MOVE-LINE.                                         DIRECTF  0408
    GO TO CHECK-SPACE.                                                 DIRECTF  0409
MOVE-CHAR.                                                             DIRECTF  0410
    ADD 1 TO D.                                                        DIRECTF  0411
    MOVE MA (A) TO ECRR (D).                                           DIRECTF  0412
MOVE-LINE.                                                             DIRECTF  0413
    ADD 1 TO CN-CNT.                                                   DIRECTF  0414
    MOVE EC-REC TO CN-CONTENT (CN-CNT).                                DIRECTF  0415
    MOVE SPACES TO ECR.                                                DIRECTF  0416
    IF LAST-LINE = 1 GO TO SET-FORM.                                   DIRECTF  0417
    IF NDEX > 0 PERFORM CK-LINE.                                       DIRECTF  0418
    IF LEFT-ALIGN = 0 ADD 1 TO BEGIN-PRINT MOVE 1 TO LEFT-ALIGN.       DIRECTF  0419
    GO TO ANOTHER-LINE.                                                DIRECTF  0420
SET-FORM.                                                              DIRECTF  0421
    MOVE 0 TO LEFT-ALIGN.                                              DIRECTF  0422
    MOVE 111 TO END-PRINT.                                             DIRECTF  0423
    MOVE 2 TO BEGIN-PRINT.                                             DIRECTF  0424
ML.  EXIT.                                                             DIRECTF  0425
CK-LINE SECTION.                                                       DIRECTF  0426
    COMPUTE J = LINE-CNT / 2.                                          DIRECTF  0427
    COMPUTE K = LINE-CNT - ( J * 2 ).                                  DIRECTF  0428
    IF K > 0 GO TO WRT-NXT.                                            DIRECTF  0429
    MOVE NDEX TO A.                                                    DIRECTF  0430
    MOVE '+' TO ECC-CC.                                                DIRECTF  0431
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```
    ADD 1 TO LINE-CNT.                                                    DIRECTF  0432
    GO TO MOVE-LINES.                                                     DIRECTF  0433
WRT-NXT.                                                                  DIRECTF  0434
    MOVE A TO NDEX.                                                       DIRECTF  0435
    MOVE ' ' TO ECC-CC.                                                   DIRECTF  0436
    ADD 1 TO LINE-CNT.                                                    DIRECTF  0437
CK-EXIT.  EXIT.                                                           DIRECTF  0438
FINAL-PROC SECTION.                                                       DIRECTF  0439
CLOSE-OPEN-FILES.                                                         DIRECTF  0440
    DISPLAY ' TOTAL RECORDS ON MASTERFILE = ' MR-COUNT.                   DIRECTF  0441
    DISPLAY ' TOTAL KEYWORDS ON MASTERFILE = ' KEYWORD-COUNT.             DIRECTF  0442
    COMPUTE MR-COUNT = MR-COUNT - KEYWORD-COUNT.                          DIRECTF  0443
    DISPLAY ' TOTAL LER RECORDS ON MASTERFILE = ' MR-COUNT.               DIRECTF  0444
    DISPLAY ' TOTAL KEYWORD MEMBERS FROM CARDS = ' CARD-COUNT.            DIRECTF  0445
    DISPLAY ' TOTAL RECORDS WRITTEN ON KEYWORDFILE=' KOREC-COUNT.         DIRECTF  0446
    DISPLAY ' TOTAL RECORDS WRITTEN ON CITATIONFILE ='                    DIRECTF  0447
         CNREC-COUNT.                                                     DIRECTF  0448
    IF MF-OPEN = 1 CLOSE MASTERFILE.                                      DIRECTF  0449
    IF CF-OPEN = 1 CLOSE CARDFILE.                                        DIRECTF  0450
    IF CNF-OPEN = 1 CLOSE CITATIONFILE.                                   DIRECTF  0451
    IF KOF-OPEN = 1 CLOSE KEYWORDFILE.                                    DIRECTF  0452
    IF PF-OPEN = 1 CLOSE PRINTFILE.                                       DIRECTF  0453
    DISPLAY 'STOP RUN'                                                    DIRECTF  0454
    STOP RUN.                                                             DIRECTF  0455
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12.2. Document LER Retrieval Program (RETRIEVAL-LER)

```
IDENTIFICATION DIVISION.                                        RET-LER 0001
PROGRAM-ID. RETRIEVAL-LER.                                      RET-LER 0002
AUTHOR. H Y CHO.                                                RET-LER 0003
DATE-WRITTEN. JULY,1978                                         RET-LER 0004
REMARKS. RETRIEVAL-LER IS INTENDED TO RETRIEVE DATA             RET-LER 0005
    FROM NRC-LER BY THE USER REQUESTED KEYWORDS.                RET-LER 0006
ENVIRONMENT DIVISION.                                           RET-LER 0007
CONFIGURATION SECTION.                                          RET-LER 0008
SOURCE-COMPUTER. IBM-360-165.                                   RET-LER 0009
OBJECT-COMPUTER. IBM-360-165.                                   RET-LER 0010
INPUT-OUTPUT SECTION.                                           RET-LER 0011
    SELECT CARDF ASSIGN UR-S-SYSIN.                             RET-LER 0012
    SELECT MASTERF ASSIGN UT-S-MF.                              RET-LER 0013
    SELECT KEYF1 ASSIGN UT-S-KF1.                               RET-LER 0014
    SELECT KEYF2 ASSIGN UT-S-KF2.                               RET-LER 0015
    SELECT KEYF3 ASSIGN UT-S-KF3.                               RET-LER 0016
    SELECT SKF2 ASSIGN UT-S-SKF2.                               RET-LER 0017
    SELECT CITATIONF ASSIGN UT-S-CF.                            RET-LER 0018
    SELECT EDITEDF ASSIGN UT-S-EF.                              RET-LER 0019
DATA DIVISION.                                                  RET-LER 0020
FILE SECTION.                                                   RET-LER 0021
FD CARDF RECORDING F LABEL RECORD OMITTED                       RET-LER 0022
    DATA RECORD CDREC.                                          RET-LER 0023
01 CDREC SYNC.                                                  RET-LER 0024
    02 CA PIC X OCCURS 80.                                      RET-LER 0025
FD MASTERF LABEL RECORD OMITTED RECORDING V                     RET-LER 0026
    BLOCK 10004 CHARACTERS DATA RECORD MASTER-RECORD.           RET-LER 0027
01 MASTER-RECORD SYNC.                                          RET-LER 0028
    02 FILLER PIC X(2).                                         RET-LER 0029
    02 MST-CNT PIC S9(4) COMPUTATIONAL.                         RET-LER 0030
    02 MR PIC X OCCURS 1966 DEPENDING ON MST-CNT.               RET-LER 0031
FD KEYF1 RECORDING F LABEL RECORD OMITTED                       RET-LER 0032
    BLOCK 7272 CHARACTERS DATA RECORD KR1-REC.                  RET-LER 0033
01 KR1-REC SYNC.                                                RET-LER 0034
    02 KR1-ID PIC X.                                            RET-LER 0035
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     02 KR1-ACC PIC 9(6).                                          RET-LER 0036
     02 KR1-LC PIC X(2).                                           RET-LER 0037
     02 KR1-RTYPE-NAME PIC X(5).                                   RET-LER 0038
     02 KR1-SIGDAT PIC 9(6).                                       RET-LER 0039
     02 KR1-KEY PIC 9(4).                                          RET-LER 0040
FD KEYF2 RECORDING F LABEL RECORD OMITTED                          RET-LER 0041
    BLOCK 7280 CHARACTERS DATA RECORD KR2-REC.                     RET-LER 0042
01 KR2-REC SYNC.                                                   RET-LER 0043
     02 KR2-ID PIC X.                                              RET-LER 0044
     02 KR2-ACC PIC 9(6).                                          RET-LER 0045
     02 KR2-LC PIC X(2).                                           RET-LER 0046
     02 KR2-RTYPE-NAME PIC X(5).                                   RET-LER 0047
     02 KR2-SIGDAT PIC 9(6).                                       RET-LER 0048
     02 KR2-KEY PIC 9(4).                                          RET-LER 0049
     02 KR2-T-ORDER PIC 9(2).                                      RET-LER 0050
01   KR2-RC REDEFINES KR2-REC SYNC.                                RET-LER 0051
     02   KR2-R PIC X(24).                                        RET-LER 0052
     02   KR2-T-ORD PIC 9(2).                                     RET-LER 0053
FD KEYF3 RECORDING F LABEL RECORD OMITTED                          RET-LER 0054
    BLOCK 2060 CHARACTERS DATA RECORD KR3-REC.                     RET-LER 0055
01 KR3-REC SYNC.                                                   RET-LER 0056
     02 KR3-ID PIC X.                                              RET-LER 0057
     02 KR3-ACC PIC 9(6).                                          RET-LER 0058
     02 KR3-LC PIC X(2).                                           RET-LER 0059
     02 KR3-RTYPE-NAME PIC X(5).                                   RET-LER 0060
     02 KR3-SIGDAT PIC 9(6).                                       RET-LER 0061
SD SKF2 RECORDING F LABEL RECORD OMITTED                           RET-LER 0062
    BLOCK CONTAINS 7280 CHARACTERS DATA RECORD SK2-REC.            RET-LER 0063
01 SK2-REC SYNC.                                                   RET-LER 0064
     02 FILLER PIC X.                                              RET-LER 0065
     02 SK2-ACC PIC 9(6).                                          RET-LER 0066
     02 FILLER PIC X(17).                                          RET-LER 0067
     02   SK2-ORDER PIC 9(2).                                     RET-LER 0068
FD CITATIONF LABEL RECORD OMITTED RECORDING V                      RET-LER 0069
    BLOCK CONTAINS 7298 CHARACTERS DATA RECORD CNREC.              RET-LER 0070
01 CNREC SYNC.                                                     RET-LER 0071
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    02 FILLER PIC X.                                                    RET-LER 0072
    02 CNR-ACCNO PIC 9(6).                                              RET-LER 0073
    02 CNR-CONTENT-CNT PIC 9(2).                                        RET-LER 0074
    02 CNR-EDITED-AREA.                                                 RET-LER 0075
      03 CNR-CONTENT  OCCURS 30 DEPENDING ON CNR-CONTENT-CNT.           RET-LER 0076
        04 CNR-CC PIC X.                                                RET-LER 0077
        04 CNR-CCNT PIC X(110).                                         RET-LER 0078
FD EDITEDF LABEL RECORD OMITTED RECORDING F                             RET-LER 0079
    BLOCK CONTAINS 8 RECORDS DATA RECORD EDREC.                         RET-LER 0080
01 EDREC SYNC.                                                          RET-LER 0081
    02 ED-R.                                                            RET-LER 0082
      03 EDC-CC PIC X.                                                  RET-LER 0083
       03 EDR-FILL1 PIC X(10).                                           RET-LER 0084
      03 EDR PIC X(110).                                                RET-LER 0085
      03 FILLER PIC X(12).                                              RET-LER 0086
WORKING-STORAGE SECTION.                                                RET-LER 0087
77 A PIC 9(2) VALUE 0.                                                  RET-LER 0088
77 B PIC 9(4) VALUE 0.                                                  RET-LER 0089
77 BAD-COUNT PIC 9(6) VALUE 0.                                          RET-LER 0090
77 C PIC 9(8) VALUE 1.                                                  RET-LER 0091
77 CARD-COUNT PIC 9 VALUE 0.                                            RET-LER 0092
77 CF-OPEN PIC 9 VALUE 0.                                               RET-LER 0093
77 DPTR        PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                    RET-LER 0094
77 EPTR        PIC S9(4) COMPUTATIONAL VALUE 1 SYNC.                    RET-LER 0095
77 HIGH9       PIC S9(8) COMPUTATIONAL VALUE 999999 SYNC.               RET-LER 0096
77 I           PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                    RET-LER 0097
77 ISP PIC S9(3) VALUE 0 SYNC.                                          RET-LER 0098
77 J           PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                    RET-LER 0099
77 K           PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                    RET-LER 0100
77 KEYNINE     PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                    RET-LER 0101
77 KF1         PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                    RET-LER 0102
77 KF2         PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                    RET-LER 0103
77 KK          PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                    RET-LER 0104
77 KK1         PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                    RET-LER 0105
77 KN          PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                    RET-LER 0106
77 MM          PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                    RET-LER 0107
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77 MM1          PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                RET-LER 0108
77 MM2 PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                         RET-LER 0109
77 NZ           PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                RET-LER 0110
77 NO-COUNT     PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                RET-LER 0111
77 PATHPTR      PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                RET-LER 0112
77 ST1 PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                         RET-LER 0113
77 ST2 PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                         RET-LER 0114
77 SW-LP PIC 9 VALUE 0 SYNC.                                         RET-LER 0115
77 TEMP-ACC     PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                RET-LER 0116
77 TEMP-CACC    PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                RET-LER 0117
77 TEMP-KACC    PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                RET-LER 0118
77 TEMP-RN  PIC X(5) VALUE SPACE.                                    RET-LER 0119
77 TEMP-PRE PIC X VALUE SPACE SYNC.                                  RET-LER 0120
77 TEMP-KEY PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                    RET-LER 0121
77 TEMP-KEYS  PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                  RET-LER 0122
77 TEMP-ST1 PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                    RET-LER 0123
77 TEMP-ST2 PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                    RET-LER 0124
77 TOP PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                         RET-LER 0125
77 TOP1         PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                RET-LER 0126
77 TOP2         PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                RET-LER 0127
77 TOT-C-KEYS PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                  RET-LER 0128
77 WT1 PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                         RET-LER 0129
01 MSG-REC SYNC.                                                     RET-LER 0130
    02 FILLER PIC X VALUE SPACE.                                     RET-LER 0131
    02 FIRST-80 PIC X(80).                                           RET-LER 0132
    02 LAST-40 PIC X(40).                                            RET-LER 0133
    02 FILLER PIC X(12) VALUE SPACE.                                 RET-LER 0134
01 RESERVEAREA SYNC.                                                 RET-LER 0135
    02 RA-KEY OCCURS 50 PIC 9(4).                                    RET-LER 0136
01  SYMBOLAREA SYNC.                                                RET-LER 0137
    02  SYM-KEY OCCURS 50 PIC 9(4).                                 RET-LER 0138
01 INFIX-AREA SYNC.                                                  RET-LER 0139
    02 E OCCURS 50 PIC S9(2).                                        RET-LER 0140
01 POSTFIX-AREA SYNC.                                                RET-LER 0141
    02 D OCCURS 50 PIC S9(2).                                        RET-LER 0142
01 STACK-AREA SYNC.                                                  RET-LER 0143
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    02 STACK1 OCCURS 50 PIC S9(2).                          RET-LER 0144
01 STACKAREA SYNC.                                          RET-LER 0145
    02 STACK2 OCCURS 50 PIC S9(2).                          RET-LER 0146
01 KEYWORD-TABLE SYNC.                                      RET-LER 0147
    02 KT OCCURS 3500 PIC 9.                                RET-LER 0148
01 PATHDIAGRAM SYNC.                                        RET-LER 0149
    02 PATH-LINE OCCURS 50.                                 RET-LER 0150
       03 PATHDGMS PIC 9 OCCURS 3.                          RET-LER 0151
01 TEMP-TABLE SYNC.                                         RET-LER 0152
    02 TEMP-NO PIC X OCCURS 4.                              RET-LER 0153
01 TEMP-TAB1 REDEFINES TEMP-TABLE SYNC.                     RET-LER 0154
    02 TEMP-NO1 PIC 9.                                      RET-LER 0155
    02 FILLER PIC X(3).                                     RET-LER 0156
01 TEMP-TAB2 REDEFINES TEMP-TABLE SYNC.                     RET-LER 0157
    02 TEMP-NO2 PIC 99.                                     RET-LER 0158
    02 FILLER PIC X(2).                                     RET-LER 0159
01 TEMP-TAB3 REDEFINES TEMP-TABLE SYNC.                     RET-LER 0160
    02 TEMP-NO3 PIC 999.                                    RET-LER 0161
    02 FILLER PIC X.                                        RET-LER 0162
01 TEMP-NO4 REDEFINES TEMP-TABLE PIC 9(4) SYNC.             RET-LER 0163
01 MAST-REC SYNC.                                           RET-LER 0164
    02 REC-ID PIC X.                                        RET-LER 0165
    02 FILLER PIC X(3).                                     RET-LER 0166
    02 SEL-NO PIC S9(4) COMPUTATIONAL.                      RET-LER 0167
    02 TRM PIC X(48).                                       RET-LER 0168
01  KR2-REC-RESERVE SYNC.                                   RET-LER 0169
    02  K2-REC PIC X(20).                                   RET-LER 0170
    02  KORD PIC 9(2) OCCURS 50.                            RET-LER 0171
01  TEMP-REC SYNC.                                          RET-LER 0172
    02  KR2-FILL PIC X(20).                                 RET-LER 0173
    02  FILLER PIC X(4).                                    RET-LER 0174
    02  KR2-TORD PIC 9(2).                                  RET-LER 0175
01  TEMP-R REDEFINES TEMP-REC SYNC.                         RET-LER 0176
    02  FILLER PIC X.                                       RET-LER 0177
    02  ACC-NO PIC 9(6).                                    RET-LER 0178
    02  FILLER PIC X(19).                                   RET-LER 0179
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01   TEMP-KR3 SYNC.                                                    RET-LER 0180
     02  FILLER PIC X.                                                 RET-LER 0181
     02  K3-ACC PIC 9(6).                                              RET-LER 0182
     02  FILLER PIC X(13).                                             RET-LER 0183
01   TEMP-CNR SYNC.                                                    RET-LER 0184
     02  FILLER PIC X.                                                 RET-LER 0185
     02  T-ACCNO PIC 9(6).                                             RET-LER 0186
     02  T-CONTENT-CNT PIC 9(2).                                       RET-LER 0187
     02  T-EDITED-AREA.                                                RET-LER 0188
        03  T-CONTENT OCCURS 30.                                       RET-LER 0189
           04  T-CC PIC X.                                             RET-LER 0190
           04  T-CONT PIC X(110).                                      RET-LER 0191
01   ZERO-TAB SYNC.                                                    RET-LER 0192
     02  ZERO-T PIC X(6) VALUE '000000'.                               RET-LER 0193
PROCEDURE DIVISION                                                     RET-LER 0194
     OPEN INPUT CARDF.                                                 RET-LER 0195
     DISPLAY '********** REQUESTED KEYWORD CHECK **********'.         RET-LER 0196
     MOVE SPACES TO RESERVEAREA.                                       RET-LER 0197
CLEAR-TABLE.                                                           RET-LER 0198
     IF C > 50 GO TO RD-CARD.                                          RET-LER 0199
     MOVE ZERO-T TO PATH-LINE (C).                                     RET-LER 0200
     MOVE ZERO TO KORD (C).                                            RET-LER 0201
     MOVE ZERO TO STACK1 (C).                                          RET-LER 0202
     ADD 1 TO C.                                                       RET-LER 0203
     GO TO CLEAR-TABLE.                                                RET-LER 0204
CLEAR-INITIAL.                                                         RET-LER 0205
     MOVE 0 TO K.                                                      RET-LER 0206
     MOVE SPACE TO TEMP-PRE.                                           RET-LER 0207
RD-CARD.                                                               RET-LER 0208
     READ CARDF INTO FIRST-80 END CLOSE CARDF GO TO EOC.               RET-LER 0209
     ADD 1 TO CARD-COUNT.                                              RET-LER 0210
     DISPLAY FIRST-80 ' REQUESTED KEYWORD'.                            RET-LER 0211
     MOVE 1 TO CF-OPEN.                                                RET-LER 0212
SEARCH-CA1.                                                            RET-LER 0213
     IF CA (1) = '@'                                                   RET-LER 0214
     SUBTRACT 1 FROM EPTR                                              RET-LER 0215
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        MOVE KN TO TOT-C-KEYS GO TO EOC.                                    RET-LER 0216
     IF CARD-COUNT > 5                                                      RET-LER 0217
        DISPLAY ' REQUESTED CARDS > 5 ***' CLOSE CARDF GO TO EOJ.           RET-LER 0218
SEARCH-CA2.                                                                 RET-LER 0219
     ADD 1 TO K.                                                            RET-LER 0220
     IF K > 80 IF SW-LP = 0 IF NO-COUNT = 0                                 RET-LER 0221
     GO TO CLEAR-INITIAL                                                    RET-LER 0222
     ELSE GO TO ERR-CARD                                                    RET-LER 0223
     ELSE GO TO ERR-CARD.                                                   RET-LER 0224
     GO TO CK-BLANK.                                                        RET-LER 0225
CK-BLANK.                                                                   RET-LER 0226
     IF CA (K) = ' ' GO TO SEARCH-CA2.                                      RET-LER 0227
     IF CA (K) = '('                                                        RET-LER 0228
       IF TEMP-PRE = '+' OR '*' OR '¬' OR '(' OR ' ' GO TO CK-CNT1          RET-LER 0229
       ELSE GO TO ERR-CARD                                                  RET-LER 0230
     ELSE GO TO CK-OR.                                                      RET-LER 0231
CK-CNT1.                                                                    RET-LER 0232
     ADD 1 TO SW-LP.                                                        RET-LER 0233
     IF NO-COUNT = 0 MOVE -1 TO E (EPTR)                                    RET-LER 0234
     GO TO INC.                                                             RET-LER 0235
     GO TO ERR-CARD.                                                        RET-LER 0236
CK-OR.                                                                      RET-LER 0237
     IF CA (K) = '+' IF TEMP-PRE = '(' OR '+' OR '*' OR ' ¬'                RET-LER 0238
     GO TO ERR-CARD                                                         RET-LER 0239
       ELSE GO TO MOVE-FLAG1.                                               RET-LER 0240
     GO TO CK-AND.                                                          RET-LER 0241
MOVE-FLAG1.                                                                 RET-LER 0242
     IF NO-COUNT NOT = 0  GO TO ERR-CARD.                                   RET-LER 0243
     MOVE -3 TO E (EPTR).                                                   RET-LER 0244
     MOVE '+' TO TEMP-PRE.                                                  RET-LER 0245
     GO TO INC.                                                             RET-LER 0246
CK-AND.                                                                     RET-LER 0247
     IF CA (K) = '*' IF TEMP-PRE = '(' OR '+' OR '*' OR ' ¬'                RET-LER 0248
     GO TO ERR-CARD                                                         RET-LER 0249
     ELSE ADD 1 TO K GO TO CK-NOT.                                          RET-LER 0250
     GO TO CK-RP.                                                           RET-LER 0251
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CK-NCT.                                                          RET-LER 0252
    IF CA (K) = '¬' GO TO MOVE-FLAG3.                            RET-LER 0253
    IF NO-CCUNT = 0 GO TO MOVE-FLAG2.                            RET-LER 0254
    GO TO ERR-CARD.                                              RET-LER 0255
MOVE-FLAG2.                                                      RET-LER 0256
    MOVE '*' TO TEMP-PRE.                                        RET-LER 0257
    SUBTRACT 1 FROM K.                                           RET-LER 0258
MOVE-FG2.                                                        RET-LER 0259
    MOVE -2 TO E (EPTR) GO TO INC.                               RET-LER 0260
MOVE-FLAG3.                                                      RET-LER 0261
    IF NC-CCUNT = 0                                              RET-LER 0262
    MOVE '¬' TO TEMP-PRE GO TO MOVE-FG2.                         RET-LER 0263
    GO TO ERR-CARD.                                              RET-LER 0264
CK-RP.                                                           RET-LER 0265
    IF CA (K) = ')'                                              RET-LER 0266
      IF TEMP-PRE = '+' OR '*' OR '¬' OR '(' GO TO ERR-CARD      RET-LER 0267
      ELSE GO TO MOVE-FLAG4                                      RET-LER 0268
    ELSE GO TO CK-NUMERIC.                                       RET-LER 0269
MOVE-FLAG4.                                                      RET-LER 0270
    IF NO-CCUNT NOT = 0  GO TO ERR-CARD.                         RET-LER 0271
    SUBTRACT 1 FROM SW-LP.                                       RET-LER 0272
    MOVE -5 TO E (EPTR).                                         RET-LER 0273
    MOVE ')' TO TEMP-PRE.                                        RET-LER 0274
INC.                                                             RET-LER 0275
    ADD 1 TO EPTR.                                               RET-LER 0276
    GO TO SEARCH-CA2.                                            RET-LER 0277
CK-NUMERIC.                                                      RET-LER 0278
    IF CA (K) < '0' OR > '9' GO TO ERR-CARD.                     RET-LER 0279
    ADD 1 TC NO-COUNT.                                           RET-LER 0280
    IF NO-CCUNT > 4 GO TO ERR-CARD.                              RET-LER 0281
    MOVE CA (K) TO TEMP-NO (NO-COUNT).                           RET-LER 0282
    IF NO-CCUNT NOT = 4 GO TO SEARCH-CA2.                        RET-LER 0283
PUTK.                                                            RET-LER 0284
    ADD 1 TC KN.                                                 RET-LER 0285
    MOVE TEMP-NO4 TO RA-KEY (KN) SYM-KEY (KN).                   RET-LER 0286
    COMPUTE J = PATHPTR + 1.                                     RET-LER 0287
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    MOVE J TO E (EPTR) PATHPTR.                                    RET-LER 0288
    IF TEMP-PRE = '¬' MOVE 1 TO PATHDGMS (J,3).                    RET-LER 0289
    MOVE SPACES TO TEMP-PRE.                                       RET-LER 0290
    MOVE SPACES TO TEMP-TABLE.                                     RET-LER 0291
    MOVE 0 TO NO-COUNT.                                            RET-LER 0292
    GO TO INC.                                                     RET-LER 0293
ERR-CARD.                                                          RET-LER 0294
    IF CF-OPEN = 1 CLOSE CARDF MOVE 0 TO CF-OPEN.                  RET-LER 0295
    DISPLAY 'REQUESTED KEYWORD-CARD OUT OF RANGE***'.              RET-LER 0296
    GO TO EOJ.                                                     RET-LER 0297
EOC.                                                               RET-LER 0298
    CLOSE CARDF.                                                   RET-LER 0299
    MOVE 0 TO C.                                                   RET-LER 0300
FILL-ZEROS.                                                        RET-LER 0301
    ADD 1 TO C.                                                    RET-LER 0302
    IF C > 3500 MOVE 0 TO C GO TO NXT-RT1.                         RET-LER 0303
    MOVE 0 TO KT (C).                                              RET-LER 0304
    GO TO FILL-ZEROS.                                              RET-LER 0305
NXT-RT1.                                                           RET-LER 0306
    OPEN INPUT MASTERF.                                            RET-LER 0307
RD-HD1.                                                            RET-LER 0308
    READ MASTERF INTO MAST-REC AT END CLOSE MASTERF                RET-LER 0309
    GO TO KEY-CHECK1.                                              RET-LER 0310
    IF REC-ID NOT = 2 CLOSE MASTERF GO TO KEY-CHECK1.              RET-LER 0311
    ADD 1 TO C.                                                    RET-LER 0312
    IF C > 3500                                                    RET-LER 0313
    DISPLAY MAST-REC ' TOO MANY KEYWORDS***'                       RET-LER 0314
    CLOSE MASTERF GO TO EOJ.                                       RET-LER 0315
    IF SEL-NO < 0 OR > 3499                                        RET-LER 0316
    DISPLAY MAST-REC ' KEYWORD ON MASTER OUT OF RANGE***'          RET-LER 0317
    CLOSE MASTERF GO TO EOJ.                                       RET-LER 0318
    ADD 1 TO SEL-NO.                                               RET-LER 0319
    MOVE 1 TO KT (SEL-NO).                                         RET-LER 0320
    GO TO RD-HD1.                                                  RET-LER 0321
KEY-CHECK1.                                                        RET-LER 0322
    MOVE 0 TO C.                                                   RET-LER 0323
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KEY-CHECK2.                                                          RET-LER 0324
    ADD 1 TO C.                                                      RET-LER 0325
    IF TOT-C-KEYS < C GO TO MAKE-PATH.                               RET-LER 0326
    MOVE RA-KEY (C) TO KEYNINE.                                      RET-LER 0327
    IF KT (KEYNINE) = 1 GO TO KEY-CHECK2.                            RET-LER 0328
    DISPLAY KEYNINE ' REQUESTED KEYWORD OUT OF RANGE***'             RET-LER 0329
    GO TO ECJ.                                                       RET-LER 0330
MAKE-PATH.                                                           RET-LER 0331
    DISPLAY 'GOOD REQUESTED KEYWORDS'.                               RET-LER 0332
    MOVE 1 TO C.                                                     RET-LER 0333
REPEAT.                                                              RET-LER 0334
    ADD 1 TO I.                                                      RET-LER 0335
    IF I > EPTR GO TO EMPTY.                                         RET-LER 0336
    IF E (I) > 0 ADD 1 TO DPTR                                       RET-LER 0337
    MOVE E (I) TO D (DPTR) GO TO REPEAT.                             RET-LER 0338
    IF E (I) NOT = -5 GO TO CHECK-ORDER.                             RET-LER 0339
    MOVE 0 TO J.                                                     RET-LER 0340
LOOP-KK1.                                                            RET-LER 0341
    ADD 1 TO J.                                                      RET-LER 0342
    IF J > 50 GO TO ERROR-REGION.                                    RET-LER 0343
    IF STACK1 (TOP1) NOT = -1                                        RET-LER 0344
    ADD 1 TO DPTR                                                    RET-LER 0345
    MOVE STACK1 (TOP1) TO D (DPTR)                                   RET-LER 0346
    SUBTRACT 1 FROM TOP1 GO TO LOOP-KK1.                             RET-LER 0347
    SUBTRACT 1 FROM TOP1 GO TO REPEAT.                               RET-LER 0348
CHECK-ORDER.                                                         RET-LER 0349
    IF TOP1 = 0 MOVE -6 TO ISP GO TO KK2.                            RET-LER 0350
    IF STACK1 (TOP1) = -1 MOVE -4 TO ISP GO TO KK2.                  RET-LER 0351
    MOVE STACK1 (TOP1) TO ISP.                                       RET-LER 0352
KK2.                                                                 RET-LER 0353
    MOVE 0 TO J.                                                     RET-LER 0354
    IF ISP > E (I) GO TO LOOP-KK2.                                   RET-LER 0355
    GO TO ADD-TOP1.                                                  RET-LER 0356
LOOP-KK2.                                                            RET-LER 0357
    ADD 1 TO J.                                                      RET-LER 0358
    IF J > 50 GO TO ERROR-REGION.                                    RET-LER 0359
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     ADD 1 TO DPTR.                                                    RET-LER 0360
     MOVE STACK1 (TOP1) TO D (DPTR).                                   RET-LER 0361
     SUBTRACT 1 FROM TOP1.                                             RET-LER 0362
     GO TO LOOP-KK2.                                                   RET-LER 0363
ADD-TOP1.                                                              RET-LER 0364
     ADD 1 TO TOP1.                                                    RET-LER 0365
     MOVE E (I) TO STACK1 (TOP1)                                       RET-LER 0366
     GO TO REPEAT.                                                     RET-LER 0367
EMPTY.                                                                 RET-LER 0368
     MOVE 0 TO J.                                                      RET-LER 0369
LOOP-KK3.                                                              RET-LER 0370
     ADD 1 TC J.                                                       RET-LER 0371
     IF J > 50 GO TO ERRCR-REGION.                                     RET-LER 0372
     IF TOP1 > 0 ADD 1 TC DPTR                                         RET-LER 0373
     MOVE STACK1 (TOP1) TO D (DPTR)                                    RET-LER 0374
     SUBTRACT 1 FROM TOP1 GO TO LOOP-KK3.                              RET-LER 0375
CLEAR-TAG.                                                             RET-LER 0376
     MOVE 0 TO I TOP2 TOP1.                                            RET-LER 0377
KEEP.                                                                  RET-LER 0378
      ADD 1 TO I.                                                      RET-LER 0379
     IF I > DPTR GO TO SORT-KEY.                                       RET-LER 0380
     IF D (I) > 0 ADD 1 TO TOP1 MOVE D (I) TO STACK1 (TOP1)            RET-LER 0381
     GO TO KEEP.                                                       RET-LER 0382
     SUBTRACT 1 FROM TOP1.                                             RET-LER 0383
     MOVE STACK1 (TOP1) TO KK.                                         RET-LER 0384
     IF D (I) NOT = -3 GO TO STILL.                                    RET-LER 0385
     MOVE 0 TO J.                                                      RET-LER 0386
LOOP-MM.                                                               RET-LER 0387
     ADD 1 TC J.                                                       RET-LER 0388
     IF J > 50 GO TO ERRCR-REGION.                                     RET-LER 0389
     IF PATHDGMS (KK,2) = 0 GO TO NOT-ZERO.                            RET-LER 0390
     MOVE PATHDGMS (KK,2) TO KK.                                       RET-LER 0391
     GO TO LOOP-MM.                                                    RET-LER 0392
NOT-ZERO.                                                              RET-LER 0393
     COMPUTE TOP = TOP1 + 1.                                           RET-LER 0394
     MOVE STACK1 (TOP) TO PATHDGMS (KK, 2).                            RET-LER 0395
```

```
    GO TO KEEP.                                                    RET-LER 0396
STILL.                                                             RET-LER 0397
    IF PATHDGMS (KK, 2) = 0 GO TO STL1.                            RET-LER 0398
    ADD 1 TO TOP2.                                                 RET-LER 0399
    MOVE PATHDGMS (KK, 2) TO STACK2 (TOP2).                        RET-LER 0400
STL1.                                                              RET-LER 0401
    IF PATHDGMS (KK, 1) = 0 GO TO STL2.                            RET-LER 0402
    MOVE PATHDGMS (KK, 1) TO KK GO TO STILL.                       RET-LER 0403
STL2.  COMPUTE TOP = TOP1 + 1.                                     RET-LER 0404
    MOVE STACK1 (TOP) TO PATHDGMS (KK, 1).                         RET-LER 0405
    IF TOP2 = 0 GO TO KEEP.                                        RET-LER 0406
    MOVE STACK2 (TOP2) TO KK.                                      RET-LER 0407
    SUBTRACT 1 FROM TOP2 GO TO STILL.                              RET-LER 0408
    NOTE KEYF1 FILE SHOULD BE SORTED BY KR1-KEY BEFORE USING       RET-LER 0409
        THAT FILE HERE.                                            RET-LER 0410
SORT-KEY.                                                          RET-LER 0411
    MOVE 0 TO B.                                                   RET-LER 0412
    COMPUTE A = TOT-C-KEYS - 1.                                    RET-LER 0413
SORT-LOOP1.                                                        RET-LER 0414
    ADD 1 TO ST1.                                                  RET-LER 0415
    IF ST1 > A GO TO SL4.                                          RET-LER 0416
    ADD 1 TO B.                                                    RET-LER 0417
    MOVE B TO ST2.                                                 RET-LER 0418
SORT-LOOP2.                                                        RET-LER 0419
    ADD 1 TO ST2.                                                  RET-LER 0420
    IF ST2 > TOT-C-KEYS GO TO SORT-LOOP1.                          RET-LER 0421
    COMPUTE TEMP-ST1 = RA-KEY (ST1) - RA-KEY (ST2).                RET-LER 0422
    IF TEMP-ST1 > 0 GO TO SL2.                                     RET-LER 0423
    GO TO SORT-LOOP2.                                              RET-LER 0424
SL2.  MOVE RA-KEY (ST1) TO TEMP-ST2.                               RET-LER 0425
    MOVE RA-KEY (ST2) TO RA-KEY (ST1).                             RET-LER 0426
    MOVE TEMP-ST2 TO RA-KEY (ST2).                                 RET-LER 0427
    GO TO SORT-LOOP2.                                              RET-LER 0428
SL4.                                                               RET-LER 0429
    OPEN INPUT KEYF1 OUTPUT KEYF2.                                 RET-LER 0430
    READ KEYF1 AT END DISPLAY 'NO RECORDS ON KEYFILE***'           RET-LER 0431
```

```
    CLOSE KEYF1 GO TO ECJ.                                          RET-LER 0432
    ADD 1 TO KF1.                                                   RET-LER 0433
    DISPLAY '********** SEARCH KEYWORDFILE1$$$$$$$$$$'.            RET-LER 0434
    MOVE 0 TO C.                                                    RET-LER 0435
SEARCH-KEY.                                                         RET-LER 0436
    MOVE 0 TO KR2-T-ORDER.                                          RET-LER 0437
    ADD 1 TO C.                                                     RET-LER 0438
    IF TOT-C-KEYS < C GO TO EOF-KEY1.                               RET-LER 0439
COMPARE-KEY1.                                                       RET-LER 0440
    IF RA-KEY (TOT-C-KEYS) < KR1-KEY GO TO EOF-KEY1.                RET-LER 0441
    IF RA-KEY (C) > KR1-KEY GO TO RD-KEYF1.                         RET-LER 0442
    IF RA-KEY (C)  = KR1-KEY GO TO FOUND-RK.                        RET-LER 0443
SEARCH-NO.                                                          RET-LER 0444
    ADD 1 TO C.                                                     RET-LER 0445
    IF TOT-C-KEYS < C GO TO RD-KEYF1.                               RET-LER 0446
    IF RA-KEY (C) > KR1-KEY GO TO RD-KEYF1.                         RET-LER 0447
    IF RA-KEY (C) = KR1-KEY GO TO FOUND-RK.                         RET-LER 0448
    GO TO SEARCH-NO.                                                RET-LER 0449
FOUND-RK.                                                           RET-LER 0450
    PERFORM LOOP-AA1 VARYING MM1 FROM 1 BY 1 UNTIL                  RET-LER 0451
      MM1 > TOT-C-KEYS.                                             RET-LER 0452
    GO TO ERROR-RANGE.                                              RET-LER 0453
LOOP-AA1.                                                           RET-LER 0454
    IF SYM-KEY (MM1) = RA-KEY (C) GO TO FOUND-MM1.                  RET-LER 0455
LA1.  EXIT.                                                         RET-LER 0456
FOUND-MM1.                                                          RET-LER 0457
    MOVE MM1 TO KR2-T-ORD.                                          RET-LER 0458
    MOVE KR1-REC TO KR2-R WRITE KR2-REC.                            RET-LER 0459
    ADD 1 TO KF2.                                                   RET-LER 0460
RD-KEYF1.                                                           RET-LER 0461
    READ KEYF1 AT END GO TO EOF-KEY1.                               RET-LER 0462
    ADD 1 TO KF1 GO TO COMPARE-KEY1.                                RET-LER 0463
EOF-KEY1.                                                           RET-LER 0464
    CLOSE KEYF1 KEYF2.                                              RET-LER 0465
    DISPLAY 'TOTAL RECORDS READ ON KEYWORDFILE1 = ' KF1.            RET-LER 0466
    DISPLAY 'TOTAL RECORDS WRITTEN ON KEYWORDFILE2 = ' KF2.         RET-LER 0467
```

```
SORT-KEYF2.                                                    RET-LER 0468
    SORT SKF2 ASCENDING SK2-ACC SK2-ORDER                      RET-LER 0469
    USING KEYF2 GIVING KEYF2.                                  RET-LER 0470
COMPARE-TOT-KEYS.                                              RET-LER 0471
    OPEN INPUT KEYF2 OUTPUT KEYF3.                             RET-LER 0472
    READ KEYF2 INTO TEMP-REC END GO TO EOKF2.                  RET-LER 0473
    MOVE KR2-FILL TO K2-REC.                                   RET-LER 0474
    MOVE ACC-NO TO TEMP-ACC.                                   RET-LER 0475
    MOVE KR2-TORD TO KORD (KR2-TORD).                          RET-LER 0476
READ-KF2.                                                      RET-LER 0477
    READ KEYF2 INTO TEMP-REC END GO TO EOKF2.                  RET-LER 0478
    IF ACC-NO  = TEMP-ACC MOVE KR2-TORD TO KORD (KR2-TORD)     RET-LER 0479
    GO TO READ-KF2.                                            RET-LER 0480
    MOVE ACC-NO TO TEMP-ACC.                                   RET-LER 0481
CTK1.                                                          RET-LER 0482
    MOVE 1 TO C J.                                             RET-LER 0483
    MOVE 0 TO MM2.                                             RET-LER 0484
CTK2.                                                          RET-LER 0485
    ADD 1 TO MM2.                                              RET-LER 0486
    IF MM2 > 50 GO TO ERROR-RANGE.                             RET-LER 0487
    IF TOT-C-KEYS < C GO TO RD-KF2.                            RET-LER 0488
    IF PATHDGMS (J, 3) = 0 GO TO CTK3.                         RET-LER 0489
    IF KORD (C) = 0 GO TO CTK6.                                RET-LER 0490
    GO TO CTK4.                                                RET-LER 0491
CTK3.  IF KORD (C) NOT = 0 GO TO CTK6.                         RET-LER 0492
CTK4.  IF PATHDGMS (J, 2) = 0 GO TO RD-KF2.                    RET-LER 0493
    MOVE PATHDGMS (J, 2) TO C.                                 RET-LER 0494
    MOVE C TO J.                                               RET-LER 0495
    GO TO CTK2.                                                RET-LER 0496
CTK6.  IF PATHDGMS (J, 1) = 0 GO TO CTK7.                      RET-LER 0497
    MOVE PATHDGMS (J, 1) TO C.                                 RET-LER 0498
    MOVE C TO J GO TO CTK2.                                    RET-LER 0499
CTK7.                                                          RET-LER 0500
    WRITE KR3-REC FROM K2-REC.                                 RET-LER 0501
RD-KF2.                                                        RET-LER 0502
    MOVE 0 TO A.                                               RET-LER 0503
```

```
CLEAR-KORD.                                                              RET-LER 0504
    IF A > TOT-C-KEYS GO TO RK2.                                         RET-LER 0505
    MOVE ZERO TO KORD (A).                                               RET-LER 0506
    ADD 1 TO A.                                                          RET-LER 0507
    GO TO CLEAR-KORD.                                                    RET-LER 0508
RK2.                                                                     RET-LER 0509
    MOVE KR2-FILL TO K2-REC.                                             RET-LER 0510
    MOVE KR2-TORD TO KORD (KR2-TORD).                                    RET-LER 0511
    READ KEYF2 INTO TEMP-REC END GO TO EOKF2.                            RET-LER 0512
    IF ACC-NO = TEMP-ACC MOVE KR2-TORD TO KORD (KR2-TORD)                RET-LER 0513
    GO TO RD-KF2.                                                        RET-LER 0514
    MOVE ACC-NO TO TEMP-ACC.                                             RET-LER 0515
    GO TO CTK1.                                                          RET-LER 0516
ERROR-RANGE.                                                             RET-LER 0517
    CLOSE KEYF2 KEYF3.                                                   RET-LER 0518
    DISPLAY 'SEARCH AREA > 50 ***'.                                      RET-LER 0519
    GO TO ECJ.                                                           RET-LER 0520
EOKF2.                                                                   RET-LER 0521
    CLOSE KEYF2 KEYF3.                                                   RET-LER 0522
WRT-EDITED-FILE.                                                         RET-LER 0523
    OPEN INPUT KEYF3 CITATIONF OUTPUT EDITEDF.                           RET-LER 0524
    DISPLAY '********** USE COPY CONTROL CARDS TO GET PRINT OUTPU        RET-LER 0525
-   'T**********'.                                                       RET-LER 0526
    MOVE 0 TO C.                                                         RET-LER 0527
    READ CITATIONF INTO TEMP-CNR END GO TO EOEDF.                        RET-LER 0528
    MOVE T-ACCNO TO TEMP-CACC.                                           RET-LER 0529
READ-KF3.                                                                RET-LER 0530
    READ KEYF3 INTO TEMP-KR3 END GO TO EOEDF.                            RET-LER 0531
MOVE-ACC.                                                                RET-LER 0532
    MOVE K3-ACC TO TEMP-KACC.                                            RET-LER 0533
COMPARE-ACC.                                                             RET-LER 0534
    IF TEMP-KACC > TEMP-CACC GO TO READ-CNF.                             RET-LER 0535
    IF TEMP-KACC NOT = TEMP-CACC GO TO MSG-BAD.                          RET-LER 0536
    PERFORM WRT-LOOP VARYING WT1 FROM 1 BY 1                             RET-LER 0537
    UNTIL WT1 > T-CONTENT-CNT.                                           RET-LER 0538
    GO TO RD-AGAIN.                                                      RET-LER 0539
```

```
WRT-LOOP.                                                          RET-LER 0540
    MOVE SPACE TO EDREC.                                           RET-LER 0541
    MOVE T-CONT (WT1) TC EDR.                                      RET-LER 0542
    MOVE T-CC (WT1) TO EDC-CC.                                     RET-LER 0543
    WRITE EDREC ADD 1 TC C.                                        RET-LER 0544
WL1.  EXIT.                                                        RET-LER 0545
RD-AGAIN.                                                          RET-LER 0546
    READ KEYF3 INTO TEMP-KR3 END GO TO EOEDF.                      RET-LER 0547
    DISPLAY TEMP-KR3 'KEYF3'.                                      RET-LER 0548
    IF TEMP-KACC = K3-ACC GO TO RD-AGAIN.                          RET-LER 0549
READ-CNF.                                                          RET-LER 0550
    MOVE K3-ACC TO TEMP-KACC.                                      RET-LER 0551
    READ CITATIONF INTO TEMP-CNR END GO TO EOEDF.                  RET-LER 0552
    MOVE T-ACCNO TO TEMP-CACC.                                     RET-LER 0553
    GO TO CCMPARE-ACC.                                             RET-LER 0554
MSG-BAD.                                                           RET-LER 0555
    ADD 1 TO BAD-COUNT.                                            RET-LER 0556
    DISPLAY TEMP-KACC ' BAD ACCESSION NUMBER***' BAD-COUNT.        RET-LER 0557
    GO TO RD-AGAIN.                                                RET-LER 0558
ERROR-REGION.                                                      RET-LER 0559
    DISPLAY J ' SEARCH REGION > 50***'                             RET-LER 0560
    GO TO EOJ.                                                     RET-LER 0561
EOEDF.                                                             RET-LER 0562
    CLOSE EDITEDF KEYF3 CITATIONF.                                 RET-LER 0563
    DISPLAY '**EXPECTED PRINT OUTPUT LINES FOR LER***'  C.         RET-LER 0564
EOJ.                                                               RET-LER 0565
    DISPLAY 'STOP RUN'.                                            RET-LER 0566
    STOP RUN.                                                      RET-LER 0567
```

12.3. Master File Generating and Checking Program (MAKE-MF)

```
IDENTIFICATION DIVISION.                                    MAKE-MF  0001
PROGRAM-ID. MAKE-MF.                                        MAKE-MF  0002
AUTHOR. H Y CHO.                                            MAKE-MF  0003
DATE-WRITTEN. JULY, 1978.                                   MAKE-MF  0004
REMAKS. MAKE-MF IS INTENDED TO MAKE MASTER FILE             MAKE-MF  0005
        AND TO PROVIDE PUNCHED CARDS.                       MAKE-MF  0006
ENVIRONMENT DIVISION.                                       MAKE-MF  0007
CONFIGURATION SECTION.                                      MAKE-MF  0008
SOURCE-COMPUTER. IBM-360-165.                               MAKE-MF  0009
OBJECT-COMPUTER. IBM-360-165.                               MAKE-MF  0010
INPUT-OUTPUT SECTION.                                       MAKE-MF  0011
FILE-CONTROL.                                               MAKE-MF  0012
    SELECT CARDF ASSIGN TO UT-S-SYSIN.                      MAKE-MF  0013
    SELECT SD-MF ASSIGN TO UT-S-SORTN.                      MAKE-MF  0014
    SELECT MASTF ASSIGN TO UT-S-MF.                         MAKE-MF  0015
    SELECT PUNCHF ASSIGN TO UT-S-SYSPUNCH.                  MAKE-MF  0016
    SELECT PRINTF ASSIGN TO UT-S-SYSPRINT.                  MAKE-MF  0017
DATA DIVISION.                                              MAKE-MF  0018
FILE SECTION.                                               MAKE-MF  0019
FD  CARDF LABEL RECORD OMITTED RECORDING F                  MAKE-MF  0020
    DATA RECORD C-R.                                        MAKE-MF  0021
01  C-R SYNC.                                              MAKE-MF  0022
    02  CR-FACILITY PIC X(23).                             MAKE-MF  0023
    02  CR-LOC PIC X(25).                                  MAKE-MF  0024
    02  CR-REACTOR-T PIC X(5).                             MAKE-MF  0025
    02  CR-POWER PIC 9(5).                                 MAKE-MF  0026
    02  FILLER PIC X.                                      MAKE-MF  0027
    02  CR-DEL PIC 9(5).                                   MAKE-MF  0028
    02  FILLER PIC X.                                      MAKE-MF  0029
    02  CR-CRIT-DATE PIC 9(6).                             MAKE-MF  0030
    02  FILLER PIC X(2).                                   MAKE-MF  0031
    02  CR-COM-DATE PIC 9(6).                              MAKE-MF  0032
    02  FILLER PIC X.                                      MAKE-MF  0033
01  C-R1 REDEFINES C-R SYNC.                               MAKE-MF  0034
    02  CR-LICENSEE PIC X(50).                             MAKE-MF  0035
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    02  CR-ARCH-ENG PIC X(30).                                    MAKE-MF  0036
01  C-R2 REDEFINES C-R SYNC.                                      MAKE-MF  0037
    02  CR-DOCKET-CODE PIC 9(3).                                  MAKE-MF  0038
    02  CR-LOC-CODE PIC 9(2).                                     MAKE-MF  0039
    02  CR-R-TYPE PIC 9.                                          MAKE-MF  0040
    02  CR-POWER-L PIC 9(5).                                      MAKE-MF  0041
    02  CR-POWER-CODE PIC 9.                                      MAKE-MF  0042
    02  CR-LICENSEE-CODE PIC 9(3).                                MAKE-MF  0043
    02  CR-ARCH-CODE PIC 9(3).                                    MAKE-MF  0044
    02  CR-NSSS-CODE PIC 9(2).                                    MAKE-MF  0045
    02  CR-CONST-CODE PIC 9(3).                                   MAKE-MF  0046
    02  CR-FILLER PIC X(57).                                      MAKE-MF  0047
01  CR2 REDEFINES C-R SYNC.                                       MAKE-MF  0048
    02  CR-DLRP-CODE PIC 9(11).                                   MAKE-MF  0049
    02  CR-PLANC-CODE PIC 9(12).                                  MAKE-MF  0050
    02  FILLER PIC X(57).                                         MAKE-MF  0051
01  C-R3 REDEFINES C-R SYNC.                                      MAKE-MF  0052
    02  CR-NSSS PIC X(5).                                         MAKE-MF  0053
    02  CR-CONSTRUCTOR PIC X(30).                                 MAKE-MF  0054
    02  CR-DOCKET PIC 9(5).                                       MAKE-MF  0055
    02  CR-DOCKT REDEFINES CR-DOCKET.                             MAKE-MF  0056
        03  CR-FILL PIC X(2).                                     MAKE-MF  0057
        03  CR-DOCK PIC 9(3).                                     MAKE-MF  0058
    02  FILLER PIC X(2).                                          MAKE-MF  0059
    02  CR-LICENSE-NO PIC X(6).                                   MAKE-MF  0060
    02  FILLER PIC X(2).                                          MAKE-MF  0061
    02  CR-ISSUE-DATE PIC 9(6).                                   MAKE-MF  0062
    02  FILLER PIC X(3).                                          MAKE-MF  0063
    02  CR-PUNCH-DATE PIC 9(6).                                   MAKE-MF  0064
    02  FILLER PIC X(5).                                          MAKE-MF  0065
    02  CR-SERIAL PIC 9(3).                                       MAKE-MF  0066
    02  FILLER PIC X(5).                                          MAKE-MF  0067
FD  MASTF LABEL RECORD OMITTED RECORDING F                         MAKE-MF  0068
    BLOCK CONTAINS 7040 CHARACTERS DATA RECORD MAST-REC.           MAKE-MF  0069
01  MAST-REC SYNC.                                                MAKE-MF  0070
    02  MREC1 PIC X(80).                                          MAKE-MF  0071
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    02  MREC2 PIC X(80).                                    MAKE-MF  0072
    02  MREC3 PIC X(80).                                    MAKE-MF  0073
    02  MREC4 PIC X(80).                                    MAKE-MF  0074
01  MASTREC REDEFINES MAST-REC SYNC.                        MAKE-MF  0075
    02  FACILITY PIC X(23).                                 MAKE-MF  0076
    02  LOC PIC X(25).                                      MAKE-MF  0077
    02  REACTOR-T PIC X(5).                                 MAKE-MF  0078
    02  POWER PIC 9(5).                                     MAKE-MF  0079
    02  FILLER PIC X.                                       MAKE-MF  0080
    02  DEL PIC 9(5).                                       MAKE-MF  0081
    02  FILLER PIC X.                                       MAKE-MF  0082
    02  CRIT-D PIC 9(6).                                    MAKE-MF  0083
    02  FILLER PIC X(2).                                    MAKE-MF  0084
    02  COMM-D PIC 9(6).                                    MAKE-MF  0085
    02  FILLER PIC X.                                       MAKE-MF  0086
    02  LICENSEE PIC X(50).                                 MAKE-MF  0087
    02  ARCHITECT PIC X(30).                                MAKE-MF  0088
    02  DOCKET-CODE PIC 9(3).                               MAKE-MF  0089
    02  LOC-CODE PIC 9(2).                                  MAKE-MF  0090
    02  R-TYPE PIC 9.                                       MAKE-MF  0091
    02  POWER-L PIC 9(5).                                   MAKE-MF  0092
    02  POWER-CODE PIC 9.                                   MAKE-MF  0093
    02  LICENSEE-CODE PIC 9(3).                             MAKE-MF  0094
    02  ARCH-CODE PIC 9(3).                                 MAKE-MF  0095
    02  NSSS-CODE PIC 9(2).                                 MAKE-MF  0096
    02  CONST-CODE PIC 9(3).                                MAKE-MF  0097
    02  FILLER PIC X(57).                                   MAKE-MF  0098
    02  NSSS PIC X(5).                                      MAKE-MF  0099
    02  CONSTRUCTOR PIC X(30).                              MAKE-MF  0100
    02  DOCKET PIC 9(5).                                    MAKE-MF  0101
    02  DOCKT REDEFINES DOCKET.                             MAKE-MF  0102
        03  FILLER PIC X(2).                                MAKE-MF  0103
        03  DOCK-R PIC 9(3).                                MAKE-MF  0104
    02  FILLER PIC X(2).                                    MAKE-MF  0105
    02  LICENSE PIC X(6).                                   MAKE-MF  0106
    02  FILLER PIC X(2).                                    MAKE-MF  0107
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     02  ISSUE-D PIC 9(6).                                          MAKE-MF  0108
     02  FILLER PIC X(5).                                           MAKE-MF  0109
     02  PUNCH-D PIC 9(6).                                          MAKE-MF  0110
     02  FILLER PIC X(5).                                           MAKE-MF  0111
     02  SER PIC 9(3).                                              MAKE-MF  0112
     02  FILLER PIC X(5).                                           MAKE-MF  0113
SD   SD-MF LABEL RECORD OMITTED RECORDING F                         MAKE-MF  0114
     BLOCK CONTAINS 7040 CHARACTERS DATA RECORD SD-MREC.            MAKE-MF  0115
01   SD-MREC SYNC.                                                 MAKE-MF  0116
     02  SD-MREC1 PIC X(275).                                       MAKE-MF  0117
     02  SD-DOCKET PIC 9(5).                                        MAKE-MF  0118
     02  SD-MREC2 PIC X(40).                                        MAKE-MF  0119
FD   PUNCHF LABEL RECORD OMITTED RECORDING F                        MAKE-MF  0120
     BLOCK CONTAINS 80 CHARACTERS DATA RECORD PC-REC.               MAKE-MF  0121
01   PC-REC SYNC.                                                  MAKE-MF  0122
     02  DOCK PIC 9(3).                                             MAKE-MF  0123
     02  DOCKET-CODE PIC 9(3).                                      MAKE-MF  0124
     02  LOC-CODE PIC 9(2).                                         MAKE-MF  0125
     02  R-TYPE PIC 9.                                              MAKE-MF  0126
     02  POWER-L PIC 9(5).                                          MAKE-MF  0127
     02  POWER-CODE PIC 9.                                          MAKE-MF  0128
     02  LICENSEE-CODE PIC 9(3).                                    MAKE-MF  0129
     02  ARCH-CODE PIC 9(3).                                        MAKE-MF  0130
     02  NSSS-CODE PIC 9(2).                                        MAKE-MF  0131
     02  CONST-CODE PIC 9(3).                                       MAKE-MF  0132
     02  PC-FILLER PIC X(48).                                       MAKE-MF  0133
     02  PC-COUNT PIC 9(6).                                         MAKE-MF  0134
FD   PRINTF LABEL RECORD OMITTED RECORDING F                        MAKE-MF  0135
     DATA RECORD P-R.                                               MAKE-MF  0136
01   P-R PIC X(133) SYNC.                                          MAKE-MF  0137
WORKING-STORAGE SECTION.                                           MAKE-MF  0138
77   MR-COUNT PIC 9(3) VALUE 0 SYNC.                               MAKE-MF  0139
77   PR-COUNT PIC 9(6) VALUE 0 SYNC.                               MAKE-MF  0140
01   HEAD1 SYNC.                                                   MAKE-MF  0141
     02  FILLER PIC X VALUE SPACE.                                  MAKE-MF  0142
     02  FILLER PIC X(29) VALUE SPACE.                              MAKE-MF  0143
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    02  FILLER PIC X(10) VALUE '**********'.                    MAKE-MF  0144
    02  FILLER PIC X(50) VALUE '  F   A   C   I   L   I   T   Y   MAKE-MF  0145
    ' D   A   T   A  '.                                          MAKE-MF  0146
    02  FILLER PIC X(10) VALUE '**********'.                    MAKE-MF  0147
    02  FILLER PIC X(29) VALUE SPACE.                           MAKE-MF  0148
01  HEAD2 SYNC.                                                 MAKE-MF  0149
    02  FILLER PIC X VALUE SPACE.                               MAKE-MF  0150
    02  FILLER PIC X(25) VALUE 'F  A  C  I  L  I  T  Y  '.      MAKE-MF  0151
    02  FILLER PIC X(30) VALUE 'L  O  C  A  T  I  O  N R-T    '. MAKE-MF  0152
    02  FILLER PIC X(27) VALUE ' POWER  D E L    CRIT-D    '.   MAKE-MF  0153
    02  FILLER PIC X(31) VALUE 'COMM-D  NSSS C C N S T R U C T '. MAKE-MF  0154
    02  FILLER PIC X(20) VALUE 'O R          DOCK  '.           MAKE-MF  0155
01  HEAD3 SYNC.                                                 MAKE-MF  0156
    02  FILLER PIC X VALUE SPACE.                               MAKE-MF  0157
    02  FILLER PIC X(21) VALUE  ' LICENSE-NO  ISSUE-D'.         MAKE-MF  0158
    02  FILLER PIC X(2) VALUE SPACE.                            MAKE-MF  0159
    02  FILLER PIC X(30) VALUE 'L   I   C   E   N   S   E   E '. MAKE-MF  0160
    02  FILLER PIC X(15) VALUE SPACE.                           MAKE-MF  0161
    02  FILLER PIC X(19) VALUE '    A  R  C  H  I  '.           MAKE-MF  0162
    02  FILLER PIC X(31) VALUE 'T  E  C  T   PUNCH-D   SERIAL '. MAKE-MF  0163
    02  FILLER PIC X(12) VALUE SPACE.                           MAKE-MF  0164
01  HEAD4 SYNC.                                                 MAKE-MF  0165
    02  FILLER PIC X VALUE SPACE.                               MAKE-MF  0166
    02  FILLER PIC X(29) VALUE SPACE.                           MAKE-MF  0167
    02  FILLER PIC X(71) VALUE '**********  C O D E  T A B L E  F MAKE-MF  0168
    ' O R  M A S T E R  F I L E  **********'.                    MAKE-MF  0169
    02  FILLER PIC X(32) VALUE SPACE.                           MAKE-MF  0170
01  TITLE4 SYNC.                                                MAKE-MF  0171
    02  FILLER PIC X(2) VALUE SPACE.                            MAKE-MF  0172
    02  FILLER PIC X(29) VALUE  ' DOCKET  DOC-CODE  LOC-CODE  '. MAKE-MF  0173
    02  FILLER PIC X(29) VALUE 'R-TYPE  POWER-L  POWER-CODE  '. MAKE-MF  0174
    02  FILLER PIC X(26) VALUE 'LICENSEE-CODE  ARCH-CODE  '.    MAKE-MF  0175
    02  FILLER PIC X(29) VALUE 'NSSS-CODE  CONST-CODE  SERIAL'. MAKE-MF  0176
    02  FILLER PIC X(22) VALUE SPACE.                           MAKE-MF  0177
01  DETAIL-L1 SYNC.                                             MAKE-MF  0178
    02  FILLER PIC X VALUE SPACE.                               MAKE-MF  0179
```

```
    02  FACILITY PIC X(23).                                    MAKE-MF  0180
    02  LOC PIC X(25).                                         MAKE-MF  0181
    02  REACTOR-T PIC X(5).                                    MAKE-MF  0182
    02  FILLER PIC X(2) VALUE SPACE.                           MAKE-MF  0183
    02  POWER PIC ZZ,ZZ9.                                      MAKE-MF  0184
    02  FILLER PIC X VALUE SPACE.                              MAKE-MF  0185
    02  DEL PIC ZZ,ZZ9.                                        MAKE-MF  0186
    02  FILLER PIC X(4) VALUE SPACE.                           MAKE-MF  0187
    02  CRIT-D PIC 9(6).                                       MAKE-MF  0188
    02  FILLER PIC X(4) VALUE SPACE.                           MAKE-MF  0189
    02  COMM-D PIC 9(6).                                       MAKE-MF  0190
    02  FILLER PIC X(2) VALUE SPACE.                           MAKE-MF  0191
    02  NSSS PIC X(5).                                         MAKE-MF  0192
    02  CONSTRUCTOR PIC X(30).                                 MAKE-MF  0193
    02  FILLER PIC X VALUE SPACE.                              MAKE-MF  0194
    02  DOCKET PIC 9(5).                                       MAKE-MF  0195
01  DETAIL-L2 SYNC.                                            MAKE-MF  0196
    02  FILLER PIC X VALUE SPACE.                              MAKE-MF  0197
    02  FILLER PIC X(6) VALUE SPACE.                           MAKE-MF  0198
    02  LICENSE PIC X(6).                                      MAKE-MF  0199
    02  FILLER PIC X(3) VALUE SPACE.                           MAKE-MF  0200
    02  ISSUE-D PIC 9(6).                                      MAKE-MF  0201
    02  FILLER PIC X VALUE SPACE.                              MAKE-MF  0202
    02  LICENSEE PIC X(50).                                    MAKE-MF  0203
    02  ARCHITECT PIC X(30).                                   MAKE-MF  0204
    02  PUNCH-D PIC 9(6).                                      MAKE-MF  0205
    02  FILLER PIC X(6) VALUE SPACE.                           MAKE-MF  0206
    02  SER PIC 9(3).                                          MAKE-MF  0207
    02  FILLER PIC X(15) VALUE SPACE.                          MAKE-MF  0208
01  DETAIL-L3 SYNC.                                            MAKE-MF  0209
    02  FILLER PIC X VALUE SPACE.                              MAKE-MF  0210
    02  FILLER PIC X(3) VALUE SPACE.                           MAKE-MF  0211
    02  DOCKET PIC 9(5).                                       MAKE-MF  0212
    02  FILLER PIC X(7) VALUE SPACE.                           MAKE-MF  0213
    02  DOCKET-CODE PIC 9(3).                                  MAKE-MF  0214
    02  FILLER PIC X(8) VALUE SPACE.                           MAKE-MF  0215
```

```
     02  LCC-CODE PIC 9(2).                                          MAKE-MF  0216
     02  FILLER PIC X(7) VALUE SPACE.                                MAKE-MF  0217
     02  R-TYPE PIC 9.                                               MAKE-MF  0218
     02  FILLER PIC X(4) VALUE SPACE.                                MAKE-MF  0219
     02  POWER-L PIC 9(5).                                           MAKE-MF  0220
     02  FILLER PIC X(11) VALUE SPACE.                               MAKE-MF  0221
     02  POWER-CODE PIC 9.                                           MAKE-MF  0222
     02  FILLER PIC X(12) VALUE SPACE.                               MAKE-MF  0223
     02  LICENSEE-CODE PIC 9(3).                                     MAKE-MF  0224
     02  FILLER PIC X(8) VALUE SPACE.                                MAKE-MF  0225
     02  ARCH-CODE PIC 9(3).                                         MAKE-MF  0226
     02  FILLER PIC X(9) VALUE SPACE.                                MAKE-MF  0227
     02  NSSS-CODE PIC 9(2).                                         MAKE-MF  0228
     02  FILLER PIC X(9) VALUE SPACE.                                MAKE-MF  0229
     02  CONST-CODE PIC 9(3).                                        MAKE-MF  0230
     02  FILLER PIC X(5) VALUE SPACE.                                MAKE-MF  0231
     02  SER PIC 9(3).                                               MAKE-MF  0232
     02  FILLER PIC X(18) VALUE SPACE.                               MAKE-MF  0233
01   MSG-REC SYNC.                                                   MAKE-MF  0234
     02  FILLER PIC X VALUE SPACE.                                   MAKE-MF  0235
     02  FIRST-80 PIC X(80).                                         MAKE-MF  0236
     02  LAST-40 PIC X(40).                                          MAKE-MF  0237
     02  FILLER PIC X(12) VALUE SPACE.                               MAKE-MF  0238
01   BLANK-L PIC X(133) VALUE ALL '-' SYNC.                          MAKE-MF  0239
PROCEDURE DIVISION.                                                  MAKE-MF  0240
     OPEN INPUT CARDF OUTPUT MASTF PRINTF.                           MAKE-MF  0241
     MOVE ' ' TO LAST-40.                                            MAKE-MF  0242
     MOVE '********** MASTER FILE DATA CHECK **********' TO         MAKE-MF  0243
     FIRST-80.                                                       MAKE-MF  0244
     WRITE P-R FROM MSG-REC AFTER POSITIONING 0 LINES.               MAKE-MF  0245
RD-CARD1.                                                            MAKE-MF  0246
     READ CARDF INTO FIRST-80 AT END GO TO EOF-CARD.                 MAKE-MF  0247
     IF CR-POWER NOT NUMERIC                                         MAKE-MF  0248
       MOVE 'POWER NOT NUMEIC ON CARD' TO LAST-40                    MAKE-MF  0249
     GO TO ERR-1.                                                    MAKE-MF  0250
     IF CR-DEL NOT NUMERIC                                           MAKE-MF  0251
```

```
      MOVE 'DESIGN ELECTRICITY NOT NUMERIC ON CARD' TO LAST-40     MAKE-MF  0252
    GO TO ERR-1.                                                  MAKE-MF  0253
    IF CR-CRIT-DATE NOT NUMERIC                                   MAKE-MF  0254
      MOVE 'CRITICAL DATE NOT NUMERIC ON CARD' TO LAST-40         MAKE-MF  0255
    GO TO ERR-1.                                                  MAKE-MF  0256
    IF CR-COM-DATE NOT NUMERIC                                    MAKE-MF  0257
      MOVE 'COMMERCIAL DATE NOT NUMERIC ON CARD' TO LAST-40       MAKE-MF  0258
    GO TO ERR-1.                                                  MAKE-MF  0259
    MOVE C-R TO MREC1.                                            MAKE-MF  0260
RD-CARD2.                                                         MAKE-MF  0261
    READ CARDF INTO FIRST-80 AT END GO TO EOF-CARD.               MAKE-MF  0262
    MOVE C-R1 TO MREC2.                                           MAKE-MF  0263
RD-CARD3.                                                         MAKE-MF  0264
    READ CARDF INTO FIRST-80 AT END GO TO EOF-CARD.               MAKE-MF  0265
    IF CR-DLRP-CODE  NOT NUMERIC                                  MAKE-MF  0266
      MOVE 'DOC-LOC-R-POWER NOT NUMERIC ON CARD*' TO LAST-40      MAKE-MF  0267
    GO TO ERR-2.                                                  MAKE-MF  0268
    IF CR-PLANC-CODE NOT NUMERIC                                  MAKE-MF  0269
      MOVE 'POWER-LICEN-ARCH-NSSS-CONST NOT NUMERIC ' TO LAST-40  MAKE-MF  0270
    GO TO ERR-2.                                                  MAKE-MF  0271
    MOVE C-R2 TO MREC3.                                           MAKE-MF  0272
RD-CARD4.                                                         MAKE-MF  0273
    READ CARDF INTO FIRST-80 AT END GO TO EOF-CARD.               MAKE-MF  0274
    IF CR-DOCK NOT NUMERIC                                        MAKE-MF  0275
      MOVE 'DOCKET NUMBER NOT NUMERIC ON CARD' TO LAST-40         MAKE-MF  0276
    GO TO ERR-3.                                                  MAKE-MF  0277
    IF CR-ISSUE-DATE NOT NUMERIC                                  MAKE-MF  0278
      MOVE 'ISSUE DATE NOT NUMERIC ON CARD' TO LAST-40            MAKE-MF  0279
    GO TO ERR-3.                                                  MAKE-MF  0280
    IF CR-PUNCH-DATE NOT NUMERIC                                  MAKE-MF  0281
      MOVE 'PUNCH DATE NOT NUMERIC ON CARD' TO LAST-40            MAKE-MF  0282
    GO TO ERR-3.                                                  MAKE-MF  0283
    IF CR-SERIAL NOT NUMERIC                                      MAKE-MF  0284
      MOVE 'SERIAL NOT NUMERIC ON CARD' TO LAST-40                MAKE-MF  0285
    GO TO ERR-3.                                                  MAKE-MF  0286
    MOVE C-R3 TO MREC4.                                           MAKE-MF  0287
```

```
    ADD 1 TO MR-COUNT.                                          MAKE-MF  0288
    MOVE MR-COUNT TO SER OF MASTREC.                            MAKE-MF  0289
    WRITE MAST-REC.                                             MAKE-MF  0290
    GO TO RD-CARD1.                                             MAKE-MF  0291
ERR-1.                                                          MAKE-MF  0292
    WRITE P-R FROM MSG-REC AFTER POSITIONING 1 LINES.           MAKE-MF  0293
    GO TO RD-CARD2.                                             MAKE-MF  0294
ERR-2.                                                          MAKE-MF  0295
    WRITE P-R FROM MSG-REC AFTER POSITIONING 1 LINES.           MAKE-MF  0296
    GO TO RD-CARD4.                                             MAKE-MF  0297
ERR-3.                                                          MAKE-MF  0298
    WRITE P-R FROM MSG-REC AFTER POSITIONING 1 LINES.           MAKE-MF  0299
    GO TO RD-CARD1.                                             MAKE-MF  0300
EOF-CARD.                                                       MAKE-MF  0301
    CLOSE CARDF MASTF.                                          MAKE-MF  0302
    OPEN INPUT MASTF.                                           MAKE-MF  0303
    WRITE P-R FROM HEAD1 AFTER POSITIONING 0 LINES.             MAKE-MF  0304
    WRITE P-R FROM BLANK-L AFTER POSITIONING 2 LINES.           MAKE-MF  0305
    WRITE P-R FROM HEAD2 AFTER POSITIONING 1 LINES.             MAKE-MF  0306
    WRITE P-R FROM BLANK-L AFTER POSITIONING 2 LINES.           MAKE-MF  0307
    WRITE P-R FROM HEAD3 AFTER POSITIONING 1 LINES.             MAKE-MF  0308
    WRITE P-R FROM BLANK-L AFTER POSITIONING 1 LINES.           MAKE-MF  0309
RD-MASTF1.                                                      MAKE-MF  0310
    READ MASTF AT END CLOSE MASTF GO TO NXT-WRT.                MAKE-MF  0311
    MOVE CORRESPONDING MASTREC TO DETAIL-L1.                    MAKE-MF  0312
    WRITE P-R FROM DETAIL-L1 AFTER POSITIONING 2 LINES.         MAKE-MF  0313
    MOVE CORRESPONDING MASTREC TO DETAIL-L2.                    MAKE-MF  0314
    WRITE P-R FROM DETAIL-L2 AFTER POSITIONING 2 LINES.         MAKE-MF  0315
    WRITE P-R FROM BLANK-L AFTER POSITIONING 1 LINES.           MAKE-MF  0316
    GO TO RD-MASTF1.                                            MAKE-MF  0317
NXT-WRT.                                                        MAKE-MF  0318
    SORT SD-MF ON ASCENDING KEY SD-DOCKET                       MAKE-MF  0319
    USING MASTF GIVING MASTF.                                   MAKE-MF  0320
    OPEN INPUT MASTF OUTPUT PUNCHF.                             MAKE-MF  0321
    MOVE SPACE TO PC-REC.                                       MAKE-MF  0322
    MOVE 0 TO PR-COUNT.                                         MAKE-MF  0323
```

```
    WRITE P-R FROM HEAD1 AFTER POSITIONING 0 LINES.                    MAKE-MF  0324
    WRITE P-R FROM BLANK-L AFTER POSITIONING 2 LINES.                  MAKE-MF  0325
    WRITE P-R FROM HEAD2 AFTER POSITIONING 1 LINES.                    MAKE-MF  0326
    WRITE P-R FROM BLANK-L AFTER POSITIONING 2 LINES.                  MAKE-MF  0327
    WRITE P-R FROM HEAD3 AFTER POSITIONING 1 LINES.                    MAKE-MF  0328
    WRITE P-R FROM BLANK-L AFTER POSITIONING 1 LINES.                  MAKE-MF  0329
RD-MASTF.                                                              MAKE-MF  0330
    READ MASTF AT END CLOSE MASTF PUNCHF                               MAKE-MF  0331
    GO TO NEXT-RT.                                                     MAKE-MF  0332
    MOVE CORRESPONDING MASTREC TO DETAIL-L1.                           MAKE-MF  0333
    WRITE P-R FROM DETAIL-L1 AFTER POSITIONING 2 LINES.                MAKE-MF  0334
    MOVE CORRESPONDING MASTREC TO DETAIL-L2.                           MAKE-MF  0335
    WRITE P-R FROM DETAIL-L2 AFTER POSITIONING 2 LINES.                MAKE-MF  0336
    WRITE P-R FROM BLANK-L AFTER POSITIONING 1 LINES.                  MAKE-MF  0337
    MOVE CORRESPONDING MASTREC TO PC-REC.                              MAKE-MF  0338
    MOVE ' ' TO PC-FILLER.                                             MAKE-MF  0339
    ADD 1 TO PR-COUNT.                                                 MAKE-MF  0340
    MOVE PR-COUNT TO PC-COUNT.                                         MAKE-MF  0341
    MOVE DECK-R TO DECK OF PC-REC.                                     MAKE-MF  0342
    WRITE PC-REC.                                                      MAKE-MF  0343
    GO TO RD-MASTF.                                                    MAKE-MF  0344
NEXT-RT.                                                               MAKE-MF  0345
    OPEN INPUT MASTF.                                                  MAKE-MF  0346
    WRITE P-R FROM HEAD4 AFTER POSITIONING 0 LINES.                    MAKE-MF  0347
    WRITE P-R FROM TITLE4 AFTER POSITIONING 2 LINES.                   MAKE-MF  0348
    WRITE P-R FROM BLANK-L AFTER POSITIONING 1 LINES.                  MAKE-MF  0349
READ-MASTF.                                                            MAKE-MF  0350
    READ MASTF AT END CLOSE MASTF PRINTF                               MAKE-MF  0351
    DISPLAY 'NUMBER OF RECORDS WRITTEN ON MASTERFILE= ' MR-COUNT       MAKE-MF  0352
    DISPLAY 'NUMBER OF RECORDS PUNCHED ON PUNCHFILE= ' PR-COUNT        MAKE-MF  0353
      DISPLAY 'STOP RUN'                                               MAKE-MF  0354
      STOP RUN.                                                        MAKE-MF  0355
    MOVE CORRESPONDING MASTREC TO DETAIL-L3.                           MAKE-MF  0356
    WRITE P-R FROM DETAIL-L3 AFTER POSITIONING 1 LINES.                MAKE-MF  0357
    GO TO READ-MASTF.                                                  MAKE-MF  0358
```

12.4. Matching Program for Source Event File (MATCHING)

```
IDENTIFICATION DIVISION.                                                MATCHING 0001
PROGRAM-ID. MATCHING.                                                   MATCHING 0002
AUTHOR. H Y CHO.                                                        MATCHING 0003
DATE-WRITTEN. JULY, 1978.                                               MATCHING 0004
REMARKS. MATCHING IS INTENTED TO MOVE PART OF MASTER INTO               MATCHING 0005
         SEF BY MATCHING OF DOCKET-NUMBER.                              MATCHING 0006
ENVIRONMENT DIVISION.                                                   MATCHING 0007
CONFIGURATION SECTION.                                                  MATCHING 0008
SOURCE-COMPUTER. IBM-360-165.                                           MATCHING 0009
OBJECT-COMPUTER. IBM-360-165.                                           MATCHING 0010
INPUT-OUTPUT SECTION.                                                   MATCHING 0011
FILE-CONTROL.                                                           MATCHING 0012
    SELECT CARDF ASSIGN TO UT-S-SYSIN.                                  MATCHING 0013
    SELECT SEF ASSIGN TO UT-S-SEF.                                      MATCHING 0014
    SELECT MEF ASSIGN TO UT-S-MEF.                                      MATCHING 0015
    SELECT SD-SEF ASSIGN TO UT-S-SORTN.                                 MATCHING 0016
DATA DIVISION.                                                          MATCHING 0017
FILE SECTION.                                                           MATCHING 0018
FD  CARDF LABEL RECORD OMITTED RECORDING F                              MATCHING 0019
    DATA RECORD C-R.                                                    MATCHING 0020
01  C-R SYNC.                                                          MATCHING 0021
    02  CR-DOC PIC 9(3).                                               MATCHING 0022
    02  CR-DOC-CODE PIC 9(3).                                          MATCHING 0023
    02  CR-FILL PIC X(20).                                             MATCHING 0024
    02  FILLER PIC X(54).                                              MATCHING 0025
01  CR REDEFINES C-R SYNC.                                             MATCHING 0026
    02  FILLER PIC 9(3).                                               MATCHING 0027
    02  CR-TABLE PIC X(23).                                            MATCHING 0028
    02  FILLER PIC X(54).                                              MATCHING 0029
FD  SEF LABEL RECORD OMITTED RECORDING F                                MATCHING 0030
    BLOCK CONTAINS 7238 CHARACTERS DATA RECORD SEREC.                   MATCHING 0031
01  SEREC SYNC.                                                        MATCHING 0032
    02  SER-FILL1 PIC X(11).                                           MATCHING 0033
    02  SER-DOCK  PIC 9(3).                                            MATCHING 0034
    02  SER-FILL2 PIC X(80).                                           MATCHING 0035
```

```
SD SD-SEF LABEL RECORD CMITTED RECORDING F                          MATCHING 0036
    BLOCK CONTAINS 7238 CHARACTERS DATA RECORD SD-REC.              MATCHING 0037
01  SD-REC SYNC.                                                   MATCHING 0038
    02  SD-SER-FILL1 PIC X(11).                                    MATCHING 0039
    02  SD-SER-DOCK PIC 9(3).                                      MATCHING 0040
    02  SD-SER-FILL2 PIC X(80).                                    MATCHING 0041
FD  MEF LABEL RECORD CMITTED RECORDING F                            MATCHING 0042
    BLOCK CONTAINS 7254 CHARACTERS DATA RECORD MEREC.               MATCHING 0043
01  MEREC PIC X(117) SYNC.                                         MATCHING 0044
WORKING-STORAGE SECTION.                                            MATCHING 0045
77  E-DOCK PIC 9(3) VALUE 0 SYNC.                                  MATCHING 0046
77  CARD-COUNT PIC S9(6) COMPUTATIONAL VALUE 0 SYNC.                MATCHING 0047
77  DOCKCODE PIC S9(6) COMPUTATIONAL VALUE 0 SYNC.                  MATCHING 0048
77  MEF-COUNT PIC S9(6) COMPUTATIONAL VALUE 0 SYNC.                 MATCHING 0049
77  C PIC S9(6) COMPUTATIONAL VALUE 0 SYNC.                        MATCHING 0050
01  MASTREC SYNC.                                                  MATCHING 0051
    02  MR-MATCH1 PIC X(94).                                       MATCHING 0052
    02  MR-MATCH2 PIC X(23).                                       MATCHING 0053
01  DOCKET-TAB SYNC.                                               MATCHING 0054
    02  DOCKET-T OCCURS 500.                                       MATCHING 0055
       03  DOC-CODE PIC 9(3).                                      MATCHING 0056
01  MAST-TAB SYNC.                                                 MATCHING 0057
    02  MAST-T OCCURS 99.                                          MATCHING 0058
        03  MAST-FILL PIC X(23).                                   MATCHING 0059
PROCEDURE DIVISION.                                                 MATCHING 0060
    MOVE 0 TO C.                                                    MATCHING 0061
    DISPLAY 'DOCKET  DOC-CODE  FILLER                  COUNT'.      MATCHING 0062
FILL-ZERO.                                                          MATCHING 0063
    ADD 1 TO C.                                                     MATCHING 0064
    IF C > 500 MOVE 0 TO C GO TO RD-CARD.                           MATCHING 0065
    MOVE 0 TO DOC-CODE (C).                                         MATCHING 0066
    GO TO FILL-ZERO.                                                MATCHING 0067
RD-CARD.                                                            MATCHING 0068
    OPEN INPUT CARDF.                                               MATCHING 0069
READ-CARD.                                                          MATCHING 0070
    READ CARDF END GO TO EOC.                                       MATCHING 0071
```

```
    ADD 1 TO CARD-COUNT.                                                MATCHING 0072
    MOVE CR-TABLE TO MAST-FILL (CR-DOC-CODE).                           MATCHING 0073
    MOVE CR-DOC-CODE TO DOC-CODE (CR-DCC).                              MATCHING 0074
    DISPLAY '   ' CR-DOC '        ' CR-DOC-CODE '   ' CR-TABLE '   ' MATCHING 0075
    CARD-COUNT.                                                         MATCHING 0076
    GO TO READ-CARD.                                                    MATCHING 0077
EOC.                                                                    MATCHING 0078
    CLOSE CARDF DISPLAY 'TOTAL NUMBER OF RECORDS READ ON CARDF= '       MATCHING 0079
     CARD-COUNT.                                                        MATCHING 0080
    SORT SD-SEF ASCENDING KEY SD-SER-DOCK                               MATCHING 0081
    USING SEF OUTPUT PROCEDURE WRT-MEF.                                 MATCHING 0082
EOJ.                                                                    MATCHING 0083
    DISPLAY 'STOP RUN'.                                                 MATCHING 0084
    STOP RUN.                                                           MATCHING 0085
WRT-MEF SECTION.                                                        MATCHING 0086
    OPEN OUTPUT MEF.                                                    MATCHING 0087
RETURN-AGAIN.                                                           MATCHING 0088
    RETURN SD-SEF INTO MR-MATCH1 END GO TO EOSF.                        MATCHING 0089
MOVE-MAST.                                                              MATCHING 0090
    MOVE SD-SER-DOCK TO E-DOCK.                                         MATCHING 0091
    MOVE DOC-CODE (E-DOCK) TO DOCKCODE.                                 MATCHING 0092
    IF DOCKCODE > 99                                                    MATCHING 0093
      DISPLAY MR-MATCH1 ' DOCKET CODE > 99***'                          MATCHING 0094
      GO TO RETURN-AGAIN.                                               MATCHING 0095
    IF DOCKCODE = 0                                                     MATCHING 0096
       DISPLAY MR-MATCH1 '  DOCKET NUMBER ON SEF OUT OF RANGE'          MATCHING 0097
    GO TO RETURN-AGAIN.                                                 MATCHING 0098
    MOVE MAST-FILL (DOCKCODE) TO MR-MATCH2.                             MATCHING 0099
WRT-MER.                                                                MATCHING 0100
    WRITE MEREC FROM MASTREC ADD 1 TO MEF-COUNT.                        MATCHING 0101
    RETURN SD-SEF INTO MR-MATCH1 END GO TO EOSF.                        MATCHING 0102
    IF E-DOCK = SD-SER-DOCK GO TO WRT-MER.                              MATCHING 0103
    GO TO MOVE-MAST.                                                    MATCHING 0104
EOSF.                                                                   MATCHING 0105
    CLOSE MEF.                                                          MATCHING 0106
    DISPLAY 'TOTAL NUMBER OF RECORDS WRITTEN ON MEF = ' MEF-COUNT       MATCHING 0107
```

```
WM1.  EXIT.                                          MATCHING 0108
WRM1.                                                MATCHING 0109
```

12.5. LER Retrieval Program for GENCLASS (RETRIEVAL-GEN)

```
IDENTIFICATION DIVISION.                                                RET-GEN  0001
PROGRAM-ID. RETRIEVAL-GEN.                                              RET-GEN  0002
AUTHOR. H Y CHO.                                                        RET-GEN  0003
DATE-WRITTEN. JULY,1978                                                 RET-GEN  0004
REMARKS. RETRIEVAL-GEN IS INTENDED TO RETRIEVE DATA FROM GENCLASS       RET-GEN  0005
         WHICH IS CLASSIFIED MANUALLY BY THE GENERAL                    RET-GEN  0006
         CLASSIFICATION.                                                RET-GEN  0007
ENVIRONMENT DIVISION.                                                   RET-GEN  0008
CONFIGURATION SECTION.                                                  RET-GEN  0009
SOURCE-COMPUTER. IBM-360-165.                                           RET-GEN  0010
OBJECT-COMPUTER. IBM-360-165.                                           RET-GEN  0011
INPUT-OUTPUT SECTION.                                                   RET-GEN  0012
    SELECT CARDF ASSIGN UR-S-SYSIN.                                     RET-GEN  0013
    SELECT MOVEDF ASSIGN UT-S-MEF.                                      RET-GEN  0014
    SELECT SD-MF ASSIGN UT-S-SORTN.                                     RET-GEN  0015
    SELECT PUNCHF ASSIGN UT-S-SYSPUNCH.                                 RET-GEN  0016
    SELECT PRINTF ASSIGN UT-S-SYSPRINT.                                 RET-GEN  0017
DATA DIVISION.                                                          RET-GEN  0018
FILE SECTION.                                                           RET-GEN  0019
FD CARDF RECORDING F LABEL RECORD OMITTED                               RET-GEN  0020
    DATA RECORD CDREC.                                                  RET-GEN  0021
01 CDREC SYNC.                                                          RET-GEN  0022
    02 CA PIC X OCCURS 80.                                              RET-GEN  0023
FD  MOVEDF LABEL RECORD OMITTED RECORDING F                             RET-GEN  0024
    BLOCK 7254 CHARACTERS DATA RECORD MOVED-REC.                        RET-GEN  0025
01  MOVED-REC SYNC.                                                    RET-GEN  0026
    02  FILLER PIC X(2).                                               RET-GEN  0027
    02  MR-REFERENCE PIC 9(6).                                         RET-GEN  0028
    02  MR-DUP PIC 9.                                                  RET-GEN  0029
    02  MR-DOCKET PIC 9(5).                                            RET-GEN  0030
    02  MR-DATE-F PIC 9(6).                                            RET-GEN  0031
    02  MR-DATE-R PIC 9(6).                                            RET-GEN  0032
    02  MR-DATE-E.                                                     RET-GEN  0033
        03  MR-E-MO PIC 9(2).                                          RET-GEN  0034
        03  MR-E-DY PIC 9(2).                                          RET-GEN  0035
```

```
           03  MR-E-YR PIC 9(2).                                    RET-GEN  0036
       02  FILLER PIC X(4).                                         RET-GEN  0037
       02  MR-OUTAGE PIC 9(2).                                      RET-GEN  0038
       02  MR-ERR-D PIC 9(4).                                       RET-GEN  0039
       02  FILLER PIC X(2).                                         RET-GEN  0040
       02  MR-EQUIP PIC 9(2).                                       RET-GEN  0041
       02  FILLER PIC X(5).                                         RET-GEN  0042
       02  MR-DURATION PIC 9(4).                                    RET-GEN  0043
       02  MR-R-ENV PIC 9(4).                                       RET-GEN  0044
       02  MR-R-EXP PIC 9(4).                                       RET-GEN  0045
       02  FILLER PIC X(2).                                         RET-GEN  0046
       02  MR-HET PIC 9(4).                                         RET-GEN  0047
       02  FILLER PIC X(3).                                         RET-GEN  0048
       02  MR-SYSTEM PIC 9.                                         RET-GEN  0049
       02  MR-COMP-LOC PIC 9(3).                                    RET-GEN  0050
       02  MR-CRIT PIC 9(2).                                        RET-GEN  0051
       02  MR-DATE-P PIC 9(6).                                      RET-GEN  0052
       02  MR-SER PIC 9(4).                                         RET-GEN  0053
       02  MR-COUNT PIC 9(6).                                       RET-GEN  0054
       02  MR-DOCKET-CODE PIC 9(3).                                 RET-GEN  0055
       02  MR-LOC-CODE PIC 9(2).                                    RET-GEN  0056
       02  MR-R-TYPE PIC 9.                                         RET-GEN  0057
       02  MR-POWER-L PIC 9(5).                                     RET-GEN  0058
       02  MR-POWER-CODE PIC 9.                                     RET-GEN  0059
       02  MR-LICENSEE-CODE PIC 9(3).                               RET-GEN  0060
       02  MR-ARCH-CODE PIC 9(3).                                   RET-GEN  0061
       02  MR-NSSS-CODE PIC 9(2).                                   RET-GEN  0062
       02  MR-CONST-CODE PIC 9(3).                                  RET-GEN  0063
01     M-R REDEFINES MOVED-REC SYNC.                                RET-GEN  0064
       02  FILLER PIC X(30).                                        RET-GEN  0065
       02  M-08 PIC 9(2).                                           RET-GEN  0066
       02  FILLER PIC X(4).                                         RET-GEN  0067
       02  M-10 PIC 9(2).                                           RET-GEN  0068
       02  M-11 PIC 9(4).                                           RET-GEN  0069
       02  FILLER PIC X(2).                                         RET-GEN  0070
       02  M-14 PIC 9(2).                                           RET-GEN  0071
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    02  FILLER PIC X(5).                                    RET-GEN  0072
    02  M-17 PIC 9(4).                                      RET-GEN  0073
    02  M-18 PIC 9(4).                                      RET-GEN  0074
    02  M-19 PIC 9(4).                                      RET-GEN  0075
    02  FILLER PIC X(2).                                    RET-GEN  0076
    02  M-21 PIC 9(4).                                      RET-GEN  0077
    02  FILLER PIC X(3).                                    RET-GEN  0078
    02  M-23 PIC 9.                                         RET-GEN  0079
    02  M-24 PIC 9(3).                                      RET-GEN  0080
    02  M-25 PIC 9(2).                                      RET-GEN  0081
    02  FILLER PIC X(16).                                   RET-GEN  0082
    02  M-29 PIC 9(3).                                      RET-GEN  0083
    02  M-30 PIC 9(2).                                      RET-GEN  0084
    02  M-31 PIC 9.                                         RET-GEN  0085
    02  FILLER PIC X(5).                                    RET-GEN  0086
    02  M-33 PIC 9.                                         RET-GEN  0087
    02  M-34 PIC 9(3).                                      RET-GEN  0088
    02  M-35 PIC 9(3).                                      RET-GEN  0089
    02  M-36 PIC 9(2).                                      RET-GEN  0090
    02  M-37 PIC 9(3).                                      RET-GEN  0091
01  MREC REDEFINES MOVED-REC SYNC.                          RET-GEN  0092
    02  FILLER PIC X(2).                                    RET-GEN  0093
    02  MR1 PIC X(18).                                      RET-GEN  0094
    02  FILLER PIC X(6).                                    RET-GEN  0095
    02  MR2 PIC 9(6).                                       RET-GEN  0096
    02  FILLER PIC X(4).                                    RET-GEN  0097
    02  MR3 PIC 9(6).                                       RET-GEN  0098
    02  FILLER PIC X(2).                                    RET-GEN  0099
    02  MR4 PIC 9(2).                                       RET-GEN  0100
    02  FILLER PIC X(5).                                    RET-GEN  0101
    02  MR5 PIC 9(12).                                      RET-GEN  0102
    02  FILLER PIC X(2).                                    RET-GEN  0103
    02  MR6 PIC 9(4).                                       RET-GEN  0104
    02  FILLER PIC X(3).                                    RET-GEN  0105
    02  MR7 PIC 9(6).                                       RET-GEN  0106
    02  FILLER PIC X(19).                                   RET-GEN  0107
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    02  MR8 PIC X(20).                                          RET-GEN  0108
SD  SD-MF LABEL RECORD OMITTED RECORDING F                       RET-GEN  0109
    BLOCK 7254 CHARACTERS DATA RECORD SD-MREC.                   RET-GEN  0110
01  SD-MREC SYNC.                                               RET-GEN  0111
    02  FILLER PIC X(26).                                       RET-GEN  0112
    02  SD-E-MO PIC 9(2).                                       RET-GEN  0113
    02  FILLER PIC X(2).                                        RET-GEN  0114
    02  SD-E-YR PIC 9(2).                                       RET-GEN  0115
    02  FILLER PIC X(62).                                       RET-GEN  0116
    02  SD-DOCKET-CODE PIC 9(3).                                RET-GEN  0117
    02  FILLER PIC X(2).                                        RET-GEN  0118
    02  SD-R-TYPE PIC 9.                                        RET-GEN  0119
    02  FILLER PIC X(17).                                       RET-GEN  0120
FD  PUNCHF LABEL RECORD OMITTED RECORDING F                      RET-GEN  0121
    BLOCK 80 CHARACTERS DATA RECORD PUNCH-REC.                   RET-GEN  0122
01  PUNCH-REC SYNC.                                             RET-GEN  0123
    02  MR1 PIC X(18).                                          RET-GEN  0124
    02  MR2 PIC 9(6).                                           RET-GEN  0125
    02  MR3 PIC 9(6).                                           RET-GEN  0126
    02  MR4 PIC 9(2).                                           RET-GEN  0127
    02  MR5 PIC 9(12).                                          RET-GEN  0128
    02  MR6 PIC 9(4).                                           RET-GEN  0129
    02  MR7 PIC 9(6).                                           RET-GEN  0130
    02  MR8 PIC X(20).                                          RET-GEN  0131
    02  PC-FILL1 PIC X.                                         RET-GEN  0132
    02  PR-COUNT PIC 9(5).                                      RET-GEN  0133
FD PRINTF LABEL RECORD OMITTED RECORDING F                       RET-GEN  0134
    DATA RECORD P-R.                                             RET-GEN  0135
01  P-R PIC X(133) SYNC.                                        RET-GEN  0136
WORKING-STORAGE SECTION.                                         RET-GEN  0137
77 A PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                       RET-GEN  0138
77 B PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                       RET-GEN  0139
77 C PIC S9(8) COMPUTATIONAL VALUE 1 SYNC.                       RET-GEN  0140
77 CARD-COUNT PIC 9 VALUE 0 SYNC.                                RET-GEN  0141
77 CF-OPEN PIC 9 VALUE 0 SYNC.                                   RET-GEN  0142
77 DPTR       PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.              RET-GEN  0143
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77 EPTR         PIC S9(4) COMPUTATIONAL VALUE 1 SYNC.          RET-GEN  0144
77 HIGH9        PIC S9(8) COMPUTATIONAL VALUE 999999 SYNC.     RET-GEN  0145
77 I            PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.          RET-GEN  0146
77 IORD         PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.          RET-GEN  0147
77 ISP          PIC S9(3) VALUE 0 SYNC.                        RET-GEN  0148
77 J            PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.          RET-GEN  0149
77 K            PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.          RET-GEN  0150
77 KEYNINE      PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.          RET-GEN  0151
77 KK           PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.          RET-GEN  0152
77 KK1          PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.          RET-GEN  0153
77 KN           PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.          RET-GEN  0154
77 KORDER       PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.          RET-GEN  0155
77 LINE-COUNT PIC 9(2) VALUE 0 SYNC.                           RET-GEN  0156
77 MM           PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.          RET-GEN  0157
77 MM1          PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.          RET-GEN  0158
77 NZ           PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.          RET-GEN  0159
77 NO-COUNT     PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.          RET-GEN  0160
77 PATHPTR      PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.          RET-GEN  0161
77 PO-COUNT PIC S9(5) COMPUTATIONAL VALUE 0 SYNC.              RET-GEN  0162
77 S-KEY PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                 RET-GEN  0163
77 SW-LP PIC 9 VALUE 0 SYNC.                                   RET-GEN  0164
77 TEMP-KEY PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.              RET-GEN  0165
77 TEMP-KEYS  PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.            RET-GEN  0166
77 TEMP-PRE PIC X VALUE SPACE SYNC.                            RET-GEN  0167
77 TOP PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.                   RET-GEN  0168
77 TOP1         PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.          RET-GEN  0169
77 TOP2         PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.          RET-GEN  0170
77 TOT-C-KEYS PIC S9(4) COMPUTATIONAL VALUE 0 SYNC.            RET-GEN  0171
01 MSG-REC SYNC.                                               RET-GEN  0172
    02 FILLER PIC X VALUE SPACE.                               RET-GEN  0173
    02 FIRST-80 PIC X(80).                                     RET-GEN  0174
    02 LAST-40 PIC X(40).                                      RET-GEN  0175
    02 FILLER PIC X(12) VALUE SPACE.                           RET-GEN  0176
01  MASTAREA SYNC.                                            RET-GEN  0177
    02  M-08 PIC 9(4).                                        RET-GEN  0178
    02  M-10 PIC 9(4).                                        RET-GEN  0179
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     02   M-11 PIC 9(4).                                                  RET-GEN  0180
     02   M-14 PIC 9(4).                                                  RET-GEN  0181
     02   M-17 PIC 9(4).                                                  RET-GEN  0182
     02   M-18 PIC 9(4).                                                  RET-GEN  0183
     02   M-19 PIC 9(4).                                                  RET-GEN  0184
     02   M-21 PIC 9(4).                                                  RET-GEN  0185
     02   M-23 PIC 9(4).                                                  RET-GEN  0186
     02   M-24 PIC 9(4).                                                  RET-GEN  0187
     02   M-25 PIC 9(4).                                                  RET-GEN  0188
     02   M-29 PIC 9(4).                                                  RET-GEN  0189
     02   M-30 PIC 9(4).                                                  RET-GEN  0190
     02   M-31 PIC 9(4).                                                  RET-GEN  0191
     02   M-33 PIC 9(4).                                                  RET-GEN  0192
     02   M-34 PIC 9(4).                                                  RET-GEN  0193
     02   M-35 PIC 9(4).                                                  RET-GEN  0194
     02   M-36 PIC 9(4).                                                  RET-GEN  0195
     02   M-37 PIC 9(4).                                                  RET-GEN  0196
01   MAREA REDEFINES MASTAREA SYNC.                                       RET-GEN  0197
     02   MA PIC 9(4) OCCURS 19.                                          RET-GEN  0198
01   SEARCH-AREA SYNC.                                                    RET-GEN  0199
     02   SAREA PIC X(38) VALUE '0810111417181921232425293031333435 RET-GEN  0200
     '3637'.                                                              RET-GEN  0201
01   SEARCH-A REDEFINES SEARCH-AREA SYNC.                                 RET-GEN  0202
     02   SA PIC 9(2) OCCURS 19.                                          RET-GEN  0203
01   TOTAL-SEARCH-AREA SYNC.                                              RET-GEN  0204
     02   CK-SEARCH-AREA PIC 9(2).                                        RET-GEN  0205
          88   TRUE-SEARCH VALUES 00 08 10 11 14 17 THRU 19 21            RET-GEN  0206
               23 THRU 25 29 THRU 31 33 THRU 37.                          RET-GEN  0207
01   RESERVEAREA SYNC.                                                    RET-GEN  0208
     02   RAREA OCCURS 50.                                                RET-GEN  0209
          03   RA-SEARCH PIC 9(2).                                        RET-GEN  0210
          03   RA-KEY PIC 9(2).                                           RET-GEN  0211
01 SYMBOL-AREA SYNC.                                                      RET-GEN  0212
     02   SYM OCCURS 50.                                                  RET-GEN  0213
          03   SYM-SEARCH PIC 9(2).                                       RET-GEN  0214
          03   SYM-KEY PIC 9(4).                                          RET-GEN  0215
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01  CHECK-REGION-AREA SYNC.                                                  RET-GEN  0216
    02  CK-RN OCCURS 100.                                                    RET-GEN  0217
        03  CRA-1 PIC 9(2).                                                  RET-GEN  0218
        03  CRA-2 PIC 9(2).                                                  RET-GEN  0219
01 INFIX-AREA SYNC.                                                         RET-GEN  0220
    02 E OCCURS 50 PIC S9(2).                                               RET-GEN  0221
01 POSTFIX-AREA SYNC.                                                       RET-GEN  0222
    02 D OCCURS 50 PIC S9(2).                                               RET-GEN  0223
01 STACK-AREA SYNC.                                                         RET-GEN  0224
    02 STACK1 OCCURS 50 PIC S9(2).                                          RET-GEN  0225
01 STACKAREA SYNC.                                                          RET-GEN  0226
    02 STACK2 OCCURS 50 PIC S9(2).                                          RET-GEN  0227
01 PATHDIAGRAM SYNC.                                                        RET-GEN  0228
    02 PATH-LINE OCCURS 50.                                                 RET-GEN  0229
       03 PATHDGMS PIC 9(2) OCCURS 3.                                       RET-GEN  0230
01 TEMP-TABLE SYNC.                                                         RET-GEN  0231
    02 TEMP-NO PIC X OCCURS 4.                                              RET-GEN  0232
01 TEMP-NO4 REDEFINES TEMP-TABLE PIC 9(4) SYNC.                             RET-GEN  0233
01  TAB-EVENT-YR SYNC.                                                      RET-GEN  0234
    02  E-YR PIC X(50) VALUE '606162636465666768697071727374757 67 RET-GEN  0235
    '778798081828384'.                                                      RET-GEN  0236
01  CODE-EVENT-YR REDEFINES TAB-EVENT-YR SYNC.                              RET-GEN  0237
    02  C-E-YR PIC 9(2) OCCURS 25.                                         RET-GEN  0238
01  TAB-OUTAGE SYNC.                                                        RET-GEN  0239
    02  OUTAGE PIC X(46) VALUE '00101112131415162021222324253031 3 RET-GEN  0240
    '2333440'.                                                              RET-GEN  0241
01  CODE-OUTAGE REDEFINES TAB-OUTAGE SYNC.                                  RET-GEN  0242
    02  C-OUTAGE PIC 9(2) OCCURS 20.                                       RET-GEN  0243
01  TAB-ERR-D SYNC.                                                         RET-GEN  0244
    02  ERR-D1 PIC X(88) VALUE '00001000110012001300140015001 6001 RET-GEN  0245
    '70018001900200021002200230024002500260027003000310031 05'.  RET-GEN  0246
    02  ERR-D2 PIC X(96) VALUE '11031153120312531303135314031 4531 RET-GEN  0247
    '50315531603165317031753180318531903195320032053210321 5322032 RET-GEN  0248
    '25'.                                                                   RET-GEN  0249
01  CODE-ERR-D REDEFINES TAB-ERR-D SYNC.                                    RET-GEN  0250
    02  C-ERR-D PIC 9(4) OCCURS 46.                                        RET-GEN  0251
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01  TAB-EQUIP SYNC.                                                    RET-GEN  0252
    02  EQUIP PIC X(12) VALUE '000102101112'.                          RET-GEN  0253
01  CODE-EQUIP SYNC.                                                   RET-GEN  0254
    02  C-EQUIP PIC 9(2) OCCURS 6.                                     RET-GEN  0255
01  TAB-DURATION SYNC.                                                 RET-GEN  0256
    02  DURATION PIC X(27) VALUE '001025049073097121145169999'.        RET-GEN  0257
01  CODE-DURATION REDEFINES TAB-DURATION SYNC.                         RET-GEN  0258
    02  C-DURATION PIC 9(3) OCCURS 9.                                  RET-GEN  0259
01  TAB-R-ENV SYNC.                                                    RET-GEN  0260
    02  R-ENV PIC X(48) VALUE '405041004150420042014210421142204 2'    RET-GEN  0261
    '21423042314240'.                                                   RET-GEN  0262
01  CODE-R-ENV REDEFINES TAB-R-ENV SYNC.                               RET-GEN  0263
    02  C-R-ENV PIC 9(4) OCCURS 12.                                    RET-GEN  0264
01  TAB-R-EXP SYNC.                                                    RET-GEN  0265
    02  R-EXP PIC X(56) VALUE '43054310432043214324433043314332 43'    RET-GEN  0266
    '34434043414342434 4'.                                              RET-GEN  0267
01  CODE-R-EXP REDEFINES TAB-R-EXP SYNC.                               RET-GEN  0268
    02  C-R-EXP PIC 9(4) OCCURS 14.                                    RET-GEN  0269
01  TAB-HET SYNC.                                                      RET-GEN  0270
    02  HET1 PIC X(88) VALUE '000010001100111011201130120012101 22'    RET-GEN  0271
    '01300131013111312131313141400141014201430200021002110'.           RET-GEN  0272
    02  HET2 PIC X(92) VALUE '21202130214021502160217021802200221'     RET-GEN  0273
    '02220230023102311231223202321232223232324232524002410242 0'.      RET-GEN  0274
01  CODE-HET REDEFINES TAB-HET SYNC.                                   RET-GEN  0275
    02  C-HET PIC 9(4) OCCURS 45.                                      RET-GEN  0276
01  TAB-SYSTEM SYNC.                                                   RET-GEN  0277
    02  SYSTEM PIC X(20) VALUE '01020304050607080910'.                 RET-GEN  0278
01  CODE-SYSTEM REDEFINES TAB-SYSTEM SYNC.                             RET-GEN  0279
    02  C-SYSTEM PIC 9(2) OCCURS 10.                                   RET-GEN  0280
01  TAB-COMP SYNC.                                                     RET-GEN  0281
    02  COMP1 PIC X(90) VALUE '000001002003010011012013014015 0160'    RET-GEN  0282
    '17018019020021022023024025026027028029030031032033034035'.       RET-GEN  0283
    02  COMP2 PIC X(90) VALUE '036037038040041042043044045046047 0'    RET-GEN  0284
    '50051052053054055056060061062063064070071072073074075080'.       RET-GEN  0285
    02  COMP3 PIC X(66) VALUE '08108208308408508608709009109209 30'    RET-GEN  0286
    '94100101102103104110111112113200'.                                RET-GEN  0287
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01  CODE-COMP REDEFINES TAB-COMP SYNC.                          RET-GEN  0288
    02  C-COMP PIC 9(3) OCCURS 82.                              RET-GEN  0289
01  TAB-CRIT SYNC.                                              RET-GEN  0290
    02  CRIT PIC X(8) VALUE '00051015'.                         RET-GEN  0291
01  CODE-CRIT REDEFINES TAB-CRIT SYNC.                          RET-GEN  0292
    02  C-CRIT PIC 9(2) OCCURS 4.                               RET-GEN  0293
01  HEAD1 SYNC.                                                 RET-GEN  0294
    02  FILLER PIC X VALUE SPACE.                               RET-GEN  0295
    02  FILLER PIC X(45) VALUE '********************************* RET-GEN  0296
    '************'.                                             RET-GEN  0297
    02  FILLER PIC X(40) VALUE ' DATA PULL-OUT FOR HUMAN-ERROR TA RET-GEN  0298
    'XONOMY'.                                                    RET-GEN  0299
    02  FILLER PIC X(45) VALUE '********************************* RET-GEN  0300
    '************'.                                             RET-GEN  0301
01  TITLE1 SYNC.                                                RET-GEN  0302
    02  FILLER PIC X VALUE SPACE.                               RET-GEN  0303
    02  FILLER PIC X(28) VALUE '  REF-NO D DOCKET  DATE-F  '.   RET-GEN  0304
    02  FILLER PIC X(30) VALUE 'DATE-R  DATE-E OUT ERR-D  EQ  '. RET-GEN  0305
    02  FILLER PIC X(31) VALUE 'DRN R-ENV R-EXP  HET  S COMP CC'. RET-GEN  0306
    02  FILLER PIC X(31) VALUE '  LOC  R POWER  P  LCNS ARCH  '. RET-GEN  0307
    02  FILLER PIC X(13) VALUE 'NS CON   SER '.                 RET-GEN  0308
01  DETAIL-LINE SYNC.                                           RET-GEN  0309
    02  FILLER PIC X VALUE SPACE.                               RET-GEN  0310
    02  FILLER PIC X(2) VALUE SPACE.                            RET-GEN  0311
    02  MR-REFERENCE PIC 9(6).                                  RET-GEN  0312
    02  FILLER PIC X(4) VALUE SPACE.                            RET-GEN  0313
    02  MR-DOCKET PIC 9(5).                                     RET-GEN  0314
    02  FILLER PIC X(2) VALUE SPACE.                            RET-GEN  0315
    02  MR-DATE-F PIC 9(6).                                     RET-GEN  0316
    02  FILLER PIC X(3) VALUE SPACE.                            RET-GEN  0317
    02  MR-DATE-R PIC 9(6).                                     RET-GEN  0318
    02  FILLER PIC X(2) VALUE SPACE.                            RET-GEN  0319
    02  MR-DATE-E PIC 9(6).                                     RET-GEN  0320
    02  FILLER PIC X(2) VALUE SPACE.                            RET-GEN  0321
    02  MR-OUTAGE PIC 9(2).                                     RET-GEN  0322
    02  FILLER PIC X(2) VALUE SPACE.                            RET-GEN  0323
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02  MR-ERR-D PIC 9(4).                                  RET-GEN  0324
02  FILLER PIC X(2) VALUE SPACE.                        RET-GEN  0325
02  MR-EQUIP PIC 9(2).                                  RET-GEN  0326
02  FILLER PIC X VALUE SPACE.                           RET-GEN  0327
02  MR-DURATION PIC 9(4).                               RET-GEN  0328
02  FILLER PIC X(2) VALUE SPACE.                        RET-GEN  0329
02  MR-R-ENV PIC 9(4).                                  RET-GEN  0330
02  FILLER PIC X(2) VALUE SPACE.                        RET-GEN  0331
02  MR-R-EXP PIC 9(4).                                  RET-GEN  0332
02  FILLER PIC X VALUE SPACE.                           RET-GEN  0333
02  MR-HET PIC 9(4).                                    RET-GEN  0334
02  FILLER PIC X(2) VALUE SPACE.                        RET-GEN  0335
02  MR-SYSTEM PIC 9.                                    RET-GEN  0336
02  FILLER PIC X(2) VALUE SPACE.                        RET-GEN  0337
02  MR-COMP-LOC PIC 9(3).                               RET-GEN  0338
02  FILLER PIC X VALUE SPACE.                           RET-GEN  0339
02  MR-CRIT PIC 9(2).                                   RET-GEN  0340
02  FILLER PIC X(3) VALUE SPACE.                        RET-GEN  0341
02  MR-LOC-CODE PIC 9(2).                               RET-GEN  0342
02  FILLER PIC X(2) VALUE SPACE.                        RET-GEN  0343
02  MR-R-TYPE PIC 9.                                    RET-GEN  0344
02  FILLER PIC X VALUE SPACE.                           RET-GEN  0345
02  MR-POWER-L PIC 9(5).                                RET-GEN  0346
02  FILLER PIC X(2) VALUE SPACE.                        RET-GEN  0347
02  MR-POWER-CODE PIC 9.                                RET-GEN  0348
02  FILLER PIC X(3) VALUE SPACE.                        RET-GEN  0349
02  MR-LICENSEE-CODE PIC 9(3).                          RET-GEN  0350
02  FILLER PIC X(2) VALUE SPACE.                        RET-GEN  0351
02  MR-ARCH-CODE PIC 9(3).                              RET-GEN  0352
02  FILLER PIC X(3) VALUE SPACE.                        RET-GEN  0353
02  MR-NSSS-CODE PIC 9(2).                              RET-GEN  0354
02  FILLER PIC X VALUE SPACE.                           RET-GEN  0355
02  MR-CONST-CODE PIC 9(3).                             RET-GEN  0356
02  FILLER PIC X VALUE SPACE.                           RET-GEN  0357
02  SER PIC 9(5).                                       RET-GEN  0358
02  FILLER PIC X VALUE SPACE.                           RET-GEN  0359
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01  DASH-L SYNC.                                                          RET-GEN  0360
    02  FILLER PIC X VALUE SPACE.                                         RET-GEN  0361
    02  DASH-SIGN PIC X(132) VALUE ALL '-' SYNC.                          RET-GEN  0362
01  ZERO-TAB SYNC.                                                        RET-GEN  0363
    02  ZERO-T PIC X(6) VALUE '000000'.                                   RET-GEN  0364
PROCEDURE DIVISION                                                         RET-GEN  0365
    OPEN INPUT CARDF.                                                      RET-GEN  0366
    DISPLAY '********** REQUESTED KEYWORD CHECK **********'.              RET-GEN  0367
    MOVE SPACES TO RESERVEAREA.                                            RET-GEN  0368
CLEAR-TABLE.                                                               RET-GEN  0369
    IF C > 50 GO TO RD-CARD.                                               RET-GEN  0370
    MOVE ZERO-T TO PATH-LINE (C).                                          RET-GEN  0371
    MOVE ZERO TO STACK1 (C).                                               RET-GEN  0372
    ADD 1 TO C.                                                            RET-GEN  0373
    GO TO CLEAR-TABLE.                                                     RET-GEN  0374
CLEAR-INITIAL.                                                             RET-GEN  0375
    MOVE 0 TO K.                                                           RET-GEN  0376
    MOVE SPACE TO TEMP-PRE.                                                RET-GEN  0377
RD-CARD.                                                                   RET-GEN  0378
    READ CARDF INTO FIRST-80 END CLOSE CARDF GO TO EOC.                    RET-GEN  0379
    ADD 1 TO CARD-COUNT.                                                   RET-GEN  0380
    DISPLAY FIRST-80 ' REQUESTED KEYWORD'.                                 RET-GEN  0381
    MOVE 1 TO CF-OPEN.                                                     RET-GEN  0382
SEARCH-CA1.                                                                RET-GEN  0383
    IF CA (1) = '@'                                                        RET-GEN  0384
    SUBTRACT 1 FROM EPTR                                                   RET-GEN  0385
       MOVE KN TO TOT-C-KEYS GO TO EOC.                                    RET-GEN  0386
    IF CARD-COUNT > 5                                                      RET-GEN  0387
       DISPLAY ' REQUESTED CARDS > 5 ***' CLOSE CARDF GO TO EOJ.           RET-GEN  0388
SEARCH-CA2.                                                                RET-GEN  0389
    ADD 1 TO K.                                                            RET-GEN  0390
    IF K > 80 IF SW-LP = 0 IF NO-COUNT = 0                                 RET-GEN  0391
    GO TO CLEAR-INITIAL                                                    RET-GEN  0392
    ELSE GO TO ERR-CARD                                                    RET-GEN  0393
    ELSE GO TO ERR-CARD.                                                   RET-GEN  0394
    GO TO CK-BLANK.                                                        RET-GEN  0395
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CK-BLANK.                                                                RET-GEN  0396
    IF CA (K) = ' ' GO TC SEARCH-CA2.                                    RET-GEN  0397
    IF CA (K) = '('                                                      RET-GEN  0398
      IF TEMP-PRE = '+' CR '*' OR '¬' OR '(' OR ' ' GO TO CK-CNT1        RET-GEN  0399
      ELSE GO TO ERR-CARC                                                RET-GEN  0400
    ELSE GO TO CK-OR.                                                    RET-GEN  0401
CK-CNT1.                                                                 RET-GEN  0402
    ADD 1 TO SW-LP.                                                      RET-GEN  0403
    IF NO-CCUNT = 0 MOVE -1 TO E (EPTR)                                  RET-GEN  0404
    GO TO INC.                                                           RET-GEN  0405
    GO TO ERR-CARD.                                                      RET-GEN  0406
CK-OR.                                                                   RET-GEN  0407
    IF CA (K) = '+' IF TEMP-PRE = '(' OR '+' OR '*' OR ' ¬'              RET-GEN  0408
    GO TC ERR-CARD                                                       RET-GEN  0409
      ELSE GO TO MOVE-FLAG1.                                             RET-GEN  0410
    GO TC CK-AND.                                                        RET-GEN  0411
MOVE-FLAG1.                                                              RET-GEN  0412
    IF NO-CCUNT NOT = 0  GO TO ERR-CARD.                                 RET-GEN  0413
    MOVE -3 TO E (EPTR).                                                 RET-GEN  0414
    MCVE '+' TC TEMP-PRE.                                                RET-GEN  0415
    GC TO INC.                                                           RET-GEN  0416
CK-AND.                                                                  RET-GEN  0417
    IF CA (K) = '*' IF TEMP-PRE = '(' OR '+' OR '*' OR ' ¬'              RET-GEN  0418
    GO TO ERR-CARD                                                       RET-GEN  0419
    ELSE ADD 1 TO K GO TC CK-NOT.                                        RET-GEN  0420
    GO TO CK-RP.                                                         RET-GEN  0421
CK-NOT.                                                                  RET-GEN  0422
    IF CA (K) = '¬' GO TC MOVE-FLAG3.                                    RET-GEN  0423
    IF NO-CCUNT = 0 GO TC MOVE-FLAG2.                                    RET-GEN  0424
    GO TO ERR-CARD.                                                      RET-GEN  0425
MOVE-FLAG2.                                                              RET-GEN  0426
    MOVE '*' TO TEMP-PRE.                                                RET-GEN  0427
    SUBTRACT 1 FRCM K.                                                   RET-GEN  0428
MOVE-FG2.                                                                RET-GEN  0429
    MOVE -2 TO E (EPTR) GO TO INC.                                       RET-GEN  0430
MOVE-FLAG3.                                                              RET-GEN  0431
```

```
    IF NO-COUNT = 0                                                    RET-GEN  0432
    MOVE '¬' TO TEMP-PRE GO TO MOVE-FG2.                               RET-GEN  0433
    GO TO ERR-CARD.                                                    RET-GEN  0434
CK-RP.                                                                 RET-GEN  0435
    IF CA (K) = ')'                                                    RET-GEN  0436
      IF TEMP-PRE = '+' OR '*' OR '¬' OR '(' GO TO ERR-CARD            RET-GEN  0437
      ELSE GO TO MOVE-FLAG4                                            RET-GEN  0438
    ELSE GO TO CK-NUMERIC.                                             RET-GEN  0439
MOVE-FLAG4.                                                            RET-GEN  0440
    IF NO-COUNT NOT = 0  GO TO ERR-CARD.                               RET-GEN  0441
    SUBTRACT 1 FROM SW-LP.                                             RET-GEN  0442
    MOVE -5 TO E (EPTR).                                               RET-GEN  0443
    MOVE ')' TO TEMP-PRE.                                              RET-GEN  0444
INC.                                                                   RET-GEN  0445
    ADD 1 TO EPTR.                                                     RET-GEN  0446
    GO TO SEARCH-CA2.                                                  RET-GEN  0447
CK-NUMERIC.                                                            RET-GEN  0448
    IF CA (K) < '0' OR > '9' GO TO ERR-CARD.                           RET-GEN  0449
    ADD 1 TO NO-COUNT.                                                 RET-GEN  0450
    IF NO-COUNT > 4 GO TO ERR-CARD.                                    RET-GEN  0451
    MOVE CA (K) TO TEMP-NO (NO-COUNT).                                 RET-GEN  0452
    IF NO-COUNT NOT = 4 GO TO SEARCH-CA2.                              RET-GEN  0453
PUTK.                                                                  RET-GEN  0454
    ADD 1 TO KN.                                                       RET-GEN  0455
    MOVE TEMP-NO4 TO RAREA (KN).                                       RET-GEN  0456
    COMPUTE J = PATHPTR + 1.                                           RET-GEN  0457
    MOVE J TO E (EPTR) PATHPTR.                                        RET-GEN  0458
    IF TEMP-PRE = '¬' MOVE 1 TO PATHDOMS (J,3).                        RET-GEN  0459
    MOVE SPACES TO TEMP-PRE.                                           RET-GEN  0460
    MOVE SPACES TO TEMP-TABLE.                                         RET-GEN  0461
    MOVE 0 TO NO-COUNT.                                                RET-GEN  0462
    GO TO INC.                                                         RET-GEN  0463
ERR-CARD.                                                              RET-GEN  0464
    IF CF-OPEN = 1 CLOSE CARDF MOVE 0 TO CF-OPEN.                      RET-GEN  0465
    DISPLAY 'REQUESTED KEYWORD-CARD OUT OF RANGE***'.                  RET-GEN  0466
    GO TO EOJOB.                                                       RET-GEN  0467
```

```
EOC.                                                                RET-GEN  0468
    CLOSE CARDF.                                                    RET-GEN  0469
    MOVE 1 TO C.                                                    RET-GEN  0470
CK-KEYWORD.                                                         RET-GEN  0471
    IF TOT-C-KEYS < C GO TO MAKE-PATH.                              RET-GEN  0472
    MOVE RA-SEARCH (C) TO CK-SEARCH-AREA SYM-SEARCH (C).            RET-GEN  0473
    IF NOT TRUE-SEARCH GO TO ERROR-RANGE.                           RET-GEN  0474
    IF RAREA (1) = 0 GO TO SORT-MOVEDF.                             RET-GEN  0475
    MOVE RA-SEARCH (C) TO TEMP-KEYS.                                RET-GEN  0476
    MOVE RA-KEY (C) TO TEMP-KEY.                                    RET-GEN  0477
    IF TEMP-KEY = 0 MOVE 0 TO SYM-KEY (C) GO TO NEXT-CK.            RET-GEN  0478
    IF TEMP-KEYS = 08 GO TO CK-EVENT-YR.                            RET-GEN  0479
    IF TEMP-KEYS = 10 GO TO CK-OUTAGE.                              RET-GEN  0480
    IF TEMP-KEYS = 11 GO TO CK-ERR-D.                               RET-GEN  0481
    IF TEMP-KEYS = 14 GO TO CK-EQUIP.                               RET-GEN  0482
    IF TEMP-KEYS = 17 GO TO CK-DURATION.                            RET-GEN  0483
    IF TEMP-KEYS = 18 GO TO CK-R-ENV.                               RET-GEN  0484
    IF TEMP-KEYS = 19 GO TO CK-R-EXP.                               RET-GEN  0485
    IF TEMP-KEYS = 21 GO TO CK-HET.                                 RET-GEN  0486
    IF TEMP-KEYS = 23 GO TO CK-SYSTEM.                              RET-GEN  0487
    IF TEMP-KEYS = 24 GO TO CK-COMP.                                RET-GEN  0488
    IF TEMP-KEYS = 25 GO TO CK-CRIT.                                RET-GEN  0489
    IF TEMP-KEYS = 29 GO TO CK-DOCKET-CODE.                         RET-GEN  0490
    IF TEMP-KEYS = 30 GO TO CK-LOC-CODE.                            RET-GEN  0491
    IF TEMP-KEYS = 31 GO TO CK-R-TYPE.                              RET-GEN  0492
    IF TEMP-KEYS = 33 GO TO CK-POWER-CODE.                          RET-GEN  0493
    IF TEMP-KEYS = 34 GO TO CK-LICENSEE-CODE.                       RET-GEN  0494
    IF TEMP-KEYS = 35 GO TO CK-ARCH-CODE.                           RET-GEN  0495
    IF TEMP-KEYS = 36 GO TO CK-NSSS-CODE.                           RET-GEN  0496
    IF TEMP-KEYS = 37 GO TO CK-CONST-CODE.                          RET-GEN  0497
    GO TO ERR-CARD.                                                 RET-GEN  0498
CK-EVENT-YR.                                                        RET-GEN  0499
    IF TEMP-KEY < 26 OR > 0                                         RET-GEN  0500
    THEN MOVE C-E-YR (TEMP-KEY) TO SYM-KEY (C)                      RET-GEN  0501
    GO TO NEXT-CK.                                                  RET-GEN  0502
    MOVE '*REQ. EVENT-YR OUT OF RANGE**' TO LAST-40                 RET-GEN  0503
```

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    GO TO ERROR-CARD.                                                    RET-GEN  0504
CK-OUTAGE.                                                               RET-GEN  0505
    IF TEMP-KEY < 21 OR > 0                                              RET-GEN  0506
    THEN MOVE C-OUTAGE (TEMP-KEY) TO SYM-KEY (C)                         RET-GEN  0507
    GO TO NEXT-CK.                                                       RET-GEN  0508
    MOVE 'REQ. OUTAGE OUT OF RANGE**' TO LAST-40                         RET-GEN  0509
    GO TO ERROR-CARD.                                                    RET-GEN  0510
CK-ERR-D.                                                                RET-GEN  0511
    IF TEMP-KEY < 47 OR > 0                                              RET-GEN  0512
    THEN MOVE C-ERR-D (TEMP-KEY) TO SYM-KEY (C)                          RET-GEN  0513
    GO TO NEXT-CK.                                                       RET-GEN  0514
    MOVE 'REQ. ERROR DOMAIN OUT OF RANGE**' TO LAST-40                   RET-GEN  0515
    GO TO ERROR-CARD.                                                    RET-GEN  0516
CK-EQUIP.                                                                RET-GEN  0517
    IF TEMP-KEY < 07 OR > 0                                              RET-GEN  0518
    THEN MOVE C-EQUIP (TEMP-KEY) TO SYM-KEY (C)                          RET-GEN  0519
    GO TO NEXT-CK.                                                       RET-GEN  0520
    MOVE 'REQ. EQUIP OUT OF RANGE**' TO LAST-40                          RET-GEN  0521
    GO TO ERROR-CARD.                                                    RET-GEN  0522
CK-DURATION.                                                             RET-GEN  0523
    IF TEMP-KEY < 10 OR > 0                                              RET-GEN  0524
    THEN MOVE C-DURATION (TEMP-KEY) TO SYM-KEY (C)                       RET-GEN  0525
    GO TO NEXT-CK.                                                       RET-GEN  0526
    MOVE 'REQ. DURATION OUT OF RANGE**' TO LAST-40                       RET-GEN  0527
    GO TO ERROR-CARD.                                                    RET-GEN  0528
CK-R-ENV.                                                                RET-GEN  0529
    IF TEMP-KEY < 13 OR > 0                                              RET-GEN  0530
    THEN MOVE C-R-ENV (TEMP-KEY) TO SYM-KEY (C)                          RET-GEN  0531
    GO TO NEXT-CK.                                                       RET-GEN  0532
    MOVE 'REQ. RAD-ENVIRONMENT OUT OF RANGE**' TO LAST-40                RET-GEN  0533
    GO TO ERROR-CARD.                                                    RET-GEN  0534
CK-R-EXP.                                                                RET-GEN  0535
    IF TEMP-KEY < 15 OR > 0                                              RET-GEN  0536
    THEN MOVE C-R-EXP (TEMP-KEY) TO SYM-KEY (C)                          RET-GEN  0537
    GO TO NEXT-CK.                                                       RET-GEN  0538
    MOVE 'REQ. RAD-EXPOSURE OUT OF RANGE**' TO LAST-40                   RET-GEN  0539
```

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    GO TO ERROR-CARD.                                                    RET-GEN  0540
CK-HET.                                                                  RET-GEN  0541
    IF TEMP-KEY < 46 OR > 0                                              RET-GEN  0542
    THEN MOVE C-HET (TEMP-KEY) TO SYM-KEY (C)                            RET-GEN  0543
    GO TO NEXT-CK.                                                       RET-GEN  0544
    MOVE 'REQ. HUMAN ERROR TYPE OUT OF RANGE**' TO LAST-40               RET-GEN  0545
    GO TO ERROR-CARD.                                                    RET-GEN  0546
CK-SYSTEM.                                                               RET-GEN  0547
    IF TEMP-KEY < 11 OR > 0                                              RET-GEN  0548
    THEN MOVE C-SYSTEM (TEMP-KEY) TO SYM-KEY (C)                         RET-GEN  0549
    GO TO NEXT-CK.                                                       RET-GEN  0550
    MOVE 'REQ. SYSTEM OUT OF RANGE**' TO LAST-40                         RET-GEN  0551
    GO TO ERROR-CARD.                                                    RET-GEN  0552
CK-COMP.                                                                 RET-GEN  0553
    IF TEMP-KEY < 83 OR > 0                                              RET-GEN  0554
    THEN MOVE C-COMP (TEMP-KEY) TO SYM-KEY (C)                           RET-GEN  0555
    GO TO NEXT-CK.                                                       RET-GEN  0556
    MOVE 'REQ. COMPONENT LOCATION OUT OF RANGE**' TO LAST-40.            RET-GEN  0557
    GO TO ERROR-CARD.                                                    RET-GEN  0558
CK-CRIT.                                                                 RET-GEN  0559
    IF TEMP-KEY < 05 OR > 0                                              RET-GEN  0560
    THEN MOVE C-CRIT (TEMP-KEY) TO SYM-KEY (C)                           RET-GEN  0561
    GO TO NEXT-CK.                                                       RET-GEN  0562
    MOVE 'REQ. CRITICAL-CODE OUT OF RANGE**' TO LAST-40.                 RET-GEN  0563
    GO TO ERROR-CARD.                                                    RET-GEN  0564
CK-DOCKET-CODE.                                                          RET-GEN  0565
    IF TEMP-KEY < 69 OR > 0                                              RET-GEN  0566
      THEN MOVE TEMP-KEY TO SYM-KEY (C).                                 RET-GEN  0567
    GO TO NEXT-CK.                                                       RET-GEN  0568
    MOVE 'REQ. DOCKET-CODE OUT OF RANGE**' TO LAST-40.                   RET-GEN  0569
    GO TO ERROR-CARD.                                                    RET-GEN  0570
CK-LOC-CODE.                                                             RET-GEN  0571
    IF TEMP-KEY < 51 OR > 0                                              RET-GEN  0572
      THEN MOVE TEMP-KEY TO SYM-KEY (C).                                 RET-GEN  0573
    GO TO NEXT-CK.                                                       RET-GEN  0574
    MOVE 'REQ. LOCATION-CODE OUT OF RANGE**' TO LAST-40.                 RET-GEN  0575
```

```
    GO TO ERROR-CARD.                                                    RET-GEN  0576
CK-R-TYPE.                                                               RET-GEN  0577
    IF TEMP-KEY < 05 OR > 0                                              RET-GEN  0578
      THEN MOVE TEMP-KEY TO SYM-KEY (C).                                 RET-GEN  0579
    GO TO NEXT-CK.                                                       RET-GEN  0580
    MOVE 'REQ. REACTOR-TYPE OUT OF RANGE**' TO LAST-40.                  RET-GEN  0581
    GO TO ERROR-CARD.                                                    RET-GEN  0582
CK-POWER-CODE.                                                           RET-GEN  0583
    IF TEMP-KEY < 10 OR > 0                                              RET-GEN  0584
      THEN MOVE TEMP-KEY TO SYM-KEY (C).                                 RET-GEN  0585
    GO TO NEXT-CK.                                                       RET-GEN  0586
    MOVE 'REQ. POWER-CODE OUT OF RANGE**' TO LAST-40.                    RET-GEN  0587
    GO TO ERROR-CARD.                                                    RET-GEN  0588
CK-LICENSEE-CODE.                                                        RET-GEN  0589
    IF TEMP-KEY < 43 OR > 0                                              RET-GEN  0590
      THEN MOVE TEMP-KEY TO SYM-KEY (C).                                 RET-GEN  0591
    GO TO NEXT-CK.                                                       RET-GEN  0592
    MOVE 'REQ. LICENSEE-CODE OUT OF RANGE**' TO LAST-40.                 RET-GEN  0593
    GO TO ERROR-CARD.                                                    RET-GEN  0594
CK-ARCH-CODE.                                                            RET-GEN  0595
    IF TEMP-KEY < 30 OR > 0                                              RET-GEN  0596
      THEN MOVE TEMP-KEY TO SYM-KEY (C).                                 RET-GEN  0597
    GO TO NEXT-CK.                                                       RET-GEN  0598
    MOVE 'REQ. ARCHITECT/ENG OUT OF RANGE**' TO LAST-40.                 RET-GEN  0599
    GO TO ERROR-CARD.                                                    RET-GEN  0600
CK-NSSS-CODE.                                                            RET-GEN  0601
    IF TEMP-KEY < 07 OR > 0                                              RET-GEN  0602
      THEN MOVE TEMP-KEY TO SYM-KEY (C).                                 RET-GEN  0603
    THEN MOVE RA-KEY (C) TO SYM-KEY (C).                                 RET-GEN  0604
    GO TO NEXT-CK.                                                       RET-GEN  0605
    MOVE 'REQ. NSSS-CODE OUT OF RANGE**' TO LAST-40.                     RET-GEN  0606
    GO TO ERROR-CARD.                                                    RET-GEN  0607
CK-CONST-CODE.                                                           RET-GEN  0608
    IF TEMP-KEY < 30 OR > 0                                              RET-GEN  0609
      THEN MOVE TEMP-KEY TO SYM-KEY (C).                                 RET-GEN  0610
    MOVE 'REQ. CONSTRUCTOR-CODE OUT OF RANGE**' TO LAST-40.              RET-GEN  0611
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ADD-TOP1.                                                          RET-GEN  0648
    ADD 1 TO TOP1.                                                 RET-GEN  0649
    MOVE E (I) TO STACK1 (TOP1)                                    RET-GEN  0650
    GO TO REPEAT.                                                  RET-GEN  0651
EMPTY.                                                             RET-GEN  0652
    MOVE 0 TO J.                                                   RET-GEN  0653
LOOP-KK3.                                                          RET-GEN  0654
    ADD 1 TO J.                                                    RET-GEN  0655
    IF J > 50 GO TO ERROR-REGION.                                  RET-GEN  0656
    IF TOP1 > 0 ADD 1 TO DPTR                                      RET-GEN  0657
    MOVE STACK1 (TOP1) TO D (DPTR)                                 RET-GEN  0658
    SUBTRACT 1 FROM TOP1 GO TO LOOP-KK3.                           RET-GEN  0659
CLEAR-TAG.                                                         RET-GEN  0660
    MOVE 0 TO I TOP2 TOP1.                                         RET-GEN  0661
KEEP.                                                              RET-GEN  0662
     ADD 1 TO I.                                                   RET-GEN  0663
    IF I > DPTR GO TO SORT-MOVEOF.                                 RET-GEN  0664
    IF D (I) > 0 ADD 1 TO TOP1 MOVE D (I) TO STACK1 (TOP1)         RET-GEN  0665
    GO TO KEEP.                                                    RET-GEN  0666
    SUBTRACT 1 FROM TOP1.                                          RET-GEN  0667
    MOVE STACK1 (TOP1) TO KK.                                      RET-GEN  0668
    IF D (I) NOT = -3 GO TO STILL.                                 RET-GEN  0669
    MOVE 0 TO J.                                                   RET-GEN  0670
LOOP-MM.                                                           RET-GEN  0671
    ADD 1 TO J.                                                    RET-GEN  0672
    IF J > 50 GO TO ERROR-REGION.                                  RET-GEN  0673
    IF PATHDGMS (KK,2) = 0 GO TO NOT-ZERO.                         RET-GEN  0674
    MOVE PATHDGMS (KK,2) TO KK.                                    RET-GEN  0675
    GO TO LOOP-MM.                                                 RET-GEN  0676
NOT-ZERO.                                                          RET-GEN  0677
    COMPUTE TOP = TOP1 + 1.                                        RET-GEN  0678
    MOVE STACK1 (TOP) TO PATHDGMS (KK, 2).                         RET-GEN  0679
    GO TO KEEP.                                                    RET-GEN  0680
STILL.                                                             RET-GEN  0681
    IF PATHDGMS (KK, 2) = 0 GO TO STL1.                            RET-GEN  0682
    ADD 1 TO TOP2.                                                 RET-GEN  0683
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    MOVE PATHDGMS (KK, 2) TO STACK2 (TOP2).                    RET-GEN  0684
STL1.                                                          RET-GEN  0685
    IF PATHDGMS (KK, 1) = 0 GO TO STL2.                        RET-GEN  0686
    MOVE PATHDGMS (KK, 1) TO KK GO TO STILL.                   RET-GEN  0687
STL2.  COMPUTE TOP = TOP1 + 1.                                 RET-GEN  0688
    MOVE STACK1 (TOP) TO PATHDGMS (KK, 1).                     RET-GEN  0689
    IF TOP2 = 0 GO TO KEEP.                                    RET-GEN  0690
    MOVE STACK2 (TOP2) TO KK.                                  RET-GEN  0691
    SUBTRACT 1 FROM TOP2 GO TO STILL.                          RET-GEN  0692
SORT-MOVEDF.                                                   RET-GEN  0693
    SORT SD-MF ON ASCENDING KEY SD-R-TYPE SD-E-YR SD-E-MO      RET-GEN  0694
         SD-DOCKET-CODE                                        RET-GEN  0695
    USING MOVEDF GIVING MOVEDF.                                RET-GEN  0696
    OPEN OUTPUT PRINTF.                                        RET-GEN  0697
    PERFORM WRITE-TITLE.                                       RET-GEN  0698
    MOVE 0 TO SER PG-COUNT.                                    RET-GEN  0699
    MOVE SPACES TO FIRST-80.                                   RET-GEN  0700
COMPARE-TOT-KEYS.                                              RET-GEN  0701
    OPEN INPUT MOVEDF OUTPUT PUNCHF.                           RET-GEN  0702
    IF RA-SEARCH (1) = 0 GO TO ALL-PRINT.                      RET-GEN  0703
    MOVE 1 TO A C J.                                           RET-GEN  0704
    READ MOVEDF AT END GO TO EOF-MF.                           RET-GEN  0705
CTK1.                                                          RET-GEN  0706
    MOVE 0 TO MM1.                                             RET-GEN  0707
    MOVE CORRESPONDING M-R TO MASTAREA.                        RET-GEN  0708
CTK2.                                                          RET-GEN  0709
    ADD 1 TO MM1.                                              RET-GEN  0710
    IF MM1 > 50 GO TO ERROR-RANGE.                             RET-GEN  0711
    IF TOT-C-KEYS < C GO TO RD-MF.                             RET-GEN  0712
    PERFORM LOOP-AA1 VARYING A FROM 1 BY 1 UNTIL A >19.        RET-GEN  0713
    GO TO ERROR-RANGE.                                         RET-GEN  0714
LOOP-AA1.                                                      RET-GEN  0715
    IF SYM-SEARCH (C) = SA (A) GO TO FOUND-A.                  RET-GEN  0716
LA1.  EXIT.                                                    RET-GEN  0717
FOUND-A.                                                       RET-GEN  0718
    IF PATHDGMS (J,3) = 0 GO TO CTK3.                          RET-GEN  0719
```

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    IF SYM-KEY (C) NOT = MA (A) GO TO CTK6.                          RET-GEN  0720
    GO TO CTK4.                                                      RET-GEN  0721
CTK3.                                                                RET-GEN  0722
    IF SYM-KEY (C) = 0 GO TO CTK6.                                   RET-GEN  0723
    IF SYM-KEY (C) = MA (A) GO TO CTK6.                              RET-GEN  0724
CTK4.                                                                RET-GEN  0725
    IF PATHDGMS (J,2) = 0 GO TO RD-MF.                               RET-GEN  0726
    MOVE PATHDGMS (J,2) TO C.                                        RET-GEN  0727
    MOVE C TO J.                                                     RET-GEN  0728
    GO TO CTK2.                                                      RET-GEN  0729
CTK6.                                                                RET-GEN  0730
    IF PATHDGMS (J,1) = 0 GO TO CTK7.                                RET-GEN  0731
    MOVE PATHDGMS (J,1) TO C.                                        RET-GEN  0732
    MOVE C TO J GO TO CTK2.                                          RET-GEN  0733
CTK7.                                                                RET-GEN  0734
    ADD 1 TO SER PC-COUNT.                                           RET-GEN  0735
    MOVE CORRESPONDING MOVED-REC TO DETAIL-LINE.                     RET-GEN  0736
    IF LINE-COUNT > 54 PERFORM WRITE-TITLE.                          RET-GEN  0737
    WRITE P-R FROM DETAIL-LINE  AFTER POSITIONING 1 LINES.           RET-GEN  0738
    ADD 1 TO LINE-COUNT.                                             RET-GEN  0739
    MOVE CORRESPONDING MREC TO PUNCH-REC.                            RET-GEN  0740
    MOVE SPACES TO PC-FILL1.                                         RET-GEN  0741
    MOVE PC-COUNT TO PR-COUNT.                                       RET-GEN  0742
    WRITE PUNCH-REC.                                                 RET-GEN  0743
RD-MF.                                                               RET-GEN  0744
    READ MOVEDF AT END GO TO EOF-MF.                                 RET-GEN  0745
    GO TO CTK1.                                                      RET-GEN  0746
ALL-PRINT.                                                           RET-GEN  0747
READ-MF.                                                             RET-GEN  0748
    READ MOVEDF AT END GO TO EOF-MF.                                 RET-GEN  0749
    ADD 1 TO SER PC-COUNT.                                           RET-GEN  0750
    MOVE CORRESPONDING MOVED-REC TO DETAIL-LINE.                     RET-GEN  0751
    IF LINE-COUNT > 54 PERFORM WRITE-TITLE.                          RET-GEN  0752
    WRITE P-R FROM DETAIL-LINE  AFTER POSITIONING 1 LINES.           RET-GEN  0753
    ADD 1 TO LINE-COUNT.                                             RET-GEN  0754
    MOVE CORRESPONDING MREC TO PUNCH-REC.                            RET-GEN  0755
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    MOVE SPACES TO PC-FILL1.                                    RET-GEN  0756
    MOVE PC-COUNT TO PR-COUNT.                                  RET-GEN  0757
    DISPLAY PUNCH-REC.                                          RET-GEN  0758
    WRITE PUNCH-REC.                                            RET-GEN  0759
    GO TO READ-MF.                                              RET-GEN  0760
WRITE-TITLE.                                                    RET-GEN  0761
    WRITE P-R FROM HEAD1 AFTER POSITIONING 0 LINES.             RET-GEN  0762
    WRITE P-R FROM DASH-L AFTER POSITIONING 1 LINES.            RET-GEN  0763
    WRITE P-R FROM TITLE1 AFTER POSITIONING 2 LINES.            RET-GEN  0764
    WRITE P-R FROM DASH-L AFTER POSITIONING 1 LINES.            RET-GEN  0765
    MOVE 5 TO LINE-COUNT.                                       RET-GEN  0766
WT. EXIT.                                                       RET-GEN  0767
ERROR-RANGE.                                                    RET-GEN  0768
    MOVE 'SEARCH AREA OUT OF RANGE**' TO LAST-40.               RET-GEN  0769
    WRITE P-R FROM MSG-REC AFTER POSITIONING 1 LINES.           RET-GEN  0770
    GO TO EOJ.                                                  RET-GEN  0771
ERROR-CARD.                                                     RET-GEN  0772
    DISPLAY LAST-40.                                            RET-GEN  0773
    GO TO EOJOB.                                                RET-GEN  0774
ERROR-REGION.                                                   RET-GEN  0775
    DISPLAY J '  SEARCH REGION > 50 ***'.                       RET-GEN  0776
    GO TO EOJOB.                                                RET-GEN  0777
EOF-MF.                                                         RET-GEN  0778
    CLOSE MOVEDF PUNCHF.                                        RET-GEN  0779
EOJ.                                                            RET-GEN  0780
    WRITE P-R FROM DASH-L AFTER POSITIONING 1 LINES.            RET-GEN  0781
    CLOSE PRINTF.                                               RET-GEN  0782
EOJOB.                                                          RET-GEN  0783
    DISPLAY 'STOP RUN'.                                         RET-GEN  0784
    STOP RUN.                                                   RET-GEN  0785
```

13. APPENDIX C: SOURCE PROGRAM PROVIDED BY NSIC (NSIC-PROG)

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IDENTIFICATION DIVISION.                                                NSIC-PROG0001
PROGRAM-ID.  BIBLIO.                                                    NSIC-PROG0002
AUTHOR.  W W ROBINSON.                                                  NSIC-PROG0003
DATE-WRITTEN.  FEBRUARY, 1969.                                          NSIC-PROG0004
REMARKS.  BIBLIO IS INTENDED TO REPLACE THE CURRENT 7090 PROGRAM        NSIC-PROG0005
          WHICH WRITES THE NSIC BIBLIOGRAPHY.                           NSIC-PROG0006
ENVIRONMENT DIVISION.                                                   NSIC-PROG0007
CONFIGURATION SECTION.                                                  NSIC-PROG0008
SOURCE-COMPUTER.  IBM-360-I65.                                          NSIC-PROG0009
OBJECT-COMPUTER.  IBM-360-I65.                                          NSIC-PROG0010
INPUT-OUTPUT SECTION.                                                   NSIC-PROG0011
FILE-CONTROL.                                                           NSIC-PROG0012
    SELECT SD-CK ASSIGN TO UT-S-SD1.                                    NSIC-PROG0013
    SELECT MASTERFILE ASSIGN UT-S-MF.                                   NSIC-PROG0014
    SELECT CARDFILE ASSIGN UT-S-SYSIN.                                  NSIC-PROG0015
    SELECT CATEGORYKEYWORDFILE ASSIGN UT-S-SORTN.                       NSIC-PROG0016
    SELECT AUTHORKEYWORDFILE ASSIGN UT-S-AKF.                           NSIC-PROG0017
    SELECT NEWCK ASSIGN UT-S-SORTOUT.                                   NSIC-PROG0018
    SELECT EDITEDCATEGORY ASSIGN UT-S-EC.                               NSIC-PROG0019
    SELECT PAGESTORE ASSIGN UT-S-PS.                                    NSIC-PROG0020
    SELECT TITLFL ASSIGN TO UT-S-TITFL.                                 NSIC-PROG0021
    SELECT PRINTFILE ASSIGN TO UT-S-SYSPRINT.                           NSIC-PROG0022
DATA DIVISION.                                                          NSIC-PROG0023
FILE SECTION.                                                           NSIC-PROG0024
FD  MASTERFILE LABEL RECORD OMITTED RECORDING V                         NSIC-PROG0025
    BLOCK 10004 CHARACTERS DATA RECORD MASTER-RECORD.                   NSIC-PROG0026
01  MASTER-RECORD SYNC.                                                NSIC-PROG0027
    02 FILLER     PICTURE X(2).                                         NSIC-PROG0028
    02 MST-CNT    PICTURE S9(4) COMPUTATIONAL.                          NSIC-PROG0029
    02 MR         PICTURE X OCCURS 1966 DEPENDING ON MST-CNT.           NSIC-PROG0030
FD  CARDFILE RECORDING F LABEL RECORD OMITTED                           NSIC-PROG0031
    DATA RECORD CARD-RECORD.                                            NSIC-PROG0032
01  CARD-RECORD SYNC.                                                  NSIC-PROG0033
    02 EDITION-NUMBER PICTURE 9(5).                                     NSIC-PROG0034
    02 CARD-FILL PICTURE X(75).                                         NSIC-PROG0035
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FD  NEWCK LABEL RECORD OMITTED RECORDING V                                  NSIC-PROG0036
    BLOCK CONTAINS 7298 CHARACTERS, DATA RECORD NEW-CK-REC.                 NSIC-PROG0037
01  NEW-CK-REC SYNC.                                                       NSIC-PROG0038
    02  FILLER PICTURE X(2).                                               NSIC-PROG0039
    02  TOT-CHAR-NC PICTURE S9(4) COMPUTATIONAL.                           NSIC-PROG0040
    02  FILLER PICTURE X(76).                                              NSIC-PROG0041
    02  MAST-AREA-NC.                                                      NSIC-PROG0042
        03  MAN PICTURE X OCCURS 1890 DEPENDING ON TOT-CHAR-NC.            NSIC-PROG0043
FD  CATEGORYKEYWORDFILE LABEL RECORD OMITTED RECORDING V                    NSIC-PROG0044
    BLOCK CONTAINS 7298 CHARACTERS, DATA RECORD CKREC.                      NSIC-PROG0045
01  CKREC SYNC.                                                            NSIC-PROG0046
    02  CK-ID PICTURE X(2).                                                NSIC-PROG0047
    02  CK-TOT-CHAR PICTURE S9(4) COMPUTATIONAL.                           NSIC-PROG0048
    02  CK-ACC PICTURE S9(6) COMPUTATIONAL.                                NSIC-PROG0049
    02  SIG-DATE PICTURE S9(6) COMPUTATIONAL.                              NSIC-PROG0050
    02  FILLER PICTURE X(14).                                              NSIC-PROG0051
    02  CK-CATG.                                                           NSIC-PROG0052
        03  FILLER PICTURE 9(10).                                          NSIC-PROG0053
        03  CK-CATG1 PICTURE 99.                                           NSIC-PROG0054
    02  FILLER PICTURE X(12).                                              NSIC-PROG0055
    02  CK-SELNUM-CNT PICTURE S9(4) COMPUTATIONAL.                         NSIC-PROG0056
    02  CK-AUTH-CHAR  PICTURE S9(4) COMPUTATIONAL.                         NSIC-PROG0057
    02  CK-TITLE-CHAR PICTURE S9(4) COMPUTATIONAL.                         NSIC-PROG0058
    02  CK-CAUTH-CHAR PICTURE S9(4) COMPUTATIONAL.                         NSIC-PROG0059
    02  CK-MEMO-CHAR  PICTURE S9(4) COMPUTATIONAL.                         NSIC-PROG0060
    02  CK-AES-CHAR   PICTURE S9(4) COMPUTATIONAL.                         NSIC-PROG0061
    02  CK-AVL-CHAR   PICTURE S9(4) COMPUTATIONAL.                         NSIC-PROG0062
    02  FILLER PICTURE X(16).                                              NSIC-PROG0063
    02  CK-MAST-AREA.                                                      NSIC-PROG0064
        03  CK-MA PICTURE X OCCURS 1890 DEPENDING ON CK-TOT-CHAR.          NSIC-PROG0065
SD  SD-CK RECORDING V DATA RECORD SD-CK-REC.                                NSIC-PROG0066
01  SD-CK-REC SYNC.                                                        NSIC-PROG0067
    02  ID-SD PICTURE X(2).                                                NSIC-PROG0068
    02  TOT-CHAR-SD PICTURE S9(4) COMPUTATIONAL.                           NSIC-PROG0069
    02  ACC-SD PICTURE S9(6) COMPUTATIONAL.                                NSIC-PROG0070
    02  SIGDAT-SD  PICTURE S9(6) COMPUTATIONAL.                            NSIC-PROG0071
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    02  FILLER PICTURE X(14).                                          NSIC-PROG0072
    02  CATG-SD.                                                       NSIC-PROG0073
        03  FILLER PICTURE X(10).                                      NSIC-PROG0074
        03  CTG-SD PICTURE 99.                                         NSIC-PROG0075
    02  FILLER PICTURE X(12).                                          NSIC-PROG0076
    02  FILLER PICTURE X(30).                                          NSIC-PROG0077
    02  MAST-AREA-SD.                                                  NSIC-PROG0078
        03  MASD PICTURE X OCCURS 1890 DEPENDING ON TOT-CHAR-SD.       NSIC-PROG0079
FD  AUTHORKEYWORDFILE LABEL RECORD OMITTED RECORDING F                  NSIC-PROG0080
    BLOCK 50 RECORDS DATA RECORD AUTHOR-KEYWORD-RECORD.                 NSIC-PROG0081
01  AUTHOR-KEYWORD-RECORD SYNC.                                        NSIC-PROG0082
    02  AK-FLAG PICTURE S9(4) COMPUTATIONAL.                           NSIC-PROG0083
    02  AK-INFO.                                                       NSIC-PROG0084
        03  AKI PICTURE X OCCURS 48.                                   NSIC-PROG0085
    02  AK-CATG PICTURE S9(4) COMPUTATIONAL.                           NSIC-PROG0086
    02  AK-ACC PICTURE S9(8) COMPUTATIONAL.                            NSIC-PROG0087
FD  EDITEDCATEGORY LABEL RECORD OMITTED RECORDING F                     NSIC-PROG0088
    BLOCK 8 RECORDS DATA RECORD EC-REC.                                 NSIC-PROG0089
01  EC-REC SYNC.                                                       NSIC-PROG0090
    02  ECR.                                                           NSIC-PROG0091
        03  ECC-CC PICTURE X.                                          NSIC-PROG0092
        03  FILLER.                                                    NSIC-PROG0093
            04  ECRR PICTURE X OCCURS 130.                             NSIC-PROG0094
    03  TELPCST PICTURE XX.                                            NSIC-PROG0095
FD  PAGESTORE RECORDING F LABEL RECORD STANDARD                         NSIC-PROG0096
    DATA RECORD PAGE-STORE-REC.                                         NSIC-PROG0097
01  PAGE-STORE-REC SYNC.                                               NSIC-PROG0098
    02  FILLER OCCURS 25.                                              NSIC-PROG0099
        03  CATEGORY-SAVE PICTURE S9(4) COMPUTATIONAL.                 NSIC-PROG0100
        03  CS PICTURE S9(4) COMPUTATIONAL.                            NSIC-PROG0101
    02  KEYWORD-PAGE-SAVE PICTURE S9(4) COMPUTATIONAL.                 NSIC-PROG0102
    02  FILLER PICTURE XX.                                             NSIC-PROG0103
    02  AUTHOR-PAGE-SAVE PICTURE S9(4) COMPUTATIONAL.                  NSIC-PROG0104
    02  FILLER PICTURE XX.                                             NSIC-PROG0105
    02  APPENDIX-PAGE-SAVE PICTURE S9(4) COMPUTATIONAL.                NSIC-PROG0106
    02  FILLER PICTURE X(2).                                           NSIC-PROG0107
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FD  TITLFL RECORDING V LABEL CMITTED,                                    NSIC-PROG0108
     BLOCK 2000 CHARACTERS DATA RECORD TITL-REC.                         NSIC-PROG0109
01  TITL-REC SYNC.                                                      NSIC-PROG0110
    02 TITL-ACC PICTURE X(8).                                            NSIC-PROG0111
    02 FILLER   PICTURE X(4).                                            NSIC-PROG0112
    02 YAK-CNT  PICTURE S9(4) COMPUTATIONAL.                             NSIC-PROG0113
    02 YAK      PICTURE X OCCURS 360 DEPENDING ON YAK-CNT.               NSIC-PROG0114
FD  PRINTFILE RECORDING F LABEL RECORD STANDARD,                         NSIC-PROG0115
     BLOCK 1 RECORDS DATA RECORD P-R.                                    NSIC-PROG0116
01  P-R PICTURE X(133) SYNC.                                            NSIC-PROG0117
WORKING-STORAGE SECTION.                                                 NSIC-PROG0118
77  CHOCNT PICTURE S9(4) COMPUTATIONAL VALUE 0 SYNC.                    NSIC-PROG0119
77  A PICTURE S9(8) COMPUTATIONAL SYNC.                                 NSIC-PROG0120
77  AKF-OPEN  PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.                 NSIC-PROG0121
77  AKREC-COUNT PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.               NSIC-PROG0122
77  B PICTURE S9(8) COMPUTATIONAL SYNC.                                 NSIC-PROG0123
77  BEGIN-PRINT PICTURE S9(8) COMPUTATIONAL SYNC.                       NSIC-PROG0124
77  C PICTURE S9(8) COMPUTATIONAL SYNC.                                 NSIC-PROG0125
77  CF-OPEN   PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.                 NSIC-PROG0126
77  CKF-OPEN  PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.                 NSIC-PROG0127
77  CKREC-COUNT PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.               NSIC-PROG0128
77  CTG-ACC PICTURE S9(8) COMPUTATIONAL SYNC.                           NSIC-PROG0129
77  D PICTURE S9(8) COMPUTATIONAL SYNC.                                 NSIC-PROG0130
77  DOUBLE-RECORDS PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.            NSIC-PROG0131
77  E PICTURE S9(8) COMPUTATIONAL SYNC.                                 NSIC-PROG0132
77  EC-OPEN   PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.                 NSIC-PROG0133
77  END-PRINT PICTURE S9(8) COMPUTATIONAL SYNC.                         NSIC-PROG0134
77  F PICTURE S9(8) COMPUTATIONAL SYNC.                                 NSIC-PROG0135
77  LAST-LINE PICTURE S9(8) COMPUTATIONAL SYNC.                         NSIC-PROG0136
77  LEFT-ALIGN PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.                NSIC-PROG0137
77  LER-COUNT PIC S9(8) COMPUTATIONAL VALUE 0 SYNC.                     NSIC-PROG0138
77  LINE-COUNT PICTURE S9(8) COMPUTATIONAL SYNC.                        NSIC-PROG0139
77  MF-OPEN   PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.                 NSIC-PROG0140
77  MR-COUNT PICTURE S9(8) COMPUTATIONAL SYNC.                          NSIC-PROG0141
77  NEXT-ACC-CT PICTURE S9(8) COMPUTATIONAL SYNC.                       NSIC-PROG0142
77  NC-OPEN   PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.                 NSIC-PROG0143
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77  NCREC-COUNT PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.          NSIC-PROG0144
77  NUMBER-AUTHORS PICTURE S9(8) COMPUTATIONAL SYNC.              NSIC-PROG0145
77  PAST-CATEGORY PICTURE S9(8) COMPUTATIONAL VALUE -1 SYNC.      NSIC-PROG0146
77  PRESENT-CATEGORY PICTURE S9(8) COMPUTATIONAL SYNC.            NSIC-PROG0147
77  PS-OPEN   PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.          NSIC-PROG0148
77  TET-CT PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.             NSIC-PROG0149
77  EMP-FLAG PICTURE S9(4) COMPUTATIONAL VALUE 0 SYNC.           NSIC-PROG0150
77  NDEX PICTURE S9(4) COMPUTATIONAL VALUE 0 SYNC.               NSIC-PROG0151
77  MAGIC-CNT   PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.        NSIC-PROG0152
77  NDEXA       PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.        NSIC-PROG0153
77  NDEXB       PICTURE S9(8) COMPUTATIONAL VALUE 0 SYNC.        NSIC-PROG0154
77  J                  PICTURE S9(4) COMPUTATIONAL VALUE 0 SYNC. NSIC-PROG0155
77  K                  PICTURE S9(4) COMPUTATIONAL VALUE 0 SYNC. NSIC-PROG0156
77  LINE-CNT           PICTURE S9(4) COMPUTATIONAL VALUE 2 SYNC. NSIC-PROG0157
77  PR-OPEN  PIC  S9(8) COMPUTATIONAL VALUE 0 SYNC.              NSIC-PROG0158
77  T-REF-NO PIC 9(6) VALUE 0 SYNC.                              NSIC-PROG0159
77  SKIP-FLG PICTURE S9(4) COMPUTATIONAL VALUE 1 SYNC.           NSIC-PROG0160
77  HUNDRD-FLG PICTURE S9(4) COMPUTATIONAL VALUE 0 SYNC.         NSIC-PROG0161
77  FOUND-CNT   PIC S9(4) COMP SYNC VALUE +0.                    NSIC-PROG0162
77  C99-COUNT PIC 9(8) VALUE 0 SYNC.                             NSIC-PROG0163
01  PART-1-CDE SYNC.                                             NSIC-PROG0164
    02 FILLER PICTURE X(60) VALUE ' '.                          NSIC-PROG0165
    02 PART-CDE PICTURE X(16) VALUE 'PART I - SITING '.         NSIC-PROG0166
    02 FILLER PICTURE X(56) VALUE ' '.                          NSIC-PROG0167
01  TITL-KORE SYNC.                                              NSIC-PROG0168
    02 TITL-CTG      PICTURE Z9.                                NSIC-PROG0169
    02  TITL-DASH PIC X(3) VALUE ' - '.                        NSIC-PROG0170
    02  TITL-BCH  PIC 9(6).                                    NSIC-PROG0171
    02  FILLER  PIC X.                                         NSIC-PROG0172
    02 TITL-YK-CT    PICTURE S9(4) COMPUTATIONAL.               NSIC-PROG0173
    02 TITL-YAK      PICTURE X OCCURS 360.                      NSIC-PROG0174
01  KEYWORD-NUMBER-ON-MASTER SYNC.                               NSIC-PROG0175
    02  KNCM PICTURE X OCCURS 4.                               NSIC-PROG0176
01  KNCM-COMP REDEFINES KEYWORD-NUMBER-ON-MASTER                 NSIC-PROG0177
      PICTURE S9(8) COMPUTATIONAL SYNC.                         NSIC-PROG0178
01  KEYWORDS-TABLE SYNC.                                         NSIC-PROG0179
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    02  KT OCCURS 3500 PICTURE X(48).                                  NSIC-PROG0180
01  PAGE-COUNT PICTURE 9(5) VALUE 01 SYNC.                             NSIC-PROG0181
01  PAGE-NUMEER SYNC.                                                  NSIC-PROG0182
    02  FILLER PICTURE X(110) VALUE '1'.                               NSIC-PROG0183
    02  FILLER PICTURE X(5) VALUE 'PAGE '.                             NSIC-PROG0184
    02  PN PICTURE Z(4)9.                                              NSIC-PROG0185
01  PAGE-NUMEER-EVEN SYNC.                                             NSIC-PROG0186
    02  FILLER PICTURE X(10) VALUE '1'.                                NSIC-PROG0187
    02  FILLER PICTURE X(5) VALUE 'PAGE '.                             NSIC-PROG0188
    02  PNE PICTURE Z(4)9.                                             NSIC-PROG0189
01  CATEGORY-HEAD SYNC.                                                NSIC-PROG0190
    02  FILLER PICTURE X(60) VALUE '0'.                                NSIC-PROG0191
    02  FILLER PICTURE X(9) VALUE 'CATEGORY'.                          NSIC-PROG0192
    02  CATEGORY-NUMBER PICTURE Z9.                                    NSIC-PROG0193
01  MAST-REC SYNC.                                                     NSIC-PROG0194
    02 HDRDTA.                                                         NSIC-PROG0195
       03 REC-ID.                                                      NSIC-PROG0196
          04 RECID PIC X.                                              NSIC-PROG0197
          04 EVALU PIC X.                                              NSIC-PROG0198
       03 TOTL-CHAR  PICTURE S9(4) COMPUTATIONAL.                      NSIC-PROG0199
       03 ACC-NO     PICTURE S9(6) COMPUTATIONAL.                      NSIC-PROG0200
       03 SIGDAT     PICTURE S9(6) COMPUTATIONAL.                      NSIC-PROG0201
       03 C-ATHR     PICTURE X(9).                                     NSIC-PROG0202
       03 TYP        PICTURE X(3).                                     NSIC-PROG0203
       03 LANG       PICTURE X.                                        NSIC-PROG0204
       03 CUNTRY     PICTURE X.                                        NSIC-PROG0205
       03 CTEGORY.                                                     NSIC-PROG0206
          04 CTG     PICTURE 99 OCCURS 6.                              NSIC-PROG0207
       03 SUBNO      PICTURE 9(6).                                     NSIC-PROG0208
       03 J-ABRV     PICTURE X(4).                                     NSIC-PROG0209
       03 EDITN      PICTURE S9(4) COMPUTATIONAL.                      NSIC-PROG0210
       03 SELNUM-CNT PICTURE S9(4) COMPUTATIONAL.                      NSIC-PROG0211
       03 AUTH-CHAR  PICTURE S9(4) COMPUTATIONAL.                      NSIC-PROG0212
       03 TITLE-CHAR PICTURE S9(4) COMPUTATIONAL.                      NSIC-PROG0213
       03 CAUTH-CHAR PICTURE S9(4) COMPUTATIONAL.                      NSIC-PROG0214
       03 MEMO-CHAR  PICTURE S9(4) COMPUTATIONAL.                      NSIC-PROG0215
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           03 ABS-CHAR   PICTURE S9(4) COMPUTATIONAL.                    NSIC-PROG0216
           03 AVL-CHAR PICTURE S9(4) COMPUTATIONAL.                      NSIC-PROG0217
           03 ABS-FMAT   PICTURE S9 COMPUTATIONAL-3.                     NSIC-PROG0218
           03 BIB-FLG    PICTURE S9 COMPUTATIONAL-3.                     NSIC-PROG0219
           03 DOC-FLG    PICTURE S9 COMPUTATIONAL-3.                     NSIC-PROG0220
           03 OPN-FLG    PICTURE S9 COMPUTATIONAL-3.                     NSIC-PROG0221
           03 PROP-FLG   PICTURE S99 COMPUTATIONAL.                      NSIC-PROG0222
           03 NEW-MASK   PICTURE X(10).                                  NSIC-PROG0223
        02 MAST-AREA     PICTURE X(1890).                                NSIC-PROG0224
        02 FOR-ABS REDEFINES MAST-AREA.                                  NSIC-PROG0225
           03 MA  PICTURE  X OCCURS 1890.                                NSIC-PROG0226
        02 KWDS-YAK REDEFINES MAST-AREA.                                 NSIC-PROG0227
          03 KWD-NTRY PICTURE S9(4) COMPUTATIONAL OCCURS 48 TIMES.       NSIC-PROG0228
01   MASTR-KWD REDEFINES MAST-REC SYNC.                                  NSIC-PROG0229
        02 KWD-ID     PICTURE X.                                         NSIC-PROG0230
        02 FILLER     PICTURE X.                                         NSIC-PROG0231
        02 SEL-VRB    PICTURE S9(4) COMPUTATIONAL.                       NSIC-PROG0232
        02 SEL-NO     PICTURE S9(4) COMPUTATIONAL.                       NSIC-PROG0233
        02 TRM        PICTURE X(48).                                     NSIC-PROG0234
01   BOTTOM-INFO SYNC.                                                   NSIC-PROG0235
        02  FILLER PICTURE X(57) VALUE    '-                            NSIC-PROG0236
            '              ACCESSION NUMBER '.                           NSIC-PROG0237
        02  BI-CATG PICTURE Z9.                                         NSIC-PROG0238
        02  FILLER VALUE '-' PICTURE X.                                 NSIC-PROG0239
        02  BI-ACC PICTURE 9(6).                                        NSIC-PROG0240
        02  FILLER VALUE ' TO ' PICTURE X(4).                           NSIC-PROG0241
        02  BI-CATG2 PICTURE Z9.                                        NSIC-PROG0242
        02  FILLER VALUE '-' PICTURE X.                                 NSIC-PROG0243
        02  BI-ACC2 PICTURE 9(6).                                       NSIC-PROG0244
01   HEADER-INFO PICTURE X(3325) VALUE SPACES SYNC.                      NSIC-PROG0245
01   FILLER REDEFINES HEADER-INFO SYNC.                                  NSIC-PROG0246
        02  HI OCCURS 25.                                               NSIC-PROG0247
            03  HI-BYTE PICTURE X OCCURS 133.                           NSIC-PROG0248
01   ABOVE-CATEGORY PICTURE 99 SYNC.                                     NSIC-PROG0249
01   ABOVE-ACCESSION PICTURE 9(6) SYNC.                                  NSIC-PROG0250
01   PULL-YR  PICTURE 9(6) SYNC.                                         NSIC-PROG0251
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01  PULL-YRA REDEFINES PULL-YR SYNC.                          NSIC-PROG0252
    02 GCT-YR    PICTURE 9(2).                                NSIC-PROG0253
    02 FIRST-DT  PICTURE 9(4).                                NSIC-PROG0254
01  PULL-YRR REDEFINES PULL-YR SYNC.                          NSIC-PROG0255
    02 FILLER PICTURE X(2).                                   NSIC-PROG0256
    02 GCT-MONTH PICTURE 9(2).                                NSIC-PROG0257
    02 GCT-DAY PICTURE 9(2).                                  NSIC-PROG0258
01  PULL-DATE SYNC.                                          NSIC-PROG0259
    02  PD-MODY PIC 9(4).                                    NSIC-PROG0260
    02  PD-YR PIC 9(2).                                      NSIC-PROG0261
01  BIB-CAT-HEAD SYNC.                                       NSIC-PROG0262
    02  FILLER PICTURE X(9) VALUE '-'.                       NSIC-PROG0263
    02  BCH.                                                 NSIC-PROG0264
        03  BC-CTG PICTURE Z9.                               NSIC-PROG0265
        03  BC-DASH PICTURE X.                               NSIC-PROG0266
        03  EC-ACC PICTURE 9(6).                             NSIC-PROG0267
        03  EC-MESSAGE PICTURE X(24).                        NSIC-PROG0268
        03 BC-LRL-DATE.                                      NSIC-PROG0269
         04  FILLER  PIC X(20).                              NSIC-PROG0270
         04  FILL-DATE  PICTURE X(16).                       NSIC-PROG0271
         04  FILLER PICTURE X(2).                            NSIC-PROG0272
         04  FILL-MONTH  PICTURE 9(2).                       NSIC-PROG0273
         04  FILLER  PICTURE X VALUE '/'.                    NSIC-PROG0274
         04  FILL-DAY PICTURE 9(2).                          NSIC-PROG0275
         04  FILLER  PICTURE X VALUE '/'.                    NSIC-PROG0276
         04  FILL-YR  PICTURE 9(2).                          NSIC-PROG0277
         04  FILLER  PIC  X(37).                             NSIC-PROG0278
        03 BC-CAT-NAM REDEFINES BC-LRL-DATE.                 NSIC-PROG0279
           04 BCN PICTURE X OCCURS 83.                       NSIC-PROG0280
01  CTRED SYNC.                                              NSIC-PROG0281
        02  CTR1 PICTURE 9.                                  NSIC-PROG0282
        02  CTR2 PICTURE 9.                                  NSIC-PROG0283
01  SAVE-CTG REDEFINES CTRED PICTURE 99 SYNC.                 NSIC-PROG0284
01  SAVE-EC-REC SYNC.                                        NSIC-PROG0285
    02  SER-CC PICTURE X.                                    NSIC-PROG0286
    02  FILLER PICTURE X(132).                               NSIC-PROG0287
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01   KEYWORD-NINE PICTURE 9(4).                                          NSIC-PROG0288
01   KEYWORD-FULL SYNC.                                                  NSIC-PROG0289
     02  KP PICTURE X OCCURS 1000.                                       NSIC-PROG0290
01   PROP-SPELL VALUE 'LIMITED DISTRIBUTION' PIC X(20) SYNC.             NSIC-PROG0291
01   FILLER REDEFINES PROP-SPELL SYNC.                                   NSIC-PROG0292
     02  PPRTR PIC X OCCURS 20.                                          NSIC-PROG0293
01   CHECK-LAST-CATEGORY PICTURE X(5) SYNC.                              NSIC-PROG0294
01   SP-ACC PICTURE 9(7) SYNC.                                           NSIC-PROG0295
PROCEDURE DIVISION.                                                      NSIC-PROG0296
          OPEN INPUT CARDFILE                                            NSIC-PROG0297
          MOVE 1 TO CF-OPEN.                                             NSIC-PROG0298
     NOTE                                                                NSIC-PROG0299
     READ CARDFILE END  DISPLAY 'NO EDITION GIVEN'                       NSIC-PROG0300
          GO TO CLOSE-OPEN-FILES.                                        NSIC-PROG0301
     OPEN INPUT MASTERFILE.                                              NSIC-PROG0302
     MOVE 1 TO MF-OPEN.                                                  NSIC-PROG0303
     MOVE 0 TO C.                                                        NSIC-PROG0304
FILL-SPACES.                                                             NSIC-PROG0305
     ADD 1 TO C.                                                         NSIC-PROG0306
     IF C > 3500 MOVE 0 TO C GO TO RD-HD1.                               NSIC-PROG0307
     MOVE ' ' TO KT (C).                                                 NSIC-PROG0308
     GO TO FILL-SPACES.                                                  NSIC-PROG0309
RD-HD1.                                                                  NSIC-PROG0310
     READ MASTERFILE INTO MAST-REC AT END GO TO CLOSE-OPEN-FILES.        NSIC-PROG0311
     IF RECID NOT = '2'  GO TO RD-HD1.                                   NSIC-PROG0312
     MOVE SPACES TO KEYWORDS-TABLE PERFORM FILL-TABLE.                   NSIC-PROG0313
RD-SELS.                                                                 NSIC-PROG0314
     READ MASTERFILE INTO MAST-REC AT END GO TO CLOSE-OPEN-FILES.        NSIC-PROG0315
     IF RECID NOT = '2'   GO TO ALL-SELS.                                NSIC-PROG0316
     ADD 1 TO C.                                                         NSIC-PROG0317
     ADD 1 TO SEL-NO.                                                    NSIC-PROG0318
     MOVE TRM TO KT(SEL-NO).                                             NSIC-PROG0319
     GO TO RD-SELS.                                                      NSIC-PROG0320
FILL-TABLE.                                                              NSIC-PROG0321
     ADD 1 TO C.                                                         NSIC-PROG0322
     IF C > 3500 DISPLAY 'TOO MANY KEYWORDS  ' C                         NSIC-PROG0323
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    GO TC CLOSE-OPEN-FILES.                                              NSIC-PROG0324
    IF SEL-NO < 0 OR > 3499 DISPLAY 'KEYWORD ON MASTER OUT OF            NSIC-PROG0325
    'RANGE ' SEL-NO GO TC FT.                                            NSIC-PROG0326
    ADD 1 TO SEL-NO.                                                     NSIC-PROG0327
    MOVE TRM TO KT (SEL-NO).                                             NSIC-PROG0328
FT. EXIT.                                                                NSIC-PROG0329
ALL-SELS.                                                                NSIC-PROG0330
    DISPLAY 'TABLE MEMBERS = ' C.                                        NSIC-PROG0331
    OPEN OUTPUT CATEGORYKEYWORDFILE.                                     NSIC-PROG0332
    MOVE 1 TO CKF-OPEN.                                                  NSIC-PROG0333
    OPEN OUTPUT AUTHORKEYWORDFILE.                                       NSIC-PROG0334
    MOVE 1 TO AKF-OPEN.                                                  NSIC-PROG0335
    GC TO START-TESTING.                                                 NSIC-PROG0336
RD-MAST.                                                                 NSIC-PROG0337
    READ MASTERFILE INTO MAST-REC                                        NSIC-PROG0338
         END GC TO END-CREATE.                                           NSIC-PROG0339
    MOVE 0 TO FOUND-CNT.                                                 NSIC-PROG0340
START-TESTING.                                                           NSIC-PROG0341
    COMPUTE TOTL-CHAR = TOTL-CHAR - 76.                                  NSIC-PROG0342
    IF TOTL-CHAR = 0 DISPLAY ACC-NO ' RECORD HAS TOTAL CHARACTER         NSIC-PROG0343
         'COUNT OF ZERC' GO TO RD-MAST.                                  NSIC-PROG0344
    MOVE TOTL-CHAR TO MR-COUNT.                                          NSIC-PROG0345
    ADD 1 TC DOUBLE-RECORDS.                                             NSIC-PROG0346
    IF PROP-FLG NOT = 0 GO TO RD-MAST.                                   NSIC-PROG0347
    MOVE 1 TO C.                                                         NSIC-PROG0348
NEW-KEYWORD-CHECK.                                                       NSIC-PROG0349
    IF C > SELNUM-CNT GC TO CSK2.                                        NSIC-PROG0350
    IF KWD-NTRY (C) NOT < 0 AND NOT = 9999                               NSIC-PROG0351
    MOVE KWD-NTRY (C) TO KEYWORD-NINE.                                   NSIC-PROG0352
    IF KWD-NTRY (C) < 0 COMPUTE KEYWORD-NINE = KWD-NTRY (C) * -1.        NSIC-PROG0353
    IF KWD-NTRY (C) = 9999 MOVE 0 TO KEYWORD-NINE.                       NSIC-PROG0354
CHECK-SPECIAL-KEYWORDS.                                                  NSIC-PROG0355
    IF KEYWORD-NINE = 0235 OR 1515 OR 0631 OR 1095 OR 0654               NSIC-PROG0356
    MOVE 1 TO FOUND-CNT GO TO CSK1.                                      NSIC-PROG0357
    IF KEYWORD-NINE = 0022 MOVE 01 TO REC-ID GO TO CSK1.                 NSIC-PROG0358
    IF KEYWORD-NINE = 2021 MOVE 02 TO REC-ID GO TO CSK1.                 NSIC-PROG0359
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IF KEYWORD-NINE = 1517 MOVE 03 TO REC-ID GO TO CSK1.          NSIC-PROG0360
IF KEYWORD-NINE = 1764 MOVE 04 TO REC-ID GO TO CSK1.          NSIC-PROG0361
IF KEYWORD-NINE = 1758 MOVE 05 TO REC-ID GO TO CSK1.          NSIC-PROG0362
IF KEYWORD-NINE = 1772 MOVE 06 TO REC-ID GO TO CSK1.          NSIC-PROG0363
IF KEYWORD-NINE = 1723 MOVE 07 TO REC-ID GO TO CSK1.          NSIC-PROG0364
IF KEYWORD-NINE = 0109 MOVE 08 TO REC-ID GO TO CSK1.          NSIC-PROG0365
IF KEYWORD-NINE = 0860 MOVE 09 TO REC-ID GO TO CSK1.          NSIC-PROG0366
IF KEYWORD-NINE = 0515 MOVE 10 TO REC-ID GO TO CSK1.          NSIC-PROG0367
IF KEYWORD-NINE = 1770 MOVE 11 TO REC-ID GO TO CSK1.          NSIC-PROG0368
IF KEYWORD-NINE = 0389 MOVE 12 TO REC-ID GO TO CSK1.          NSIC-PROG0369
IF KEYWORD-NINE = 1734 MOVE 13 TO REC-ID GO TO CSK1.          NSIC-PROG0370
IF KEYWORD-NINE = 0192 MOVE 14 TO REC-ID GO TO CSK1.          NSIC-PROG0371
IF KEYWORD-NINE = 1163 MOVE 15 TO REC-ID GO TO CSK1.          NSIC-PROG0372
IF KEYWORD-NINE = 1861 MOVE 16 TO REC-ID GO TO CSK1.          NSIC-PROG0373
IF KEYWORD-NINE = 1339 MOVE 17 TO REC-ID GO TO CSK1.          NSIC-PROG0374
IF KEYWORD-NINE = 0266 MOVE 18 TO REC-ID GO TO CSK1.          NSIC-PROG0375
IF KEYWORD-NINE = 0283 MOVE 19 TO REC-ID GO TO CSK1.          NSIC-PROG0376
IF KEYWORD-NINE = 1551 MOVE 20 TO REC-ID GO TO CSK1.          NSIC-PROG0377
IF KEYWORD-NINE = 2016 MOVE 21 TO REC-ID GO TO CSK1.          NSIC-PROG0378
IF KEYWORD-NINE = 1419 MOVE 22 TO REC-ID GO TO CSK1.          NSIC-PROG0379
IF KEYWORD-NINE = 1344 MOVE 23 TO REC-ID GO TO CSK1.          NSIC-PROG0380
IF KEYWORD-NINE = 1797 MOVE 24 TO REC-ID GO TO CSK1.          NSIC-PROG0381
IF KEYWORD-NINE = 1352 MOVE 25 TO REC-ID GO TO CSK1.          NSIC-PROG0382
IF KEYWORD-NINE = 1675 MOVE 26 TO REC-ID GO TO CSK1.          NSIC-PROG0383
IF KEYWORD-NINE = 1787 MOVE 27 TO REC-ID GO TO CSK1.          NSIC-PROG0384
IF KEYWORD-NINE = 1729 MOVE 28 TO REC-ID GO TO CSK1.          NSIC-PROG0385
IF KEYWORD-NINE = 1773 MOVE 29 TO REC-ID GO TO CSK1.          NSIC-PROG0386
IF KEYWORD-NINE = 1662 MOVE 30 TO REC-ID GO TO CSK1.          NSIC-PROG0387
IF KEYWORD-NINE = 1561 MOVE 31 TO REC-ID GO TO CSK1.          NSIC-PROG0388
IF KEYWORD-NINE = 1412 MOVE 32 TO REC-ID GO TO CSK1.          NSIC-PROG0389
IF KEYWORD-NINE = 1942 MOVE 33 TO REC-ID GO TO CSK1.          NSIC-PROG0390
IF KEYWORD-NINE = 1333 MOVE 34 TO REC-ID GO TO CSK1.          NSIC-PROG0391
IF KEYWORD-NINE = 1851 MOVE 35 TO REC-ID GO TO CSK1.          NSIC-PROG0392
IF KEYWORD-NINE = 0493 MOVE 36 TO REC-ID GO TO CSK1.          NSIC-PROG0393
IF KEYWORD-NINE = 0201 MOVE 37 TO REC-ID GO TO CSK1.          NSIC-PROG0394
IF KEYWORD-NINE = 1255 MOVE 38 TO REC-ID GO TO CSK1.          NSIC-PROG0395
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    IF KEYWORD-NINE = 1639 MOVE 39 TO REC-ID GO TO CSK1.          NSIC-PROG0396
    IF KEYWORD-NINE = 1728 MOVE 40 TO REC-ID GO TO CSK1.          NSIC-PROG0397
    IF KEYWORD-NINE = 1737 MOVE 41 TO REC-ID GO TO CSK1.          NSIC-PROG0398
    IF KEYWORD-NINE = 1842 MOVE 42 TO REC-ID GO TO CSK1.          NSIC-PROG0399
    IF KEYWORD-NINE = 1855 MOVE 43 TO REC-ID GO TO CSK1.          NSIC-PROG0400
    IF KEYWORD-NINE = 3021 MOVE 44 TO REC-ID GO TO CSK1.          NSIC-PROG0401
    IF KEYWORD-NINE = 3012 MOVE 45 TO REC-ID GO TO CSK1.          NSIC-PROG0402
    IF KEYWORD-NINE = 1341 MOVE 46 TO REC-ID GO TO CSK1.          NSIC-PROG0403
    IF KEYWORD-NINE = 1343 MOVE 47 TO REC-ID GO TO CSK1.          NSIC-PROG0404
    IF KEYWORD-NINE = 3000 MOVE 48 TO REC-ID GO TO CSK1.          NSIC-PROG0405
    IF KEYWORD-NINE = 1618 MOVE 49 TO REC-ID GO TO CSK1.          NSIC-PROG0406
    IF KEYWORD-NINE = 1775 MOVE 50 TO REC-ID GO TO CSK1.          NSIC-PROG0407
    IF KEYWORD-NINE = 1674 MOVE 51 TO REC-ID GO TO CSK1.          NSIC-PROG0408
    IF KEYWORD-NINE = 1347 MOVE 52 TO REC-ID GO TO CSK1.          NSIC-PROG0409
    IF KEYWORD-NINE = 1676 MOVE 53 TO REC-ID GO TO CSK1.          NSIC-PROG0410
    IF KEYWORD-NINE = 0569 MOVE 54 TO REC-ID GO TO CSK1.          NSIC-PROG0411
    IF KEYWORD-NINE = 2581 MOVE 55 TO REC-ID GO TO CSK1.          NSIC-PROG0412
    IF KEYWORD-NINE = 1562 MOVE 56 TO REC-ID GO TO CSK1.          NSIC-PROG0413
    IF KEYWORD-NINE = 1800 MOVE 57 TO REC-ID GO TO CSK1.          NSIC-PROG0414
    IF KEYWORD-NINE = 1631 MOVE 58 TO REC-ID GO TO CSK1.          NSIC-PROG0415
    IF KEYWORD-NINE = 1874 MOVE 59 TO REC-ID GO TO CSK1.          NSIC-PROG0416
    IF KEYWORD-NINE = 1350 MOVE 60 TO REC-ID GO TO CSK1.          NSIC-PROG0417
    IF KEYWORD-NINE = 1804 MOVE 61 TO REC-ID GO TO CSK1.          NSIC-PROG0418
    IF KEYWORD-NINE = 0451 MOVE 62 TO REC-ID GO TO CSK1.          NSIC-PROG0419
    IF KEYWORD-NINE = 1692 MOVE 63 TO REC-ID GO TO CSK1.          NSIC-PROG0420
    IF KEYWORD-NINE = 1778 MOVE 64 TO REC-ID GO TO CSK1.          NSIC-PROG0421
    IF KEYWORD-NINE = 1334 MOVE 65 TO REC-ID GO TO CSK1.          NSIC-PROG0422
    MOVE 00 TO REC-ID.                                            NSIC-PROG0423
CSK1.                                                             NSIC-PROG0424
    ADD 1 TO C GO TO NEW-KEYWORD-CHECK.                           NSIC-PROG0425
CSK2.                                                             NSIC-PROG0426
    IF REC-ID = '00' GO TO RD-MAST.                               NSIC-PROG0427
    IF FOUND-CNT > 0 GO TO CHECK-CATS.                            NSIC-PROG0428
    GO TO RD-MAST.                                                NSIC-PROG0429
CHECK-CATS.                                                       NSIC-PROG0430
  IF YOU WANT TO CHECK FOR A PARTICULAR CATEGORY DO IT AT THIS PO NSIC-PROG0431
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    WHEN COMPARING ON CATEGORY YOU MUST CHECK ALL CATEGORIES, I.E NSIC-PROG0432
          IF CTG (1) NOT EQUAL 19 MOVE 0 TO CTG (1)... ETC.      NSIC-PROG0433
     IF YOU DO NOT WANT TO CHECK ON KEYWORDS JUST BRANCH TO      NSIC-PROG0434
     CHECK-ACCEPT AT THIS POINT.                                 NSIC-PROG0435
    COMPUTE A = 0.                                               NSIC-PROG0436
TST-CATS.            COMPUTE A = A + 1.                          NSIC-PROG0437
    IF A > 6 GO TO CHECK-ACCEPT.                                 NSIC-PROG0438
    IF CTG (A) NOT = 17                                          NSIC-PROG0439
      MOVE 0 TO CTG (A).                                         NSIC-PROG0440
    GO TO TST-CATS.                                              NSIC-PROG0441
CHECK-ACCEPT.                                                    NSIC-PROG0442
    ADD 1 TO LER-COUNT.                                          NSIC-PROG0443
SC1.                                                             NSIC-PROG0444
    MOVE 6 TO C.                                                 NSIC-PROG0445
SORT-CATEGORIES.                                                 NSIC-PROG0446
    MOVE 2 TO B.                                                 NSIC-PROG0447
    CALL 'SORTREAC' USING CTG (1) B C.                           NSIC-PROG0448
    NOTE SORTREAC SORTS THE CATEGORY LIST.                       NSIC-PROG0449
    NOTE B IS LENGTH OF MEMBERS, C IS NUMBER OF MEMBERS.         NSIC-PROG0450
SCEND.                                                           NSIC-PROG0451
    MOVE 7 TO A.                                                 NSIC-PROG0452
    MOVE 1 TO F.                                                 NSIC-PROG0453
NEXT-CATEGORY.                                                   NSIC-PROG0454
    SUBTRACT 1 FROM A.                                           NSIC-PROG0455
    IF A NOT > 0 GO TO RD-MAST.                                  NSIC-PROG0456
    IF CTG (A) = 00 GO TO RD-MAST.                               NSIC-PROG0457
    IF CTG (A) > 25 OR < 00 DISPLAY 'CATEGORY BAD ' ACC-NO ' '   NSIC-PROG0458
         CTG (A) GO TO NEXT-CATEGORY.                            NSIC-PROG0459
    MOVE CTG (6) TO SAVE-CTG.                                    NSIC-PROG0460
    MOVE CTG (A) TO CTG (6).                                     NSIC-PROG0461
    MOVE SAVE-CTG TO CTG (A).                                    NSIC-PROG0462
    IF F = 1 PERFORM EVEN-COUNT                                  NSIC-PROG0463
         MOVE TOTL-CHAR TO CK-TOT-CHAR                           NSIC-PROG0464
         WRITE CKREC FROM MAST-REC                               NSIC-PROG0465
         MOVE 0 TO F ADD 1 TO CKREC-COUNT.                       NSIC-PROG0466
    COMPUTE B = SELNUM-CNT * 2 + 1.                              NSIC-PROG0467
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    COMPUTE C = B + AUTH-CHAR.                                          NSIC-PROG0468
NEXT-AUTH-CHAR.                                                         NSIC-PROG0469
    IF B NOT < C GO TO NEXT-CATEGORY.                                   NSIC-PROG0470
    IF MA (B) < 'A' ADD 1 TO B GO TO NEXT-AUTH-CHAR.                    NSIC-PROG0471
    MOVE SPACES TO AK-INFO.                                             NSIC-PROG0472
    MOVE 1 TO D.                                                        NSIC-PROG0473
MOVE-AUTH-CHAR.                                                         NSIC-PROG0474
    IF D NOT > 48                                                       NSIC-PROG0475
        MOVE MA (B) TO AKI (D).                                         NSIC-PROG0476
    ADD 1 TO B.                                                         NSIC-PROG0477
    IF MA (B) = '+' GO TO WRITE-AUTHOR.                                 NSIC-PROG0478
    IF B NOT < C GO TO WRITE-AUTHOR.                                    NSIC-PROG0479
    ADD 1 TO D.                                                         NSIC-PROG0480
    GO TO MOVE-AUTH-CHAR.                                               NSIC-PROG0481
WRITE-AUTHOR.                                                           NSIC-PROG0482
    MOVE CTG (6) TO AK-CATG.                                            NSIC-PROG0483
    MOVE 1 TO AK-FLAG.                                                  NSIC-PROG0484
    MOVE ACC-NO TO AK-ACC.                                              NSIC-PROG0485
    WRITE AUTHOR-KEYWORD-RECORD.                                        NSIC-PROG0486
    ADD 1 TO AKREC-COUNT.                                               NSIC-PROG0487
    GO TO NEXT-AUTH-CHAR.                                               NSIC-PROG0488
EVEN-COUNT.                                                             NSIC-PROG0489
    COMPUTE B = TOTL-CHAR / 2.                                          NSIC-PROG0490
    COMPUTE C = B * 2.                                                  NSIC-PROG0491
    IF TOTL-CHAR NOT = C ADD 1 TO TOTL-CHAR.                            NSIC-PROG0492
CREATE-ALL-CATEGORIES SECTION.                                          NSIC-PROG0493
    OPEN INPUT CATEGORYKEYWORDFILE.                                     NSIC-PROG0494
    MOVE 1 TO CKF-OPEN.                                                 NSIC-PROG0495
CAC-READ-CK.                                                            NSIC-PROG0496
    READ CATEGORYKEYWORDFILE INTO MAST-REC END GO TO CAC-END.           NSIC-PROG0497
    MOVE 7 TO A.                                                        NSIC-PROG0498
CAC-NEXT-CAT.                                                           NSIC-PROG0499
    SUBTRACT 1 FROM A.                                                  NSIC-PROG0500
    IF A NOT > 0 GO TO CAC-READ-CK.                                     NSIC-PROG0501
    IF CTG (A) = 00 GO TO CAC-READ-CK.                                  NSIC-PROG0502
    MOVE CTG (6) TO SAVE-CTG.                                           NSIC-PROG0503
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    MOVE CTG (A) TO CTG (6).                                    NSIC-PROG0504
    MOVE SAVE-CTG TO CTG (A).                                   NSIC-PROG0505
    MOVE TOTL-CHAR TO TOT-CHAR-SD.                              NSIC-PROG0506
    MOVE MAST-REC TO SD-CK-REC.                                 NSIC-PROG0507
    RELEASE SD-CK-REC.                                          NSIC-PROG0508
    ADD 1 TO NCREC-COUNT.                                       NSIC-PROG0509
    GO TO CAC-NEXT-CAT.                                         NSIC-PROG0510
CAC-END.                                                        NSIC-PROG0511
    DISPLAY ' NCREC-COUNT=' NCREC-COUNT.                        NSIC-PROG0512
    CLOSE CATEGORYKEYWORDFILE.                                  NSIC-PROG0513
    MOVE 0 TO CKF-OPEN.                                         NSIC-PROG0514
CACE.  EXIT.                                                    NSIC-PROG0515
END-CREATE SECTION.                                             NSIC-PROG0516
    IF LER-COUNT = 0 GO TO CLOSE-OPEN-FILES.                    NSIC-PROG0517
    CLOSE CATEGORYKEYWORDFILE.                                  NSIC-PROG0518
    MOVE 0 TO CKF-OPEN.                                         NSIC-PROG0519
    CLOSE MASTERFILE.                                           NSIC-PROG0520
    MOVE 0 TO MF-OPEN.                                          NSIC-PROG0521
    OPEN OUTPUT PAGESTORE.                                      NSIC-PROG0522
    MOVE 1 TO PS-OPEN.                                          NSIC-PROG0523
    DISPLAY DOUBLE-RECORDS ' DOUBLE RECORDS ON MASTER'.         NSIC-PROG0524
    DISPLAY TET-CT ' RECORDS WITH 1282 KEYWORD'.                NSIC-PROG0525
    DISPLAY 'CKREC-COUNT = ' CKREC-COUNT.                       NSIC-PROG0526
    DISPLAY ' AUTHORS=' AKREC-COUNT.                            NSIC-PROG0527
    MOVE AKREC-COUNT TO NUMBER-AUTHORS.                         NSIC-PROG0528
    MOVE 1 TO A.                                                NSIC-PROG0529
BLANK-PAGE-NUMBERS.                                             NSIC-PROG0530
    MOVE -1 TO CATEGORY-SAVE (A).                               NSIC-PROG0531
    MOVE 0 TO CS (A).                                           NSIC-PROG0532
    ADD 1 TO A.                                                 NSIC-PROG0533
BEN.                                                            NSIC-PROG0534
    PERFORM BLANK-PAGE-NUMBERS 25 TIMES.                        NSIC-PROG0535
    SORT SD-CK  ASCENDING CTG-SD ID-SD SIGDAT-SD                NSIC-PROG0536
         INPUT PROCEDURE CREATE-ALL-CATEGORIES GIVING NEWCK.    NSIC-PROG0537
    MOVE 1 TO A.                                                NSIC-PROG0538
GET-NEW-CATEGORY-HEAD.                                          NSIC-PROG0539
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    READ CARDFILE END                                                    NSIC-PROG0540
         DISPLAY 'CATEGORY DESCRIPTIONS NOT COMPLETE'                    NSIC-PROG0541
         GO TO CLOSE-OPEN-FILES.                                         NSIC-PROG0542
    MOVE CARD-RECORD TO CHECK-LAST-CATEGORY.                             NSIC-PROG0543
    IF CHECK-LAST-CATEGORY = 'ALLCT' GO TO ALL-CATEGORY-HEADS.           NSIC-PROG0544
    MOVE CARD-RECORD TO HI (A).                                          NSIC-PROG0545
    MOVE 1 TO B.                                                         NSIC-PROG0546
NEXT-BYTE-CATEGORY.                                                      NSIC-PROG0547
    IF HI-BYTE (A, B) NOT = '.' AND B < 80                               NSIC-PROG0548
         ADD 1 TO B                                                      NSIC-PROG0549
         GO TO NEXT-BYTE-CATEGORY.                                       NSIC-PROG0550
    MOVE SPACE TO HI-BYTE (A, B).                                        NSIC-PROG0551
    SUBTRACT 1 FROM B.                                                   NSIC-PROG0552
    COMPUTE C = B / 2.                                                   NSIC-PROG0553
    COMPUTE D = 66 + C.                                                  NSIC-PROG0554
MOVE-BYTE-TO-CENTER.                                                     NSIC-PROG0555
    MOVE HI-BYTE (A, B) TO HI-BYTE (A, D).                               NSIC-PROG0556
    MOVE SPACE TO HI-BYTE (A, B).                                        NSIC-PROG0557
    SUBTRACT 1 FROM B.                                                   NSIC-PROG0558
    SUBTRACT 1 FROM D.                                                   NSIC-PROG0559
MBTC.                                                                    NSIC-PROG0560
    PERFORM MOVE-BYTE-TO-CENTER UNTIL B < 1.                             NSIC-PROG0561
    ADD 1 TO A.                                                          NSIC-PROG0562
    GO TO GET-NEW-CATEGORY-HEAD.                                         NSIC-PROG0563
ALL-CATEGORY-HEADS.                                                      NSIC-PROG0564
    OPEN INPUT NEWCK.                                                    NSIC-PROG0565
    MOVE 1 TO NC-OPEN.                                                   NSIC-PROG0566
    OPEN OUTPUT TITLFL.                                                  NSIC-PROG0567
    IF EC-OPEN = 0                                                       NSIC-PROG0568
    OPEN OUTPUT EDITEDCATEGORY.                                          NSIC-PROG0569
    MOVE 1 TO EC-OPEN.                                                   NSIC-PROG0570
    OPEN OUTPUT PRINTFILE.                                               NSIC-PROG0571
    MOVE 1 TO PR-OPEN.                                                   NSIC-PROG0572
    MOVE 00 TO CTG (6).                                                  NSIC-PROG0573
    MOVE 0 TO ACC-NO.                                                    NSIC-PROG0574
READ-NEW-CK.                                                             NSIC-PROG0575
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     MOVE CTG (6) TO ABOVE-CATEGORY.                                    NSIC-PR00576
     MOVE ACC-NO TO ABOVE-ACCESSION.                                    NSIC-PR00577
     READ NEWCK INTO MAST-REC END GO TO END-BIBLIO.                     NSIC-PR00578
     IF TOTL-CHAR > 1966                                                NSIC-PR00579
          DISPLAY TOTL-CHAR ' TOTL-CHAR HIGH ' ACC-NO.                  NSIC-PR00580
     MOVE 5 TO C.                                                       NSIC-PR00581
     PERFORM SORT-CATEGORIES.                                           NSIC-PR00582
     MOVE CTG (6) TO PRESENT-CATEGORY.                                  NSIC-PR00583
     MOVE SPACES TO BCH.                                                NSIC-PR00584
     MOVE CTG (6) TO BC-CTG.                                            NSIC-PR00585
     MOVE '-' TO BC-DASH.                                               NSIC-PR00586
     MOVE ACC-NO TO BC-ACC.                                             NSIC-PR00587
     MOVE ACC-NO TO TITL-BCH.                                           NSIC-PR00588
     MOVE CTG (6) TO TITL-CTG.                                          NSIC-PR00589
     IF CTG (5) = 00 GO TO LAST-CAT.                                    NSIC-PR00590
     MOVE 1 TO B.                                                       NSIC-PR00591
     MOVE '          ALSO IN CATEGORY' TO BC-MESSAGE.                  NSIC-PR00592
     IF CTG (4) NOT = 00                                                NSIC-PR00593
          MOVE 'I' TO BCN (B) ADD 1 TO B                                NSIC-PR00594
          MOVE 'E' TO BCN (B) ADD 1 TO B                                NSIC-PR00595
          MOVE 'S' TO BCN (B)                                           NSIC-PR00596
     ELSE MOVE 'Y' TO BCN (B).                                          NSIC-PR00597
     ADD 2 TO B.                                                        NSIC-PR00598
     MOVE 0 TO A.                                                       NSIC-PR00599
HIGHER-CATEGORY.                                                        NSIC-PR00600
     ADD 1 TO A.                                                        NSIC-PR00601
     IF CTG (A) = 00 GO TO HIGHER-CATEGORY.                             NSIC-PR00602
MOVE-CATEGORY.                                                          NSIC-PR00603
     MOVE CTG (A) TO CTRED.                                             NSIC-PR00604
     IF CTR1 NOT = 0 MOVE CTR1 TO BCN (B) ADD 1 TO B.                   NSIC-PR00605
     MOVE CTR2 TO BCN (B) ADD 2 TO B.                                   NSIC-PR00606
     IF A = 5 GO TO LAST-CAT.                                           NSIC-PR00607
     MOVE 'A' TO BCN (B) ADD 1 TO B.                                    NSIC-PR00608
     MOVE 'N' TO BCN (B) ADD 1 TO B.                                    NSIC-PR00609
     MOVE 'D' TO BCN (B) ADD 2 TO B.                                    NSIC-PR00610
     ADD 1 TO A.                                                        NSIC-PR00611
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    GO TO MOVE-CATEGORY.                                                    NSIC-PROG0612
WRITE-TOP-PAGE.                                                             NSIC-PROG0613
    IF PAST-CATEGORY NOT = -1 PERFORM WRITE-BOTTOM-PAGE.                    NSIC-PROG0614
    IF PRESENT-CATEGORY NOT = PAST-CATEGORY AND                             NSIC-PROG0615
         PAST-CATEGORY NOT = -1 DISPLAY 'CATEGORY '                         NSIC-PROG0616
         PAST-CATEGORY ', PAGE ' CATEGORY-SAVE (PAST-CATEGORY)              NSIC-PROG0617
         ', ' CS (PAST-CATEGORY) ' ENTRIES'.                                NSIC-PROG0618
    IF PRESENT-CATEGORY NOT = PAST-CATEGORY                                 NSIC-PROG0619
         MOVE PAGE-COUNT TO CATEGORY-SAVE (PRESENT-CATEGORY)                NSIC-PROG0620
         MOVE PRESENT-CATEGORY TO PAST-CATEGORY.                            NSIC-PROG0621
    PERFORM NEW-PAGE THRU NP11.                                             NSIC-PROG0622
    IF F = E MOVE PAGE-COUNT TO PNE                                         NSIC-PROG0623
         MOVE PAGE-NUMBER-EVEN TO EC-REC                                    NSIC-PROG0624
    ELSE MOVE PAGE-COUNT TO PN                                              NSIC-PROG0625
         MOVE PAGE-NUMBER TO EC-REC.                                        NSIC-PROG0626
    ADD 1 TO PAGE-COUNT.                                                    NSIC-PROG0627
    PERFORM WECR.                                                           NSIC-PROG0628
    MOVE CTG (6) TO CATEGORY-NUMBER.                                        NSIC-PROG0629
    MOVE CATEGORY-HEAD TO ECR.                                              NSIC-PROG0630
    PERFORM WECR.                                                           NSIC-PROG0631
    MOVE HI (PRESENT-CATEGORY) TO ECR.                                      NSIC-PROG0632
    PERFORM WECR.                                                           NSIC-PROG0633
    IF CTG-ACC = 0  MOVE '   *CONTINUED*' TO BC-MESSAGE                    NSIC-PROG0634
         MOVE SPACES TO BC-CAT-NAM MOVE BIB-CAT-HEAD TO ECR                 NSIC-PROG0635
         PERFORM WECR MOVE ' ' TO SER-CC                                    NSIC-PROG0636
    ELSE MOVE '-' TO SER-CC.                                                NSIC-PROG0637
    MOVE CTG (6) TO BI-CATG.                                                NSIC-PROG0638
    MOVE ACC-NO TO BI-ACC.                                                  NSIC-PROG0639
    MOVE SAVE-EC-REC TO EC-REC.                                             NSIC-PROG0640
    MOVE 11 TO LINE-COUNT.                                                  NSIC-PROG0641
WECR.                                                                       NSIC-PROG0642
    WRITE EC-REC.                                                           NSIC-PROG0643
    MOVE SPACES TO ECR.                                                     NSIC-PROG0644
WRITE-ECC-REC.                                                              NSIC-PROG0645
    IF ECC-CC = ' ' ADD 1 TO LINE-COUNT GO TO ALC.                          NSIC-PROG0646
    IF ECC-CC = '0' ADD 2 TO LINE-COUNT GO TO ALC.                          NSIC-PROG0647
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    IF ECC-CC = '-' ADD 3 TO LINE-COUNT                          NSIC-PROG0648
ALC.                                                             NSIC-PROG0649
    IF LINE-COUNT NOT < 60 OR                                    NSIC-PROG0650
         PRESENT-CATEGORY NOT = PAST-CATEGORY                    NSIC-PROG0651
         MOVE EC-REC TO SAVE-EC-REC                              NSIC-PROG0652
         PERFORM WRITE-TOP-PAGE.                                 NSIC-PROG0653
    PERFORM WECR.                                                NSIC-PROG0654
WER.  EXIT.                                                      NSIC-PROG0655
WRITE-BOTTOM-PAGE.                                               NSIC-PROG0656
    IF CTG-ACC = 1                                               NSIC-PROG0657
         MOVE ABOVE-CATEGORY TO BI-CATG2                         NSIC-PROG0658
         MOVE ABOVE-ACCESSION TO BI-ACC2                         NSIC-PROG0659
    ELSE MOVE CTG (6) TO BI-CATG2                                NSIC-PROG0660
         MOVE ACC-NO TO BI-ACC2.                                 NSIC-PROG0661
    MOVE BOTTOM-INFO TO ECR.                                     NSIC-PROG0662
    PERFORM WECR.                                                NSIC-PROG0663
LAST-CAT.                                                        NSIC-PROG0664
    IF PROP-FLG = 0 GO TO SKIP-PROP-MOVE.                        NSIC-PROG0665
    MOVE 1 TO A.                                                 NSIC-PROG0666
    MOVE 64 TO B.                                                NSIC-PROG0667
MOVE-PROP-FLAG.                                                  NSIC-PROG0668
    MOVE PPRTR (A) TO BCN (B).                                   NSIC-PROG0669
    ADD 1 TO A.                                                  NSIC-PROG0670
    ADD 1 TO B.                                                  NSIC-PROG0671
MPF.                                                             NSIC-PROG0672
    PERFORM MOVE-PROP-FLAG 19 TIMES.                             NSIC-PROG0673
SKIP-PROP-MOVE.                                                  NSIC-PROG0674
    MOVE 1 TO CTG-ACC.                                           NSIC-PROG0675
    MOVE SIGCAT TO PULL-YR.                                      NSIC-PROG0676
    MOVE ' DATED(MO/DY/YR)' TO FILL-DATE.                        NSIC-PROG0677
    MOVE GOT-MONTH TO FILL-MONTH.                                NSIC-PROG0678
    MOVE GOT-DAY TO FILL-DAY.                                    NSIC-PROG0679
    MOVE GOT-YR TO FILL-YR.                                      NSIC-PROG0680
MOVE-ACC.                                                        NSIC-PROG0681
    MOVE BIB-CAT-HEAD TO EC-REC.                                 NSIC-PROG0682
    PERFORM WRITE-ECC-REC THRU WER.                              NSIC-PROG0683
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    MOVE ' ' TO  BC-LRL-CATE.                                              NSIC-PROG0684
    ADD 1 TO CS (PRESENT-CATEGORY).                                        NSIC-PROG0685
    MOVE 0 TO CTG-ACC.                                                     NSIC-PROG0686
    COMPUTE A = 1 + SELNUM-CNT * 2.                                        NSIC-PROG0687
    COMPUTE B = A + AUTH-CHAR.                                             NSIC-PROG0688
    MOVE 122 TO END-PRINT.                                                 NSIC-PROG0689
    MOVE 10 TO BEGIN-PRINT.                                                NSIC-PROG0690
    PERFORM MOVE-LINES THRU ML.                                            NSIC-PROG0691
    MOVE B TO A.                                                           NSIC-PROG0692
    MOVE B TO NDEX.                                                        NSIC-PROG0693
    MOVE B TO NDEXA.                                                       NSIC-PROG0694
    COMPUTE NDEXB = 1.                                                     NSIC-PROG0695
    PERFORM TITLE-TEXT-JUNK THRU JUNK-END.                                 NSIC-PROG0696
    ADD TITLE-CHAR TO B.                                                   NSIC-PROG0697
    PERFORM MOVE-LINES THRU ML.                                            NSIC-PROG0698
    IF LINE-CNT = 2 GO TO WRT-ONE.                                         NSIC-PROG0699
    MOVE NDEX TO A.                                                        NSIC-PROG0700
    IF LEFT-ALIGN = 0 ADD 1 TO BEGIN-PRINT MOVE 1 TO LEFT-ALIGN            NSIC-PROG0701
      GO TO SKP-ONE.                                                       NSIC-PROG0702
WRT-ONE.                                                                   NSIC-PROG0703
    MOVE NDEX TO A.                                                        NSIC-PROG0704
    COMPUTE B = NDEX + TITLE-CHAR.                                         NSIC-PROG0705
SKP-ONE.                                                                   NSIC-PROG0706
    MOVE 0 TO NDEX.                                                        NSIC-PROG0707
    COMPUTE LINE-CNT = 2.                                                  NSIC-PROG0708
    MOVE B TO A.                                                           NSIC-PROG0709
    ADD CAUTH-CHAR TO B.                                                   NSIC-PROG0710
    PERFORM MOVE-LINES THRU ML.                                            NSIC-PROG0711
    MOVE B TO A.                                                           NSIC-PROG0712
    ADD MEMO-CHAR TO B.                                                    NSIC-PROG0713
    PERFORM MOVE-LINES THRU ML.                                            NSIC-PROG0714
    MOVE '0' TO ECC-CC.                                                    NSIC-PROG0715
    ADD 6 TO BEGIN-PRINT.                                                  NSIC-PROG0716
    SUBTRACT 6 FROM END-PRINT.                                             NSIC-PROG0717
    IF ABS-FMAT NOT = 0                                                    NSIC-PROG0718
         MOVE 1 TO LEFT-ALIGN                                              NSIC-PROG0719
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           MOVE 34 TO BEGIN-PRINT MOVE 101 TO END-PRINT.          NSIC-PROG0720
       MOVE 8 TO A.                                               NSIC-PROG0721
       ADD ABS-CHAR TO B.                                         NSIC-PROG0722
       PERFORM MOVE-LINES THRU ML.                                NSIC-PROG0723
       MOVE '0' TO ECC-CC.                                        NSIC-PROG0724
       MOVE 8 TO A.                                               NSIC-PROG0725
       ADD AVL-CHAR TO B.                                         NSIC-PROG0726
       PERFORM MOVE-LINES THRU ML.                                NSIC-PROG0727
       IF SELNUM-CNT = 0 GO TO READ-NEW-CK.                       NSIC-PROG0728
       MOVE '0' TO ECC-CC.                                        NSIC-PROG0729
       MOVE SPACES TO KEYWORD-PULL.                               NSIC-PROG0730
       MOVE 1 TO E.                                               NSIC-PROG0731
       MOVE 0 TO B.                                               NSIC-PROG0732
AK.                                                               NSIC-PROG0733
       ADD 1 TO B.                                                NSIC-PROG0734
       IF SELNUM-CNT < B GO TO ALL-KEYWORDS.                      NSIC-PROG0735
       IF KWD-NTRY (B) < 0 COMPUTE D = KWD-NTRY (B) * -1.         NSIC-PROG0736
       MOVE 1 TO EMP-FLAG.                                        NSIC-PROG0737
       IF KWD-NTRY (B) NOT < 0 AND NOT = 9999 MOVE KWD-NTRY (B)   NSIC-PROG0738
       TO D.                                                      NSIC-PROG0739
       IF KWD-NTRY (B) = 9999 MOVE 0 TO D, MOVE 1 TO EMP-FLAG.    NSIC-PROG0740
       ADD 1 TO D.                                                NSIC-PROG0741
       IF D > 3500 OR < 1 DISPLAY 'KEYWORD OUT OF 0 TO 3499 RANGE'NSIC-PROG0742
            BC-CTG '-' BC-ACC ' ' KEYWORD-NINE GO TO AK.          NSIC-PROG0743
       IF KT (D) = SPACES DISPLAY 'NO KEYWORD IN TABLE FOR '      NSIC-PROG0744
            KEYWORD-NINE ' ' BC-CTG '-' BC-ACC ADD 6 TO A GO TO AK.NSIC-PROG0745
       IF EMP-FLAG = 1 MOVE '*' TO KP (E) ADD 1 TO E.             NSIC-PROG0746
       MOVE 0 TO EMP-FLAG.                                        NSIC-PROG0747
       IF E > 950 DISPLAY 'KEYWORDS EXCEEDED TABLE ' D ' ' BC-CTG NSIC-PROG0748
            '-' BC-ACC GO TO ALL-KEYWORDS.                        NSIC-PROG0749
       MOVE 48 TO C.                                              NSIC-PROG0750
       CALL 'MOVEIT' USING KT (D) KP (E) C.                       NSIC-PROG0751
       ADD 47 TO E.                                               NSIC-PROG0752
LIMIT-KEYWORD.                                                    NSIC-PROG0753
       IF E < 2 GO TO NEW-KEYWORD.                                NSIC-PROG0754
       IF KP (E) = ' ' SUBTRACT 1 FROM E GO TO LIMIT-KEYWORD.     NSIC-PROG0755
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NEW-KEYWORD.                                                              NSIC-PROG0756
    ADD 2 TO E.                                                           NSIC-PROG0757
    MOVE '+' TO KP (E).                                                   NSIC-PROG0758
    ADD 2 TO E.                                                           NSIC-PROG0759
    MOVE 0 TO AK-FLAG.                                                    NSIC-PROG0760
    MOVE KT (D) TO AK-INFO.                                               NSIC-PROG0761
    MOVE ACC-NO TO AK-ACC.                                                NSIC-PROG0762
    MOVE CTG (6) TO AK-CATG.                                              NSIC-PROG0763
         WRITE AUTHOR-KEYWORD-RECORD.                                     NSIC-PROG0764
    ADD 1 TO AKREC-COUNT.                                                 NSIC-PROG0765
    GO TO AK.                                                             NSIC-PROG0766
MOVE-LINES.                                                               NSIC-PROG0767
    IF A = B GO TO SET-FORM.                                              NSIC-PROG0768
ANOTHER-LINE.                                                             NSIC-PROG0769
    COMPUTE C = A + END-PRINT - BEGIN-PRINT - 1.                          NSIC-PROG0770
    IF C NOT < B MOVE B TO C MOVE 1 TO LAST-LINE                          NSIC-PROG0771
          ELSE MOVE 0 TO LAST-LINE.                                       NSIC-PROG0772
    COMPUTE D = BEGIN-PRINT - 2.                                          NSIC-PROG0773
    PERFORM MOVE-CHAR VARYING A FROM A BY 1 UNTIL A NOT < C.              NSIC-PROG0774
CHECK-SPACE.                                                              NSIC-PROG0775
    IF ECRR (D) = (SPACE OR '-') OR LAST-LINE = 1                         NSIC-PROG0776
         GO TO WRITE-LINE.                                                NSIC-PROG0777
    MOVE SPACES TO ECRR (D).                                              NSIC-PROG0778
    SUBTRACT 1 FROM D.                                                    NSIC-PROG0779
    SUBTRACT 1 FROM A.                                                    NSIC-PROG0780
    IF A = 50 GO TO WRITE-LINE.                                           NSIC-PROG0781
    GO TO CHECK-SPACE.                                                    NSIC-PROG0782
MOVE-CHAR.                                                                NSIC-PROG0783
    ADD 1 TO D.                                                           NSIC-PROG0784
    MOVE  MA  (A) TO ECRR (D).                                            NSIC-PROG0785
WRITE-LINE.                                                               NSIC-PROG0786
    PERFORM WRITE-ECC-REC THRU WER.                                       NSIC-PROG0787
    IF LAST-LINE = 1 GO TO SET-FORM.                                      NSIC-PROG0788
    IF NDEX > 0 PERFORM CK-LINE.                                          NSIC-PROG0789
    IF LEFT-ALIGN = 0 ADD 1 TO BEGIN-PRINT MOVE 1 TO LEFT-ALIGN.          NSIC-PROG0790
    GO TO ANOTHER-LINE.                                                   NSIC-PROG0791
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SET-FORM.                                                                NSIC-PROG0792
    MOVE 0 TO LEFT-ALIGN.                                                NSIC-PROG0793
    MOVE 122 TO END-PRINT.                                               NSIC-PROG0794
    MOVE 10 TO BEGIN-PRINT.                                              NSIC-PROG0795
ML.  EXIT.                                                               NSIC-PROG0796
ALL-KEYWORDS.                                                            NSIC-PROG0797
    IF E < 2 GO TO AKC.                                                  NSIC-PROG0798
    IF KP (E) = '+' OR ' '                                               NSIC-PROG0799
          MOVE ' ' TO KP (E)                                             NSIC-PROG0800
          SUBTRACT 1 FROM E                                              NSIC-PROG0801
          GO TO ALL-KEYWORDS.                                            NSIC-PROG0802
AKC.                                                                     NSIC-PROG0803
    MOVE KEYWORD-PULL TO MAST-AREA.                                      NSIC-PROG0804
    MOVE 1 TO A.                                                         NSIC-PROG0805
    COMPUTE B = E + 1.                                                   NSIC-PROG0806
    MOVE '0' TO ECC-CC.                                                  NSIC-PROG0807
    PERFORM MOVE-LINES THRU ML.                                          NSIC-PROG0808
    GO TO READ-NEW-CK.                                                   NSIC-PROG0809
END-BIBLIO SECTION.                                                      NSIC-PROG0810
    PERFORM WRITE-BOTTOM-PAGE.                                           NSIC-PROG0811
    IF CKREC-COUNT > 0                                                   NSIC-PROG0812
    DISPLAY 'CATEGORY ' PRESENT-CATEGORY ', PAGE ' CATEGORY-SAVE         NSIC-PROG0813
         (PRESENT-CATEGORY) ', ' CS (PRESENT-CATEGORY) ' ENTRIES'        NSIC-PROG0814
    DISPLAY 'SUM OF ENTRIES FOR CATEGORIES SHOULD EQUAL NOREC-COU        NSIC-PROG0815
         'NT'.                                                           NSIC-PROG0816
    COMPUTE A = AKREC-COUNT - NUMBER-AUTHORS.                            NSIC-PROG0817
    DISPLAY A ' KEYWORDS'.                                               NSIC-PROG0818
    DISPLAY 'AKREC-COUNT = ' AKREC-COUNT.                                NSIC-PROG0819
    PERFORM NEW-PAGE THRU NP11.                                          NSIC-PROG0820
    IF F = E ADD 1 TO PAGE-COUNT.                                        NSIC-PROG0821
    MOVE PAGE-COUNT TO KEYWORD-PAGE-SAVE.                                NSIC-PROG0822
    WRITE PAGE-STORE-REC.                                                NSIC-PROG0823
CLOSE-OPEN-FILES.                                                        NSIC-PROG0824
    CLOSE TITLFL.                                                        NSIC-PROG0825
    IF MF-OPEN = 1 CLOSE MASTERFILE DISP.                                NSIC-PROG0826
    IF CF-OPEN = 1 CLOSE CARDFILE.                                       NSIC-PROG0827
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    IF CKF-OPEN = 1 CLOSE CATEGORYKEYWORDFILE DISP.                NSIC-PROG0828
    IF AKF-OPEN = 1 CLOSE AUTHORKEYWORDFILE DISP.                  NSIC-PROG0829
    IF NC-OPEN = 1 CLOSE NEWCK DISP.                               NSIC-PROG0830
    IF EC-OPEN = 1 CLOSE EDITEDCATEGORY.                           NSIC-PROG0831
    IF PS-OPEN = 1 CLOSE PAGESTORE.                                NSIC-PROG0832
    IF PR-OPEN = 1 CLOSE PRINTFILE.                                NSIC-PROG0833
    DISPLAY 'STOP RUN'.                                            NSIC-PROG0834
    READY TRACE.                                                   NSIC-PROG0835
    GOBACK.                                                        NSIC-PROG0836
NEW-PAGE.                                                          NSIC-PROG0837
    MOVE PAGE-COUNT TO E.                                          NSIC-PROG0838
    COMPUTE D = E / 2.                                             NSIC-PROG0839
    COMPUTE F = D * 2.                                             NSIC-PROG0840
NP11.  EXIT.                                                       NSIC-PROG0841
TITLE-TEXT-JUNK SECTION.                                           NSIC-PROG0842
MOVE-TITLE.                                                        NSIC-PROG0843
    MOVE MA (NDEXA) TO TITL-YAK (NDEXB).                           NSIC-PROG0844
    ADD 1 TO NDEXB.                                                NSIC-PROG0845
    ADD 1 TO NDEXA.                                                NSIC-PROG0846
    IF NDEXB > TITLE-CHAR GO TO TEXT-JUNK-END.                     NSIC-PROG0847
    GO TO MOVE-TITLE.                                              NSIC-PROG0848
TEXT-JUNK-END.                                                     NSIC-PROG0849
    COMPUTE TITL-YK-CT = NDEXB - 1.                                NSIC-PROG0850
    MOVE TITL-YK-CT TO E.                                          NSIC-PROG0851
    COMPUTE D = E / 2.                                             NSIC-PROG0852
    COMPUTE F = D * 2.                                             NSIC-PROG0853
    IF F NOT = E MOVE ' ' TO TITL-YAK (NDEXB)                      NSIC-PROG0854
    ADD 1 TO TITL-YK-CT.                                           NSIC-PROG0855
    MOVE TITL-YK-CT TO YAK-CNT.                                    NSIC-PROG0856
    WRITE TITL-REC FROM TITL-KORE.                                 NSIC-PROG0857
    ADD 1 TO MAGIC-CNT.                                            NSIC-PROG0858
JUNK-END. EXIT.                                                    NSIC-PROG0859
CK-LINE SECTION.                                                   NSIC-PROG0860
    COMPUTE J = LINE-CNT / 2.                                      NSIC-PROG0861
    COMPUTE K = LINE-CNT - (J * 2).                                NSIC-PROG0862
    IF K > 0 GO TO WRT-NXT.                                        NSIC-PROG0863
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    MOVE NDEX TO A.                                          NSIC-PROG0864
    MOVE '+' TO ECC-CC.                                      NSIC-PROG0865
    ADD 1 TO LINE-CNT.                                       NSIC-PROG0866
    GO TO MOVE-LINES.                                        NSIC-PROG0867
WRT-NXT.                                                     NSIC-PROG0868
    MOVE A TO NDEX.                                          NSIC-PROG0869
    MOVE ' ' TO ECC-CC.                                      NSIC-PROG0870
    ADD 1 TO LINE-CNT.                                       NSIC-PROG0871
CK-EXIT. EXIT.                                               NSIC-PROG0872
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