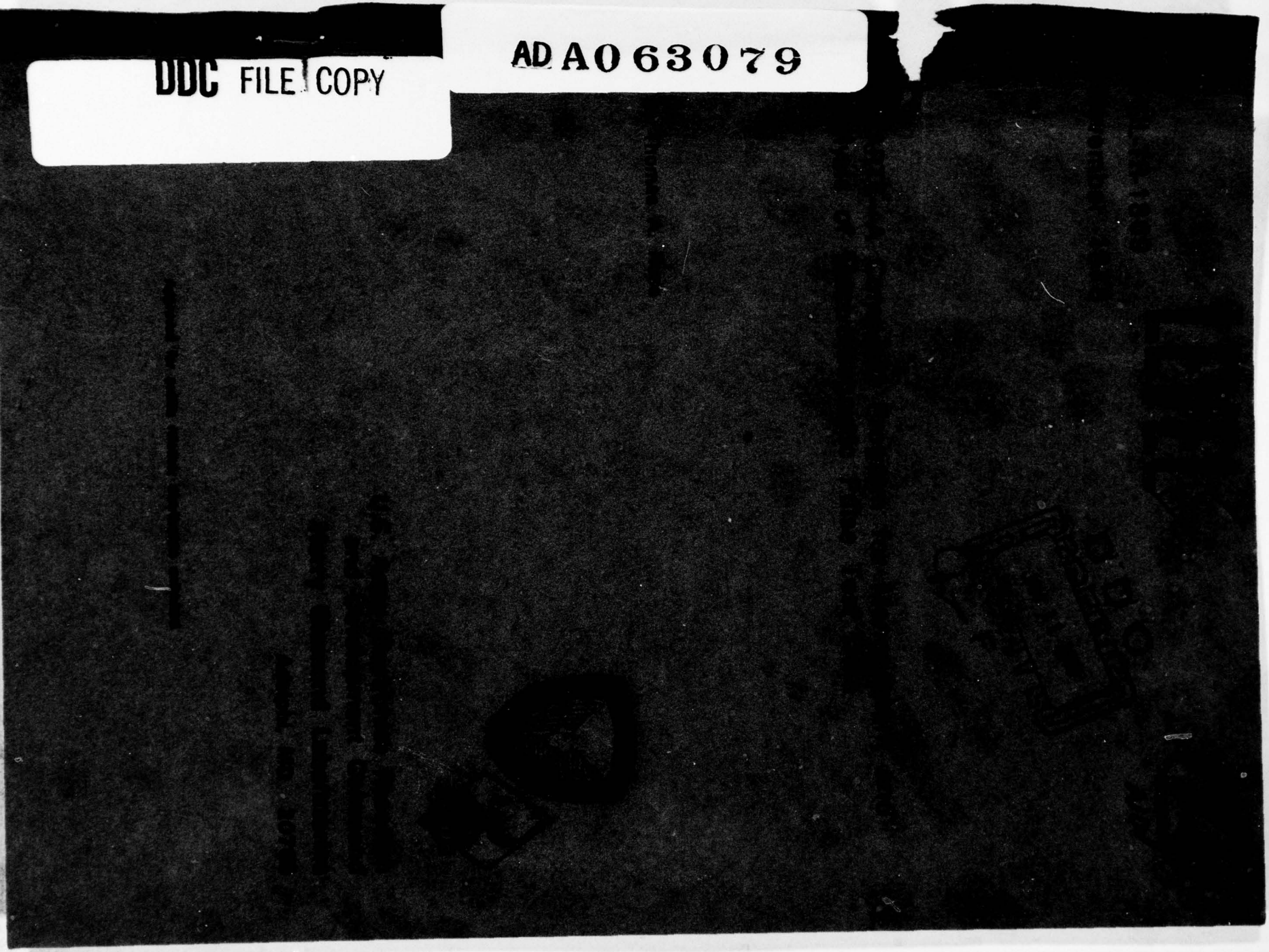
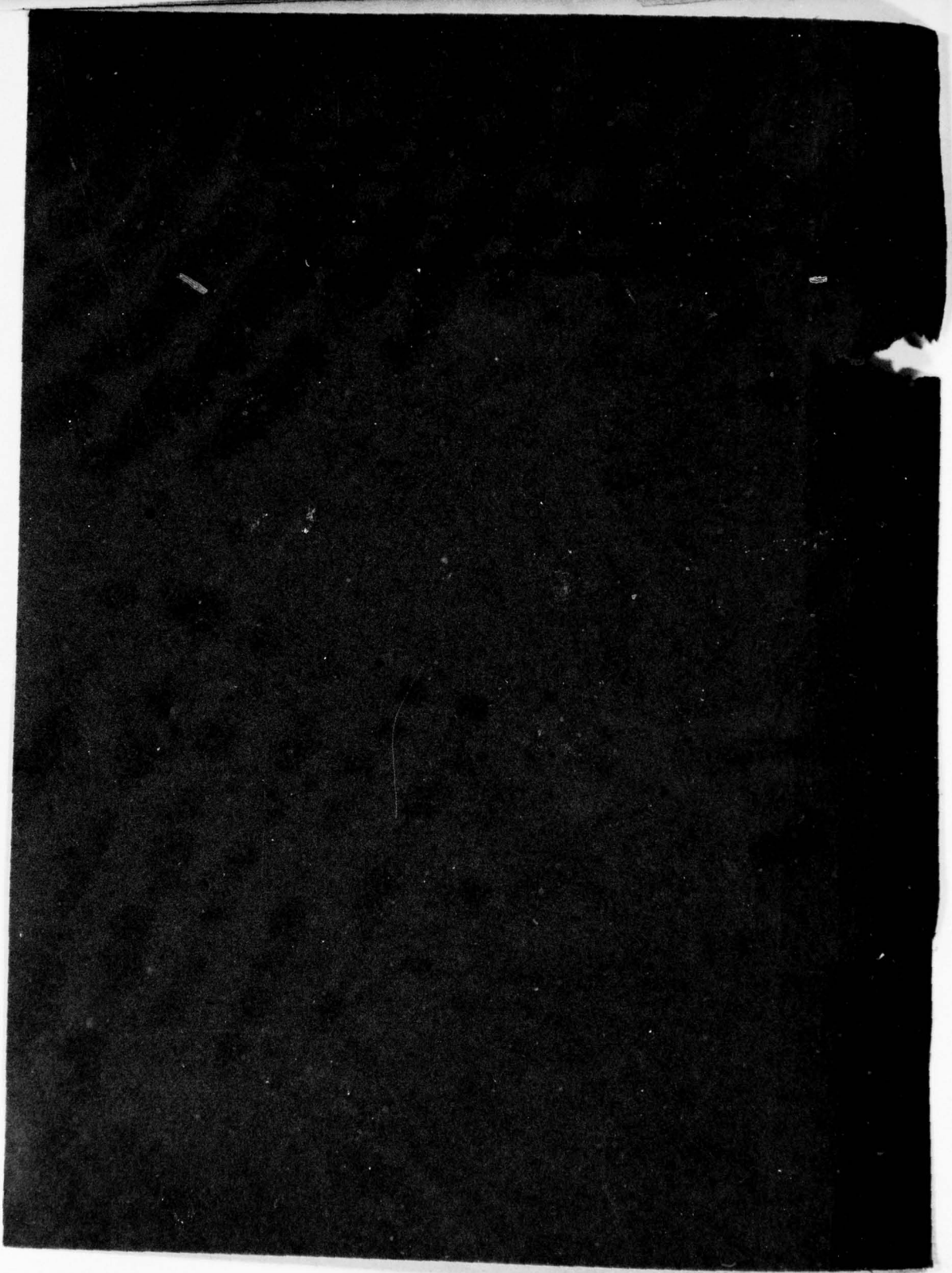
AD-A063 079 HARRY DIAMOND LABS ADELPHI MD F/G 9/2
SMARTE-A COMPUTER PROGRAM FOR MANAGEMENT AND ANALYSIS OF ELECTR--ETC(U)
NOV 78 T A ROSE
UNCLASSIFIED HDL-TR-1869 NL

1 OF 3
AD
AD63079





UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER HDL-TR-1869	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) SMARTE-A Computer Program for Management and Analysis of Electromagnetic Pulse Test Data		5. TYPE OF REPORT & PERIOD COVERED Technical Report. 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Thomas A. Rose		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Harry Diamond Laboratories 2800 Powder Mill Road Adelphi, MD 20783		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS Program Ele: MDCA
11. CONTROLLING OFFICE NAME AND ADDRESS Director Defense Communications Agency Washington, DC 20305		12. REPORT DATE November 1978 13. NUMBER OF PAGES 195
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) 12 196p.		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

HDL Project: E58T; E586
DRCMS Code: 6-691000.00.00000; T-691000.00.00000

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Electromagnetic pulse (EMP)
Computer software
Data base
Data bank
Data management

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The SMARTE computer program, Release 2, is a specialized data base management and analysis program designed to process scientific data consisting of sets of amplitude versus time or amplitude and phase versus frequency coordinates.

The data management capabilities allow for the creation, deletion, and editing of records. Records may be retrieved —> next page

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

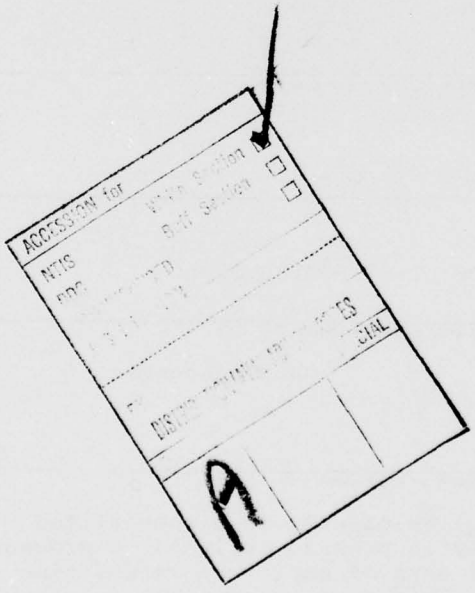
163050

cont.

either explicitly by name or by conditional searches on record item values. Retrieved records may be (1) dumped to a storage device for later processing by other programs, (2) used as the subject of built-in and user specified reports, or (3) further analyzed with built-in analysis algorithms. The built-in analysis capabilities allow for the scaling, shifting, and combining of records. Additionally, Fourier transforms can be generated for time records.

Each record may contain up to 512 coordinates. Each record also contains space for 128 items of descriptive information. One to five data bases can be controlled. Each data base can contain up to 90,000 records, where the actual limit depends on record size and storage capacity of the peripheral device employed for the data base.

This document describes Release 2 of the SMARTE program, which is compatible with IBM 370 computer systems. An earlier Control Data Corp. CDC 6000 version, Release 1, also is available, but it is not fully debugged or fully documented, and its capabilities are more limited than for Release 2 discussed here.



CONTENTS

CONTENTS (Cont'd)

CONTENTS (Cont'd)

CONTENTS (Cont'd)

CONTENTS (Cont'd)

1. INTRODUCTION

This report presents a description of the capabilities and the operation of the SMARTE computer program. SMARTE is a specialized data base management and analysis program designed to process scientific data consisting of sets of coordinates for amplitude versus time or amplitude and phase versus frequency.

The data management capabilities allow for the creation, deletion, and editing of records. Records may be retrieved either explicity by name or by conditional searches on record item values. Retrieved records may be (1) dumped to a storage device for later processing by other programs, (2) used as the subject of built-in and user specified reports, or (3) further analyzed with built-in analysis algorithms. The built-in analysis capabilities allow for the scaling, shifting, and combining of records. Additionally, Fourier transforms can be generated for time records.

Each record may contain up to 512 coordinates. Each record also contains space for 128 items of descriptive information. One to five data bases can be controlled. Each data base can contain up to 90,000 records, where the actual limit depends on the record size and the storage capacity of the peripheral device employed for the data base.

This document describes Release 2 of SMARTE, which is compatible with IBM 370 computer systems. An earlier Control Data Corp. CDC 6000 version, Release 1, also is available, but it is not fully debugged or fully documented, and its capabilities are more limited than those of Release 2. Appendix A describes major program variables, appendix B lists procedures for executing the program, and appendix C lists seven example runs. Copies of the program source listing are available upon request.

SMARTE was developed at the Harry Diamond Laboratories over several years as support for various electromagnetic pulse (EMP) vulnerability and hardening tests of defense systems. The software comprises several routines contributed by individuals other than the author. Comments in the source listings of the various routines cite those responsible for the generation of each routine. Special mention is warranted for Joseph R. Miletta and Jere D. Dando, who defined the need for this program and who were responsible for pushing its development. Throughout the development of the code, Miletta served as a consultant in all technical areas.

2. DETAILED DESCRIPTION

This section explains SMARTE capabilities and details the methods employed by the program to provide these capabilities. General instructions for exercising the program are provided in section 3, and section 4 explains the various directives that the user provides as input to control the program execution.

Many parts of this section, especially those describing programming technique, are important only to someone who needs to debug or modify the program software. It is recommended that the reader who wishes only to employ the existing program skim over this section and go to sections 3 and 4 for instructions on using the program. Many terms used in this section and in later sections that have ambiguous meanings or special meanings in this report are explained in the glossary.

2.1 Capabilities

SMARTE was designed to manage and perform limited analysis on data records created by various EMP vulnerability and hardening tests of electronic systems. The raw test data from such tests exist initially as photographs of oscilloscope displays. These photographs are digitized (converted to a set of numerical coordinates) and stored on some computer compatible storage medium, usually magnetic tape, before being loaded into a data base by SMARTE. The data from each photograph and descriptive information are stored as a separate data base record. Several records, corresponding to different oscilloscope settings, generally make up a *full physical test measurement*. Test measurements are described with test point names of 17 characters (sometimes fewer) that relate to the location of the measurement, the purpose, the system configuration, the simulator configuration, and so on. These test point names are used to generate a 20-character record name for the data base records. Because of limitations in resolution and accuracy of test equipment and especially digitization equipment, data can more than adequately be represented by sets of 512 coordinates or less.

The capabilities and the requirements of SMARTE are generalized so that the program may be employed to process many types of data not like those for which the program was designed. The following paragraphs describe the program requirements and the limitations when other forms of data are processed.

The program is structured to handle two types of data base records: time records and log-frequency records. Time records may contain up to 512 pairs of coordinate values. The abscissa values must represent time information, whereas the ordinate values may be any of

several physical quantities. The coordinate pairs must be ordered by increasing time values. In other words, a time record coordinate set must correspond to some quantity that is a single valued function of time. The time values may be equispaced or random in interval. All time values are assumed to be in units of seconds.

Coordinate pairs for data that do not represent a single valued function of time may be stored as time records with certain program limitations. Fourier analysis is not possible for such records. Also, the built-in report facilities yield erroneous unit labels. If the data do not represent a function of time, but do represent a single valued function, then the other analysis capabilities can be used.

Log-frequency records may contain up to 512 sets of coordinates that consist of amplitude, phase, and frequency values. Only amplitude and phase values are actually stored in data base records. An initial frequency value and a frequency interval are stored instead of the complete set of frequency values. Log-frequency records contain coordinates ordered by increasing frequency value, and the frequency interval is logarithmic. All frequency values are assumed to be in units of hertz (cycles per second). Phase values are assumed to be in degrees.

For both time records and log-frequency records, the program is set up to handle amplitude units of (1) volts per meter, (2) amperes per meter, (3) volts, (4) amperes, (5) coulombs per meter squared-second, or (6) tesla per second (1 tesla equals 1 weber per square meter). Coordinate sets representing other units or quantities may be handled by the program with little problem. The only program function affected by nonstandard ordinate units is the plotting function, which normally generates ordinate labels appropriate for the data record.

If he uses other than standard units, the user must be careful that he is consistent. The user is responsible for assuring compatibility between the units of records in analysis operations.

Each data base record contains 128 items of descriptive information and 0 to 1024 coordinate values. The descriptive items include information of interest to the user and also information used by the program. SMARTE currently handles data bases of up to 90,000 records. This capacity may not be realizable with some computer systems due to the physical capacity of direct access storage devices and due to the variable size of data base records. The program can control up to five data bases during one computer run. When more than one data base is under control, then alternately one data base is assigned by the user as the primary data base. All functions may be performed on records resident on the primary data base, whereas only limited functions can be performed on the other data bases.

The data management capabilities include the abilities to create, purge, and edit data base records. Records may be created from data input or from certain analysis operations. Records may be purged either explicitly by name or by by conditional search. The editing capability allows the user to alter the values stored for the descriptive items. Editing may be performed on individual records or on groups of records.

Records may be retrieved from a data base either explicitly by name or by conditional search. The conditional search feature allows the user to search a data base for records whose item values match specified conditions. Any of the record descriptive items may be the subject of examination in a conditional search, and there is no limit on the number of conditions that may be specified.

Records that have been retrieved may be further processed by other program functions. A sort capability provides the capability of changing the order in which retrieved records are processed. The sort function can be based on any of the record descriptive items and may be used repeatedly to sort on higher levels.

Retrieved records may be used as the subject of various types of reports or may be used as input for built-in analysis functions. Several built-in report types include several summary table formats, plots, and tabulations of full record contents. A generalized report generation function allows the user to define custom reports. Retrieved records may be dumped to a storage medium for later processing by other programs.

The analysis capabilities include the abilities to shift and to scale the amplitude or abscissa values or both for any retrieved records by a constant amount specified by the user. Fourier transforms can be calculated for time records by a piecewise linear integral Fourier transform technique. Resultant frequency records may be stored as new data base records. Any number of records may be combined by a choice of several concatenation algorithms, and the results may be stored as new data base records. The final analysis capability allows the user to write a FORTRAN subroutine that may perform calculations based on the contents of retrieved records and input data, modify record contents, or both.

2.2 Program Language and Structure

SMARTE is written exclusively in the FORTRAN language. To the extent practical, it is written in American National Standard (ANS) FORTRAN.[1] The non-ANS FORTRAN features used fall into two categories. (1) Checking for end-of-file marks is performed with all formatted READ statements and with most other READ statements. (2) Input and output performed with the direct access data base devices employ statements that are unique to the computer system manufacturer, since ANS FORTRAN does not define this type of input/output.

Release 2 of SMARTE, the subject of this report, is written for an IBM 370 computer system.[2,3] Application of the program to date has been on an IBM 370 model 168 system operating with VS2, Release 3.7. With this system, the program is compiled with the FORTRAN H-Extended compiler with the XL (extended logic) option in effect.

SMARTE is set up for either batch or interactive access. Input to the program is identical in content and format for both modes of access. For interactive access, the program provides prompting to logical unit 6 prior to the execution of each READ statement associated with directive input on logical unit 4.

The major program variables used are described in appendix A.

2.3 Data Base Security and Passwords

Several types of passwords are required by the program to access data bases and perform program functions. Optionally, the user may define additional passwords via the computer system job control language to further protect program software files and data base files.

The first input to SMARTE must be an access password. The value entered is matched against values defined in subroutine PASS to determine (1) whether prompting is desired or not, (2) which type of access is to be used, either interactive or batch, (3) whether debugging output messages are desired or not, and (4) how much access is allowed, either read only or read and write.

---

[1] *American National Standard FORTRAN, United States of America Standards Institute, USAS Standard No. X3.9-1966 (1966).*

[2] *IBM System/360 and System/370 FORTRAN IV Language, International Business Machines Corp. GC28-6515-10 (1974).*

[3] *IBM OS FORTRAN IV (H-Extended) Compiler Programmer's Guide, International Business Machines Corp. SC28-6852-2 (1974).*

If a prompting desire is recognized, prompting is performed for all directive input entries. If interactive access is recognized, then program detected error conditions, which normally result in program termination, instead terminate only the current task being performed. When a debugging desire is recognized, limited additional program messages are generated during the processing of some tasks.

The security feature of the access password is the determination of either read only or read and write access permission. If read only access is recognized, then the user is not allowed to execute any of the program functions that alter the contents of any data base in any way. Read only access allows the user to exercise any of the query functions that include all retrieval and report generation capabilities.

A second password, an initialize password, is required by the program whenever the user attempts to establish a new data base. This password protects against creating a new data base on a file that contains an existing data base and against destroying the existing data base. The creation of a new data base is requested of the program via the INITIALIZE directive (sect. 4). The initialize password is provided as a supplementary input entry with the INITIALIZE directive and is evaluated by subroutine INITIL.

2.4 Data Base Structure

SMARTE creates and transfers information to and from data bases by the IBM FORTRAN direct access statements.[2] These include a DEFINE FILE statement, a FIND statement, and special READ and WRITE statements.

When SMARTE initially creates a data base, it does so via a DEFINE FILE statement. This statement requires that the maximum size of the data base be defined at creation time. The program is set up to automatically define the data base to be one of the three sizes, depending on the logical unit number assigned with the computer system job control language to the data base. The sizes are 9000, 33,000, and 90,000 physical record units (PRU's). One PRU equals 128 IBM 32-bit words. (One word equals 4 bytes, and 1 byte contains 8 bits.) A data base record is variable in size and is composed of from 1 to 9 PRU's. Throughout this report, the term "record" refers to a data base record, not a PRU, unless either "PRU" or "physical record unit" is explicitly stated.

---

[2] *IBM System/360 and System/370 FORTRAN IV Language, International Business Machines Corp. GC28-6515-10 (1974).*

The minimum information stored for each data base record is the descriptive information, 128 items. All 128 descriptive items are stored whether all items have defined values or not. Each item in a data base record uses one word of storage. Therefore, the descriptive information takes up 1 PRU. Additional storage used by a data base record depends on the number of coordinates in the record. Integral numbers of PRU's store each data base record. If a record contains 150 coordinates, for example, then space is needed for 128 descriptive items plus 300 coordinate values. The total 428 words require 4 PRU's. The maximum allowed number of coordinates, 512, yields a data base record of 1152 words, which is exactly 9 PRU's.

Depending on the size of data base records in a data base, the number of records that can be stored in each size of data base ranges as follows:

PRU size	Records	
	Min	Max
9,000	1,000	9,000
33,000	3,666	33,000
90,000	10,000	90,000

SMARTE monitors the space used in each data base and issues an error message if an attempt is made to store too many records. The actual sizes of data bases are always 2 PRU's larger than the nominal sizes indicated in the table above. The extra 2 PRU's allow for the data base control record and 1 PRU of scratch space at the end of information.

A 33,000-PRU data base uses 2760 tracks of storage on an IBM model 3340 disc drive. This is just under one third the capacity of such a drive. If a user needs to alter the set data base sizes, he must alter the appropriate file definition statements in subroutine DBDEF.

In the Release 2 version of SMARTE, a master index containing PRU locations on the data base storage device is automatically established and controlled by system software when using the direct access statements. SMARTE identifies each data base record by a record identification (ID) number, which it stores with the record as one of the descriptive items. This record ID corresponds to the number of the first PRU of the data base record. It is the first PRU of each data base record where the descriptive items are stored.

The first record stored in the data base is the data base control record, of 1 PRU size, which is used by SMARTE for controlling the data base. The data base control record has a record ID of 1. The

actual data records use consecutive record ID numbers beginning at 2. The first data record stored then has a record ID equal to 2. If this record is 4 PRU's in size, for example, then the second data record stored has a record ID equal to 6.

2.5 Data Base Control Record

The data base control record contains 128 words of storage, of which only 11 are currently used by the program. This record is stored as the first record on each data base and is used by the program to control the data base. The program reads this record into array IDBCR when a data base is assigned as the primary data base and updates the information in both the array and on the data base as execution proceeds. The information stored in this record corresponds to the values stored in array IDBCR (app A).

With this record, the program can determine the maximum and the currently used space in the data base. It can determine where to store a new record. An ID number assigned to a data base at creation also is stored in this record.

References to subindexes in the explanation of the contents of array IDBCR do not apply to Release 2. Subindexes are used only in the CDC 6000 version, Release 1, of SMARTE.

2.6 Record Structure

Each data base record consists of from 128 to 1152 words (and is thus stored as 1 to 9 PRU's). For each record, 128 descriptive items are always stored. Also, the record can contain 0 to 1024 numerical values corresponding to 0 to 512 coordinates. Each descriptive item and each coordinate value use one word of storage and are referred to as either a word or an item.

The descriptive information is stored as items 1 to 128, and the coordinate values are stored beginning at item 129. The record items may be one of four types (format). Table I describes the structure of a data base record. In the table beside each item number are its type and a description of the information intended to be stored for that item value. The type of each item cannot be changed without fundamental changes to the program. The actual information stored in the item, however, in many cases does not have to agree with the description given in the table. The descriptions in the table are provided as guidelines and correspond to past applications of SMARTE.

TABLE I. DESCRIPTION OF RECORD CONTENTS

Item	Data type	Description of item
1	A1	*Record name (test point name), character 1
2	A1	*Record name (test point name), character 2
3	A1	*Record name (test point name), character 3
4	A1	*Record name (test point name), character 4
5	A1	*Record name (test point name), character 5
6	A1	*Record name (test point name), character 6
7	A1	*Record name (test point name), character 7
8	A1	*Record name (test point name), character 8
9	A1	*Record name (test point name), character 9
10	A1	*Record name (test point name), character 10
11	A1	*Record name (test point name), character 11
12	A1	*Record name (test point name), character 12
13	A1	*Record name (test point name), character 13
14	A1	*Record name (test point name), character 14
15	A1	*Record name (test point name), character 15
16	A1	*Record name (test point name), character 16
17	A1	*Record name (test point name), character 17
18	A1	*Record name, character 18 (record major type) (1 = single photo digitization from W2500) (2 = time tied digitization from W2500) (3 = single photo digitization from HP 2116C) (4 = type 3 records--combined) (C = type 3 records--frequency transformed) (D = type 4 records--frequency transformed)
19	A1	*Record name, character 19 (record group)
20	A1	*Record name, character 20 (record group sequence)
21	I	*Record ID (record master name)
22	A2	-Measurement comment, part 1
23	A2	-Measurement comment, part 2
24	A2	-Measurement comment, part 3
25	A2	-Measurement comment, part 4
26	A2	-Measurement comment, part 5 (priority classification)
27	A2	-Measurement comment, part 6
28	A2	-Pulser type
29	I	-Pulse number
30	A2	-Driver location, part 1
31	A2	-Driver location, part 2
32	A2	-Driver location, part 3
33	F	-Driver level
34	A2	-Driver configuration, part 1
35	A2	-Driver configuration, part 2
36	I	-Date
37	I	-Time
38	A2	-Measurement type
39	A2	-Probe serial number, part 1
40	A2	-Probe serial number, part 2
41	A2	-Probe serial number, part 3
42	A2	-Alternate name (seven or eight character test point name), part 1
43	A2	-Alternate name (seven or eight character test point name), part 2
44	A2	-Alternate name (seven or eight character test point name), part 3
45	A2	-Alternate name (seven or eight character test point name), part 4

TABLE I. DESCRIPTION OF RECORD CONTENTS (CONT'D)

Item	Data type	Description of item
46	A2	-Probe attenuation, part 1
47	A2	-Probe attenuation, part 2
48	A2	-Integrator, part 1
49	A2	-Integrator, part 2
50	A2	-Transmitter attenuation, part 1
51	A2	-Transmitter attenuation, part 2
52	A2	-Instrumentation unit, part 1
53	A2	-Instrumentation unit, part 2
54	F	-Measurement scale factor
55	I	-Horizontal scale setting 1
56	I	-Vertical scale setting 1
57	I	-Horizontal scale setting 2
58	I	-Vertical scale setting 2
59	I	-Horizontal scale setting 3
60	I	-Vertical scale setting 3
61	I	-Data code
62	I	-Original number of points
63	I	*Abscissa indicator 0 = Time 1 = Frequency--logarithmically spaced
64	F	+Abscissa scale
65	F	+Abscissa shift value
66	I	+Ordinate indicator 0 = Volts per meter 1 = Amperes per meter 2 = Volts 3 = Amperes 4 = Coulombs per meter squared-second 5 = Tesla per second
67	F	+Ordinate scale
68	F	+Ordinate shift value
69	F	-Rotation value
70	I	*Number of data points
71	I	-Source of record indicator 1 = Hewlett-Packard HP 2116C minicomputer 2 = Westinghouse W2500 computer, Pickens, MS, format
72	I	-History indicator 0 = Single photo digitization 1 = Time tied
73	I	-Normalization indicator
74	F	-Normalization factor
75	I	+Interpolation indicator 0 = Not interpolated 1 = Equispaced interpolated
76	I	-ID reference 1 (group number)
77	I	-ID reference 2
78	I	-ID reference 3
79	I	-ID reference 4
80	I	* Number of blocks of storage used

TABLE I. DESCRIPTION OF RECORD CONTENTS (CONT'D)

Item	Data type	Description of item
81	F	-Threshold value 1
82	F	-Threshold value 2
83	F	-Threshold value 3
84	F	-Threshold value 4
85	F	-Threshold value 5
86	I	-Update level of threshold values
87	F	-Ratio of data to threshold value 1
88	F	-Ratio of data to threshold value 2
89	F	-Ratio of data to threshold value 3
90	F	-Ratio of data to threshold value 4
91	F	-Ratio of data to threshold value 5
92	I	-Microfilm reel number reference (10-digit integer) Digits 1, 2 = site code (16 = P = Pickens) Digits 3 to 10 = digitization number
93	F	+Data peak, absolute amplitude value
94	F	+Corresponding abscissa value of peak
95	F	-Data characteristic 1 Decay time for time records Bandwidth for frequency records
96	F	-Data characteristic 2; for time records--time to 10 percent of peak
97	F	-Data characteristic 3 (group peak)
98	F	-Data characteristic 4 (total intensity for group)
99	F	-Data characteristic 5 (individual sweep intensity)
100	F	-Data characteristic 6 (accumulated intensity for this and previous group members)
101	A2	-Record description, part 1
.	.	. . .
.	.	. . .
.	.	. . .
125	A2	-Record description, part 25
126	F	*Data characteristic 7 (scaled group peak); for log frequency records--base 10 log of frequency interval
127	F	*Data characteristic 8 (scaled total intensity for group); for log frequency records--base 10 log of initial frequency value

TABLE I. DESCRIPTION OF RECORD CONTENTS (CONT'D)

Item	Data type	Description of item
128	F	-Data characteristic 9
129	F	*Time records—abscissa value 1; frequency records—amplitude value 1
130	F	*Time records—ordinate value 1; frequency records—phase value 1
131	F	*Time records—abscissa value 2; frequency records—amplitude value 2
132	F	*Time records—ordinate value 2; frequency records—phase value 2
.	.	. . . . .
.	.	. . . . .
.	.	. . . . .
1152	F	*Time records--ordinate value 512; frequency records—phase value 512

Note: *This table describes the items that are stored in each record of the data base. Each item corresponds to a word of storage in the data base. In the column labeled "Description of the item," each description begins with a special character. The meaning of these characters is defined as follows:*

- ** The item affects program execution. The contents of the item must match the description, except where text is enclosed in parentheses. Text enclosed in parentheses refers only to special applications.*
- *+ The item does not affect program execution, but the program does assume special use for the item. One or more program functions alter the item value. The use of the item is optional. Values may be left undefined. The assumed use of the item is given. Text enclosed in parentheses refers only to special program applications.*
- *- The item does not affect program execution, and the item value is not altered by the program. The user may store any information for the item as long as the information matches the format specified in the column labeled "Data type." The value of the item may be left undefined. The description provided refers only to special program applications.*

Data type: F = Floating point.
I = Integer.
A1 = Alphanumeric, one character left justified in word.
A2 = Alphanumeric, two characters left justified in word.

For log frequency records, the frequency values are not stored. Instead, the base 10 log of the frequency interval is stored in item 126, and the base 10 log of the initial frequency value is stored in item 127.

The A1 and A2 item types indicate that 1 or 2 alphanumeric characters, respectively, are stored for the item values. Any characters that are part of the user's particular computer system's character set may be stored in the items. On an IBM 370, one word has four bytes and can hold four characters. SMARTE limits the number of characters to two and thus wastes space to provide compatibility with future applications with computer equipment where fewer characters are stored per word.

In table I, the I item type indicates that an integer number is stored for the item value. The F item type indicates that a floating point (real) number is stored for the item value.

Certain requirements apply to information stored in each record item. When item use is described as optional, the user can use that item for any information that he desires, as long as its format matches the type indicated for the item in table I. He may also leave values for these items undefined. Record items are assigned values when loaded from data input using the ADD directive (sect. 4). Additionally, records can be created by built-in functions. Section 4 also describes the EDIT and FIX directives, which may be used to modify descriptive item values in existing records.

Items 1 to 20 (record name).--Each record has a 20-character record name assigned to it by the user when it is created. It never changes unless it is explicitly changed by a user. The 20 characters of the record name are stored, each character separately, as items 1 to 20 in the record. Items 1 to 20 must always be a record name. The scheme for how names are chosen is totally up to the user. In past applications, character 18 has been used to indicate the record major type, but it need not be. Likewise, character 19 has been used to indicate a group of records that describe related data. Character 20 has been used to distinguish between records within a group. The record name is stored as 20 separate items to allow more efficient searching on individual parts of a record name. Blanks and all other characters are allowed as part of a record name. Record names need not be unique. It is advisable to assign unique names, however, to identify all records by record name.

Item 21 (record ID).--The record ID is stored as item 21. This serves as the master name by which the program identifies and locates a record. The record ID is assigned by the program and can never be altered directly by the user in any way. A record ID for a given record depends on where a record is stored in a data base. For this reason, a record's ID may change if the record is restored from a backup copy. Either the record name or the record ID can be used to specify a record for all program operations. Record ID's are unique within a given data base, whereas record names need not be.

Items 22 to 62.--Record items 22 to 62 do not affect program execution in any way and therefore can contain any desired information as long as the information matches the type given for the item in table I. The descriptions given in table I represent uses of these items for past data base applications.

Item 63 (abscissa indicator).--Item 63 must have one of the values listed in table I. This item is used by the program as an abscissa indicator value for determining the basic nature of the data base record.

Item 64 (abscissa scale).--Item 64 is expected to be a scale value relating to abscissa values. This item is updated whenever normal program functions are used to rescale coordinate values. Item 64 is never used to control program execution, and it is therefore optional. In past applications, this item was used to store the scale factor that relates the current record abscissa values to the raw data abscissa values in instrumentation units.

Item 65 (abscissa shift value).--Item 65 is expected to be a shift value relating to abscissa values. This item is updated whenever program functions are used to shift coordinate values. Item 65 is never used to control program execution, and it is therefore optional.

Item 66 (ordinate indicator).--Item 66 must have one of the values listed in table I if the program is to produce plot labels indicating the proper amplitude units. Item 66 is otherwise not used to affect program execution. The ordinate indicator applies to ordinate (amplitude) values for time records and amplitude values for log-frequency records. Phase values for log-frequency records are always assumed to be in units of degrees.

Item 67 (ordinate scale).--Item 67 is expected to be a scale value relating to amplitude values. This item is updated whenever normal program functions are used to rescale coordinate values. Item 67 is never used to control program execution, and it is therefore optional. In past applications, this item was used to store the scale factor that relates the current record amplitude values to the raw data amplitude values in instrumentation units.

Item 68 (ordinate shift value).--Item 68 is expected to be a shift value relating to amplitude values. This item is updated whenever program functions are used to shift coordinate values. Item 68 is never used to control program execution, and it is therefore optional.

Item 69 (rotation value).--Item 69 is intended to contain a rotation value (in units of radians) that relates the amount of rotation applied to the coordinate set from its original position. The program does not currently use this item, and it is therefore optional.

Item 70 (number of data points).--Item 70 is expected to equal the number of coordinates in the data record. This item must contain a correct value for the number of coordinates and must be updated whenever the number of coordinates is altered. Built-in analysis functions, which create new records, set the value of this item appropriately.

Items 71 to 74.--Record items 71 to 74 do not affect program execution in any way and therefore can contain any desired information as long as the information matches the type of the item specified in table I. The descriptions given in table I represent uses of these items for past data base applications.

Item 75 (interpolation indicator).--Item 75 is used as an interpolation indicator. Built-in functions that perform interpolation set this value appropriately. This item does not affect program execution, and it is therefore optional.

Items 76 to 79.--Record items 76 to 79 do not affect program execution in any way and therefore can contain any desired information as long as the information matches the type given for the item in table I. The descriptions given in table I represent uses of these items for past data base applications.

Item 80 (blocks of storage).--Item 80 is set by the program to the amount of storage in PRU's used by the record when the record is stored. This value should not be set or altered by the user in any way.

Items 81 to 92.--Record items 81 to 92 do not affect program execution in any way and therefore can contain any desired information as long as the information matches the type given for the item in table I. The descriptions given in table I represent uses of these items for past data base applications.

Items 93 and 94 (data peak).--The program assumes items 93 and 94 to be the amplitude value and the corresponding abscissa value, respectively, for the coordinate in the data record that has the largest absolute amplitude value. Built-in program functions that alter coordinate sets automatically adjust these values or recalculate them as necessary. The values stored for these items do not affect program execution and therefore are optional.

Items 95 to 125.--Record items 95 to 125 do not affect program execution in any way and therefore can contain any desired information as long as the information matches the type given for item in table I. The descriptions given in table I represent uses of these items for past data base applications.

Items 126 and 127.--Items 126 and 127 must be used as defined in table I for log-frequency records. For time records, these items are optional.

Item 128.--Record item 128 does not affect program execution in any way and therefore can contain any desired information as long as the information matches the type given for the item in table I. The description given in table I represents uses of this item for past data base applications.

Item 129 and subsequent items.--Item 129 and subsequent items are used to store coordinate values as described in table I. The total number of items in the record is defined by the number of coordinate values and is equal to 128 plus twice the number of coordinates. No other information should be stored by the user for these items.

2.7 Index Structure and Record Access

Release 2 employs a single master index for each data base that allows the program to locate data base records on the data base direct access storage device. Subindexes are used only in the CDC 6000 version, Release 1 (not discussed in this report).

The master index contains addresses for all PRU locations on the data base storage device. The master index is automatically established and maintained by system software. All necessary information relating to the index structure is stored on the data base device and is updated as necessary.

The record ID, stored as item 21 of each data base record, corresponds to an entry in the master index. This entry gives the location of the first PRU of the data base record, which contains items 1 to 128. The other PRU's that make up the data base record are stored in PRU locations found in index entries following consecutively after the first.

The 128-word data base control record is stored as the first PRU and, thus, has a record ID equal to 1. Data records are stored thereafter, with the first having a record ID equal to 2. If the first data base record, for example, requires 9 PRU's total, then the next data base record has a record ID equal to 11.

To retrieve a data base record, SMARTE must know the record ID of that record. Subroutine DBGET is employed for record retrieval. The first PRU of the record can be retrieved by executing the following statement:

```
READ(LUDB'ID) (RI(ITEM),ITEM=1,128)
```

where LUDB is the logical unit number assigned to the data base and ID is the record ID (item 21). The contents of the first 128 words of the data base record are placed by the above statement into the first 128 words of array RI. Array IR is equivalenced to RI (with zero bias) so that integer values may be accessed. The number of total PRU's used by the data base record is stored as item 80 and therefore equals IR(80). The number of words in the data base record, NOWDS, is calculated as follows:

```
NOWDS=IR(80)*128
```

The remainder of the data base record can then be retrieved by executing the following statement:

```
READ(LUDB'ID+1) (RI(ITEM),ITEM=129,NOWDS)
```

At this point, the entire record contents would reside in array RI. The actual valid record items equal this number:

```
128+(2*IR(70))
```

The data base control record is used by SMARTE to store the additional pieces of information needed to control the data base. The program always maintains a copy of this record for the primary data base in array IDBCR. The function of the currently used items of this record corresponds to the explanation of IDBCR in appendix A. As necessary, the program updates both the array IDBCR and the data base control record stored on the data base.

If the program wishes to retrieve a record without knowing its record ID, then a search must be made. The first PRU of each record is examined to see if it is the desired record. When the desired record is found, it is retrieved. Subroutine FIND is used to locate a record given the record name, items 1 to 20. Subroutine DBSER is used to locate a record if other information must be matched. DBSER is the key routine of the conditional search capability.

To store a new record, the program first sets up the record's contents in array RI (with array IR equivalenced to it as before). The space required for the record is calculated and stored for item 80 as follows:

```
IR(80)=(128+(2*IR(70))+127)/128
```

The program first attempts to store the new record in an existing hole. By comparing IR(80) to IDBCR(8), the program can find out if a large enough hole exists. If adequate hole space exists, the record is stored as described in section 2.8. Otherwise, the new record must be stored at the end of information.

Before storing a new record at the end of information, the program checks to see if adequate space remains in the data base. IDBCR(1) gives the size of the master index, which is the total number of PRU's that may be stored. If the space is not adequate, the attempt to store the record is aborted, and a diagnostic message is printed. To store the new record, the record ID (item 21) of the new record is set to the next available record ID number, IDBCR(2). IDBCR(2) is then updated. Words 7, 10, and 11 of the data base control record also are updated. The new record is stored by executing the following statements:

```
NOWDS=IR(80)*128
WRITE(LUDB'ID) (RI(ITEM),ITEM=1,NOWDS)
```

where LUDB is the logical unit number assigned to the data base and ID is the record ID (item 21). Subroutine DBPUT is used for all record storage. DBPUT calls subroutine DBSWAP if a record is to be written in an existing hole.

The above discussion is provided as an overview to assist the user in understanding how SMARTE communicates with a data base storage device. The discussion does not begin to cover all of the details performed by the program in storing and retrieving records. For full information, the user should refer to the programming statements and comments in the following relevant subroutines:

DBDEF	assigns a data base as the primary data base.
DBGET	retrieves a record given the record ID.
DBPUT	stores a record (see also DBSWAP).
DBSER	locates a record given information other than the record ID or record name.
DBSWAP	stores a record in an existing hole (called by DBPUT).
DBVOID	purges a record.
FIND	locates a record given the record name.

2.8 Purged Record Procedure

When a record is purged, it is not actually removed from the data base. The space remains allocated. SMARTE flags the record so that it is not considered for use in functions and so that it can be located and overwritten by a new record at a later time. A new record can use an old hole only if the hole is greater than or equal to the needed size for the new record.

SMARTE flags the first purged record by setting its record ID (item 21) to 0. That record's old ID is stored in word 3 of the data base control record, and the size of the hole is stored in word 8 (in units of PRU's) of the data base control record. If a new record is to be added, a check of the data base control record shows if a hole exists and if its size is adequate.

When a second or later record is purged, the negative of the ID stored in word 3 of the data base control record is stored in item 21 of the newly purged record, and the purged record's old ID is stored in the data base control record word 3. Word 8 also is updated to show the largest existing hole size.

No practical limit exists on the size of the chain of purged record ID's. The last purged record's ID is in the data base control record word 3. If SMARTE goes to the record indicated by that ID, item 21 equals the negative of the ID of the next hole. But if the record indicated by the ID is the last hole in the chain, item 21 equals 0.

If a new record is to be stored and a check of the maximum hole size shows that a large enough hole exists, then the program sets out to find a good hole. The program searches the hole chain for the first hole of adequate size. It then updates the data base control record and modifies the chain to no longer include the selected hole. Item 80 (the space used by the record) for the new record is set to the size of the hole, item 21 is set to the ID of the hole, and the new record is then written over the hole. Subroutine DBPUT performs the search and the bulk of the storage operation. Subroutine DBSWAP is called to actually write over the old record.

2.9 Find File

SMARTE maintains a separate direct access scratch file in which it records the identity of retrieved records. Since the file is a scratch file, it exists only for the duration of the computer run.

Two SMARTE functions that are requested by the user via the GET and SEARCH directives (sect. 4) are used to retrieve records. These are actually only identified in the find file. Nothing is done to the records until later when the user requests via another directive or directives that further processing be performed on the so-called retrieved records.

The program stores two pieces of information in the find file for each record identified there: the record ID and the logical unit number of the data base storage device where the record resides.

The find file can handle 90,240 records. Creation and maintenance of the find file employs the same type of direct access input and output statements used for transferring information to and from data bases. The find file is implemented by the following subroutines:

FFCHEK checks for an entry in the find file.

FFGET retrieves an entry from the find file.

FFMOD zeroes an entry in the find file.

FFPAK packs the find file to eliminate zeroed entries.

FFPUT places an entry in the find file.

FFPUT 2 (called by subroutine FFPUT) places an entry in the find file in a way that avoids duplication of entries.

The physical records stored on the find file are 1280 words in size. Each such physical record contains 640 record ID's and 640 corresponding logical unit numbers. Each record ID and its matching logical unit number are combined into one word for storing. Each such word is an eight digit integer. The left-most two digits represent the logical unit number, and the remaining six digits represent the record ID number. Identity words of this form, for up to 640 records, are stored in words 1 to 640 of the find file physical record. The remaining 640 words (641 to 1280) are reserved for use by subroutine SORT and the routines that it calls. Stored in these latter words by subroutine SORT are record item values for the corresponding records identified in words 1 to 640. The record item values stored are those to be used as the basis of a sort.

A COMMON block named D is used in all related routines and contains variables NFINDS and IDFIND. The value of variable NFINDS is updated whenever necessary so that it always equals the total number of

data base records identified in the find file. Variable IDFIND is a 1280-word array that contains the contents of the find file physical record currently being processed.

Records are initially identified in the find file (in the order retrieved) with a GET or SEARCH function. The find file contents thereafter remain fixed unless a GET, SEARCH, CLEAR, or SORT directive (sect. 4) is issued by the user.

A GET directive generally causes additional records to be added to the end of the find file.

A SEARCH directive may cause record entries to be added to the end or deleted from the find file depending on the nature of the SEARCH function specified.

A CLEAR directive performs the sole function of removing all entries from the find file. Actually, all that is done is that the value of NFINDS in COMMON block D is set to 0.

A SORT directive lets the user reorder (sort) the entries in the find file.

New entries for the find file are placed in consecutive storage locations. If a potentially new entry matches an existing entry, no new entry is made. Whenever an entry is to be removed, its ID entry is set to 0. After zeroing one or more entries, before operations on the find file are completed, the find file is repacked to remove all 0 entries (record ID and associated logical unit number).

2.10 Stop Codes and Error Messages

SMARTE attempts to avoid any unwanted situations or errors by constantly checking the validity of operations being requested by the user. The bulk of these checks verifies user supplied directive input. Numerous other checks are made as well, whenever possible, to identify problem areas.

Generally, when the program identifies an error or a problem, a message is printed on the normal output device, logical unit 6. Table II lists the problems that when identified by the program terminate the task in progress. The text (column "Cause") is printed, possibly along with additional informative messages. If the program is being accessed interactively, the task then is terminated, and the user may continue with other operations. On the other hand, if the program is being accessed in a batch mode, then a STOP statement is executed, and the run is aborted.

The numbers listed in table II are those that appear in the corresponding STOP statement for each problem. For example, stop code 6577 is associated with the lack of a read/write access password where required. In subroutine SMACOM, the following statement appears:

```
6577 STOP 6577
```

The number to the left of STOP is a statement label. The number to the right is a value to be passed to the computer operating system. The statement labels are always used to aid in the location of the statement in the software.

When SMARTE runs on the IBM 370, the stop code is included in the completion statistics for the computer run, unless the user has requested via job control language that all system messages be suppressed.

The last entry in table II is not for an error, but corresponds to the STOP that normally ends SMARTE runs.

Numerous nonproblem messages are generated throughout the execution of the program to inform the user about the progress of the program. The sole reason for some of these messages is to provide diagnostic help should an error be detected later by either the program or the user.

The error diagnostics that are generated by the program and those that are generated by the computer operating system provide varying degrees of insight into the actual problem. A useful point to remember is that all messages are printed as processing proceeds, and therefore, by examining the preceding output, the user can almost always determine the operation that was being attempted when an error occurred.

TABLE II. SMARTE STOP CODES

Code	Routine	Cause
1001	DBPUT	Item 21 of record not 0 when DBPUT called
1047	RDUMP	Invalid dump directive packet
1057	EDIT	Record to be edited not found
1077	EDIT	Edit not possible--find file empty
1277	RPT	Error encountered during execution of REPORT directive packet (See additional messages in output.)
1777	DBSER	Invalid search operator for specified item
3177	MESAGE	End of file (EOF) encountered during buffer in or buffer out operation
3277	MESAGE	More than five parity errors encountered during buffer in or buffer out operation
4777	SURCH2	Invalid SEARCH directive packet
5667	FFPUT2	Find file capacity exceeded
5677	PLOTDI	Invalid PLOT directive packet
5777	SORT	Invalid SORT directive packet
6067	TAPEC	TAPE C option cannot be processed (See message in output.)
6077	DBPUT	Data base capacity exceeded
6167	FOUR	Read/write password required to store records
6177	FFPUT	Find file capacity exceeded
6267	COMB	Combination cannot be performed (See additional message in output.)
6277	FOUR	Invalid FOURIER directive packet
6367	COMB	Invalid COMBINE directive packet (See additional message in output.)
6377	HISTO	Invalid HISTOGRAM directive packet
6467	SKALE	Invalid SCALE directive packet
6477	EDIT	Invalid EDIT directive packet
6567	SHIFT	Invalid SHIFT directive packet
6577	SMACOM	Read/write password required for next directive
6667	MOD	Subroutine MOD (needed for FIX directive) not supplied by user
6677	SEARCH	Invalid SEARCH directive packet
6767	EXAMIN	Uncorrectable error on input tape
6777	OUTPUT	Invalid OUTPUT directive packet
7067	DECK	Incomplete record as input
7077	DECKA	Incomplete record as input
7167	DBDEF	Attempt to specify more than five data base files
7177	DECKA	Too many coordinates in input record
7267	TEXT2	Next directive not available at this time
7277	GET	Invalid GET directive packet
7367	DBDEF	Invalid data base file specification
7377	PASS	Invalid access password
7467	TAPEA	Invalid directive modifier card with ADD TAPE A option
7477	PURGE	Invalid PURGE directive packet
7567	RPT	Invalid REPORT directive packet
7577	INITIL	Missing or invalid INITIALIZE password
7667	TAPEA	Input not compatible with TAPE A option
7677	ADD	Invalid ADD directive packet
7767	SMACOM	Invalid directive encountered
7777	SMACOM	Normal termination

Unfortunately, all errors are not detectable by the program. An attempt has been made to have the program (rather than the computer operating system) identify errors since the program can invariably provide more specific diagnostic messages. Many errors can still occur, however, that the program cannot handle. The most common type of error that causes a program abort by the computer system (for interactive or batch access) occurs when a user provides invalid numerical input when the program is anticipating a numerical value. Currently, SMARTE cannot read free form input. All formatted READ statements for numerical values use E, F, or I format specifications. Whenever an invalid character is entered on such an input statement, the computer operating system aborts the run, and the diagnostic message generated may be cryptic.

The user can enter a special access password that causes the program to generate additional limited message output for normal processing of certain directives.

2.11 Subroutine READHP

Subroutine READHP is employed by the ADD directive when the TAPE C option is used (sect. 4). Subroutine READHP is used to read digitized data from magnetic tapes produced by the HP 2116C minicomputer digitization system.[4] This routine should not be confused with subroutine READHD also associated with the ADD directive.

Subroutine READHP attempts to read, on each call, the next available block of data from either (1) an HP 2116C minicomputer prepared seven-track magnetic tape or (2) disc copy of the tape. Each block of data is of constant size and represents information that in its original form was an array of 564 nonnegative integer numbers of 16 bits stored in the core memory on the HP 2116C. That information is written to the magnetic tape as follows.

For each 16-bit HP 2116C word, three 6-level tape characters are written. Each tape character is composed of 7 bits, of which 6 are information bits from the original 16-bit word and the 7th is an odd parity check bit. Bits 0 to 5 are written as character 1; bits 5 to 10 are written as character 2; and bits 10 to 15 are written as character 3. For example, for the decimal integer value 520, the 16-bit representation is as follows:

0 000 001 000 001 000

[4] *C. A. Reddish, Analysis Package Operation Manual, EG&G AL-954 (June 1973).*

This word would be written on magnetic tape as follows:

First character	1000000
Second character	0010000
Third character	0001000

Subroutine READHP returns to the calling program in array IDATA the 564 desired integer values configured as IBM 370 compatible 32-bit words.

Variable LU, supplied by the calling routine, specifies the logical unit number of the input data.

Variable IFLAG is sent by the calling routine with a value of either 0 or 1. IFLAG equal to 0 indicates that the input data are on magnetic tape. IFLAG equal to 1 indicates that the input data were previously copied to disc.

Variable IFLAG is returned by subroutine READHP with a value of -1, 0, or 1. IFLAG equal to -1 indicates that an uncorrectable error was encountered while the program was attempting to process input. IFLAG equal to 0 indicates that an end of file or end of information was encountered while the program was attempting to read input data. IFLAG equal to 1 indicates a normal return with good data.

The FORTRAN call format for READHP is as follows:

```
CALL READHP(LU,IFLAG,IDATA)
```

3. OPERATION

This section explains the details of how to execute SMARTE. The modes of access are discussed and compared. All of the input required by both the program and the computer system is described. The output generated by the program is explained.

3.1 Program Access

The two basic techniques that can be employed to exercise SMARTE are batch access and interactive access. Both have advantages and disadvantages. The manner that is preferable depends on several factors including the type of tasks to be performed and the nature of the computer system used.

The content and the format of input required by SMARTE are identical for both modes of access. Only the physical media differ.

3.1.1 Batch Access

For batch access, all input is prepared before the run and is submitted to the computer system as a single transaction. The input for the run, including all computer system job control language, the SMARTE directive deck, and other optional symbolic input, is prepared before the run on 80-column punched cards, card images stored on a disc storage device, or both.

Normally, the user prepares a single card deck, including the above-mentioned information, and submits it to the computer center for processing. Some time later, the cards are returned, and the user receives a printer listing that contains all SMARTE output as well as a record of the computer system activity relating to the run.

Batch access is well suited to production jobs (similar runs that are repeated with little or no change to the input) and to jobs that produce a large quantity or a special output. Some computer center operating policies may allow only batch access of SMARTE if data bases reside on private disc packs that must be mounted on shared disc drives or if magnetic tape input/output is required.

3.1.2 Interactive Access

With interactive access, the input is provided to the computer system as separate transactions, and the computer system generates the corresponding output as it receives these transactions.

The user communicates with the computer system via a keyboard entry terminal. Normally, the user begins by initiating a stored file of system commands that instruct the computer system to execute SMARTE in a prescribed manner. The user then enters the SMARTE directive input for the desired tasks as the program proceeds. A printed output is normally returned to the user's terminal, but SMARTE allows the output from certain directives to be diverted to an alternative device, which may be assigned to a remote high speed printer.

An advantage to interactive access is that the results are generally received much more quickly than with batch access. Also, the user can compose directive entries based on results received or being received in the current run. A third major advantage is that directive input errors are generally brought to the user's attention immediately by the program, and the user has an opportunity to correct them.

A disadvantage to interactive access is that some computer systems respond slowly to interactive transactions and thereby consume a large amount of the user's time. Also, some computer center operating policies may not allow interactive access if data bases reside on private disc packs that must be mounted on shared disc drives or if magnetic tape input/output is required.

3.2 Input

To execute SMARTE, a user must supply to the computer system as input two types of information. The first type is a set of command or job control language entries that instruct the computer system to execute SMARTE in a prescribed manner. The second type of information required is the input required by the program itself.

The second type, the SMARTE input, can be further classified into four categories: (1) directive input, (2) FIX data input, (3) header input, and (4) ADD/EXAMINE input. Directive input is always required. The other categories are optional, depending on the tasks to be performed.

3.2.1 Computer System Command and Job Control Language Input

The command or job control language input must supply to the computer system all of the information that it needs to execute SMARTE. The program is written entirely in FORTRAN. It is written in ANS FORTRAN to the extent practical. It is compatible with the IBM 370 FORTRAN H-Extended compiler. The program must be compiled with the XL compiler option. The remaining discussion assumes that the program has been compiled and that an executable load module has been produced.

The command or job control language input first must identify the location of the program executable load module and, second, must assign all of the input/output devices required by the program. The input/output devices used by the program are summarized in table III. The table indicates the purposes and attributes required for each device.

Appendix B contains examples of procedures to execute SMARTE. Command list procedures (CLIST's) are used for interactive access, and the batch job decks are for batch access. The actual form of these depends on the computer system used. The ones supplied in the appendix are useful examples that should be adequate for creating the needed procedures for any user's application.

TABLE III. SMARTE INPUT/OUTPUT UNIT ASSIGNMENTS

Application	Logical unit number, alias, type
Fix data input	LU 1 (sequential)
Header input	LU 2 (sequential)
Test point data base	LU 3/TPF (direct access)
Directive deck	LU 4/INPUT (sequential)
ADD/EXAMINE data input	LU 5/FILE1 (sequential)
Printer output	LU 6/OUTPUT (sequential)
Scratch file/find file	LU 7 (direct access)
Data base device	LU 8/DB (CDC 6000 version only) (direct access)
SMARTE dump file	LU 9/DUMP (sequential)
Data base device	LU 10, 11, 12, 13, 14 (IBM 370 version only) (direct access)
Scratch file	LU 20 (IBM 370 version only) (direct access)
Secondary print output	LU 21 (IBM 370 version only) (sequential)
Scratch file	LU 22 (IBM 370 version only) (direct access)
CALCOMP plotting	No LU/PLOTTAPE (IBM 370 version only) (sequential)

3.2.2 Directive Input

The directive input includes all of the directives and the associated supplementary entries that the user provides to the program to direct the program to perform the desired functions. This input does not include the various possible data inputs. As indicated by table III, directive input is provided on logical unit 4. For interactive access, this input is usually provided via a keyboard entry terminal. For batch access, directive input (also referred to as the "directive deck") usually is in the form of a card deck included as part of the job deck.

In this discussion, an entry refers to a single line or a card of input. For interactive access via a keyboard terminal, this is a line of zero or more characters followed by a return, a carriage return, or an equivalent line termination code. For batch access, this is a single 80-column punched card or card image.

The first entry that must be provided by the user is the access password entry of the following form:

PASSWORD=xxxxxxxxxx

The string "PASSWORD=" must appear beginning in column 1 with no spaces and is followed immediately with the proper access password value in place of the x's shown.

The possible access passwords are defined in the program software, and they vary for different copies of the program. Because more than one set of passwords exists and because there is a security threat, the user must obtain these passwords from the person responsible for SMARTE maintenance. The access password value determines (1) whether prompting is desired or not, (2) what type of access is to be used, either interactive or batch, (3) whether debugging output messages are desired or not, and (4) how much access is allowed, either read only or read and write.

If a prompting desire is recognized, prompting is performed for all directive input entries. If interactive access is recognized, then program detected error conditions, which normally terminate the program, terminate only the current task being performed. When a debugging desire is recognized, limited additional program messages are generated while some tasks are processed.

The security feature of the access password is the determination of either read only or read and write access permission. If read only access is recognized, then the user is not allowed to

execute any of the program functions that alter the contents of any data base in any way. Read only access allows the user to exercise any of the query functions that include all retrieval and report generation capabilities.

The second entry that must be provided by the user is the initial data base definition entry. This entry defines the data base that is initially assigned as the primary data base. The content and the format of this entry are identical to the supplementary input entry described under the DEFINE directive in section 4.4.

The remaining entries in the directive input follow the rules described below and vary depending on the operations desired. A detailed description of each possible directive, its supplementary input requirements, and the actions initiated by each are given in section 4. This section provides the general rules for this input. The directive input is terminated, signaling the end of the run, by entering the END directive or in batch access by the end of the directive deck.

The set of valid SMARTE directives is summarized in table IV. This table indicates the type of access password required by each directive. Each directive when entered directs the program to perform specific functions, which are described in section 4. Each directive is provided as a separate entry. An asterisk (*) is entered in column 1 to distinguish the entry as a directive. Beginning in column 2, the user enters the first two or more letters of the directive name. The program examines only the first three columns of the entry to determine the directive entered.

After each directive, a variable number of supplementary input entries is provided (sometimes none). The number, the content, and the format of the required or optional supplementary input entries vary for each directive. Specific requirements are explained in section 4. A supplementary input entry is sometimes referred to as a directive modifier card.

A directive entry followed by all of its associated supplementary entries (sometimes referred to as a directive packet) fully defines to the program a function to be performed. The function to be performed may or may not require data input that must be provided by the user on one of the other logical units listed in table III. Section 4 describes any data input that is required or optional for each directive. Sections 3.2.3 through 3.2.5 contain additional particular information relating to the several data input units.

TABLE IV. SUMMARY OF SMARTE DIRECTIVES

Directive	Function
ADD'	Provides capability of entering any number of new records in any set of prescribed formats into primary data base.
CLEAR	Clears find file of all entries.
COMBINE'	Combines coordinates of specified data base records and enters results as new record.
DEFINE	Allows user to change primary data base assignment to any data bases under program control, thus allowing processing of multiple data bases in one run.
DISPLAY	Prints contents of data base control record for primary data base.
DUMP	Causes all records specified in find file to be copied to new file. (This file can be subsequently used as input to another program or as input to another SMARTE data base by using ADD directive with dump option.)
EDIT'	Allows user to alter contents of specified item of specified data base record.
END	Terminates program execution.
EXAMINE	Generates summary tabular listing of contents of data input file (usually magnetic tape) that is of format and content provided as input to ADD directive with TAPE C option.
FIX'	Provides capability to modify selected data base records via user supplied FORTRAN subroutine named MOD.
FOURIER"	(Fourier transforms are made for specified data base records.) References entries of find file created by GET or SEARCH directive; stores new frequency records.
GET	Identifies specified primary data base records and enters their locations in find file. (Find file contents are used by other directives. Find file remains unchanged unless GET, SEARCH, or CLEAR directive is executed.)
HELP	Prints list of operational SMARTE directives.
HISTOGRAM	Generates histograms for records referenced in find file. (Previous GET or SEARCH directives establish find file.)

TABLE IV. SUMMARY OF SMARTE DIRECTIVES (CONT'D)

Directive	Function
INITIALIZE'	Establishes indexes needed for new data base. (It is issued only once when data base is to be created and must precede any other operations on data base. If directive is issued while established data base is assigned as primary data base, existing data base is destroyed. Initialize password is required by this directive.)
LIST	Generates table of current contents of primary data base, lists records in order of their record identification (ID) numbers.
OUTPUT	Generates output for specified data base record. (This output includes capabilities for generating record contents, plots, and other specialized reports.), References entries of find file created by GET or SEARCH directive.
PLOT	Allows user to select one or more of several plotting options to be executed for plot tasks initiated by subsequent directives.
PRINT	Changes assigned destination print device for output generated by directives: COMBINE, DISPLAY, EXAMINE, FOURIER, HISTOGRAM, LIST, OUTPUT, and REPORT.
PURGE'	Voids data base entries for specified records .
REPORT	Allows for generation of custom specified reports for records referenced in find file.
SCALE'	Multiplies coordinates of specified data base record (abscissa or ordinate) by specified value; references entries of find file created by GET or SEARCH directive.
SEARCH	Searches primary data base, identifies records that satisfy specified conditions, and enters their locations in find file. (Find file contents are used by other directives. Find file remains unchanged unless GET, SEARCH, or CLEAR directive is executed.)
SHIFT'	Shifts coordinates of specified data base record (abscissa or ordinate) by specified value.
SORT	Instructs SMARTE to sort contents of find file alphanumerically by specified record item or by record name (specified item may be any item in range 1 to 128); is used repeatedly to obtain more sophisticated sorts.

Note: A single prime (') after a directive name indicates that a read/write access password is required. A double prime (") indicates that a read/write access password is required only for some functions of the directive.

Directives and associated supplementary entries are provided in the order that the user desires the actions to take place. Otherwise, the order of the directive input (after the required first two entries) is unimportant. The user must be careful to request operations in the proper sequence. For example, the user cannot successfully generate a report using the REPORT directive until first he has performed a retrieval with a GET or a SEARCH directive or both to establish a list of records in the find file that will be used for the body of the report.

A verification (printed copy of interpreted input) is printed on logical unit 6, the normal output device, for each directive entry and each supplementary entry as they are read by the program.

3.2.3 FIX Data Input

When the user uses the FIX directive (sect. 4) he may read data input associated with that directive. This data input must be prepared prior to the SMARTE run in the proper format and stored on some storage medium--cards, disc, or magnetic tape. This data input as indicated in table III must be assigned to logical unit 1. This assignment is made with the computer system job control language in the SMARTE job deck for batch access. For interactive access, this assignment is made by using the computer system interactive command language prior to the execution of SMARTE. For interactive access, this assignment may be a special application of a command list (CLIST) procedure normally used to execute the program. (For interactive access, some computer center operating policies may not allow the reading of data from magnetic tapes or from private mountable disc packs.)

3.2.4 Header Input

If the user wishes to use the ADD directive with the TAPE C option (sect. 4), then he must assign his prepared input header data to logical unit 2, as indicated in table III. The data are assigned to logical unit 2 exactly as described for the FIX data input in section 3.2.3.

3.2.5 ADD/EXAMINE Input

If the user wishes to use either the EXAMINE directive or the ADD directive with the TAPE C option (sect. 4), then he must assign his prepared data to logical unit 5, as indicated in table III. The data are assigned to logical unit 5 exactly as described for the FIX data input in section 3.2.3.

3.3 Output

The output generated by a SMARTE computer run includes printed output on logical units 6 and 21 and unformatted binary data output on logical unit 9. The latter is created by the DUMP directive and is intended to be stored for later use as input to another program or another SMARTE run.

If the user wishes to use the DUMP directive, he must assign a storage device, a magnetic tape, or a disc to logical unit 9. This assignment is made with the computer system job control language in the SMARTE job deck for batch access. For interactive access, the assignment is made by using the computer system interactive command language prior to the execution of the program. For interactive access, this assignment may be a special application of a command list (CLIST) procedure normally used to execute SMARTE. (For interactive access, some computer center operating policies may not allow the writing to magnetic tapes or to private mountable disc packs.)

The bulk of printed output is directed to logical unit 6. The actual device assigned is selected by the user. Normally, for batch access, this is a high speed line printer and, for interactive access, this is the slow speed interactive terminal. Other options are reasonable as well. For example, logical unit 6 might be a disc storage file. The user may examine such a disc file of printer type output at his interactive terminal and later direct that information to a high speed printer if he desires.

The computer operating system generates various degrees of message output concerning the system's progress during the run. For batch access, the degree of output and its destination are selected by the user with the job control language. The output can be suppressed entirely, but this suppression may hinder the detection of inevitable problems. For interactive access, all but the printing of the system's completion code is normally suppressed.

Additionally, the operating system, if it detects a FORTRAN execution error, generates an error message to logical unit 6.

SMARTE allows the user to divert the bulk printed output from certain directives (sect. 4, PRINT directive) to an alternate device. This device is assigned to logical unit 21. The intention is that, for interactive access, the main output, on logical unit 6, should go to the slow speed interactive terminal while the bulk output is diverted to logical unit 21, which is assigned to a remote high speed printer.

The first output printed by the program is a banner that identifies the program and its version. This banner consists of two lines for interactive access and a full page for batch access. The remainder of the program generated output is a chronological record of the activity during the run. Printed output is generated (1) each time that directive input is read, (2) at the completion of each significant activity, and (3) at an explicit request by the user (reports, for example). All program output is generated in chronological order so that the user can trace the actions taken by the program.

The program prints a single line message after reading each entry of directive input to verify the information as interpreted by the program. Whenever a directive is read, it is printed along with an asterisk. Whenever a supplementary input entry is read, it is printed as interpreted, but enclosed in parentheses. Whenever the functions performed by a directive are completed, a one line message, preceded by a plus (+), is printed confirming this completion. Error messages are printed whenever problems are detected.

Interspersed throughout the messages described in the previous paragraph are additional message output, tabular reports, plots, etc., which are a function of the directive being processed. This output is described fully under each directive in section 4.

All message output always goes to logical unit 6. Only directive bulk output (tabular listings and plots) is divertible to the alternate print device on logical unit 21.

All printed output generated by the program is limited to 72 columns per line, with the following exceptions. All plots, not including histograms, require full width printer paper; so does the output produced by the OUTPUT directive with the TYPE11 option. The user controls the width of output produced by the REPORT directive. The limit of 72 columns exists so that output may be printed at slow speed interactive terminals, which have small carriages, like teletypewriters.

As a common practice in most SMARTE output, the record name is printed with spaces and parentheses added to enhance the readability of the 20-character record name string. This display format is of the following format:

Without added characters: ABCDEFGHIJKLMNOPQRST

With added characters: A BCDEFG HI JKLM NO PQ (RST)

3.4 Scratch File Peripheral Assignment

SMARTE uses three scratch files during a run. Being scratch files, these exist only for the duration of the run. The three files are assigned to logical units 7, 20, and 22. These are used as work space for various purposes. The file on logical unit 7, for example, is used to store the find file.

All of the files should be assigned to disc storage devices. The following job control language statements are adequate to allocate space for these files:

```
//FT07F001  DD  SPACE=(CYL,(1,1)),UNIT=SYSDA

//FT20F001  DD  SPACE=(CYL,(1,1)),UNIT=SYSDA

//FT22F001  DD  SPACE=(TRK,(1,1)),UNIT=SYSSQ,

//  DCB=(RECFM=FA,LRECL=133,BLKSIZE=133)
```

SYSDA refers to any system direct access storage device, and SYSSQ refers to any system sequential storage device. (In the assignment of logical unit 22, it is important that LRECL equal BLKSIZE.)

3.5 Data Base Peripheral Assignment

The data bases accessed by the program must be assigned to logical units 10 to 14 as indicated in table III. All data bases require a direct access storage device, like a disc. The space required by a data base varies as described in sections 2.4 and 4.4. When an IBM model 3340 disc drive is used, the space requirements are as follows:

Logical unit	Cylinders (No.)	Tracks (No.)
10	64	768
11	230	2760
12	230	2760
13	640	7680
14	640	7680

Appendix B details the procedures.

3.6 Data Base Backup

The user is responsible for developing a procedure by which he can conveniently and in a timely manner restore his data bases if they

are lost. With any computerized data base operation, the loss or the destruction (for all practical purposes) of the working copy of data base information is inevitable. In most applications, the copy is lost surprisingly often and perhaps due to no fault of the user. If for no other reason, it is eventually lost due to degradation or failure of the data base storage device.

A procedure must exist, therefore, for making backup copies of the information on the data base. Many techniques can be used for making these copies and it may be advisable to use more than one technique. It is certainly advisable to have not one, but two or more backup copies.

A good, inexpensive technique is to have three magnetic tape volumes onto which the user periodically makes backup copies of the working data base. The three tape volumes store subsequent generations of the data base. Each time that a backup copy is made, the tape containing the oldest copy is used. Records are kept of the SMARTE runs that alter the data base contents in any way.

When the data base needs to be restored, the user goes to his most recent backup copy. If it is a copy of the latest working data base, he need only copy the information to his data base device. If it is not a current copy, he must copy it to the data base device and then repeat the previous SMARTE runs necessary to restore the data base to its most recent form. If the most recent backup copy is unusable, the user must go to the next most recent backup copy or, for the worst case, to the oldest copy.

Backup copies must be made frequently enough so that the user does not have to spend long hours and many dollars restoring the data base to its preloss state.

Good computer centers normally make backup copies of all on-line storage at least weekly, and the better centers back up files daily. If the user's data base is stored on a device that is automatically backed up in this manner, he may not have a problem. The user should determine if the data base is definitely backed up and, if so, how long the backup copies are retained and what the technique is for restoring a data base. Even if the computer center does back up a user's data base, the user may wish to consider further backup.

Most computer systems provide utility programs that can be used for making backup copies. These programs are not expensive or difficult to use once the user is familiar with them.

SMARTE includes directives that may be used for making backup copies of a data base. To make a backup copy, the user assigns a magnetic tape or a disc file to logical unit 9. He then assigns his data base as the primary data base and executes a SEARCH directive so that all records of which he desires a copy qualify to the search. To have all records qualify, he executes this directive:

```
*SEARCH
021
GE
0000000002
```

Then he executes a DUMP directive with the TYPE 2 option. All records that qualified to the search are dumped to the device on logical unit 9. (Holes are not dumped since they cannot qualify to a search.)

To restore the data base from a backup copy made with the DUMP directive with the TYPE 2 option, the user does the following: He first assigns his data base device to receive the new data base as the primary data base. He then executes an INITIALIZE directive to establish the basic structure of the data base. He then executes an ADD directive with the DUMP B option. By then, the user has a restored data base of all the information on the backup copy. The record ID's of the records may be different from the original if (1) holes existed on the original, (2) all records on the original were not dumped, or (3) the records were not dumped in the order that they were stored on the original. Otherwise, the new data base records are identical to those on the backup copy and the original working data base.

4. DIRECTIVES

This section details each program directive alphabetically. Included for each directive are descriptions of its function, the password required, requirements for supplementary input, and the generated output.

4.1 ADD Directive

4.1.1 Function

The ADD directive provides the capability to store new records in the primary data base from an input file on logical unit 5. Each new record is written on the primary data base either (1) in the space (hole) vacated by a previously purged record if a large enough hole exists or (2) at the end of information.

Several different input format options are provided. These include several formats for 80-column punched card (or card image) input. One option accepts input data in a form produced by the DUMP directive. One option provides the capability to accept input in the format produced by the Harry Diamond Laboratories' HP 2116C minicomputer system with its DIGIT program,[4] which is used for digitization of raw test data. With this option, SMARTE reads additional information (sometimes referred to as header information), descriptive of the data input, from logical unit 2. Subroutine READHD is supplied by the user to read this header information in the desired format.

4.1.2 Password Required

A read/write access password is required to execute the ADD directive.

4.1.3 Supplementary Input

There are one or two supplementary input entries:

Entry 1

Columns 1 to 6 one of the following:

DECK A

DECK B

DECK C

DUMP B

TAPE C

(Column 5: always left blank)

Column 8: one digit integer number from the following list to specify the printed output desired for each record added:

0 (or blank) for no printed output

[4] C. A. Reddish, *Analysis Package Operation Manual*, EG&G AL-954 (June 1973).

1 for a plot

2 for a plot and a short tabulation

3 for a plot and a long tabulation

4 for a short tabulation

5 for a long tabulation

Entry 2 (associated only with the TAPE C option)

Parameter 1, columns 1 to 5: a five digit integer specifying the minimum allowed value for word 41 of each input record. A blank field is equivalent to 0.

Parameter 2, columns 6 to 10: a five digit integer specifying the maximum allowed value for word 41 of each input record. If the parameter is omitted, 99999 is assumed.

Parameter 3, columns 11 to 15: a five digit integer specifying a value to be used in place of the value in word 41 of each input record. This parameter is optional.

Parameter 4, columns 16 to 20: a five digit integer specifying a starting record number. Preceding records in the input file are ignored. A blank field or 0 is equivalent to entering 1.

Parameter 5, columns 21 to 25: a five digit integer specifying the total number of records to be added. If the parameter is omitted, 99999 is assumed.

Parameter 6, column 26: 0 to have the program terminate the reading input if an end of file mark is encountered, 1 to have the program ignore end of file marks on the input. A 1 should not be specified if parameter 5 is omitted. A blank is equivalent to 0.

Parameter 7, columns 27 and 28: a two digit integer that is passed to subroutine READHD as variable IFORM.

Data input devices.--The user must assign his input data file to logical unit 5, prior to executing SMARTE, with computer system job control language or interactive command language. If the TAPE C option is used, he must also assign his header card input to logical unit 2.

DECK A, DECK B, DECK C data input.--The input for DECK A, DECK B, and DECK C options is assumed to be 80-column punched cards or card images stored on a disc storage device or a magnetic tape.

The input format for the DECK A option is described in table V. Any number of coordinates may be entered up to 512. The last card for each data record must have the value 1.000000E+33 entered in columns 1 to 12. Any number of data records may be entered, each one terminated with the latter value. An end of file mark terminates the input process. (On card input, it occurs when no more cards remain.) If no value is entered for item 70, then it is set by the program to the number of coordinate pairs read. Items 21 and 80 are set by the program and override any values entered.

TABLE V. INPUT FORMAT FOR ADD DECK A OPTION

Card	Items	Format
1	1 to 27	20A1,I5,6A2
2	28 to 32	A2,I4,3A2
3	33 to 35	E12.4,2A2
4	36 to 51	2I4,14A2
5	52 to 54	2A2,E12.4
6	55 to 60	6I6
7	61, 62	2I3
8	63 to 69	I5,2E12.4,I5,3E12.4
9	70 to 80	4I3,E12.4,I3,5I5
10	81 to 86	5E12.4,I6
11	87 to 92	5E12.4,I6
12	93, 94	2E12.4
13	95 to 100	6E12.4
14	101 to 125	25A2
15	126 to 128	3E12.4
16	129, 130	2E12.4
.	. .	.
.	. .	.
.	. .	.
Last	(See note)	(See note)

Notes: *The value 1.000000E+33 is entered on the last card beginning in column 1.*

If item 70 is not entered or if A value of 0 is entered, then the program sets its value to the number of coordinate pairs read.

Items 21 and 80 have no effect on the input since values for these items are calculated by the program as records are stored.

The input for the DECK B option is identical to that for the DECK A option, except that card numbers 8 to 15 are omitted. The items otherwise entered on those cards are given null values in the data base.

The input for the DECK C option is described in table VI. Any number of coordinates may be entered up to 512. The program reads the appropriate number of cards required to contain the number of coordinate pairs specified by the value for item 70. The last card may be partially filled as appropriate. Card groups for subsequent records are placed immediately after each other in the input. An end of file mark terminates the input process. (On card input, it occurs when no more cards remain.) Items 21 and 80 are set by the program and override any values entered.

TABLE VI INPUT FORMAT FOR ADD DECK C OPTION

Card	Items	Format
1	1 to 41	20A1,I5,7A2,I4,3A2,E10.4,2A2,2I4,4A2
2	42 to 62	12A2,E10.4,6I6,2I3
3	63 to 73	I5,2E10.4,I5,3E10.4,4I3
4	74 to 84	E10.4,I3,5I5,4E10.4
5	85 to 92	E10.4,I6,5E10.4,I10
6	93 to 100	8E10.4
7	101 to 128	25A2,3E10.4
8	129 to 136	8E10.4
9	137 to 144	8E10.4
10	145 to 152	8E10.4
.	. .	.
.	. .	.
.	. .	.

Note: Items 21 and 80 have no effect on the input since values for these items are calculated by the program as records are stored.

DUMP B data input.--The input format for the DUMP B option is identical to that produced by the DUMP directive with the TYPE 2 option. The device used for this input must be a magnetic tape or a disc. Items 21 and 80 are set by the program and override any values entered.

TAPE C data input.--The basic data input on logical unit 5 is on a magnetic tape produced by the HP 2116C minicomputer. This information includes the record identification (words 1 and 2, sometimes referred to as site and shot numbers), two scaling parameters (words 41 and 44), and the digitized equispaced amplitude values (words 53, 54, . . .) up to a maximum of 512 values. Header information is provided on

logical unit 2 as 80-column punched cards or the equivalent. This header information contains the remaining description of each record, including necessary scaling factors.

Subroutine READHD.--With the TAPE C option, subroutine READHD must be supplied by the user to read the header information, place it in the proper record items, and calculate scale factors. Each time that SMARTE reads a data record from logical unit 5, it then calls subroutine READHD before continuing to process the record.

The basic form of subroutine READHD, in FORTRAN, is shown in figure 1. Subroutine READHD controls the following record items:

1 to 20, 22 to 61, 66, 72, 76 to 79, 81 to 92, 101 to 125.

The remaining record items are set by the normal SMARTE routines. Array RI and equivalenced array IR are provided through COMMON to allow the user to set the appropriate record item values. RI is type real, and IR is type integer. Real (floating point) items must be referenced via RI, and integer items must be referenced via IR. Alphanumeric items can be referenced either way. The user must define any of the above-mentioned record items that he wishes to have values in the data base. Those not defined have 0 values. The EDIT or FIX directive can be used later to change any of the record items 1 to 128, except 21. Items 66 and 72 should be assigned one of the set of values indicated for the corresponding item in table I.

Variable IFORM, which is read as parameter 7 on supplementary entry 2, is available for use in subroutine READHD. Variables IW41 and IW44 also are available to the user with the contents of data record words 41 and 44, respectively. IW1 and IW2 contain the values of the site and the shot number, respectively.

The user must define the value of ISTOP to either 0 or 1. A 0 indicates that processing of the data may continue normally. A 1 indicates that SMARTE should not process the current data record further. This latter condition arises, for example, when a header card cannot be located for a given record. Subroutine READHD can execute a STOP statement if it needs to terminate program execution altogether.

The user must calculate values for variables ABS, the abscissa scale factor, and ORD, the ordinate scale factor. These values must be ratios of the desired data units to the instrumentation system units. Variable ICAL must be set by the user to equal the number of instrumentation units per digitizer calibration block.

```
      SUBROUTINE READHD(IFORM,ISTOP,Iw1,Iw2,Iw41,Iw44,ORD,ABS,ICAL)

C     THIS IS THE DUMMY VERSION OF SUBROUTINE READHD WHICH IS INCORPORATED
C     INTO THE SMARTE PROGRAM.  A CUSTOM WRITTEN VERSION OF THIS ROUTINE
C     SHOULD BE SUPPLIED BY THE USER FOR HIS DESIRED APPLICATION.
C
C     THIS ROUTINE SUPPLIES NECESSARY AND OPTIONAL HEADER INFORMATION TO
C     THE PROGRAM SMARTE FOR THE ADD/TAPE C OPTION.  THIS ROUTINE IS
C     CALLED AFTER EACH INPUT DATA RECORD IS READ BUT BEFORE IT IS
C     TRANSFORMED AND STORED.
C
C     VARIABLES IFORM, Iw1, IW2, Iw41, Iw44 ARE SUPPLIED BY PROGRAM
C     SMARTE.  VARIABLES ISTOP, ABS, ORD, ICAL MUST BE SET IN THIS
C     ROUTINE.  THIS ROUTINE IS RESPONSIBLE ALSO FOR SETTING ANY DESIRED
C     VALUES FOR THE FOLLOWING RECORD ITEMS.
C
C       1-20, 22-61, 66, 72, 76-79, 81-92, 101-125
C
C     THE VALUES FOR ITEMS 66 AND 72 SHOULD AGREE WITH THE SET OF
C     ALLOWED VALUES DESCRIBED IN THE SMARTE DOCUMENTATION.
C
C     THIS ROUTINE MAY READ HEADER INFORMATION FROM LOGICAL UNIT NUMBER 2.
C     NORMALLY THIS ROUTINE WILL SEARCH THE INFORMATION ON LOGICAL UNIT 2
C     FOR A RECORD IDENTIFIED WITH A SITE AND SHOT NUMBER WHICH MATCHES
C     THAT FOR THE INPUT DATA RECORD.  THE SITE AND SHOT NUMBER OF THE
C     INPUT DATA RECORD ARE CONTAINED IN VARIABLES Iw1 AND Iw2,
C     RESPECTIVELY.
C
C     VARIABLES Iw41 AND Iw44 CONTAIN THE VALUES OF WORD 41 AND 44,
C     RESPECTIVELY, OF THE DIGITIZER OUTPUT FOR THE INPUT DATA RECORD.
C     IFORM CONTAINS PARAMETER 7 WHICH IS AN OPTIONAL PARAMETER READ BY
C     SMARTE ON THE SECOND SUPPLEMENTARY INPUT ENTRY FOR THE ADD
C     DIRECTIVE.
C
C     THIS ROUTINE MUST SET ISTOP TO ZERO TO INDICATE A NORMAL RETURN.
C     ISTOP IS SET TO 1 IF THE USER WISHES TO DIRECT THE SMARTE PROGRAM
C     NOT TO PROCESS THE CURRENT INPUT RECORD.  THIS ROUTINE SHOULD
C     EXECUTE A STOP STATEMENT IF SMARTE EXECUTION SHOULD BE TERMINATED
C     ALTOGETHER.
C
C     THIS ROUTINE MUST DEFINE VALUES FOR ABS, ORD, AND ICAL.
```

Figure 1. Basic form of subroutine READHD.

```
C
C   WHEN SETTING RECORD ITEM VALUES, REAL AND ALPHANUMERIC ITEMS
C   SHOULD BE REFERENCED VIA ARRAY RI.  INTEGER ITEMS SHOULD BE
C   REFERENCED VIA EQUIVALENCED ARRAY IR.
C
C*******************************************************************************
C   VARIABLES...
C
C   ABS - ABSCISSA CONVERSION FACTOR.  THE RATIO OF THE DESIRED ABSCISSA
C     UNITS TO THE ORIGINAL INSTRUMENTATION UNITS.
C   ICAL - THE NUMBER OF ORIGINAL INSTRUMENTATION UNITS PER DIGITIZER
C     CALIBRATION BLOCK.
C   IFORM - PARAMETER 7 ON ADD SUPPLEMENTARY ENTRY 2.  DESIGNED FOR
C     THE EXCLUSIVE USE OF THIS ROUTINE.
C   IR - TYPE INTEGER ARRAY EQUIVALENCED TO ARRAY RI.
C   ISTOP - RETURN CODE FLAG.  0=NORMAL RETURN.  1=SMARTE SHOULD NOT
C     FURTHER PROCESS CURRENT INPUT RECORD.
C   IW1 - SITE NUMBER OF INPUT DATA RECORD. (WORD 1 OF DIGITIZER OUTPUT)
C   IW2 - SHOT NUMBER OF INPUT DATA RECORD. (WORD 2 OF DIGITIZER OUTPUT)
C   IW41 - WORD 41 OF DIGITIZER OUTPUT FOR INPUT DATA RECORD.
C   IW44 - WORD 44 OF DIGITIZER OUTPUT FOR INPUT DATA RECORD.
C   ORD - ORDINATE CONVERSION FACTOR.  THE RATIO OF THE DESIRED ORDINATE
C     UNITS TO THE ORIGINAL INSTRUMENTATION UNITS.
C   RI - ARRAY WHICH IS TO RECEIVE RECORD ITEMS TO BE STORED IN DATA
C     BASE FOR THE CURRENT DATA RECORD.
C*******************************************************************************
C   NOTE: WHEN THE RAW DATA SET CORRESPONDS TO AN OSCILLOSCOPE TRACE, AN
C     INSTRUMENTATION UNIT NORMALLY REFERS TO A MAJOR DIVISION, I.E. ONE
C     CENTIMETER DIVISION ON AN OSCILLOSCOPE GRATICULE.  THE DIGITIZER
C     CALIBRATION BLOCK MUST DEFINE A SQUARE WITH SIDES EQUAL TO AN
C     INTEGER MULTIPLE OF AN INSTRUMENTATION UNIT.
C*******************************************************************************
      COMMON/A/RI(1280)
      DIMENSION IR(1280)
      EQUIVALENCE(RI(1),IR(1))
C*******************************************************************************
C   USER SUPPLIED STATEMENTS FOLLOW.........
C*******************************************************************************
C
      RETURN
      END
```

Figure 1. Basic form of subroutine READHD (cont'd).

Prior to executing SMARTE, the user must prepare a new executable load module that includes his subroutine READHD and any routines called by READHD.

4.1.4 Output Generated

A verification is printed for each supplementary input entry. Diagnostic messages are printed whenever errors are detected or processing cannot be performed. The output requested on supplementary input entry 1 is printed at this time, also.

4.2 CLEAR Directive

4.2.1 Function

The CLEAR directive removes all entries currently in the find file.

4.2.2 Password Required

A read or read/write access password authorizes execution of the CLEAR directive.

4.2.3 Supplementary Input

There is no supplementary input.

4.2.4 Output Generated

No output is generated.

4.3 COMBINE Directive

4.3.1 Function

The COMBINE directive provides the capability to combine the coordinate sets of two or more records into a single coordinate set, which is stored as a new record. The input records and the new record may reside on any data base under program control. The records to be combined must have the same abscissa and ordinate units, and the intention is that each record should contain different ranges of abscissa values for a related set of data.

Whenever more than two records are to be combined to form a single new record, the input records are processed two at a time. The

first pair is combined into one record, then this new record is combined with the next input record, and so on. Input records must always be specified in an order such that the last abscissa value for each record is larger than the last abscissa value of the preceding record.

Via supplementary entries, the user specifies the records to be combined, a name and a data base for the resultant record, and one of several algorithm options. The first supplementary entry always specifies the desired algorithm. The techniques used for the algorithms are described in the following paragraphs. The details of all supplementary input entries, which differ for each option, are described after the technique discussion under the heading "Supplementary Input."

MCI option.--The manual concatenation with interpolation (MCI) algorithm option performs a concatenation of the specified input coordinate sets by overlaying the user specified stop abscissa value of the first record (of each pair of records) with the user specified start abscissa value of the second record. To overlay the start and stop coordinates, the abscissa and ordinate values of the second record are shifted, if necessary. If the user chooses, he may not enter a start or stop abscissa value for a record, in which case the first or last coordinate value or both values of that record are used. Coordinates prior to the start value and after the stop value are discarded. The user can, if he desires, specify an ordinate shift for the resultant record, which is performed after all concatenations are completed. A linear interpolation is performed such that the final coordinate set contains 512 equispaced abscissa values.

PCI option.--The peak concatenation with interpolation (PCI) algorithm option performs a concatenation of the specified input coordinate sets by overlaying the abscissa value for the peak (item 94) of the first record (of each pair of records) with the same peak in the second record. To overlay the peak values, the abscissa and ordinate values of the second record are shifted, if necessary. The user may specify, for the PCI option, a limit for the deviation allowed between the original ordinate values of the two peaks overlaid. This limit is a maximum allowed absolute value for the difference between the two peak values divided by the average between the two. If no limit is entered, ∞ is used for the limit check. Coordinates prior to the chosen peak in the second record and coordinates after the peak in the first record are discarded.

The PCI option is relatively automatic, requiring only record identification from the user, but it does not work for all applications. For this option to work, the second record must contain the same peak identified for the first record.

The PCI option uses the value of item 93 for the abscissa value for the first record. The task is aborted if the peak is the last coordinate of the record. The second record is searched for the peak that has an abscissa value nearest the abscissa value of the peak in the first record. The concatenation is aborted if the two peaks do not qualify to the entered limit. The coordinate sets are then shifted and concatenated. A linear interpolation is performed such that the final coordinate set contains 512 equispaced abscissa values.

MCN option.--The manual concatenation without interpolation (MCN) algorithm option is identical to the MCI option except that no interpolation is performed. The final coordinate set contains only the actual coordinates (shifted as necessary for overlaying) from the original records. The combination process terminates when 512 final coordinates are produced.

PCN option.--The peak concatenation without interpolation (PCN) algorithm option is identical to the PCI option, except that no interpolation is performed. The final coordinate set contains only the actual coordinates (shifted as necessary for overlaying) from the original records. The combination process terminates when 512 final coordinates are produced.

When new records are stored by the program as a result of this directive, the descriptive items are assigned values that match those of the first input record of each group, except as otherwise specified in this disucssion.

Record item 75 is set to 1 if equispaced interpolation is performed by either the MCI or the PCI option.

4.3.2 Password Required

A read/write access password is required to execute the COMBINE directive.

4.3.3 Supplementary Input

There are four or more supplementary entries:

Entry 1 (one of the following, in columns 1 to 3, to specify the algorithm to be employed for the combination)

MCI for manual concatenation with interpolation
MCN for manual concatenation without interpolation
PCI for peak concatenation with interpolation
PCN for peak concatenation without interpolation

If PCI or PCN is entered in columns 1 to 3, then a limit value (see discussion of PCI option above) may be entered in columns 4 to 13 in FORTRAN E format (10-character field). If a value ≤ 0 or a blank field is entered, then the limit assumes the value of ∞.

Entry 2 (one or more of the following two-character terms to indicate the printed output desired)

NO for no printed output

PA to plot amplitude versus time (or frequency)

PP to plot phase versus frequency

TA to tabulate amplitude and time (or frequency) values

TP to tabulate amplitude, phase, and frequency values

Either "NO" or any combination of the other terms (in any order) is entered beginning in column 1 and separated by one blank or a comma. No additional blanks (spaces) or commas are allowed.

Example of entry 2:

PA,TA

Entry 3

Columns 1 to 4: NEW=

Columns 5 to 24: 20 alphanumeric characters to be assigned as the record name for the new record. An indicator character entered later in column 26 may be used in this field (columns 5 to 24) any number of times. Wherever this indicator character appears, the program assumes for that character position of the new record name a character from the same position in the name of the first input record. When several groups of input records are specified, then this new record name is determined separately in the above manner for each group. This indicator character technique therefore allows the user to define new record names that are a function of old record names.

Column 25: (not used)

Column 26: one alphanumeric character used as explained above. Blank is a valid character.

Column 27: (not used)

Columns 28 and 29: a two digit logical unit number specifying the data base where the new record is to be stored. If this field is left blank, the primary data base is used.

Example of entry 3:

NEW= 30, ,11

or

NEW=++++++++++++++++30,+,11

Either of these entries directs the program to store the new record on the data base assigned to logical unit 11 with a record name the same as that of the first record of the combination, except that characters 19 and 20 of that name are set to 30.

Entry 4 (two possible entry types)

Type 1 (for PCI or PCN options only)

Columns 1 and 2: FF, to indicate that the find file is the source of records to be combined

Type 2 (for any option)

Columns 1 to 20: a 20-character record name, or, in columns 21 to 26, a record ID. This parameter indicates a record to be combined.

Columns 27 and 28: a two digit logical unit number specifying the data base where the input record resides. If this number is not entered, the primary data base is assumed.

Column 29: any character other than blank to indicate the first record of a combination group. Blank indicates other than the first record. If the entry is the first following an entry 3 type of entry, then the program assumes that this is the first of a group, and therefore column 29 is superfluous.

Columns 31 to 40: a start abscissa value for the record. This value is optional for MCI and MCN options and is unused for PCI and PCN options.

Columns 41 to 50: a stop abscissa value for the record. This value is optional for MCI and MCN options and is unused for PCI and PCN options.

Columns 51 to 60: a shift value to be applied to the ordinate values of the new record. This value is optional for MCI and MCN options and is unused for PCI and PCN options.

Subsequent entries

If "FF" is specified for entry 4, then no further entries are allowed. Each series of records in the find file, which have identical first-17 characters for their record names, is treated as a group. All of the records in such a combination group must appear together in the order that they are to be processed.

Otherwise, the user specifies the remainder of the records to be used in the combination with additional entries of the form of entry 4.

After all records of a group are specified, the user may enter a blank entry to terminate the COMBINE directive input, or he may specify another group. To specify another group, he repeats another series of entries of the form of entry 4 for the next group, being careful to enter a nonblank character in column 29 of the entry for the first record of the group.

Whenever "FF" is not specified for entry 4, then the supplementary input to the COMBINE directive must be terminated with a blank entry.

4.3.4 Output Generated

A verification of each supplementary entry is printed. Diagnostic messages are printed whenever errors are detected or processing cannot be performed.

The printed output specified on supplementary entry 2 can be diverted to an alternate destination by prior use of the PRINT directive.

4.4 DEFINE Directive

4.4.1 Function

The DEFINE directive changes the assignment of "primary data base" to any of the up to five data bases under the control of the program. Prior to entering any directives, the program requires first an access password and then, as the second entry, a primary data base definition. This latter entry determines the data base that is initially assigned as the primary data base. If at some point in the run it is desired to designate a different data base as the primary data base, then the DEFINE directive is used. The DEFINE directive can be issued any number of times during a run.

Directives can generally perform functions only on the primary data base. An exception to this rule occurs when a directive is processing records already identified in the find file. The find file can contain record identifications from any or all of the data bases under program control.

4.4.2 Password Required

A read or read/write access password authorizes execution of the DEFINE directive.

4.4.3 Supplementary Input

One entry of the following format is input:

DB=iiiii,SIZE=jjjjjj,LU=kk

The user enters after DB=, in columns 4 to 8, a five digit integer number that is the data base number assigned to the data base when it was created or the number to be assigned to a new data base.

The user enters after SIZE=, in columns 15 to 20, a six digit integer number specifying the size of the data base. Unless altered, SMARTE requires that this size value be one of the following:

Logical unit	User entry
LU=10	SIZE=009000
LU=11	SIZE=033000
LU=12	SIZE=033000
LU=13	SIZE=090000
LU=14	SIZE=090000

The user enters after LU=, in columns 25 and 26, a two digit integer number specifying the logical unit number that is assigned to the data base with the computer system job control language.

4.4.4 Output Generated

A verification of the supplementary entry is printed along with diagnostic messages if the directive cannot be properly processed.

4.5 DISPLAY Directive

4.5.1 Function

The DISPLAY directive prints the contents of the data base control record for the primary data base.

4.5.2 Password Required

A read or read/write access password authorizes execution of the DISPLAY directive.

4.5.3 Supplementary Input

There is no supplementary input.

4.5.4 Output Generated

A 15-line tabular listing of the contents of the data base control record is output for the primary data base. The output can be diverted to an alternate destination by prior use of the PRINT directive.

4.6 DUMP Directive

4.6.1 Function

The DUMP directive generates, on logical unit 9, a copy of the full contents of the records identified in the find file. The find

file must have been previously established with a GET or SEARCH directive or both. The records identified in the find file may reside on any of the data bases under program control.

The information copied or dumped may be used as input to SMARTE on a later run by using the ADD directive with the DUMP B option. Alternatively, the dumped information may be used as input to another user program.

Only one output format is available for the DUMP directive. This corresponds to the TYPE 2 option (supplementary entry 1). This option uses FORTRAN unformatted write (binary write) statements. For each record dumped, two physical records are written to logical unit 9. The first is 128 words in size and contains items 1 to 128. The second physical record is variable in size and contains the remaining items of the data base record being dumped. To be more precise, the following FORTRAN statements are executed to dump each record:

```
WRITE(9) (RI(ITEM),ITEM=1,128)
NOWDS=128+(IR(70)*2)
WRITE(9) (RI(ITEM),ITEM=129,NOWDS)
```

where array RI contains the record items and IR(70) equals item 70, the number of coordinates.

4.6.2 Password Required

A read or read/write access password authorizes execution of the DUMP directive.

4.6.3 Supplementary Input

One supplementary entry is input as follows:

Entry

Columns 1 to 6: TYPE02 (or TYPE 2)

4.6.4 Output Generated

Diagnostic messages are printed if the requested copy cannot be made. Upon completion of the DUMP directive, the number of records copied is unreported. The actual record contents are copied to logical unit 9. The desired device must be assigned to logical unit 9 prior to program execution by using the computer system job control language or interactive commands, if using interactive access.

4.7 EDIT Directive

4.7.1 Function

The EDIT directive provides the capability to permanently alter the content of any description item (except item 21) of a specified record or records. The records to be altered must reside on the primary data base unless the find file is specified as the source of record names. If it is, they may reside on any of the data bases under program control. If the find file is specified, it must have been established with a GET or SEARCH directive or both.

Each time that the EDIT directive is issued, three types of edits are possible: (1) A single item can be altered for all records identified in the find file. (2) A single item can be altered for any one record specified by record name or by record ID. (3) Multiple independent edits can be made on single records specified by record name or by record ID. This last type of edit is equivalent to repeatedly issuing the EDIT directive to perform edits of type (2).

Any of the record description items (1 to 128) can be edited, except the record ID (item 21). Record names stored in items 1 to 20 are included in the items that may be changed. Coordinate values (items 129 to 1152) may not be changed with this directive.

4.7.2 Password Required

A read/write access password is required to execute the EDIT directive.

4.7.3 Supplementary Input

Three or more supplementary entries are input as described below.

Entry 1 (one of the following)

Columns 1 to 20: a 20-character record name

or

Columns 21 to 26: a six digit record ID number

or

Columns 1 and 2: FF

If "FF" is entered, the find file is used as the source for records to be edited.

Entry 2

Columns 1 to 3: a three digit item number for the item to be changed

Entry 3 (the new value for the item entered in one of the following formats, depending on the format of the item being edited)

For one-character alphanumeric items:

Column 1: one alphanumeric character

or

For two-character alphanumeric items:

Columns 1 and 2: two alphanumeric characters

or

For integer items:

Columns 1 to 12: a 12 digit integer value

or

For real (floating point) items:

Columns 1 to 12: a number in FORTRAN E format

Subsequent entries:

If "FF" is specified for entry 1, then no further entries are required or allowed. The supplementary input ends with entry 3.

If "FF" is not specified for entry 1, then another series of the form of entries 1 to 3 may be entered. In this way, multiple independent edit requests may be processed. This procedure may be repeated any number of times by entering more sets of three entries.

Whenever "FF" is not provided as entry 1, supplementary input to the EDIT directive must be terminated with a blank entry.

4.7.4 Output Generated

A verification is printed for each supplementary input entry. Diagnostic messages are printed whenever errors are detected or processing cannot be performed. When "FF" is specified for supplementary input entry 1, then a one-line message is printed as the editing of each record is completed. This message indicates the record name and the record ID of the edited record.

4.8 END Directive

4.8.1 Function

The END directive terminates program execution.

4.8.2 Password Required

A read or read/write access password authorizes execution of the END directive.

4.8.3 Supplementary Input

There is no supplementary input.

4.8.4 Output Generated

A four- to eight-line listing summarizes the data base numbers accessed during the run and the logical unit numbers assigned to each data base number.

4.9 EXAMINE Directive

4.9.1 Function

The EXAMINE directive generates a summary tabular listing of the contents of a data input file (usually a magnetic tape), which is of the format and the content provided as input to the ADD directive employing the TAPE C option. Magnetic tapes of this type are produced by the Harry Diamond Laboratories' HP 2116C minicomputer system, which is used for digitization of raw test data. In this application, the tape contains the digitized data records produced by the minicomputer's DIGIT program.[4]

[4] *C. A. Reddish, Analysis Package Operation Manual, EG&G AL-954 (June 1973).*

4.9.2 Password Required

A read or read/write access password authorizes execution of the EXAMINE directive.

4.9.3 Supplementary Input

No supplementary entries are associated with the EXAMINE directive. The input data file must be assigned to logical unit 5 with computer system job control language or interactive commands before SMARTE is executed.

4.9.4 Output Generated

Diagnostic messages are printed if any error is detected by the program during processing of the input data file. The tabular summary includes one line for each data record on the input file. This line includes the contents of words 1, 2, 41, and 44 of the data record.

The output can be diverted to an alternate destination by prior use of the PRINT directive.

4.10 FIX Directive

4.10.1 Function

The FIX directive provides the capability to modify selected data base records via a user supplied FORTRAN subroutine named MOD.

The FIX directive performs the following steps: (1) Each record identified in the find file is retrieved, one at a time, from the appropriate data base. (2) After retrieving each record, the program calls subroutine MOD. At this step, subroutine MOD can modify any or all items in the record. (Special rules apply to altering the record ID, item 21.) (3) On return from subroutine MOD, the new record with changes is written to the appropriate data base. The find file must have been established with a GET or SEARCH directive or both.

The new copy of the record is rewritten in place of the old, unless the new record is too large. In the latter case, the new record is added at the end of information, on the same data base that contained the original, and the original copy is purged.

As an option, if the user in subroutine MOD has set the record ID (item 21) to 0, then the changed record is added to the primary data base, and the original copy of the record also is kept.

In any case, SMARTE controls the eventual assignment of the stored record ID (item 21) since this quantity serves as the master record name that identifies the location of the record in the data base.

The user must write a custom subroutine MOD in FORTRAN to perform the desired operations. The basic form of this routine is shown in figure 2.

```
      SUBROUTINE MOD
      COMMON/A/RI(1280)
      DIMENSION IR(1280)
      EQUIVALENCE(RI(1),IR(1))
C
C  USER SUPPLIED STATEMENTS ARE PLACED HERE.
C
      RETURN
      END
```

Figure 2. Basic form of subroutine MOD.

Subroutine MOD has access to all record items via array RI containing 1280 words, of which the first 1152 words are the record items and the remaining are used by SMARTE for working space. Equivalenced to RI is an array IR of equal size. RI is type real, and IR is type integer. Real (floating point) items must be referenced through array RI, and integer items must be referenced through array IR. Alphanumeric items can be referenced either way.

Subroutine MOD may read input data if desired from logical unit 1.

Default subroutine MOD is incorporated into SMARTE to terminate execution and issue a diagnostic if a FIX directive is issued and the user has not supplied his own subroutine MOD.

The user should be careful to change all related record items. For example, if the user alters the quantity of coordinate values, he must change item 70, which is a count of the number of coordinate pairs in the record.

If he wishes, the user may write messages to be included with the printer output by writing to logical unit 6.

4.10.2 Password Required

A read/write access password is required to execute the FIX directive.

4.10.3 Supplementary Input

No supplementary entries are associated with this directive. If the user wishes to read data as input for the FIX directive operation, he may do so by placing FORTRAN READ statements in his subroutine MOD to read data from logical unit 1. The appropriate data must be prepared prior to the SMARTE run on 80-column punched cards or card images stored on a disc device, and these cards or card images must be assigned to logical unit 1 via the computer system job control language or the interactive command language.

Before executing SMARTE, the user must also prepare a new program executable load module, which includes his subroutine MOD in place of the default subroutine MOD supplied with the program.

4.10.4 Output Generated

Diagnostic messages are printed if errors are detected by the program. As directive operation is completed for each record, a one-line message is printed. The message indicates if a record has been added or changed. If a record has been added, the record name, the record ID, and the logical unit number for the primary data base where the new record was placed are printed. If a record was changed, then the record name, the old and new record ID's (the same if the changed record was written over the old), and the logical unit number for the relevant data base are printed.

If he wishes, the user may write messages to be included with the output by writing to logical unit 6.

4.11 FOURIER Directive

4.11.1 Function

The FOURIER directive provides the capability to produce Fourier transforms from one or more specified time records. The resultant frequency coordinate sets may be (1) stored as new records for later use, (2) displayed in tabular and plot form, or (3) both stored and displayed.

The records to be processed may be specified by the record name, the record ID, or reference to the find file. If specified by the record name or by the record ID, the records must reside on the primary data base. If specified by the find file, input records may reside on any data base under program control. If the find file is to be used, the user must establish it prior to this directive with a GET or SEARCH directive or both. Resultant frequency records to be retained may be stored on any data base under program control.

The FOURIER directive is structured to allow the user to specify one of a set of Fourier techniques to be employed. Currently, however, only one option is available. This is the piecewise-linear integral Fourier transform technique.[5] An advantage of this technique is that the transform can be evaluated at select frequency values. A second advantage is that the input time record may contain randomly spaced time values. The computational speed of this algorithm is faster or competitive with other Fourier algorithms for applications of this program. SMARTE allows the generation of only logarithmically spaced frequency coordinates.

With the piecewise-linear integral Fourier transform algorithm the user may specify, in addition to the input records and the disposition of results, the bounds for the calculated frequency values. When frequency records are stored, the description items for the new record match those of the original time record, with the following exceptions. The user specifies the new record name or rules for determining the new record name. Item 63 is set to 1. Item 70 is set to the number of frequency coordinates. Item 126 is set to the base 10 log of the frequency interval. Item 127 is set to the initial frequency value. Item 93 is set to the signed peak aplitude value, and item 94 is set to the peak's frequency value. The actual amplitude values are stored in odd items 129, 131, 133, ... The phase values are stored in even items 130, 132, 134 . . . .

When new records are stored by the program as a result of this directive, the descriptive items are assigned values that match those of the input record, except as otherwise specified in this discussion.

---

[5]*Melvin S. Bostian, FORWRD and INVRSE (Two Fourier Transform Subroutines), Braddock, Dunn and McDonald, Inc. (24 July 1970).*

4.11.2 Password Required

If new frequency records are to be stored, then a read/write access password is required to execute the FOURIER directive. Otherwise, a read access password is sufficient.

4.11.3 Supplementary Input

Three or more supplementary entries are input:

Entry 1 (for piecewise-linear integral alogrithm)

Parameter 1, columns 1 and 2: LO, to request logarithmically spaced frequency values

Parameter 2, columns 4 to 6: a three-digit integer value specifying the desired number of calculated frequency values. This number must be greater than 1 and less than or equal to 512.

Parameter 3, columns 8 to 15: a real (floating point) number in FORTRAN E format (eight-character field) that specifies the lowest frequency value to be calculated. This number must be greater than or equal to 0.1 to explicitly specify a minimum frequency. If 0 or a blank field is entered, parameter 5 is used to calculate a minimum frequency.

Parameter 4, columns 17 to 24: a real (floating point) number in FORTRAN E format (eight-character field) that specifies the highest frequency value to be calculated. This number must be greater than the value entered for parameter 3 to explicitly specify a maximum frequency. If 0 or a blank field is entered, parameter 6 is used to calculate a maximum frequency.

Parameter 5, columns 26 to 33: a real (floating point) number in FORTRAN E format (eight-character field) that specifies a value to be used in calculating a minimum frequency bound. If a blank field or a value less than 1.0E-15 is entered, a value of 1.0 is assumed by default. This parameter is optional. If parameter 3 specifies a minimum frequency, it overrides this parameter. Otherwise, the minimum frequency value is set to the value of parameter 5 divided by the difference between the maximum and minimum time values.

Parameter 6, columns 35 to 42: a real (floating point) number in FORTRAN E format (eight-character field) that specifies a value to be used in calculating a maximum frequency bound. If a blank field or a value less than 1.0E-15 is entered, a value of 1.0 is assumed by default. This parameter is optional. If parameter 4 specifies a maximum frequency, it overrides this parameter. Otherwise, the maximum frequency value is set to the value of parameter 6 divided by the minimum time interval.

Example of entry 1:

```
LO,101,0.      ,0.      0.
```

or

```
LO,101
```

Either of these entries yields a piecewise-linear integral Fourier transform with 101 frequency values logarithmically spaced. The frequency bounds are determined by the program based on the pulse width and the minimum delta time of the record.

Entry 2 (one or more of the following two-character terms indicate the desired disposition of results)

ST to store results in the data base

PA to plot amplitude versus frequency

PP to plot phase versus frequency

TA to tabulate amplitude and frequency values

TP to tabulate amplitude, phase, and frequency values

The appropriate terms are entered in any order beginning in column 1 and separated by one blank or a comma. No additional spaces or blanks are allowed.

Example of entry 2:

```
ST,TA,PA
```

This entry directs the program to (1) store the calculated frequency coordinates as a new record, (2) tabulate the amplitude and frequency values, and (3) plot amplitude versus frequency.

Entry 3

Columns 1 to 4: NEW=

Columns 5 to 24: 20 alphanumeric characters to be assigned as the record name for the new record. An indicator character entered later in column 26 may be used in this field (columns 5 to 24) any number of times. Whenever this indicator character appears, the program assumes for that character position of the new record name a character from the same position in the name of the input record. When several records are specified, then this new record name is determined separately in the above manner for each record. This indicator character technique therefore allows the user to define new record names that are a function of old record names.

Column 25: (not used)

Column 26: one alphanumberic character used as explained above. Blank is a valid character.

Column 27: (not used)

Columns 28 and 29: a two digit logical unit number specifying the data base where the new record is to be stored. If this field is left blank, the primary data base is used.

Example of entry 3:

NEW=30, ,11

or

NEW=++++++++++++++++++30,+,11

Either of these entries directs the program to store the new record on the data base assigned to logical unit 11 with a record name the same as that of the Fourier transform input record, except that characters 19 and 20 of that name are set to 30.

A blank entry can be made for entry 3. In this case, if a new record is stored, its record name matches exactly that of the input record.

Entry 4 (one of the following)

Columns 1 to 20: a 20-character record name

or

Columns 21 to 26: a six digit record ID

or

Columns 1 and 2: FF

If "FF" is entered, the find file is used as the source of records to be transformed.

Subsequent entries

If "FF" is specified for entry 4, then no further entries are required or allowed (no blank entry is entered).

If "FF" is not specified for entry 4, then additional record names or record ID's or both may be specified in the form of entry 4 (one per entry) as desired.

Whenever "FF" is not specified for entry 4, then supplementary input to the FOURIER directive must be terminated with a blank entry.

4.11.4 Output Generated

A verification is printed for each supplementary input entry. Diagnostic messages are printed whenever errors are detected or processing cannot be performed.

The printed output specified on supplementary entry 2 may be diverted to an alternate destination by prior use of the PRINT directive.

4.12 GET Directive

4.12.1 Function

One or more specific records are retrieved and identified in the find file. Subsequently, other directives can reference the find file to perform operations on these records.

Entries that are in the find file prior to the entering of the GET directive remain there. New entries that result from the GET directive are appended, in the order retrieved, to the end of the prior contents of the find file. The CLEAR directive must be used prior to a GET directive if it is desired to remove existing find file entries.

4.12.2 Password Required

A read or read/write access password is required to execute the GET directive.

4.12.3 Supplementary Input

One or more supplementary entries (one for each record to be retrieved) are in the following format:

Columns 1 to 20: a 20-character record name

or

Columns 21 to 26: a six digit record ID number

or

A blank entry to terminate supplementary input

4.12.4 Output Generated

Verification of each supplementary entry is output. A diagnostic message is printed if a retrieval request is not processed.

4.13 HELP Directive

4.13.1 Function

The HELP directive prints a list of operational SMARTE directives.

4.13.2 Password Required

A read or read/write access password authorizes execution of the HELP directive.

4.13.3 Supplementary Input

No supplementary entries are input.

4.13.4 Output Generated

A short list (approximately six lines) of the currently operational directives is output.

4.14 HISTOGRAM Directive

4.14.1 Function

The HISTOGRAM directive generates two histograms and an associated table of values for records identified in the find file. The user specifies the record item that represents the independent variable for the histogram plot. This item may be any of the following: 87 to 91, 93 to 100, or 126 to 128.

The find file must have been established with a GET or SEARCH directive or both.

Only absolute values of the independent variable are plotted. Up to 1280 records can be processed. Any excess is ignored.

4.14.2 Password Required

A read or read/write access password is required to execute the HISTOGRAM directive.

4.14.3 Supplementary Input

The two supplementary entries are as follows:

Entry 1

Column 2: an integer specifying the number of characters to be displayed in each bin. This may have a value from 1 to 8.

Column 4 to 6: a three digit item number for the independent variable. Valid values include 87 to 91, 93 to 100, and 126 to 128.

Columns 7 to 30: the item numbers of the characters to be displayed in the bins. Each of these is a three digit integer value right justified to its three column field. No characters or spaces separate these item numbers. The order in which the item numbers are entered determines the order of the display. Item numbers may be repeated. Only items 1 to 20, corresponding to the 20-character record name, are allowed.

Example of entry 1:

7 093 02 05 07 09 08 10 10

This example yields seven-character histograms where item 93 is the independent variable and characters 2, 5, 7, 9, 8, 10, and 10 of each record name are displayed in the bins.

Entry 2

Columns 1 to 72: a 72-character string of characters to be used as a title. This title is displayed in two lines on each histogram and on the associated table. Characters 1 to 40 appear on line 1, and characters 41 to 72 appear directly below on line 2.

4.14.4 Output Generated

A verification of each supplementary entry is printed. A diagnostic message is printed if the histogram requested cannot be generated. The normal output printed includes a table and two histograms. The tabular and plot output can be diverted to an alternate destination by prior use of the PRINT directive.

The table produced includes a list of each record involved in the histogram plots. The record name and the signed value of the independent variable are printed for each record.

Histograms with both linear and logarithmic abscissas are generated for each HISTOGRAM directive. The abscissa for each consists of bins over the range of the independent variable. The ordinate is a linear scale of how many records qualify to fall in each abscissa bin. Each record is identified in its proper bin by a string of 1 to 8 characters specified by the user from the 20-character record name.

4.15 INITIALIZE Directive

4.15.1 Function

The INITIALIZE directive performs the functions necessary to create a new data base. The directive is issued only once for a given data base. It must be issued prior to any other attempted use of that data base.

This directive establishes the master index and the data base control record for the data base. If more than one data base is under the control of the program, the one affected is the one assigned as the primary data base.

4.15.2 Password Required

A read/write access password is required to execute this directive. Additionally, an initialize password must be supplied as supplementary input.

4.15.3 Supplementary Input

One entry, the initialize password, is entered in columns 1 to 10.

4.15.4 Output Generated

A message is printed stating the acceptability of the entered initialize password. If the initialization is completed, the data base control record is printed in identical format as the table produced by the DISPLAY and LIST directives. A diagnostic message is printed if any problem is identified by the program.

4.16 LIST Directive

4.16.1 Function

The LIST directive prints a full table of contents for the primary data base.

4.16.2 Password Required

A read or read/write access password authorizes execution of the LIST directive.

4.16.3 Supplementary Input

No supplementary entry is input.

4.16.4 Output Generated

The output includes, for the primary data base only, a tabular listing of the contents of the data base control record (approximately 15 lines) followed by a one-line description of each valid and purged record in the data base. The records are listed in the order in which they are indexed by the program. The description of each record includes the 20-character record name, the 6-character record ID, and the integer values for items 70, 63, 66, 71, 72, 73, 75, and 80.

The output can be diverted to an alternate destination by prior use of the PRINT directive.

4.17 OUTPUT Directive

4.17.1 Function

The OUTPUT directive generates one of 11 built-in displays for the user specified records or for all records identified in the find file. The find file, if specified as the source, must have been established with a GET or SEARCH directive or both.

4.17.2 Password Required

A read or read/write access password authorizes execution of the OUTPUT directive.

4.17.3 Supplementary Input

Two or more supplementary entries are input as follows:

Entry 1 (one of the following in columns 1 to 6)

TYPE01	for plots of each record
TYPE02	for plots and short tabulations of each record
TYPE03	for plots and long tabulations of each record
TYPE04	for short tabulations of each record
TYPE05	for long tabulations of each record
TYPE06	for a table including the record name and items 86 to 91 (threshold ratios and version)

TYPE07 for a table including the record name and items 93 to 97

TYPE08 for a table including the record name, the ID, item 92 (reel number), and items 101 to 125 (the record label field)

TYPE09 for a table including the record name and items 81 to 86 (threshold values and version)

TYPE10 for an 80-character-wide compressed display of items 1 to 128 of each record

TYPE11 for a 132-character-wide compressed display of items 1 to 128 of each record

The tables (types 6 to 9) can be specified only if the find file is specified as the source of records to be processed.

For frequency records, types 1 to 5 produce plots or tabulations or both for both amplitude versus frequency and phase versus frequency. To eliminate the phase versus frequency portion of the output, the user replaces the 0 in entry 1 with a minus sign (-). For example, instead of TYPE01, the user enters TYPE-1.

Entry 2 and subsequent entries (one of the following)

Columns 1 to 20: a 20-character record name

or

Columns 21 to 26: a six digit record ID number

or

Columns 1 and 2: FF

or

A blank entry to terminate supplementary input

If "FF" is entered, the find file is used as the source for records processed by the OUTPUT directive. In this case, no additional entries are required or allowed. (No blank entry is used.)

If a record name or a record ID is entered, then the next entry must be another of the form of entry 2. Record name and record ID entries are continued as desired, and the input is terminated with a blank entry.

4.17.4 Output Generated

Verification of each supplementary entry is output. A diagnostic message is printed if the requested output cannot be generated.

The printer plot algorithm displays only up to 101 data points. When more than 101 are in the record to be plotted, then every nth point is plotted, where n equals the actual number divided by 101 and rounded to the higher integer value.

The output can be diverted to an alternate destination by prior use of the PRINT directive.

4.18 PLOT Directive

4.18.1 Function

The PLOT directive allows the user to select one or more plotting techniques to be executed for each plot task initiated by subsequent directives. Currently, two plotting routines are available: a printer plot routine that employs subroutine PRTPLT and a CALCOMP plot routine that employs subroutine CALPLT. Either or both of the routines may be specified to be executed for each plot operation generated by subsequent directives. If the CALCOMP plot technique is specified, the user may further specify that (1) only actual data values are to be plotted, (2) only linear interpolated values are to be plotted, or (3) both values are to be plotted.

The PLOT directive may be issued any number of times during a SMARTE run as needed. If no PLOT directive is issued, then only printer plots are generated.

The user may select more than one of the optional plot techniques. If he does, more than one plot is produced for each subject. Multiple plots of the same type may not be specified with the PLOT directive.

The printer plot routine displays only up to 101 data points. When more than 101 are in the record to be plotted, every nth point is plotted, where n equals the actual number divided by 101 and rounded to the higher integer value. No such limitation exists for the CALCOMP plot routine.

If the CALCOMP plot routine is to be employed, then prior to SMARTE execution the user must assign the file PLOTTAPE to an appropriate output device as in the job control language procedures of appendix B.

4.18.2 Password Required

A read or read/write access password authorizes execution of the PLOT directive.

4.18.3 Supplementary Input

One supplementary entry is input. The entry contains one or more of the following one-character terms to indicate the desired plotting techniques:

A for printer plots

B for CALCOMP plots (actual data values only)

C for CALCOMP plots (linear interpolated values only)

D for CALCOMP plots (actual and linear interpolated values)

The terms are entered in any order beginning in column 1. No spaces, commas, or other characters may be entered. Terms may be entered only once. If an all blank entry or a null entry is made, then no change is made to the selection of plotting techniques. Issuing the PLOT directive with a blank supplementary entry is useful for determining the plot selection in effect, since a summary of the plot selection is always printed as the last function of the PLOT directive operation.

4.18.4 Output Generated

A brief message is generated that indicates the plot types that will be produced for the plot operations of the subsequent directives.

4.19 PRINT Directive

4.19.1 Function

The PRINT directive changes the assigned destination print device for output generated by these directives: COMBINE, DISPLAY, EXAMINE, FOURIER, HISTOGRAM, LIST, OUTPUT, and REPORT. If the primary print device is currently assigned, then the assignment is changed to the secondary device. If the secondary print device is currently assigned, then the assignment is changed to the primary device.

The PRINT directive is intended for interactive access of SMARTE where the primary device is the interactive slow speed terminal and the secondary device is a remote high speed printer.

At program initiation, the primary print device is assigned for all output by default. The default assignment or any new assignment remains in effect until a subsequent PRINT directive is issued.

4.19.2 Password Required

A read or read/write access password authorizes execution of the PRINT directive.

4.19.3 Supplementary Input

No supplementary entries are input.

4.19.4 Output Generated

A brief output message (approximately three lines) indicates the resulting assignment of print devices.

4.20 PURGE Directive

4.20.1 Function

The PURGE directive provides the capability to void one or more records in data bases. The record is not actually removed, but instead is coded to indicate that it is voided. For all intents, the user can consider it removed from the data base.

A voided record still occupies space in the data base. All directives except the ADD and LIST directives ignore voided records as if they did not exist. The LIST directive shows the hole (space occupied by the purged record) in its tabular listing of contents. The ADD directive writes over an existing hole with a new record if the hole size is adequate.

The records to be purged may be specified by the record name, the record ID, or reference to the find file. Any combination of these specifications also is allowed. If a record to be purged is specified by the record name or the record ID, then it must reside in the primary data base. If the find file is specified, then the record to be purged need not reside in the primary data base.

If the find file is to be used as the source of records to be purged, then it must have been established with a GET or SEARCH directive or both.

4.20.2 Password Required

A read/write access password is required to execute this directive.

4.20.3 Supplementary Input

One or more supplementary entries of the following format are input:

Columns 1 to 20: a 20-character record name

or

Columns 21 to 26: a six digit record ID number

or

Columns 1 and 2: FF

or

A blank entry to terminate supplementary input

If "FF" is entered, the find file is used as the source for records to be purged. If the find file is to be used, it must have been established with a GET or SEARCH directive or both. If the find file is specified, no further entries are required or allowed. (No blank entry is used.)

Entries are repeated in the same format until all desired records are specified.

4.20.4 Output Generated

A verification of each supplementary entry is printed along with diagnostic messages if the directive cannot be properly processed.

4.21 REPORT Directive

4.21.1 Function

A report is generated according to the user specified format for all records identified in the find file. The find file must have been established with a GET or SEARCH directive or both.

4.21.2 Password Required

A read or read/write access password authorizes execution of the REPORT directive.

4.21.3 Supplementary Input

Six or more supplementary entries are terminated with a blank entry.

Entry 1

Columns 1 to 40: a 40-character title displayed at the top of each page of the report in report columns 2 to 41

Columns 41 to 45: a two digit integer number used to limit the number of lines per page for the body of the report. If no value is entered, 50 is assumed.

Column 46: 0 or 1. A 0 indicates that the time and the date should be printed with the title on each report page. A 1 suppresses the time and the date.

Entry 2

Columns 2 to 70: a heading to be displayed in columns 2 to 70 of line 1 of the report table on each page

Entry 3

Columns 1 to 62: a heading to be displayed in columns 71 to 132 of line 1 of the report table on each page

Entry 4

Columns 2 to 70: a heading to be displayed in columns 2 to 70 of line 2 of the report table on each page

Entry 5

Columns 1 to 62: a heading to be displayed in columns 71 to 132 of line 2 of the report table on each page

Subsequent entries

Columns 1 to 3: a three digit item number for the item to be printed next. If the value 201 is entered, the entire 20-character record name is printed with a standard format (refer to last paragraph of sect. 3.3) in report columns 2 to 29. If 201 is entered, the remaining parameters need not be entered for the entry.

Columns 4 and 5: the number of additional consecutive record items to be printed. This value must be a two digit integer. A 0 (or blank) is a valid value.

Columns 6 to 25: the FORTRAN format specification for the specified items

This type of entry is repeated until all desired items are specified. The supplementary input is terminated with a blank entry.

4.21.4 Output Generated

Verification of each supplementary entry is output. A diagnostic message is printed if the requested report cannot be generated.

The output can be diverted to an alternate destination by prior use of the PRINT directive.

4.22 SCALE Directive

4.22.1 Function

The SCALE directive provides the capability to apply a new abscissa or ordinate scaling factor to specified records. The records to be scaled can be specified by the record name, the record ID, or reference to the find file. If specified by the record name or the record ID, the records must reside in the primary data base. If the find file is specified, the records may reside in any of the data bases under the program control. To use the find file as the source of records, the user must have established the find file with a GET or SEARCH directive or both.

If an abscissa scale operation is requested, then all of the abscissa coordinate values for each specified record are multiplied by the entered scale value. If an ordinate scale operation is requested, then all of the ordinate values for each specified record are multiplied by the entered scale value.

The following description items also are multiplied by the entered scale value for each specified record:

For abscissa scaling of time records: items 64 and 94 to 96

For ordinate scaling of time records: items 67 and 93

For ordinate scaling of frequency records: item 93

Abscissa scaling is not allowed for frequency records.

4.22.2 Password Required

A read/write access password is required to execute the SCALE directive.

4.22.3 Supplementary Input

Three or more entries of the following format are input:

Entry 1

ABSCISSA or ORDINATE, to indicate the type of scaling desired

Entry 2 (one of the following)

Columns 1 to 20: a 20-character record name

or

Columns 21 to 26: a six digit record ID

or

Columns 1 and 2: FF

If "FF" is entered, the find file is used as the source of records to be scaled.

Entry 3

Columns 1 to 12: the scale value in FORTRAN E format

Subsequent entries

If "FF" is specified for entry 2, then no further entries are required or allowed. (No blank entry is entered.)

If "FF" is not specified for entry 2, then additional pairs of entries, of the types of entries 2 and 3, may be entered to specify more records and scale factors. Any number of pairs of entries may be entered to specify the desired rescaling of data.

Whenever "FF" is not specified for entry 2, then supplementary input to the SCALE directive must be terminated with a blank entry.

4.22.4 Output Generated

A verification is printed for each supplementary input entry. Diagnostic messages are printed whenever errors are detected or processing cannot be performed. A one-line message is printed as the scaling of each record is completed. This message indicates the record name, the record ID, and the scale value for the edited record.

4.23 SEARCH Directive

4.23.1 Function

The SEARCH directive produces a search of the primary data base for records whose items match conditions provided as supplementary input. Qualifying records are identified in the find file for later processing by other directives.

Either of two types of searches can be performed: a multiple-pass search or a one-pass search. There are two functional differences between the search types. For the multiple-pass search, SMARTE retrieves and examines each data base record once for each search condition. For the one-pass search, each data base record is retrieved and tested for all search conditions at the same time. The second functional difference is the format in which the search conditions are specified in the supplementary input. The results of both types of searches are generally identical. The one possible exception is discussed in the following paragraph. The one-pass search is a more recent addition to the SMARTE program than the multiple-pass search. The one-pass search is always as fast as and for most applications is substantially faster than the multiple-pass search. The supplementary input for the one-pass search is more straightforward. The user is advised to always use the one-pass search.

Entries that are in the find file prior to execution of the SEARCH directive remain there for one pass of the search. New entries are appended, in the order retrieved, to the end of the prior contents of the find file unless the record is already identified in the find file. In this case, no new entry is made. Duplicate entries never occur in the find file as a result of a SEARCH directive. The CLEAR directive must be used prior to the SEARCH directive if existing find file entries should be removed. For subsequent passes of a multiple-pass search, all find file entries are treated as if they had qualified to the first pass of the search. Records identified in the find file prior to execution of a SEARCH directive may reside on any of the data bases under program control.

Whenever SMARTE searches the primary data base, the order of the search is that in which SMARTE has indexed the records. In other words, records are examined in the order of ascending record ID numbers.

When performing the one-pass search, SMARTE retrieves each record of the primary data base one at a time and tests the record for all of the specified search conditions. If the test is successful, the record is considered a qualifying record and is identified in the find file. If the test fails, no action is taken.

When performing the multiple-pass search, SMARTE performs one pass for each specified search condition. During each pass, relevant records are retrieved and tested against the next consecutive search condition. For the first pass or if an OR operator has been specified, then all records in the primary data base are examined. Qualifying records are identified in the find file if not already entered. If an AND operator has been specified, only the records identified in the find file are retrieved and tested. Records that do not qualify have their find file entries removed.

There is no practical limit to the number of search conditions that may be specified for either the multiple-pass search or the one-pass search.

4.23.2 Password Required

A read or read/write access password authorizes execution of the SEARCH directive.

4.23.3 Supplementary Input

The format of the supplementary input is different for the multiple-pass and one-pass searches. SMARTE determines from the entered format which search to perform.

Supplementary input for multiple-pass search.--The multiple-pass search supplementary input consists of three or more entries terminated with a blank entry.

Entry 1

Columns 1 to 3: a three digit record item number specifying the initial item to be examined in the first pass of the search. Any item from 1 to 128 is valid.

Column 4: not used. A comma or any other character may be entered for convenience.

Columns 5 and 6: an optional two digit integer specifying the number of additional consecutive alphanumeric items to be examined in this pass. The additional items examined have item numbers following the item number in columns 1 to 3. All these items must be of the same type, either A1 or A2. If a value less than 0 is entered or if a blank field is entered, then 0 is assumed for this value.

Entry 2

Columns 1 and 2: the search operator for the first pass chosen from the following list:

IS for alphanumeric items only. Specifies that the record item value must exactly match the entered value.

NI for alphanumeric items only. Specifies that the record item value must not match the entered value.

EQ for integer or real items. Specifies that the record item value must equal the entered value.

NE for integer or real items. Specifies that the record item value must not equal the entered value.

LE for integer or real items. Specifies that the record item value must be less than or equal to the entered value.

LT for integer or real items. Specifies that the record item value must be less than the entered value.

GE for integer or real items. Specifies that the record item value must be greater than or equal to the entered value.

GT for integer or real items. Specifies that the record item value must be greater than the entered value.

Entry 3 (one of the following corresponding to the item type)

Column 1: one alphanumeric character

or

Columns 1 and 2: two alphanumeric characters

or

Columns 1 to 10: a 10 digit integer value

or

Columns 1 to 12: a real (floating point) value in FORTRAN E12.4 format

or

If the second parameter on entry 1 is one or greater, a string of one or two alphanumeric character values is entered beginning in column 1 (no characters or spaces separate values) to specify the values for the appropriate series of items. The number of one or two character values entered equals the second parameter on entry 1 plus one. (As an added capability, an additional one or two alphanumeric value may be entered immediately after the above values to define an indicator value. If this indicator value appears as one of the previous values, then the corresponding record item values always are considered as matches, whatever their actual values. If no indicator value is defined, then one or two blanks, as appropriate, are used for the indicator value.)

Entry 4 (one of the following)

Columns 1 and 2: OR, to continue the search in the OR mode

or

Columns 1 to 3: AND, to continue the search in the AND mode

or

A blank entry to terminate the search and end the input to the SEARCH directive.

Subsequent entries

If entry 4 is "OR" or "AND," then one or more additional search conditions must be specified. Each search condition requires three entries that have the same format of entries 1 to 3. After each search condition, an entry of the format of entry 4 must be made.

Example input for multiple items using the indicator value:

Entry 1: 001,19

Entry 2: IS

Entry 3: ABCDE**********FG301*

Entry 1 indicates that items 1 to 20 should be examined in this search pass. Qualifying records must have items 1 to 5 equal to A, B, C, D, and E, respectively, and items 16 to 20 equal to F, G, 3, 0, and 1, respectively. Record items 6 to 15 may have any values. In this example, the last character of entry 3, the asterisk (*), serves as the indicator value. This equivalent for entry 3 uses a period as the indicator value:

ABCDE.....FG301.

Supplementary input for one-pass search.--The one-pass supplementary input consists of one or more entries terminated with a blank entry. All search conditions are entered on one entry unless the specification is too long for one entry or unless the user wishes to use more entries for clarity. Each entry may be up to 72 characters long.

The search conditions are entered in a form similar to that used in Boolean algebra expressions. The operators used are like the logic operators used in FORTRAN. Parentheses may be used to specify combinations of conditions. As in algebra or FORTRAN assignment statements, there must always be matching pairs of left and right parentheses.

A basic condition is always specified as a three-digit record item number, followed by an operator, followed by a value. Parentheses may not be used within a basic condition specification, but may enclose a basic condition.

Item numbers must be entered as three digit integers and may have any value from 001 to 128.

The following operators, defined as in FORTRAN,[2] are valid for specification of basic conditions:

.EQ. equal to

.NE. not equal to

.LE. less than or equal to

.LT. less than

.GE. greater than or equal to

.GT. greater than

The values given as the final operand of a basic condition must match the type of the item shown in table I. The format for the values must be in one of the following FORTRAN formats:

Record type	Format
A1	A1
A2	A2
I	I10
F	E12.4

[2] *IBM System/360 and System/370 FORTRAN IV Language, International Business Machines Corp. GC28-6515-10 (1974).*

The following are examples of valid basic condition specifications:

```
001.EQ.A

(001.EQ.J)

092.GE.1600000521

093.LE.-1.23400E+03
```

The final expression for all of the search conditions is formed by combining basic conditions, each separated from the next by either an .OR. or an .AND. operator. Parentheses may be used as needed or desired to group combinations of conditions.

Conditions within a pair of parentheses are evaluated before operations with adjacent conditions. If no parentheses are present, evaluation is performed left to right without priority to the type of operator.

Blanks may appear anywhere in a specification, except within operator names, item numbers, or value operands. A specification may be continued onto a subsequent entry by stopping the current entry after an operator, an item number, a value operand, or a left or right parenthesis. The completion of supplementary input is indicated by a blank entry. The first supplementary entry for the one-pass search must have at least one nonblank character in columns 7 to 72. Otherwise, SMARTE assumes that the supplementary input specifies a multiple-pass search.

The following are examples of valid specifications:

```
001.EQ.A

(001.EQ.A).OR.038.EQ.DL

001.EQ.A

.AND.

092.GE.1600000521


((001.EQ.A).OR.(001.EQ.B).OR.(001.EQ.C)).AND.((017.EQ.W).OR.(017.EQ.P))
```

4.23.4 Output Generated

Output includes verification of each supplementary entry, error messages (if search cannot be completed), and the number of qualifying records upon successful completion of the search.

4.24 SHIFT Directive

4.24.1 Function

The SHIFT directive provides the capability to apply an abscissa or ordinate shift to specified records. The records to be shifted can be specified by the record name, the record ID, or reference to the find file. If specified by the record name or the record ID, the records must reside in the primary data base. If the find file is specified, the records may reside in any of the data bases under the program control. To use the find file as the source of records, the user must have previously established the find file with a GET or SEARCH directive or both.

If an abscissa shift operation is requested, then the entered shift value is added to the abscissa coordinate values for each specified record. If an ordinate shift operation is requested, then the entered shift value is added to the ordinate coordinate values for each specified record.

The following description items also are altered for each specified record:

For abscissa shifting of time records, the shift value is added to items 65 and 94.

For ordinate shifting of time records, the shift value is added to item 68, and the values of items 93 and 94 are recalculated by subroutine PEAK.

Shifting is not allowed for frequency records.

4.24.2 Password Required

A read/write access password is required to execute the SHIFT directive.

4.24.3 Supplementary Input

Three or more supplementary entries of the following format are input.

Entry 1

ABSCISSA or ORDINATE, to indicate the type of shift desired

Entry 2 (one of the following)

Columns 1 to 20: a 20-character record name

or

Columns 21 to 26: a six digit record ID

or

Columns 1 and 2: FF

If "FF" is entered, the find file is used as the source of records to be shifted.

Entry 3

Columns 1 to 12: the shift value in FORTRAN E format

Subsequent entries

If "FF" is specified for entry 2, then no further entries are required or allowed. (No blank entry is entered.)

If "FF" is not specified for entry 2, then additional pairs of entries of the types of entries 2 and 3 may be entered to specify more records and shift factors. Any number of pairs of entries may be entered to specify the desired shifting of data.

Whenever "FF" is not specified for entry 2, then supplementary input to the SHIFT directive must be terminated with a blank entry.

4.24.4 Output Generated

A verification is printed for each supplementary input entry. Diagnostic messages are printed whenever errors are detected or processing cannot be performed. A one-line message is printed as the shifting of each record is completed. This message indicates the record name, the record ID, and the shift value for the edited record.

AD-A063 079 HARRY DIAMOND LABS ADELPHI MD F/G 9/2
SMARTE-A COMPUTER PROGRAM FOR MANAGEMENT AND ANALYSIS OF ELECTR--ETC(U)
NOV 78 T A ROSE
UNCLASSIFIED HDL-TR-1869 NL

2 OF 3
AD A063079

IFIED

2 OF 3

AD
A063079

4.25 SORT Directive

4.25.1 Function

With the SORT directive, the entries in the find file are sorted by either record names or any record items from 1 to 128. The SORT directive may be issued repeatedly to obtain a multiple level sort. In this sort, the order of the SORT specifications should proceed from the least significant to the most significant.

For example, if a user desires the find file records to be sorted primarily by ordinate type and within groups of the same ordinate type by record name, then he should enter the following sequence of directive input:

```
*SORT
201
*SORT
066
```

4.25.2 Password Required

A read or read/write access password authorizes execution of the SORT directive.

4.25.3 Supplementary Input

One supplementary entry is input:

Columns 1 to 3: 201, to obtain a sort by record names

or

Columns 1 to 3: any three digit record item number in the range 1 to 128 specifying the item to be the object of the sort

4.25.4 Output Generated

No output is generated.

Entry 1

ABSCISSA or ORDINATE, to indicate the type of shift desired

Entry 2 (one of the following)

Columns 1 to 20: a 20-character record name

or

Columns 21 to 26: a six digit record ID

or

Columns 1 and 2: FF

If "FF" is entered, the find file is used as the source of records to be shifted.

Entry 3

Columns 1 to 12: the shift value in FORTRAN E format

Subsequent entries

If "FF" is specified for entry 2, then no further entries are required or allowed. (No blank entry is entered.)

If "FF" is not specified for entry 2, then additional pairs of entries of the types of entries 2 and 3 may be entered to specify more records and shift factors. Any number of pairs of entries may be entered to specify the desired shifting of data.

Whenever "FF" is not specified for entry 2, then supplementary input to the SHIFT directive must be terminated with a blank entry.

4.24.4 Output Generated

A verification is printed for each supplementary input entry. Diagnostic messages are printed whenever errors are detected or processing cannot be performed. A one-line message is printed as the shifting of each record is completed. This message indicates the record name, the record ID, and the shift value for the edited record.

LITERATURE CITED

(1) American National Standard FORTRAN, United States of America Standards Institute, USAS Standard No. X3.9-1966 (1966).

(2) IBM System/360 and System/370 FORTRAN IV Language, International Business Machines Corp. GC28-6515-10 (1974).

(3) IBM OS FORTRAN IV (H-Extended) Compiler Programmer's Guide, International Business Machines Corp. SC28-6852-2 (1974).

(4) C. A. Reddish, Analysis Package Operation Manual, EG&G AL-954 (June 1973).

(5) Melvin S. Bostian, FORWRD and INVRSE (Two Fourier Transform Subroutines), Braddock, Dunn and McDonald, Inc. (24 July 1970).

GLOSSARY

The following is a collection of terms that have special meanings as used in this report or have vague or unknown meanings outside select disciplines. Some of the definitions provided vary from their usual ones due to an attempt to more accurately describe their meanings in the context of this report.

access password	See "password."
batch access	Program application in which all input is prepared prior to the run and submitted to the computer system as a single transaction. The input for the run, including all computer system job control language and the SMARTE directive deck, is prepared prior to the run on 80-column punched cards or card images stored on a disc storage device. See also "interactive access."
blank entry	An entry containing all blanks. Sometimes referred to as a "null entry." For keyboard input, this is a null line that is generated on most interactive terminals by depressing the "return" or "carriage return" key. For card input, this is a blank card.
byte	The smallest addressable unit of information storage used by IBM 370 computer systems. One byte contains 8 binary bits and corresponds to one character of storage for alphanumeric data. Four contiguous bytes make up one word of IBM 370 storage. One word is the fundamental unit of storage used by the SMARTE program.
data base	A permanent body of information, stored as a single collection of physical records (that is, data set or logical file) on a direct access storage device. SMARTE creates the data base and provides all storage, updating, and retrieval capabilities for information records contained on data bases that it accesses. The program can, in a single run, alternately control up to five data bases. A data base may range in size up to 90,000 records, each of which is variable in size from 128 to 1152 words (items).

data base control record	A record of information stored on each data base by SMARTE containing 128 words of informaton and used by the program for its normal control of the other data base records. It is stored as the first record of the data base at creation time and is updated whenever data base records are added, removed, or altered.
data base number	A five-digit integer number assigned by the user to a data base at the time that it is created. It is intended for identification of the data base.
data base record	See "record."
description item	Record items 1 to 128 in each record. These items are used to store information that describes the coordinate sets stored in items 129 to 1152.
directive	One of a set of command entries provided as input to SMARTE to control the basic operations performed. Particular directives may have associated with them supplementary entries used to further specify the particular operation desired. Directives are always entered as a solitary word directly following an asterisk in column 1.
directive deck	The assemblage of entries, cards, or card images containing all SMARTE directives and their associated supplementary entries (directive modifier cards) for a given program run.
directive modifier card	An alternative term for a supplementary entry associated with a directive. See "supplementary entry."
directive packet	A directive entry followed by all of its associated supplementary entries (directive modifier cards).
E format	See "FORTRAN E format."
EMP	Electromagnetic pulse, a physical phenomenon associated with nuclear weapon bursts.
entry	A single line or a card of input. For interactive access via a keyboard, this is a line of 0 or more characters followed by "return," "carriage return," or its equivalent. For batch access, this is a single 80-column punched card or card image.

FF	A supplementary entry used with several directives to indicate the find file.
find file	A temporary (exists only for duration of run) direct access file maintained by SMARTE to store the identification of data base records that have been retrieved by a GET or SEARCH directive. The find file can contain identification for up to 90,240 records.
FORTRAN E format	To describe input format, value to be entered in the format required by the ANS FORTRAN programming language E format specification. Any FORTRAN textbook or user's manual describes this format.
hole	See "purged record."
ID	Identification. See "record ID."
interactive access	A program application in which SMARTE directive entries and associated supplementary entries are provided to the computer system as separate transactions and requested output is generated by the computer system as each entry is received. The advantage of this technique over batch access is that the user can compose entries as he goes based on output received from previous entries all in the same computer run. See "batch access."
item	The smallest unit of information, stored in a data base, that can be referenced by SMARTE. Each item requires precisely one word of storage. Each data base record is composed of 128 to 1152 items. Items 1 to 128 correspond to descriptive information, and items 129 to 1152 correspond to coordinate values. Four types of items are recognized by the program: (1) alphanumeric--one character, (2) alphanumeric--two characters, (3) integer, and (4) real or floating point.
item type	One of the following four formats: A1, A2, I, or F. The A1 or A2 item type indicates that one or two alphanumeric characters, respectively, are stored for the item. I indicates that the item contains an integer number. F indicates that the item contains a floating point (real) number.

job deck	The input, a deck of 80-column punched cards or card images or both stored on a disc storage device, which is used for batch access of the program and which must include computer system job control language and may also include the directive deck as well as other data.
key item	In data base management terminology, a record item that can be used for a conditional search or identification of a record for retrieval. SMARTE allows all the description items (items 1 to 128) to be used as key items.
logical unit number	Integer number referred to by SMARTE since it is written in the FORTRAN language, for all input and output devices. These numbers are assigned to the various devices with the computer system job control language prior to execution of SMARTE.
master index	A table of information stored in each data base that relates the record ID of each record to the physical address on the data base storage device where the record is located.
master name	See "record ID."
master record name	See "record ID."
password	Various values of password protection used with SMARTE data bases. This term refers to any of these password values that must be entered before levels of access can be obtained by a user. An "access password" is required by the program as the first input. This access password may be a "read access password" or a "read/write access password." When a new data base is created with the INITIALIZE directive, an "initialize password" is required. Besides these, the user may choose to assign further passwords via the computer system job control language to further restrict access to data bases.
physical record unit PRU	Always 128 words. One or more of these form a SMARTE data base record. Any reference to a record in this report refers to the variable size data base record and not to the PRU unless "PRU" or "physical record unit" is explicitly stated. The PRU is a useful unit of measure for the data base record size. Data base

records are composed of an integral number of PRU's. The data base record size varies from 128 words (1 PRU) up to 1152 words (9 PRU's).

primary data base — The one data base, of the five under the control of the program, that is totally accessible by all of the directives. If a data base is not the primary data base, its records can be processed only if they are identified in the find file. The primary data base assignment can be changed back and forth among any of the up to five data bases during a run, but only one can be assigned at a given time. The DEFINE directive is used to change this assignment.

primary print device — The output print device that is assigned via computer system job control language to logical unit 6. The output from several directives can be diverted to either the primary print device or a secondary print device on logical unit 21. The PRINT directive is used to determine which device receives any of the divertible output. All print output that is not divertible always goes to logical unit 6.

PRU — See "physical record unit."

purged record — A data base record that has been voided by the PURGE directive. This is alternatively referred to as a "hole." When a record is voided, the record is coded so that the program can identify it as such. The record otherwise remains unchanged and occupies space. All directives ignore voided records as if they did not exist, except the ADD directive, which writes over an existing hole with a new record if the hole size is adequate.

read access password — The first input required by the program. An entered password is matched against a set of valid passwords by subroutine PASS to determine the type of access to be provided to the user. If the password is determined to be a read access password, then the user may employ only directives that do not alter the contents of a data base. The description of each directive indicates the level of password required. The actual value of the access password also is used by the program to determine whether batch or interactive access is being employed and whether or not a debugging output is desired.

read/write access password	The first input requested by the program. An entered password is matched against a set of valid passwords by subroutine PASS to determine the type of access to be provided to the user. If the password is determined to be a read/write access password, then the user may employ all of the SMARTE directives. The actual value of the password is also used by the program to determine whether batch or interactive access is being employed and whether or not a debugging output is desired.
record	The basic unit in the data base consisting of 128 to 1152 words (or items) of information. Items 1 to 128 are descriptive information, and items 129 to 1152 are coordinate values. Space is always used for items 1 to 128 whether all items are defined or not. Additional space is assigned for the coordinates in increments of 128 words as needed.
record ID	The unique six digit integer number master ID of a record. This number matches an entry in the master index, which provides the physical address on the data base storage device where the record is located. This number is assigned by the program when a record is stored and is independent of any record information including the 20-character record name. Record ID's may change when records are transferred between data bases and to and from backup storage. Record names are therefore better references for most purposes since they never change unless explicitly changed by a user. Referencing a record by its record ID is more efficient than by record name, however, since the record ID relates directly to the record's location on the data base.
record item	See "item."
record name	A 20-character alphanumeric name assigned to a record by the user when a record is stored. It never changes unless explicitly changed by the user. All 20 characters are stored as separate record items (items 1 to 20) in the record so that they are individually accessible.
right justified	Characters adjusted so that the last (right-most) character is positioned in the right-most allowed column. For example, if an integer value of 4567 is to be entered right justified in columns 1 to 10 (or to column 10), then 4567 must appear in columns 7, 8, 9, and 10, respectively. Columns 1 to

	6 may contain 0's or blanks. In this report, input descriptions are often stated such as "Enter a six digit integer value in columns 1 to 6." In this statement, the value should be right justified to column 6. If the value has less than six digits, it should be entered so that the last digit of the number falls in column 6.
run	A single execution of the program. A run is initiated by requesting program execution via the computer system job control language followed by entering an access password. Subsequently, the user inputs any number of directives and their associated supplementary entries. A run is terminated when the END directive is processed or when the computer system recognizes an end of file mark on the directive deck input device, logical unit 4.
secondary print device	The output print device assigned via computer system job control language to logical unit 21. See "primary print device."
subindex	Subindexes are not employed in the Release 2 version of SMARTE.
supplementary entry	An entry required by or allowed by a directive to further specify the operation to be performed by that directive. The number of supplementary entries associated with a directive ranges from none to unlimited depending on the directive.
supplementary input	All supplementary entries and other data input associated with a directive.
test point name	A 17-character name assigned to EMP test measurements. Generally, for data records that describe such measurements, the test point name is assigned for the first 17 characters of the data base record name.
TSO	An IBM term (time sharing option) that refers to the portion of the operating system that controls interactive access by remote users.
type	See "item type."
word	The smallest unit of information storage referenced by SMARTE. Exactly one word is used to store each record item. See "item" and "byte."

APPENDIX A.--DESCRIPTION OF MAJOR PROGRAM VARIABLES

Described in this appendix are the major variables used in the SMARTE computer program. Included are those variables that are important in program operations and that have constant meaning and purpose throughout all routines. Descriptions of other variables are included as comments internal to the routines in which they are used.

DAT — A two-word array. Stored in these two words are the eight alphanumeric characters that constitute the date. DAT is set by subroutine DATE.

ICHEK — A variable in common block FF. This is a flag that indicates if subroutine FFPUT must call subroutine FFCHEK prior to placing a new record entry in the find file. FFCHEK determines if the new entry already exists in the find file. The check is made to avoid duplicate entries. ICHEK must equal either 0 or 1. A 1 indicates that FFCHEK should be called. A 0 indicates that FFPUT need not call FFCHEK. ICHEK is set to 0 at the beginning of each GET directive and each pass of a SEARCH directive if and only if NFINDS = 0 at that time.

ID — A variable used by many routines to store a record identification (ID) number.

IDBCR — A 128-word array in common block B. Stored here are the current contents of the data base control record (for the primary data base). The data base control record is stored as record 1 in the data base. The following are the word contents:

1 Size of master index

2 Next available record ID

3 Record ID of last voided record

4 Capacity of subindexes (size - 1)

5 Number of indexes (number of subindexes + 1)

6 Capacity of data base in physical record units (PRU's)

7 Currently allocated space (PRU's) in data base

8 Largest existing hole (PRU's)

9 Data base number

10 Number of good records in data base

11 Total number of data base records

Remaining words are unused.

IDFIND A 1280-word array in common block D. Stored here are the contents of the current find file physical record being processed. Words 1 to 640 are record identities (digits 1 and 2 of each word from the logical unit number; digits 3 to 8 are the record ID) and words 641 to 1280 can be corresponding record item values loaded by routine SORT for use in sorting.

IFORM A variable used to indicate the type (format) of the current item being examined. The value of IFORM is set by subroutine FORM to a value from 0 to 3 and may later be modified by subroutine SEARCH to either 4 or 5. The following are the possible IFORM values.

0 A1 (one-character alphanumeric)

1 A2 (two-character alphanumeric)

2 I (integer)

3 F (floating point)

4 Multiple items of type 0

5 Multiple items of type 1

IOP A variable set by subroutine SEARCH. It is used by SEARCH and subroutine DBSER to indicate the type of minor search operator in use. The minor search operator determines the type of match that must be made on an entered search value and a retrieved record item value. Following are the possible values of IOP:

0 Unset

1 IS (for type A1 or A2)

2 EQ (equal to) (for type I or F)

3 LT (less than) (for type I or F)

4 LE (less than or equal to) (for type I or F)

5 GT (greater than) (for type I or F)

6 GE (greater than or equal to) (for type I or F)

7 NI (not is) (for type A1 or A2)

8 NE (not equal to) (for type I or F)

IPASS A variable in common block E. This parameter is set by subroutine PASS to indicate if a debugging output is desired and if a read only or read/write access is granted. The possible values are these:

0 Read only without debugging

1 Read only with debugging

2 Read/write with debugging

3 Read/write without debugging

IR A 1280-word array equivalenced to array RI with 0 bias. IR is type integer and RI is type real. Integer items are referenced via array IR, and floating point or alphanumeric items are referenced via array RI.

IRB A 1280-word array equivalenced to array RIB with 0 bias. IRB is type integer and RIB is type real. Integer items are referenced via array IRB, and floating point or alphanumeric items are referenced via array RIB.

ISFLAG A variable set by subroutine SEARCH. It is used by SEARCH and subroutine DBSER to indicate the type of major search operator in use. The possible values are these:

0 First search pass or else major operator is "OR." Full primary data base is to be searched in current search pass.

1 Second or later search pass and major operator is "AND." Data base records identified in the find file are examined in current search pass.

ISIZE A variable in common block E. This variable equals the size of the primary data base in PRU's. The value is the entered size value plus 2. The extra two PRU's provide space for the data base control record and 1 PRU of variance at end of information.

ITSO A variable in common block E. This variable is set by subroutine PASS to indicate if prompting is desired and if the access mode is interactive or batch. The possible values are these:

0 Batch access (no prompting)

1 Interactive access with terminal prompting

2 Interactive access without terminal prompting

KOMAND The nonnegative integer value corresponding to the SMARTE directive being executed. The directive is read and the appropriate value is assigned by subroutine SMACOM. Possible values are these:

1 unused

2 LIST

3 PURGE

4 GET

5 SEARCH

6 OUTPUT

7 HISTOGRAM

8 FOURIER

9 COMBINE

10 SCALE

11 SHIFT

12 EDIT

13 THRESHOLD (unused)

14 SORT

15 DUMP

16 REPORT

17 INITIALIZE

18 ADD

19 DEFINE

20 CLEAR

21 EXAMINE

22 FIX

23 HELP

24 PRINT

25 DISPLAY

LUDB A variable in common block B. This is the logical unit number of the current data base being accessed. At the completion of each directive execution, LUDB is set to the logical unit number of the primary data base. If a directive ever changes the value of LUDB, it first holds the primary data base logical unit number in variable LUOLD so that it can later reset the number.

LUOLD A variable used to hold temporarily the value of the primary data base logical unit number.

LUPRT A variable in common block L. This is the logical unit number of the output device currently designated to receive divertible output. LUPRT is set by subroutine PRINTT to either 6 or 21, corresponding to either the normal or alternate output device for a printed output.

LUTABL A 10-word array in common block B. Stored here, in the order identified to the program, are the logical unit numbers for data bases under program control. LUTABL values are set in subroutine DBDEF.

MAV The "associated variable" for the find file direct access input and output.

NAV The "associated variable" for the data base file direct access input and output. NAV is in common block E.

NFINDS A variable in common block D. This is the current number of records identified in the find file.

APPENDIX A

NODB A variable used to temporarily store the assigned data base number of a data base.

NOFIND A variable used to store the consecutive number of a record entry in the find file.

NOTABL A 10-word array in common block B. Stored here, in the order identified to the program, are the data base numbers for data bases under program control. NOTABL values are set in subroutine DBDEF.

NOUNIT A variable used occasionally to store a logical unit number for various devices.

PROG A five-word array used to store the program name. Two characters, left justified, are placed in each word via a data statement in the main program.

RI A 1280-word array in common block A. This is the primary location used to store the contents of a data base record being processed. The first 1152 words correspond to the 1152 possible items in the data base record. The additional space is occasionally used for working space. (See also RIB, IR, and IRB.)

RIB A 1280-word array in common block C. This is the secondary location used to store the contents of a data base record being processed. The first 1152 words correspond to the 1152 possible items in the data base record. The additional space is occasionally used for working space. (See also RI, IR, and IRB.)

TIM A two-word array. Stored in these two words are the eight alphanumeric characters that constitute the time set by the most recent call to the system subroutine TIME.

TP A 12-word array in common block TPF. Its use is described in comments in subroutine TPFILE. TPFILE is not used in normal versions of SMARTE, Release 2.

VERS A five-word array used to store the program version. Two characters, left justified, are stored in each word via a data statement in the main program.

W A 128-word array in common block TPF. Its use is described in comments in subroutine TPFILE. TPFILE is not used in normal versions of SMARTE, Release 2.

APPENDIX B.--PROCEDURES FOR EXECUTING PROGRAM

Included in this appendix are examples of procedures for executing the SMARTE computer program. Command list procedures (CLIST's) relate to interactive access, and job decks relate to batch access.

B-1. EXAMPLE COMMAND LIST PROCEDURE

The listing that follows is a command list procedure (CLIST) that can be used to execute the SMARTE program in interactive access for all applications on the Harry Diamond Laboratories (HDL) IBM 370 computer system. Instructions for its use are given in the comments at the end of the listing. This CLIST performs two functions. First, logical unit assignments are made. Second the program executable load module is called.

This CLIST assumes that an executable load module of SMARTE resides as a member named "SMARTE" in a cataloged partitioned data set named "HX1234.LOAD." The CLIST itself is stored as a member named "SMARTE" in a CLIST data set that is concatenated to the file named "SYSPROC." This allows the user to execute the CLIST by simply entering the word "SMARTE."

As explained in the CLIST comments, all types of file allocations cannot be made automatically by the CLIST. Allocations for new data sets must be made by the user prior to executing the CLIST.

The direct access system software employed by SMARTE automatically formats a new data base data set by writing skeleton records in that data set. The system knows to do this only if the allocation of the data base data set has a disposition of "NEW." For this reason, any data base to be created by a SMARTE run must be on a data set that is allocated as "NEW" at the time of the run. In other words, a new data base data set must be allocated and cataloged for the first time in the same interactive session that the SMARTE initialization is made, and no FREE command can be made on that data set in between the initial allocation and the program initialization.

APPENDIX B

```
PROC 0 LU01(D) LU02(D) LU04(D) LU05(D) LU09(D) LU10(D) LU11(D)-
 LU12(D) LU13(D) LU14(D) PREF(D)
WRITE
WRITE SMARTE PROGRAM CLIST VERSION 0605780
WRITE   START TIME:  &SYSTIME &SYSDATE
IF &PREF=D THEN SET &PREF=HX1234
IF &PREF NE F THEN WRITE   DATA SET PREFIX = &PREF
IF &PREF NE F THEN SET &PREF=&PREF..
IF &PREF=F THEN SET &PREF=
CONTROL NOMSG
FREE ATTRLIST(SMA)
FREE ATTRLIST(SMB)
FREE FILE(PLOTTAPE)
FREE FILE(FT01F001)
FREE FILE(FT02F001)
FREE FILE(FT04F001)
FREE FILE(FT05F001)
FREE FILE(FT06F001)
FREE FILE(FT07F001)
IF &LU09 NE N THEN FREE FILE(FT09F001)
IF &LU10 NE N THEN FREE FILE(FT10F001)
IF &LU11 NE N THEN FREE FILE(FT11F001)
IF &LU12 NE N THEN FREE FILE(FT12F001)
IF &LU13 NE N THEN FREE FILE(FT13F001)
IF &LU14 NE N THEN FREE FILE(FT14F001)
FREE FILE(FT20F001)
FREE FILE(FT21F001)
FREE FILE(FT22F001)
CONTROL MSG
ATTRIB SMA RECFM(A,F,B) LRECL(133)
ATTRIB SMB RECFM(A,F) LRECL(133) BLKSIZE(133)
ALLOC FILE(PLOTTAPE) SYSOUT(P) DEST(LOCAL)
ALLOC FILE(FT06F001) DS(*)
ALLOC FILE(FT07F001) SPACE(10,10) CYLINDERS UNIT(SYSDA)
ALLOC FILE(FT20F001) SPACE(1,1) CYLINDERS UNIT(SYSDA)
ALLOC FILE(FT21F001) SYSOUT(A) USING(SMA)
ALLOC FILE(FT22F001) SPACE(1,1) TRACKS UNIT(VIO) USING(SMB)
IF &LU01 NE D THEN SET &F01=&PREF.&LU01
IF &LU02 NE D THEN SET &F02=&PREF.&LU02
IF &LU04 NE D THEN SET &F04=&PREF.&LU04
IF &LU05 NE D THEN SET &F05=&PREF.&LU05
IF &LU09 NE D THEN SET &F09=&PREF.&LU09
IF &LU09=N THEN SET &F09=NEW
IF &LU10 NE D THEN SET &F10=&PREF.&LU10
IF &LU10=N THEN SET &F10=NEW
IF &LU11 NE D THEN SET &F11=&PREF.&LU11
IF &LU11=N THEN SET &F11=NEW
IF &LU12 NE D THEN SET &F12=&PREF.&LU12
IF &LU12=N THEN SET &F12=NEW
IF &LU13 NE D THEN SET &F13=&PREF.&LU13
IF &LU13=N THEN SET &F13=NEW
IF &LU14 NE D THEN SET &F14=&PREF.&LU14
IF &LU14=N THEN SET &F14=NEW
```

```
IF &LU01=D THEN ALLOC FILE(FT01F001) DUMMY
ELSE ALLOC FILE(FT01F001) DS('&F01') SHR
IF &LU01 NE D THEN WRITE   LU01 = &F01
IF &LU02=D THEN ALLOC FILE(FT02F001) DUMMY
ELSE ALLOC FILE(FT02F001) DS('&F02') SHR
IF &LU02 NE D THEN WRITE   LU02 = &F02
IF &LU04=D THEN ALLOC FILE(FT04F001) DS(*)
ELSE ALLOC FILE(FT04F001) DS('&F04') SHR
IF &LU04=D THEN WRITE   LU04 = TERMINAL
IF &LU04 NE D THEN WRITE   LU04 = &F04
IF &LU05=D THEN ALLOC FILE(FT05F001) DUMMY
ELSE ALLOC FILE(FT05F001) DS('&F05') SHR
IF &LU05 NE D THEN WRITE   LU05 = &F05
IF &LU09=D THEN ALLOC FILE(FT09F001) DUMMY
IF &LU09 NE D AND &LU09 NE N THEN ALLOC FILE(FT09F001) DS('&F09')
IF &LU09 NE D THEN WRITE   LU09 = &F09
IF &LU10=D THEN ALLOC FILE(FT10F001) DUMMY
IF &LU10 NE D AND &LU10 NE N THEN ALLOC FILE(FT10F001) DS('&F10') SHR
IF &LU10 NE D THEN WRITE   LU10 = &F10
IF &LU11=D THEN ALLOC FILE(FT11F001) DUMMY
IF &LU11 NE D AND &LU11 NE N THEN ALLOC FILE(FT11F001) DS('&F11') SHR
IF &LU11 NE D THEN WRITE   LU11 = &F11
IF &LU12=D THEN ALLOC FILE(FT12F001) DUMMY
IF &LU12 NE D AND &LU12 NE N THEN ALLOC FILE(FT12F001) DS('&F12') SHR
IF &LU12 NE D THEN WRITE   LU12 = &F12
IF &LU13=D THEN ALLOC FILE(FT13F001) DUMMY
IF &LU13 NE D AND &LU13 NE N THEN ALLOC FILE(FT13F001) DS('&F13') SHR
IF &LU13 NE D THEN WRITE   LU13 = &F13
IF &LU14=D THEN ALLOC FILE(FT14F001) DUMMY
IF &LU14 NE D AND &LU14 NE N THEN ALLOC FILE(FT14F001) DS('&F14') SHR
IF &LU14 NE D THEN WRITE   LU14 = &F14
WRITE   SMARTE FILES ALLOCATED; EXECUTION PROCEEDING.
WRITE   ENTER ACCESS PASSWORD
CALL 'Hx1234.LOAD(SMARTE)'
CONTROL NOMSG
FREE FILE(FT21F001)
FREE FILE(FT10F001)
FREE FILE(FT11F001)
FREE FILE(FT12F001)
FREE FILE(FT13F001)
FREE FILE(FT14F001)
FREE FILE(FT06F001)
ALLOCATE FILE(FT06F001) DSNAME(*)
FREE FILE(FT09F001)
FREE FILE(FT01F001)
FREE FILE(FT02F001)
FREE FILE(FT04F001)
FREE FILE(FT05F001)
CONTROL MSG
WRITE  STOP TIME:  &SYSTIME &SYSDATE
```

APPENDIX B

```
EXIT
/*********************************************************************
/* PURPOSE:  THIS CLIST EXECUTES THE PROGRAM SMARTE.
/*.....................................................................
/* VERSION:  SEE CLIST LINE 4
/*.....................................................................
/* WRITTEN BY:  THOMAS A. ROSE, HARRY DIAMOND LABORATORIES, BR 1010
/*.....................................................................
/* SYNTAX:  ENTER THE WORD "SMARTE" (WITHOUT QUOTES) FOLLOWED BY ANY
/*   NUMBER (OR NONE) OF THE KEYWORD PARAMETERS.  PRECEDE EACH
/*   KEYWORD PARAMETER WITH A SPACE.  KEYWORD PARAMETERS HAVE THE
/*   FOLLOWING FORMAT...
/*     "KEYWORDNAME"("STRING")
/*
/*   "KEYWORDNAME" IS REPLACED BY ONE OF THE KEYWORD NAMES DESCRIBED
/*   BELOW.  "STRING" IS REPLACED BY THE DESIRED CHARACTER(S).
/*   QUOTES ARE NOT ENTERED.
/*.....................................................................
/* KEYWORD PAREMETERS:
/*   PREF,LU01,LU02,LU04,LU05,LU09,LU10,LU11,LU12,LU13,LU14
/*
/*   NOTE:  QUOTES (") ARE USED IN THIS DISCUSSION TO INDICATE
/*   VALUES THAT ARE TO BE REPLACED BY A CHARACTER STRING.
/*   QUOTES ARE NEVER ENTERED.
/*
/*   PREF(D) - THIS INDICATES THAT THE DEFAULT PREFIX SHOULD BE USED
/*   FOR ALL ENTERED DATA SET NAMES.  NOT ENTERING THE PREF PARAMETER
/*   IS EQUIVALENT TO ENTERING PREF(D).  THE DEFAULT PREFIX IS
/*   DEFINED IN CLIST LINE 6.
/*
/*   PREF(F) - THIS INDICATES THAT ALL DATA SET NAMES ENTERED ARE
/*   FULLY QUALIFIED.  A FULLY QUALIFIED DATA SET NAME INCLUDES ALL
/*   PARTS OF THE NAME.
/*
/*   PREF("STRING") - UP TO 8 CHARACTERS CAN BE ENTERED FOR
/*   "STRING".  THESE CHARACTERS WILL BE USED AS THE PREFIX
/*   FOR ALL ENTERED DATA SET NAMES.
/*
/*   LU01("VALUE1"),LU02("VALUE2"),ETC.
/*     THESE KEYWORD PARAMETERS ARE USED TO SPECIFY THE NAMES OF DATA
/*     SETS TO BE ASSIGNED (ALLOCATED) TO LOGICAL UNIT NUMBERS 1,2,
/*     ETC. (RESPECTIVELY).
/*
/*     IF D IS ENTERED FOR THE VALUE OF ONE OF THESE PARAMETERS, OR,
/*     IF THE KEYWORD PARAMETER IS NOT ENTERED, THEN THE
/*     CORRESPONDING LOGICAL UNIT NUMBER WILL BE GIVEN A DEFAULT
/*     ALLOCATION.  THE DEFAULT ALLOCATION FOR ALL EXCEPT NO. 4 IS
/*     DUMMY.  THE DEFAULT ALLOCATION FOR LOGICAL UNIT NUMBER 4 IS
/*     THE TERMINAL, I. E. DSNAME(*).
/*
/*     IF N IS ENTERED FOR THE VALUE OF ONE OF THESE PARAMETERS THEN
/*     NO ALLOCATION IS MADE FOR THE CORRESPONDING LOGICAL UNIT
/*     NUMBER.  THE USER MUST PERFORM THE ALLOCATION BEFORE EXECUTING
/*     THIS CLIST.
```

```
/*
/*     DATA SET NAMES CAN BE ENTERED IN PLACE OF "VALUE1","VALUE2",
/*     ETC. TO SPECIFY THE DATA SETS TO BE ALLOCATED.  THE NAMES MUST
/*     BE FULLY QUALIFIED IF PREF(F) IS ENTERED.  OTHERWISE THE
/*     PREFIX FOR THE DATA SET NAME MUST NOT BE ENTERED HERE.  SEE
/*     EXPLANATION OF PREF PARAMETER.
/*.....................................................................
/* NEW DATA SETS:
/*   ALL DATA SETS SPECIFIED MUST BE CATALOGED AND BE ON LINE.  IF A
/*   NEW DATA SET IS TO BE CREATED ON LOGICAL UNITS 9,10,11,12,13,
/*   OR 14, THEN THE USER MUST PERFORM AN ALLOCATION, SIMILAR TO THE
/*   FOLLOWING, FOR EACH, PRIOR TO EXECUTING THIS CLIST.  THE VALUE
/*   N SHOULD BE ENTERED FOR THE LU-- KEYWORD PARAMETER FOR THAT
/*   LOGICAL UNIT.
/*
/*     FOR LOGICAL UNIT NUMBER 9:
/*       ATTRIB X RECFM(V,S,B) BLKSIZE(5120)
/*       ALLOCATE DSNAME("DATASETNAME") NEW CATALOG -
/*         SPACE("PRIMARY","SECONDARY") CYLINDERS -
/*         VOLUME("VOLUMENAME") USING(X) FILE(FT09F001)
/*
/*     FOR LOGICAL UNIT NUMBERS 10-14:
/*       ALLOCATE DSNAME("DATASETNAME") NEW CATALOG -
/*         SPACE("PRIMARY","SECONDARY") CYLINDERS -
/*         VOLUME("VOLUMENAME") FILE(FT"XX"F001)
/*
/*         WHERE "XX" IS THE LOGICAL UNIT NUMBER.
/*
/*   FOR MORE INFORMATION REFER TO THE IBM PUBLICATION: "OS/VS2 TSO
/*   COMMAND LANGUAGE REFERENCE", IBM MANUAL NO. GC28-0646-3.
/*.....................................................................
/* EXAMPLE:
/*
/*   SMARTE PREF(F) LU05(HX1234.NEWDATA.DATA) LU11(HX1234.DB1.DATA)
/*
/*     LOGICAL UNITS 1,2,9,10,12,13,14 WILL BE ALLOCATED TO DUMMY.
/*     LOGICAL UNIT 4 WILL BE ALLOCATED TO TERMINAL.
/*     LOGICAL UNIT 5 WILL BE ALLOCATED TO HX1234.NEWDATA.DATA.
/*     LOGICAL UNIT 11 WILL BE ALLOCATED TO HX1234.DB1.DATA.
/*
/*   AN EQUIVALENT ENTRY IS:
/*
/*     SMARTE PREF(HX1234) LU05(NEWDATA.DATA) LU11(DB1.DATA)
/*
/*   IF THE DEFAULT CLIST PREFIX IS HX1234 THEN THE FOLLOWING IS
/*   ANOTHER EQUIVALENT ENTRY:
/*
/*     SMARTE LU05(NEWDATA.DATA) LU11(DB1.DATA)
/*********************************************************************
```

APPENDIX B

B-2. EXAMPLE JOB DECK

The following is a listing of a job deck that can be used to execute the SMARTE program in batch access for a basic application on the HDL IBM 370 computer system. In this example, a single existing data base is assigned to logical unit 11. The data base resides on the private disc pack named "PACK01" and is cataloged under the name "HX1234.NUMBER99.DB."

The SMARTE executable load module is stored as member "SMARTE" in the partitioned data set cataloged under the name "HX1234.LOAD."

The job card, the setup card, and the route card depend on the computer center. Installation policies give the proper content and format for these. The setup card requests the mounting of the private disc pack named "PACK01." The route card specifies the destination for printed output.

The SMARTE directive deck is inserted as indicated after the //FT04F001 DD card.

```
//HX1234Q JOB (HX1234,,5,100,,,1,,0), ROSE, class=A, MSGCLASS=A,
//             MSGLEVEL=(1,1),NOTIFY=HX1234
/*SETUP   DISK,PACK01
/*ROUTE  PRINT U2
//JOBLIB DD DSN=HX1234.LOAD,DISP=SHR
//STEP1 EXEC PGM=SMARTE,TIME=5
//FT01F001 DD DUMMY
//FT02F001 DD DUMMY
//FT05F001 DD DUMMY
//FT06F001 DD SYSOUT=A
//FT07F001 DD SPACE=(CYL,(1,1)),UNIT=SYSDA
//FT09F001 DD DUMMY
//FT10F001 DD DUMMY
//FT11F001 DD DSN=HX1234.NUMBER99.DB,DISP=SHR
//FT12F001 DD DUMMY
//FT13F001 DD DUMMY
//FT14F001 DD DUMMY
//FT20F001 DD SPACE=(CYL,(1,1)),UNIT=SYSDA
//FT21F001 DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133)
//FT22F001 DD SPACE=(TRK,(1,1)),UNIT=VIO,
//     DCB=(RECFM=FA,LRECL=133,BLKSIZE=133)
//PLOTTAPE DD  SYSOUT=P,DEST=LOCAL
//FT04F001 DD *
//* --- SMARTE DIRECTIVE INPUT IS INSERTED IN PLACE OF THIS CARD ---
/*
//
```

In the above example, no directive can be used to read data from logical unit 1, 2, or 5 since no assignment has been made for those units. The DUMP directive cannot write data to logical unit 9 for the same reason.

The following comments explain how a user can modify the above job deck for other applications that require additional input/output devices, additional data bases, or both. Additional setup type cards are required for any other mountable disc packs or magnetic tapes that are used in a modified version of this job deck. These additional cards can be placed in the job deck in any order directly after the job card.

Other existing data bases can be assigned to logical units 10, 12, 13, and 14 by replacing the data definition (DD) cards for those units with cards similar to the one for logical unit 11.

If one or more data bases are to be created, then more parameters must be specified on the corresponding DD cards. The following cards are examples of how to create a new data base on the various logical units. The new data base, in each case, is cataloged with the name "HX1234.NEW.DB" and resides on disc pack "PACK01."

```
//FT10F001 DD DSN=HX1234.NEW.DB,SPACE=(CYL,(64,10)),UNIT=SYSDA,
//  DISP=(NEW,CATLG),VOL=SER=PACK01

//FT11F001 DD DSN=HX1234.NEW.DB,SPACE=(CYL,(230,10)),UNIT=SYSDA,
//  DISP=(NEW,CATLG),VOL=SER=PACK01

//FT12F001 DD DSN=HX1234.NEW.DB,SPACE=(CYL,(230,10)),UNIT=SYSDA,
//  DISP=(NEW,CATLG),VOL=SER=PACK01

//FT13F001 DD DSN=HX1234.NEW.DB,SPACE=(CYL,(640,10)),UNIT=SYSDA,
//  DISP=(NEW,CATLG),VOL=SER=PACK01

//FT14F001 DD DSN=HX1234.NEW.DB,SPACE=(CYL,(640,10)),UNIT=SYSDA,
//  DISP=(NEW,CATLG),VOL=SER=PACK01
```

If the user wishes to write data via a DUMP directive to a magnetic tape on logical unit 9, then he should substitute the following DD card or an equivalent:

```
//FT09F001 DD DSN=HX1234.DATA1.DUMP,UNIT=TAPE9,VOL=SER=123456,
//  DISP=OLD,DCB=(RECFM=VSB,BLKSIZE=5120)
```

The above assumes a nine-track magnetic tape with a volume serial number "123456." The new tape has the name "HX1234.DATA1.DUMP" stored in its label area. A setup card or equivalent is needed to request the mounting of the magnetic tape.

If the DUMP data went to a disc data set on disc pack "PACK01," then the following DD card could be used:

```
//FT09F001 DD DSN=HX1234.DATA1.DUMP,DISP=(NEW,CATLG),
//  SPACE=(CYL,("PRIMARY","SECONDARY")),VOL=SER=PACK01,UNIT=SYSDA
```

where "primary" and "secondary" are replaced with appropriate size values.

If data are to be read from logical unit 1, 2, or 5, then the appropriate existing data sets, magnetic tapes, or card decks must be assigned to those logical units in the normal manner.

APPENDIX C.--EXAMPLE RUNS

This appendix lists seven example runs for the SMARTE computer program, Release 2.

APPENDIX C

EXAMPLE RUN NUMBER 1

PURPOSE:

1. DEMONSTRATE USE OF EXAMINE DIRECTIVE TO LIST CONTENTS OF MAGNETIC TAPE FROM HP 2116 C MINICOMPUTER DIGITIZATION PROCESS.
2. INITIALIZE NEW DATA BASE NUMBER 99 TO BE STORED WITH DATA SET NAME HK1010.$DB.NUMBER99.
3. LOAD DATA INTO DATA BASE FROM THE DIGITIZATION MAGNETIC TAPE.

MODE: BATCH

DIRECTIVES DEMONSTRATED:

- ADD/TAPE C
- EXAMINE
- INITIALIZE
- LIST

CPU TIME: 15.07 SECONDS

EXPLANATION OF FOLLOWING PAGES:

- FIRST PAGE - LISTING OF JOB DECK
- SECOND PAGE - LISTING OF HEADER CARDS STORED AS DATA SET NAME HK1010.H2HEADRS.DATA AND ASSIGNED AS LOGICAL UNIT NUMBER 2. THESE CARDS ARE REQUIRED BY THE ADD DIRECTIVE FOR LOADING DIGITIZATION DATA.
- SUBSEQUENT PAGES - COPY OF PROGRAM OUTPUT. NOTE THAT OUTPUT FROM THIS RUN DID NOT EXCEED 80 COLUMNS IN WIDTH.

```
//HK1010X JOB (HK1010,,5,100,,,3,,0),ROSE,CLASS=C,MSGCLASS=A,
//             MSGLEVEL=(1,1),NOTIFY=HK1010
/*SETUP    DISK,CRICDB
/*SETUP    TAPE,900090,NORING S=HK1010
/*ROUTE  PRINT RMT17
//JOBLIB DD DSN=HK1010.LOAD,DISP=SHR
//STEP1 EXEC PGM=SMARTE,TIME=5
//FT01F001 DD DUMMY
//FT02F001 DD DSN=HK1010.H2HEADRS.DATA,DISP=SHR
//FT05F001 DD UNIT=TAPE7,VOL=SER=900090,DISP=(OLD,PASS),
//            LABEL=(1,NL),DCB=(RECFM=FB,LRECL=1692,
//            BLKSIZE=1692,DEN=1,EROPT=ACC)
//FT06F001 DD SYSOUT=A
//FT07F001 DD SPACE=(CYL,(1,1)),UNIT=SYSDA
//FT09F001 DD DUMMY
//FT10F001 DD DSN=HK1010.$DB.NUMBER99,SPACE=(CYL,(64,10)),UNIT=SYSDA,
//  DISP=(NEW,CATLG),VOL=SER=USER06
//FT11F001 DD DUMMY
//FT12F001 DD DUMMY
//FT13F001 DD DUMMY
//FT14F001 DD DUMMY
//FT20F001 DD SPACE=(CYL,(1,1)),UNIT=SYSDA
//FT21F001 DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133)
//FT22F001 DD SPACE=(TRK,(1,1)),UNIT=VIO,
//    DCB=(RECFM=FA,LRECL=133,BLKSIZE=133)
//PLOTTAPE DD SYSOUT=P,DEST=LOCAL
//FT04F001 DD *
PASSWORD=ARTICHOKE
DB=00099,SIZE=009000,LU=10
*EXAMINE
*INITIALIZE
AX1HMTZ4YB
*ADD
TAPE C 0
00000000000000000000000013002
*LIST
*END
/*
//
```

APPENDIX C

```
00235MFKAK1HYT 2352.9E040.413E-0129.E-02  1000.62262HY  0000SBHP
00228MFKAK1HYT 2282.9E040.413E-0120.E-02   500.62262HY  0000SBHP
00227MFKAK1HYT 2273.0E040.413E-0120.E-02   200.62262HY  0000SBHP
00219MFKAK1HYT 2192.9E040.413E-0120.E-02    50.62262HY  0000SBHP
00209MFKAK1HYT 2093.2E040.413E-0120.E-02    50.62262HY  0000SBHP
00214MFKAK1HYT 2142.8E040.413E-0120.E-02    20.62262HY  0000SBHP
00212MFKAK1HYT 2123.2E040.413E-0120.E-02    20.62262HY  0000SBHP
00230MFKAK1HYT 2302.9E040.413E-0120.E-02     5.62262HY  0000SBHP
00118MMKF11HYT 1181.8E050.464E-0120.E-02   200.66212HY  0000SAHP
00120MMKF11HYT 1201.8E050.464E-0120.E-02   500.66212HY  0000SAHP
00117MMKF11HYT 1171.8E050.464E-0120.E-02    50.66212HY  0000SAHP
00114MMKF11HYT 1141.8E050.464E-0120.E-02    20.66212HY  0000SAHP
00116MMKF11HYT 1161.8E050.464E-0120.E-02     5.66212HY  0000SAHP
01620MS08FVRAR16204.2E030.447E-0020.E-0320 100.6280 DVD30000R5HP
16202MS08FVRAR16204.2E030.447E-0020.E-0320  50.6280 DVD20000R5HP
16203MS08FVRAR16204.2E030.447E-0020.E-0320  20.6280 DVD10000R5HP
17061MS09FVRAR17064.2E030.316E-0020.E-0320 100.6280 DVD30000R5HP
17062MS09FVRAR17064.2E030.316E-0020.E-0320  50.6280 DVD20000R5HP
17063MS09FVRAR17064.2E030.316E-0020.E-0320  20.6280 DVD10000R5HP
14341MS07FVRAR14344.2E030.794E-0120.E-0320 100.6280 DVD30000R5HP
14342MS07FVRAR14344.2E030.794E-0120.E-0320  50.6280 DVD20000R5HP
14343MS07FVRAR14344.2E030.794E-0120.E-0320  20.6280 DVD10000R5HP
14041MS06FVRAR14044.2E030.562E-0120.E-0320 100.6280 DVD30000R5HP
14042MS06FVRAR14044.2E030.562E-0120.E-0320  50.6280 DVD20000R5HP
14043MS06FVRAR14044.2E030.562E-0120.E-0320  20.6280 DVD10000R5HP
 2861JA50E6VLT-2863.0E040.631E+0120.E-0320 500.6230 DSB30000SBHP
 2862JA50E6VLT-2863.0E040.631E+0120.E-0320 100.6230 DSB20000SBHP
 2863JA50E6VLT-2863.0E040.631E+0120.E-0320  20.6230 DSB10000SBHP
 2891JA40E5VLT 2893.0E040.631E+0120.E-0320 500.6230 DSB30000SBHP
 2892JA40E5VLT 2893.0E040.631E+0120.E-0320 100.6230 DSB20000SBHP
 2893JA40E5VLT 2893.0E040.631E+0120.E-0320  20.6230 DSB10000SBHP
 2901JC30C6VLT 2903.0E040.398E+0120.E-0320  50.6230 DVD10000SBHP
 2894JC30C6VLT 2893.0E040.398E+0120.E-0320 500.6230 DVD30000SBHP
 2895JC30C6VLT 2893.0E040.398E+0120.E-0320 100.6230 DVD20000SBHP
 2896JC30C6VLT 2893.0E040.398E+0120.E-0320  20.6230 DVD10000SBHP
 2211TTT003CLT 2212.9E040.398E+0120.E-0320 500.6226 DVC30000SBHP
 2212TTT003CLT 2212.9E040.398E+0120.E-0320 100.6226 DVC20000SBHP
 2213TTT003CLT 2212.9E040.398E+0120.E-0320  20.6226 DVC10000SBHP
 2231TTT003CLT 2233.0E040.398E+0120.E-03201000.6226 DVC30000SBHP
 2232TTT003CLT 2233.0E040.398E+0120.E-0320 100.6226 DVC20000SBHP
 2233TTT003CLT 2233.0E040.398E+0120.E-0320  20.6226 DVC10000SBHP
 2741B7130VTBT 2742.9E040.794E-0020.E-0320  50.6229 DVA10000SBHP
 2731B7130VTBT 2732.9E040.794E-0020.E-0320 500.6229 DVA30000SBHP
 2732B7130VTBT 2732.9E040.794E-0020.E-0320 100.6229 DVA20000SBHP
 2733B7130VTBT 2732.9E040.794E-0020.E-0320  20.6229 DVA10000SBHP
 2591JC40A6VLT 2592.9E040.126E+0120.E-0320 500.6229 DVD30000SBHP
 2592JC40A6VLT 2592.9E040.126E+0120.E-0320 100.6229 DVD20000SBHP
 2593JC40A6VLT 2592.9E040.126E+0120.E-0320  20.6229 DVD10000SBHP
 2751JC40C6VLT 2752.9E040.398E-0020.E-0320 500.6229 DVD30000SBHP
 2752JC40C6VLT 2752.9E040.398E-0020.E-0320 100.6229 DVD20000SBHP
 2753JC40C6VLT 2752.9E040.398E-0020.E-0320  20.6229 DVD10000SBHP
```

```
7676767676767676767676767676767676767676767676767
6767676767676767676767676767676767676767676767676
76                                                  67
67    U.S. ARMY, HARRY DIAMOND LABORATORIES         76
76     COMMUNICATIONS SURVIVABILITY BRANCH          67
67                                                  76
76                PROGRAM SMARTE                    67
67                                                  76
76             VERSION     053178Q                  67
67                                                  76
7676767676767676767676767676767676767676767676767
6767676767676767676767676767676767676767676767676
```

THE PRINTED OUTPUT BEGINNING ON THE NEXT PAGE CONFORMS TO THE FOLLOWING RULES...

1. WHEN A VALID DIRECTIVE IS READ IT IS PRINTED IN ITS ENTERED FORM COMPLETE WITH THE ASTERISK (*) CHARACTER.

2. WHEN A DIRECTIVE MODIFIER CARD IS READ (IF DIRECTIVE PACKET HAS MODIFIER CARDS) IT IS PRINTED ENCLOSED IN PARENTHESES.

3. AS EXECUTION OF THE DIRECTIVE PACKET PROCEEDS THE REQUESTED INFORMATION IS PRINTED. ALSO ANY APPROPRIATE PROGRAM MESSAGES ARE PRINTED. ANY TIME AN ADDITIONAL DIRECTIVE MODIFIER CARD IS READ IT IS PRINTED AS DESCRIBED IN NO. 2 ABOVE AND PROCESSING OF THE DIRECTIVE PACKET PROCEEDS.

4. WHEN THE DIRECTIVE PACKET HAS BEEN SUCCESSFULLY COMPLETED A MESSAGE CONFIRMING THAT FACT IS PRINTED. THIS MESSAGE BEGINS WITH A PLUS (+) CHARACTER.

DEFINITIONS...

DIRECTIVE - ONE OF THE SET OF SMARTE COMMANDS ENTERED ON A CARD IN THE DIRECTIVE DECK. AN ASTERISK IS PUNCHED IN COLUMN 1. THE KEYWORD BEGINS IN COLUMN 2.

DIRECTIVE MODIFIER CARD - A CARD WHICH FOLLOWS A DIRECTIVE CARD OR ANOTHER DIRECTIVE MODIFIER CARD. IT CONTAINS ONE OR MORE WORDS OR NUMBERS WHICH FURTHER DESCRIBE THE PROCESSING REQUESTED BY THE LATTER DIRECTIVE CARD.

DIRECTIVE PACKET - ONE DIRECTIVE CARD FOLLOWED BY ALL OF ITS ASSOCIATED DIRECTIVE MODIFIER CARDS (IF ANY). DIRECTIVE PACKETS ARE GROUPED TOGETHER TO FORM THE DIRECTIVE DECK.

DIRECTIVE DECK - THE STACK OF CARDS WHICH IS PROVIDED TO THE SMARTE PROGRAM AS INPUT IN ORDER TO CONTROL THE ACTIONS OF THE PROGRAM.

APPENDIX C

```
PRIMARY DATA BASE SPECIFICATION:  DB=    99,SIZE=  9000,LU=10
ELT:      0.0         0.002

*EXAMINE
```

APPENDIX C

THE FOLLOWING DATA BLOCKS WERE LOCATED ON THE INPUT TAPE

	WORD 01	WORD 02	WORD 41	WORD 44
1	2	35	1657	1
2	2	28	1610	1
3	2	27	1775	1
4	2	19	1365	1
5	2	9	1537	1
6	2	14	1547	1
7	2	12	1530	1
8	2	30	1545	1
9	1	18	1525	1
10	1	20	1537	1
11	1	17	1525	1
12	1	14	1522	1
13	1	16	1532	1
14	16	20	1965	1
15	162	2	1970	1
16	162	3	1982	1
17	170	61	1952	1
18	170	62	1952	1
19	170	63	1967	1
20	143	41	1950	1
21	143	42	1945	1
22	143	43	1977	1
23	140	41	1970	1
24	140	42	1957	1
25	140	43	1972	1
26	28	61	1880	1
27	28	62	1892	1
28	28	63	1895	1
29	28	91	1887	1
30	28	92	1890	1
31	28	93	1890	1
32	29	1	1895	1
33	28	94	1930	1
34	28	95	1860	1
35	28	96	1897	1
36	22	11	1897	1
37	22	12	1887	1
38	22	13	1875	1
39	22	31	1897	1
40	22	32	1897	1
41	22	33	1885	1
42	27	41	1920	1
43	27	31	1900	1
44	27	32	3250	1
45	27	33	1902	1
46	25	91	1935	1
47	25	92	1867	1
48	25	93	1857	1
49	27	51	1920	1
50	27	52	1860	1
51	27	53	1870	1

APPENDIX C

```
 END OF FILE ENCOUNTERED ON INPUT

*EXAMINE COMPLETED
 ELT:      0.946      0.949

*INITIALIZE
 VALID PASSWORD READ
```

```
        S M A R T E   D A T A   B A S E   C O N T E N T S
**********************************************************************
DATA BASE NUMBER    99                                  06/06/78   11.13.22

SIZE OF MASTER INDEX (WORDS)-----  9000
NEXT AVAILABLE RECORD ID---------     2
RECORD ID OF LAST VOIDED RECORD--     0      NOTE - A PRU IS A PHYSICAL
CAPACITY OF SUBINDEXES (RECORDS)-     0             RECORD UNIT EQUAL
NUMBER OF INDEXES----------------     1             TO 128 WORDS.
CAPACITY OF DATA BASE (PRU'S)----  9000
STORAGE ALLOCATED (PRU'S)--------     0
PERCENTAGE OF DATA BASE USED-----  0.0
LARGEST EXISTING HOLE (PRU'S)----     0
NO. OF GOOD RECORDS IN DATA BASE-     0
TOTAL NO. OF DATA BASE RECORDS---     0

                                          INDICATORS
                                    ------------------------
        RECORD NAME           NO PTS ABS ORD SOU HIS NOR INT BLKS   ID
------------------------------ ------ --- --- --- --- --- --- ---- ------

**************************** DATA BASE EMPTY ****************************
```

APPENDIX C

```
*INITIALIZE COMPLETED
 ELT:      3.137      4.089

*ADD
 (TAPE C 0)
 (     099999     0     1    130 2)
 RECORD NUMBER        1 WRITTEN     319 COORDINATES     766 WORDS
   RECORD NAME J MFKAK1 HY 0000 SB HP (3  )
 RECORD NUMBER        2 WRITTEN     394 COORDINATES     916 WORDS
   RECORD NAME J MFKAK1 HY 0000 SB HP (3  )
 RECORD NUMBER        3 WRITTEN     425 COORDINATES     978 WORDS
   RECORD NAME J MFKAK1 HY 0000 SB HP (3  )
 RECORD NUMBER        4 WRITTEN     343 COORDINATES     814 WORDS
   RECORD NAME J MFKAK1 HY 0000 SB HP (3  )
 RECORD NUMBER        5 WRITTEN     361 COORDINATES     850 WORDS
   RECORD NAME J MFKAK1 HY 0000 SB HP (3  )
 RECORD NUMBER        6 WRITTEN     354 COORDINATES     836 WORDS
   RECORD NAME J MFKAK1 HY 0000 SB HP (3  )
 RECORD NUMBER        7 WRITTEN     359 COORDINATES     846 WORDS
   RECORD NAME J MFKAK1 HY 0000 SB HP (3  )
 RECORD NUMBER        8 WRITTEN     375 COORDINATES     878 WORDS
   RECORD NAME J MFKAK1 HY 0000 SB HP (3  )
 RECORD NUMBER        9 WRITTEN     371 COORDINATES     870 WORDS
   RECORD NAME J MMKF11 HY 0000 SA HP (3  )
 RECORD NUMBER       10 WRITTEN     324 COORDINATES     776 WORDS
   RECORD NAME J MMKF11 HY 0000 SA HP (3  )
 RECORD NUMBER       11 WRITTEN     360 COORDINATES     848 WORDS
   RECORD NAME J MMKF11 HY 0000 SA HP (3  )
 RECORD NUMBER       12 WRITTEN     368 COORDINATES     864 WORDS
   RECORD NAME J MMKF11 HY 0000 SA HP (3  )
 RECORD NUMBER       13 WRITTEN     377 COORDINATES     882 WORDS
   RECORD NAME J MMKF11 HY 0000 SA HP (3  )

 FIRST RECORD  =     1
 LAST RECORD   =    13
 TOTAL RECORDS =    13
*ADD COMPLETED
 ELT:      0.591      4.684

*LIST
```

S M A R T E D A T A B A S E C O N T E N T S

DATA BASE NUMBER 99 06/06/78 11.13.47

SIZE OF MASTER INDEX (WORDS)-----	9000
NEXT AVAILABLE RECORD ID---------	94
RECORD ID OF LAST VOIDED RECORD--	0
CAPACITY OF SUBINDEXES (RECORDS)-	0
NUMBER OF INDEXES---------------	1
CAPACITY OF DATA BASE (PRU'S)----	9000
STORAGE ALLOCATED (PRU'S)--------	92
PERCENTAGE OF DATA BASE USED-----	1.02
LARGEST EXISTING HOLE (PRU'S)----	0
NO. OF GOOD RECORDS IN DATA BASE-	13
TOTAL NO. OF DATA BASE RECORDS---	13

NOTE - A PRU IS A PHYSICAL RECORD UNIT EQUAL TO 128 WORDS.

RECORD NAME	NO PTS	INDICATORS ABS	ORD	SOU	HIS	NOR	INT	BLKS	ID
J MFKAK1 HY 0000 SB HP (3)	319	0	3	1	0	0	0	6	2
J MFKAK1 HY 0000 SB HP (3)	394	0	3	1	0	0	0	8	8
J MFKAK1 HY 0000 SB HP (3)	425	0	3	1	0	0	0	8	16
J MFKAK1 HY 0000 SB HP (3)	343	0	3	1	0	0	0	7	24
J MFKAK1 HY 0000 SB HP (3)	361	0	3	1	0	0	0	7	31
J MFKAK1 HY 0000 SB HP (3)	354	0	3	1	0	0	0	7	38
J MFKAK1 HY 0000 SB HP (3)	359	0	3	1	0	0	0	7	45
J MFKAK1 HY 0000 SB HP (3)	375	0	3	1	0	0	0	7	52
J MMKF11 HY 0000 SA HP (3)	371	0	3	1	0	0	0	7	59
J MMKF11 HY 0000 SA HP (3)	324	0	3	1	0	0	0	7	66
J MMKF11 HY 0000 SA HP (3)	360	0	3	1	0	0	0	7	73
J MMKF11 HY 0000 SA HP (3)	368	0	3	1	0	0	0	7	80
J MMKF11 HY 0000 SA HP (3)	377	0	3	1	0	0	0	7	87

APPENDIX C

```
+LIST COMPLETED          13 GOOD RECORDS IN DATA BASE
 ELT:      0.044       4.730
```

```
...NORMAL TERMINATION
   DIRECTIVE DECK EXHAUSTED

   THE FOLLOWING DATA BASE FILES WERE SPECIFIED FOR THIS JOB:

     ON LU 10  DATA BASE NO.     99
```

APPENDIX C

EXAMPLE RUN NUMBER 2

PURPOSE:
1. DEMONSTRATE CREATION OF DATA BASE BACKUP COPY ON MAGNETIC TAPE USING SEARCH AND DUMP DIRECTIVES.
2. DEMONSTRATE USE OF REPORT DIRECTIVE.

MODE: BATCH

DIRECTIVES DEMONSTRATED:
DUMP
REPORT
SEARCH

CPU TIME: 8.93 SECONDS

EXPLANATION OF FOLLOWING PAGES:
FIRST PAGE - LISTING OF JOB DECK
SUBSEQUENT PAGES - COPY OF PROGRAM OUTPUT. NOTE THAT OUTPUT FROM THIS RUN DID NOT EXCEED 80 COLUMNS IN WIDTH.

```
//HK1010X JOB (HK1010,,20,100,,,3,,0),ROSE,CLASS=C,MSGCLASS=A,
//             MSGLEVEL=(1,1),NOTIFY=HK1010
/*SETUP    DISK,CRICDB
/*SETUP    TAPE,400745,RING
/*ROUTE  PRINT RMT17
//JOBLIB DD DSN=HK1010.LOAD,DISP=SHR
//STEP1 EXEC PGM=SMARTE,TIME=30
//FT01F001 DD DUMMY
//FT02F001 DD DUMMY
//FT05F001 DD DUMMY
//FT06F001 DD SYSOUT=A
//FT07F001 DD SPACE=(CYL,(1,1)),UNIT=SYSDA
//FT09F001 DD DSN=HK1010.$DBA.NUMBER99,UNIT=TAPE9,VOL=SER=400745,
//  DISP=OLD,DCB=(RECFM=VSB,BLKSIZE=5120)
//FT10F001 DD DSN=HK1010.$DB.NUMBER99,DISP=SHR
//FT11F001 DD DUMMY
//FT12F001 DD DUMMY
//FT13F001 DD DUMMY
//FT14F001 DD DUMMY
//FT20F001 DD SPACE=(CYL,(1,1)),UNIT=SYSDA
//FT21F001 DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133)
//FT22F001 DD SPACE=(TRK,(1,1)),UNIT=VIO,
//    DCB=(RECFM=FA,LRECL=133,BLKSIZE=133)
//PLOTTAPE DD SYSOUT=P,DEST=LOCAL
//FT04F001 DD *
PASSWORD=KUMQUAT
DB=00099,SIZE=009000,LU=10
*SEARCH
021.GE.0000000002

*DUMP
TYPE02
*REPORT
LIST OF RECORDS DUMPED, SORTED BY REC ID   50
       RECORD NAME              ID      REEL NO.  DB PR

 --------------------------- ------- ---------- -- --

201
 21  T30,I7
 92  T38,I10
202  T49,I2
026  T52,A2

*END
/*
//
```

APPENDIX C

```
7676767676767676767676767676767676767676767676767
6767676767676767676767676767676767676767676767676
76                                                 67
67     U.S. ARMY, HARRY DIAMOND LABORATORIES       76
76      COMMUNICATIONS SURVIVABILITY BRANCH        67
67                                                 76
76                  PROGRAM SMARTE                 67
67                                                 76
76              VERSION     053178Q                67
67                                                 76
7676767676767676767676767676767676767676767676767
6767676767676767676767676767676767676767676767676
```

THE PRINTED OUTPUT BEGINNING ON THE NEXT PAGE CONFORMS TO THE FOLLOWING RULES...

1. WHEN A VALID DIRECTIVE IS READ IT IS PRINTED IN ITS ENTERED FORM COMPLETE WITH THE ASTERISK (*) CHARACTER.

2. WHEN A DIRECTIVE MODIFIER CARD IS READ (IF DIRECTIVE PACKET HAS MODIFIER CARDS) IT IS PRINTED ENCLOSED IN PARENTHESES.

3. AS EXECUTION OF THE DIRECTIVE PACKET PROCEEDS THE REQUESTED INFORMATION IS PRINTED. ALSO ANY APPROPRIATE PROGRAM MESSAGES ARE PRINTED. ANY TIME AN ADDITIONAL DIRECTIVE MODIFIER CARD IS READ IT IS PRINTED AS DESCRIBED IN NO. 2 ABOVE AND PROCESSING OF THE DIRECTIVE PACKET PROCEEDS.

4. WHEN THE DIRECTIVE PACKET HAS BEEN SUCCESSFULLY COMPLETED A MESSAGE CONFIRMING THAT FACT IS PRINTED. THIS MESSAGE BEGINS WITH A PLUS (+) CHARACTER.

DEFINITIONS...

DIRECTIVE - ONE OF THE SET OF SMARTE COMMANDS ENTERED ON A CARD IN THE DIRECTIVE DECK. AN ASTERISK IS PUNCHED IN COLUMN 1. THE KEYWORD BEGINS IN COLUMN 2.

DIRECTIVE MODIFIER CARD - A CARD WHICH FOLLOWS A DIRECTIVE CARD OR ANOTHER DIRECTIVE MODIFIER CARD. IT CONTAINS ONE OR MORE WORDS OR NUMBERS WHICH FURTHER DESCRIBE THE PROCESSING REQUESTED BY THE LATTER DIRECTIVE CARD.

DIRECTIVE PACKET - ONE DIRECTIVE CARD FOLLOWED BY ALL OF ITS ASSOCIATED DIRECTIVE MODIFIER CARDS (IF ANY). DIRECTIVE PACKETS ARE GROUPED TOGETHER TO FORM THE DIRECTIVE DECK.

DIRECTIVE DECK - THE STACK OF CARDS WHICH IS PROVIDED TO THE SMARTE PROGRAM AS INPUT IN ORDER TO CONTROL THE ACTIONS OF THE PROGRAM.

```
 PRIMARY DATA BASE SPECIFICATION:  DB=   99,SIZE=  9000,LU=10
 ELT:      0.0        0.002

*SEARCH

 (021.GE.0000000002)

+SEARCH COMPLETED.          13  RECORDS IN FIND FILE.
 ELT:      1.244      1.247

*DUMP
(TYPE 2)

+DUMP COMPLETED.         13 RECORDS WERE DUMPED.
 ELT:      0.220      1.470

*REPORT
 (LIST OF RECORDS DUMPED, SORTED BY REC ID   500)
 (        RECORD NAME                ID      REEL NO.  DB PR                )
 (                                                                          )
 ( -------------------------- ------- ---------- -- --                     )
 (                                                                          )
 (201 0                       )
 ( 21 0T30,I7                 )
 ( 92 0T38,I10                )
 (202 0T49,I2                 )
 ( 26 0T52,A2                 )
```

APPENDIX C

LIST OF RECORDS DUMPED, SORTED BY REC ID PAGE 1 06/06/78 11.40.59
DATA BASE NOS 99

RECORD NAME	ID	REEL NO.	DB	PR
J MFKAK1 HY 0000 SB HP (3)	2	1600000235	10	H2
J MFKAK1 HY 0000 SB HP (3)	8	1600000228	10	H2
J MFKAK1 HY 0000 SB HP (3)	16	1600000227	10	H2
J MFKAK1 HY 0000 SB HP (3)	24	1600000219	10	H2
J MFKAK1 HY 0000 SB HP (3)	31	1600000209	10	H2
J MFKAK1 HY 0000 SB HP (3)	38	1600000214	10	H2
J MFKAK1 HY 0000 SB HP (3)	45	1600000212	10	H2
J MFKAK1 HY 0000 SB HP (3)	52	1600000230	10	H2
J MMKF11 HY 0000 SA HP (3)	59	1600000118	10	H2
J MMKF11 HY 0000 SA HP (3)	66	1600000120	10	H2
J MMKF11 HY 0000 SA HP (3)	73	1600000117	10	H2
J MMKF11 HY 0000 SA HP (3)	80	1600000114	10	H2
J MMKF11 HY 0000 SA HP (3)	87	1600000116	10	H2

```
+REPORT COMPLETED
 ELT:     7.264      8.736
```

APPENDIX C

```
...NORMAL TERMINATION
   DIRECTIVE DECK EXHAUSTED

   THE FOLLOWING DATA BASE FILES WERE SPECIFIED FOR THIS JOB:

     ON LU 10  DATA BASE NO.    99
```

EXAMPLE RUN NUMBER 3

PURPOSE:
DEMONSTRATE RECONSTRUCTION OF DATA BASE FROM A BACKUP COPY ON MAGNETIC TAPE.

MODE: BATCH

DIRECTIVES DEMONSTRATED:
ADD/DUMP B
INITIALIZE
LIST

CPU TIME: 13.15 SECONDS

EXPLANATION OF FOLLOWING PAGES:
FIRST PAGE - LISTING OF JOB DECK
SUBSEQUENT PAGES - COPY OF PROGRAM OUTPUT. NOTE THAT OUTPUT FROM THIS RUN DID NOT EXCEED 80 COLUMNS IN WIDTH.

APPENDIX C

```
//HK1010X JOB (HK1010,,20,100,,,3,,0),ROSE,CLASS=C,MSGCLASS=A,
//              MSGLEVEL=(1,1),NOTIFY=HK1010
/*SETUP     DISK,CRICDB
/*SETUP     TAPE,400745,NORING
/*ROUTE  PRINT RMT17
//JOBLIB DD DSN=HK1010.LOAD,DISP=SHR
//STEP1 EXEC PGM=SMARTE,TIME=20
//FT01F001 DD DUMMY
//FT02F001 DD DUMMY
//FT05F001 DD DSN=HK1010.$DBA.NUMBER99,UNIT=TAPE9,VOLUME=SER=400745,
//     DISP=OLD
//FT06F001 DD SYSOUT=A
//FT07F001 DD SPACE=(CYL,(1,1)),UNIT=SYSDA
//FT09F001 DD DUMMY
//FT10F001 DD DSN=HK1010.$DB.NUMBER99,SPACE=(CYL,(64,10)),UNIT=SYSDA,
//  DISP=(NEW,CATLG),VOL=SER=USER06
//FT11F001 DD DUMMY
//FT12F001 DD DUMMY
//FT13F001 DD DUMMY
//FT14F001 DD DUMMY
//FT20F001 DD SPACE=(CYL,(1,1)),UNIT=SYSDA
//FT21F001 DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133)
//FT22F001 DD SPACE=(TRK,(1,1)),UNIT=VIO,
//     DCB=(RECFM=FA,LRECL=133,BLKSIZE=133)
//PLOTTAPE DD SYSOUT=P,DEST=LOCAL
//FT04F001 DD *
PASSWORD=ARTICHOKE
DB=00099,SIZE=009000,LU=10
*INITIALIZE
AX1HMTZ4YB
*ADD
DUMP B 0
*LIST
*END
/*
//
```

```
7676767676767676767676767676767676767676767676767
6767676767676767676767676767676767676767676767676
76                                                 67
67     U.S. ARMY, HARRY DIAMOND LABORATORIES       76
76      COMMUNICATIONS SURVIVABILITY BRANCH        67
67                                                 76
76                  PROGRAM SMARTE                 67
67                                                 76
76              VERSION     0531780                67
67                                                 76
7676767676767676767676767676767676767676767676767
6767676767676767676767676767676767676767676767676
```

THE PRINTED OUTPUT BEGINNING ON THE NEXT PAGE CONFORMS TO THE FOLLOWING RULES...

1. WHEN A VALID DIRECTIVE IS READ IT IS PRINTED IN ITS ENTERED FORM COMPLETE WITH THE ASTERISK (*) CHARACTER.

2. WHEN A DIRECTIVE MODIFIER CARD IS READ (IF DIRECTIVE PACKET HAS MODIFIER CARDS) IT IS PRINTED ENCLOSED IN PARENTHESES.

3. AS EXECUTION OF THE DIRECTIVE PACKET PROCEEDS THE REQUESTED INFORMATION IS PRINTED. ALSO ANY APPROPRIATE PROGRAM MESSAGES ARE PRINTED. ANY TIME AN ADDITIONAL DIRECTIVE MODIFIER CARD IS READ IT IS PRINTED AS DESCRIBED IN NO. 2 ABOVE AND PROCESSING OF THE DIRECTIVE PACKET PROCEEDS.

4. WHEN THE DIRECTIVE PACKET HAS BEEN SUCCESSFULLY COMPLETED A MESSAGE CONFIRMING THAT FACT IS PRINTED. THIS MESSAGE BEGINS WITH A PLUS (+) CHARACTER.

DEFINITIONS...

DIRECTIVE - ONE OF THE SET OF SMARTE COMMANDS ENTERED ON A CARD IN THE DIRECTIVE DECK. AN ASTERISK IS PUNCHED IN COLUMN 1. THE KEYWORD BEGINS IN COLUMN 2.

DIRECTIVE MODIFIER CARD - A CARD WHICH FOLLOWS A DIRECTIVE CARD OR ANOTHER DIRECTIVE MODIFIER CARD. IT CONTAINS ONE OR MORE WORDS OR NUMBERS WHICH FURTHER DESCRIBE THE PROCESSING REQUESTED BY THE LATTER DIRECTIVE CARD.

DIRECTIVE PACKET - ONE DIRECTIVE CARD FOLLOWED BY ALL OF ITS ASSOCIATED DIRECTIVE MODIFIER CARDS (IF ANY). DIRECTIVE PACKETS ARE GROUPED TOGETHER TO FORM THE DIRECTIVE DECK.

DIRECTIVE DECK - THE STACK OF CARDS WHICH IS PROVIDED TO THE SMARTE PROGRAM AS INPUT IN ORDER TO CONTROL THE ACTIONS OF THE PROGRAM.

APPENDIX C

```
PRIMARY DATA BASE SPECIFICATION:  DB=   99,SIZE=  9000,LU=10
ELT:      0.0        0.002

*INITIALIZE
 VALID PASSWORD READ
```

```
        S M A R T E    D A T A    B A S E    C O N T E N T S
**********************************************************************
DATA BASE NUMBER    99                                  06/06/78   11.57.41

SIZE OF MASTER INDEX (WORDS)-----  9000
NEXT AVAILABLE RECORD ID---------     2
RECORD ID OF LAST VOIDED RECORD--     0       NOTE - A PRU IS A PHYSICAL
CAPACITY OF SUBINDEXES (RECORDS)-     0              RECORD UNIT EQUAL
NUMBER OF INDEXES----------------     1              TO 128 WORDS.
CAPACITY OF DATA BASE (PRU'S)----  9000
STORAGE ALLOCATED (PRU'S)--------     0
PERCENTAGE OF DATA BASE USED-----  0.0
LARGEST EXISTING HOLE (PRU'S)----     0
NO. OF GOOD RECORDS IN DATA BASE-     0
TOTAL NO. OF DATA BASE RECORDS---     0

                                          INDICATORS
                                    ----------------------
        RECORD NAME           NO PTS ABS ORD SOU HIS NOR INT BLKS    ID
--------------------------- ------ --- --- --- --- --- --- ---- ------

**************************** DATA BASE EMPTY ****************************
```

APPENDIX C

```
+INITIALIZE COMPLETED
 ELT:      2.809      2.813

*ADD
 (DUMP B 0)
+ADD COMPLETED
 ELT:      0.223      3.038

*LIST
```

S M A R T E D A T A B A S E C O N T E N T S

DATA BASE NUMBER 99 06/06/78 11.59.37

SIZE OF MASTER INDEX (WORDS)-----	9000
NEXT AVAILABLE RECORD ID---------	94
RECORD ID OF LAST VOIDED RECORD--	0
CAPACITY OF SUBINDEXES (RECORDS)-	0
NUMBER OF INDEXES----------------	1
CAPACITY OF DATA BASE (PRU'S)----	9000
STORAGE ALLOCATED (PRU'S)--------	92
PERCENTAGE OF DATA BASE USED-----	1.02
LARGEST EXISTING HOLE (PRU'S)----	0
NO. OF GOOD RECORDS IN DATA BASE-	13
TOTAL NO. OF DATA BASE RECORDS---	13

NOTE - A PRU IS A PHYSICAL RECORD UNIT EQUAL TO 128 WORDS.

RECORD NAME	NO PTS	INDICATORS ABS	ORD	SOU	HIS	NOR	INT	BLKS	ID
J MFKAK1 HY 0000 SB HP (3)	319	0	3	1	0	0	0	6	2
J MFKAK1 HY 0000 SB HP (3)	394	0	3	1	0	0	0	8	8
J MFKAK1 HY 0000 SB HP (3)	425	0	3	1	0	0	0	8	16
J MFKAK1 HY 0000 SB HP (3)	343	0	3	1	0	0	0	7	24
J MFKAK1 HY 0000 SB HP (3)	361	0	3	1	0	0	0	7	31
J MFKAK1 HY 0000 SB HP (3)	354	0	3	1	0	0	0	7	38
J MFKAK1 HY 0000 SB HP (3)	359	0	3	1	0	0	0	7	45
J MFKAK1 HY 0000 SB HP (3)	375	0	3	1	0	0	0	7	52
J MMKF11 HY 0000 SA HP (3)	371	0	3	1	0	0	0	7	59
J MMKF11 HY 0000 SA HP (3)	324	0	3	1	0	0	0	7	66
J MMKF11 HY 0000 SA HP (3)	360	0	3	1	0	0	0	7	73
J MMKF11 HY 0000 SA HP (3)	368	0	3	1	0	0	0	7	80
J MMKF11 HY 0000 SA HP (3)	377	0	3	1	0	0	0	7	87

APPENDIX C

```
+LIST COMPLETED          13 GOOD RECORDS IN DATA BASE
 ELT:       0.045       3.086
```

```
...NORMAL TERMINATION
   DIRECTIVE DECK EXHAUSTED

   THE FOLLOWING DATA BASE FILES WERE SPECIFIED FOR THIS JOB:

     ON LU 10  DATA BASE NO.    99
```

APPENDIX C

EXAMPLE RUN NUMBER 4

PURPOSE:
  DEMONSTRATE SIMPLE EDIT.

MODE: INTERACTIVE

DIRECTIVES DEMONSTRATED:
  HELP
  LIST
  PURGE
  SEARCH

CPU TIME: 1.21 SECONDS

EXPLANATION OF FOLLOWING PAGES:
  THE FOLLOWING PAGES CONTAIN A FULL COPY OF USER INPUT AND PROGRAM
    OUTPUT. THE TRIANGLE SYMBOL (▷) HAS BEEN DRAWN IN AT THE BEGINNING
    OF EACH USER SUPPLIED ENTRY.

```
 READY
▷exec 'hk1010.clist(smarte)' 'pref(f) lu10(hk1010.$db.number99)'

 SMARTE PROGRAM CLIST VERSION 060578Q
   START TIME:  12:37:36 06/06/78
   LU04 = TERMINAL
   LU10 = HK1010.$DB.NUMBER99
   SMARTE FILES ALLOCATED; EXECUTION PROCEEDING.
   ENTER ACCESS PASSWORD
▷password=alleycat

 PROGRAM SMARTE VERSION   053178Q
 EMP DATA MANAGEMENT AND ANALYSIS PROGRAM



 -ENTER DATA BASE SPECIFICATION (DB=IIIII,SIZE=IIIIII,LU=II)-
▷db=00099,size=009000,lu=10
  PRIMARY DATA BASE SPECIFICATION:  DB=   99,SIZE=  9000,LU=10
  ELT:     0.0       0.002

 -ENTER DIRECTIVE-
▷*help

 SMARTE DIRECTIVES (* AND NEXT 2 CHARS SUFFICIENT):
 *ADD *CLEAR *COMBINE *DEFINE *DISPLAY *DUMP *EDIT *END *EXAMINE *FIX *FOURIER
 *GET *HELP *HISTOGRAM *INITIALIZE *LIST *OUTPUT *PLOT *PRINT *PURGE
 *REPORT *SCALE *SEARCH *SHIFT *SORT

 DIRECTIVE *END TERMINATES RUN
  ELT:     0.010     0.015

 -ENTER DIRECTIVE-
▷*purge

 *PURGE

 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END PURGE-
▷                    000024
  (                       24)
  RECORD     24 PURGED          RECORD NAME J MFKAK1 HY 0000 SB HP (3  )

 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END PURGE-
▷                          38
  (                       38)
  RECORD     38 PURGED          RECORD NAME J MFKAK1 HY 0000 SB HP (3  )

 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END PURGE-
▷
 +PURGE COMPLETED
  ELT:     0.070     0.087

 -ENTER DIRECTIVE-
▷*list
```

APPENDIX C

```
*LIST

         S M A R T E    D A T A    B A S E    C O N T E N T S
**********************************************************************
DATA BASE NUMBER    99                                  06/06/78   12.42.04

SIZE OF MASTER INDEX (WORDS)-----  9000
NEXT AVAILABLE RECORD ID---------    94
RECORD ID OF LAST VOIDED RECORD--    38      NOTE - A PRU IS A PHYSICAL
CAPACITY OF SUBINDEXES (RECORDS)-     0             RECORD UNIT EQUAL
NUMBER OF INDEXES----------------     1             TO 128 WORDS.
CAPACITY OF DATA BASE (PRU'S)----  9000
STORAGE ALLOCATED (PRU'S)--------    92
PERCENTAGE OF DATA BASE USED-----  1.02
LARGEST EXISTING HOLE (PRU'S)----     7
NO. OF GOOD RECORDS IN DATA BASE-    11
TOTAL NO. OF DATA BASE RECORDS---    13


                                                  INDICATORS
                                          ----------------------
        RECORD NAME                NO PTS ABS ORD SOU HIS NOR INT BLKS   ID
---------------------------------- ------ --- --- --- --- --- --- ---- ------
J MFKAK1 HY 0000 SB HP (3  )         319   0   3   1   0   0   0    6      2
J MFKAK1 HY 0000 SB HP (3  )         394   0   3   1   0   0   0    8      8
J MFKAK1 HY 0000 SB HP (3  )         425   0   3   1   0   0   0    8     16
**** PURGED RECORD *********                                        7      0
J MFKAK1 HY 0000 SB HP (3  )         361   0   3   1   0   0   0    7     31
**** PURGED RECORD *********                                        7    -24
J MFKAK1 HY 0000 SB HP (3  )         359   0   3   1   0   0   0    7     45
J MFKAK1 HY 0000 SB HP (3  )         375   0   3   1   0   0   0    7     52
J MMKF11 HY 0000 SA HP (3  )         371   0   3   1   0   0   0    7     59
J MMKF11 HY 0000 SA HP (3  )         324   0   3   1   0   0   0    7     66
J MMKF11 HY 0000 SA HP (3  )         360   0   3   1   0   0   0    7     73
J MMKF11 HY 0000 SA HP (3  )         368   0   3   1   0   0   0    7     80
J MMKF11 HY 0000 SA HP (3  )         377   0   3   1   0   0   0    7     87

+LIST COMPLETED       11 GOOD RECORDS IN DATA BASE
 ELT:      0.069      0.160

-ENTER DIRECTIVE-
```

```
▷*search

 *SEARCH

 -ENTER 1ST SUPPLEMENTARY ENTRY-
▷003.eq.f

  (003.EQ.F)

 -ENTER NEXT SUPPLEMENTARY ENTRY-
▷

 +SEARCH COMPLETED.          6  RECORDS IN FIND FILE.
  ELT:      0.810      0.973

 -ENTER DIRECTIVE-
▷*edit

 *EDIT

 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END EDIT-
▷ff
  (FF)

 -ENTER ITEM NO. (III)-
▷019

  ( 19)

 -ENTER NEW VALUE (1 OR 2 ALPHANUMERIC CHARS)-
▷1
  (1 )
    J MFKAK1 HY 0000 SB HP (31 ) -       2  EDIT COMPLETED
    J MFKAK1 HY 0000 SB HP (31 ) -       8  EDIT COMPLETED
    J MFKAK1 HY 0000 SB HP (31 ) -      16  EDIT COMPLETED
    J MFKAK1 HY 0000 SB HP (31 ) -      31  EDIT COMPLETED
    J MFKAK1 HY 0000 SB HP (31 ) -      45  EDIT COMPLETED
    J MFKAK1 HY 0000 SB HP (31 ) -      52  EDIT COMPLETED

 +EDIT PACKET COMPLETED
  ELT:      0.161      1.137

 -ENTER DIRECTIVE-
▷*list
```

APPENDIX C

```
*LIST

        S M A R T E   D A T A   B A S E   C O N T E N T S
**********************************************************************
DATA BASE NUMBER    99                                  06/06/78   12.50.18

SIZE OF MASTER INDEX (WORDS)-----  9000
NEXT AVAILABLE RECORD ID---------    94
RECORD ID OF LAST VOIDED RECORD--    38      NOTE - A PRU IS A PHYSICAL
CAPACITY OF SUBINDEXES (RECORDS)-    0              RECORD UNIT EQUAL
NUMBER OF INDEXES----------------    1              TO 128 WORDS.
CAPACITY OF DATA BASE (PRU'S)----  9000
STORAGE ALLOCATED (PRU'S)--------    92
PERCENTAGE OF DATA BASE USED-----  1.02
LARGEST EXISTING HOLE (PRU'S)----    7
NO. OF GOOD RECORDS IN DATA BASE-   11
TOTAL NO. OF DATA BASE RECORDS---   13

                                          INDICATORS
                                    ----------------------
        RECORD NAME           NO PTS ABS ORD SOU HIS NOR INT BLKS   ID
------------------------------ ------ --- --- --- --- --- --- ---- ------
J MFKAK1 HY 0000 SB HP (31 )    319    0   3   1   0   0   0    6      2
J MFKAK1 HY 0000 SB HP (31 )    394    0   3   1   0   0   0    8      8
J MFKAK1 HY 0000 SB HP (31 )    425    0   3   1   0   0   0    8     16
**** PURGED RECORD *********                                    7      0
J MFKAK1 HY 0000 SB HP (31 )    361    0   3   1   0   0   0    7     31
**** PURGED RECORD *********                                    7    -24
J MFKAK1 HY 0000 SB HP (31 )    359    0   3   1   0   0   0    7     45
J MFKAK1 HY 0000 SB HP (31 )    375    0   3   1   0   0   0    7     52
J MMKF11 HY 0000 SA HP (3  )    371    0   3   1   0   0   0    7     59
J MMKF11 HY 0000 SA HP (3  )    324    0   3   1   0   0   0    7     66
J MMKF11 HY 0000 SA HP (3  )    360    0   3   1   0   0   0    7     73
J MMKF11 HY 0000 SA HP (3  )    368    0   3   1   0   0   0    7     80
J MMKF11 HY 0000 SA HP (3  )    377    0   3   1   0   0   0    7     87

+LIST COMPLETED      11 GOOD RECORDS IN DATA BASE
 ELT:     0.064     1.203

-ENTER DIRECTIVE-
▷*end


...NORMAL TERMINATION
   DIRECTIVE DECK EXHAUSTED


   THE FOLLOWING DATA BASE FILES WERE SPECIFIED FOR THIS JOB:

     ON LU 10  DATA BASE NO.    99
IH0002I STOP   7777
 STOP TIME:  12:54:15 06/06/78
READY
```

APPENDIX C

EXAMPLE RUN NUMBER 5

PURPOSE:
1. DEMONSTRATE RETRIEVALS FROM TWO DATA BASES.
2. DEMONSTRATE VARIOUS FORMS OF OUTPUT DIRECTIVE.
3. DEMONSTRATE USE OF ALTERNATE PRINT DEVICE.

MODE: INTERACTIVE WITH PARTIAL OUTPUT AT REMOTE HIGH SPEED PRINTER

DIRECTIVES DEMONSTRATED:
- CLEAR
- DEFINE
- DISPLAY
- GET
- OUTPUT/TYPE 3, 6-11
- PRINT
- SEARCH
- SORT

CPU TIME: 6.72 SECONDS

EXPLANATION OF FOLLOWING PAGES:
- FIRST TEN PAGES - COPY OF ALL USER SUPPLIED INPUT AND PROGRAM OUTPUT RECEIVED AT THE INTERACTIVE TERMINAL. THE TRIANGLE CHARACTER (▷) HAS BEEN DRAWN IN AT THE BEGINNING OF EACH USER SUPPLIED ENTRY. THE BACK ARROW SYMBOL (←) INDICATES THE USE OF THE CHARACTER DELETE KEY.
- SUBSEQUENT PAGES - COPY OF OUTPUT RECEIVED AT REMOTE HIGH SPEED PRINTER.

APPENDIX C

```
  READY
▷exec 'hk1010.clist(smarte)' 'pref(hk1010) lu10($db.number99) -
  lu11($db.number11)'

  SMARTE PROGRAM CLIST VERSION 060578Q
    START TIME:  13:49:38 06/06/78
    DATA SET PREFIX = HK1010
    LU04 = TERMINAL
    LU10 = HK1010.$DB.NUMBER99
    LU11 = HK1010.$DB.NUMBER11
    SMARTE FILES ALLOCATED; EXECUTION PROCEEDING.
    ENTER ACCESS PASSWORD
▷password=manx

  PROGRAM SMARTE VERSION   053178Q
  EMP DATA MANAGEMENT AND ANALYSIS PROGRAM



  -ENTER DATA BASE SPECIFICATION (DB=IIIII,SIZE=IIIIII,LU=II)-
▷db=00099,size=009000,lu=10
   PRIMARY DATA BASE SPECIFICATION:  DB=   99,SIZE=  9000,LU=10
   ELT:     0.0       0.002

  -ENTER DIRECTIVE-
▷*display

  *DISPLAY

          S M A R T E   D A T A   B A S E   C O N T E N T S
  ********************************************************************************
  DATA BASE NUMBER    99                                  06/06/78   13.51.20

  SIZE OF MASTER INDEX (WORDS)-----  9000
  NEXT AVAILABLE RECORD ID---------    94
  RECORD ID OF LAST VOIDED RECORD--    38      NOTE - A PRU IS A PHYSICAL
  CAPACITY OF SUBINDEXES (RECORDS)-     0             RECORD UNIT EQUAL
  NUMBER OF INDEXES----------------     1             TO 128 WORDS.
  CAPACITY OF DATA BASE (PRU'S)----  9000
  STORAGE ALLOCATED (PRU'S)--------    92
  PERCENTAGE OF DATA BASE USED-----  1.02
  LARGEST EXISTING HOLE (PRU'S)----     7
  NO. OF GOOD RECORDS IN DATA BASE-    11
  TOTAL NO. OF DATA BASE RECORDS---    13



  +DISPLAY COMPLETED
   ELT:     0.052     0.056

  -ENTER DIRECTIVE-
▷*get

  *GET
```

```
 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26 OR BLANK TO END GET-
▷                      000016
  (                         16)

 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26 OR BLANK TO END GET-
▷
 +GET COMPLETED
  ELT:      0.537      0.595

 -ENTER DIRECTIVE-
▷*output

 *OUTPUT

 -ENTER OUTPUT TYPE (TYPEII)-
▷type08
  (TYPE 8)

 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END OUTPUT-
▷ff
  (FF)

                                                PAGE -  1  06/06/78   13.54.16

 RECORD NAME, REEL NUMBER, RECORD ID, 2ND LINE-RECORD LABEL
 ----------------------------------------------------------
 J MFKAK1 HY 0000 SB HP (31 )    1600000227        16


 +OUTPUT DIRECTIVE PACKET COMPLETED.
  ELT:      0.046      0.644

 -ENTER DIRECTIVE-
▷*define

 *DEFINE

 -ENTER DATA BASE SPECIFICATION (DB=IIIII,SIZE=IIIIII,LU=II)-
▷db=00011,size=033000,lu=11
  (DB=    11,SIZE= 33000,LU=11)
 +DEFINE COMPLETED
  ELT:      0.014      0.661

 -ENTER DIRECTIVE-
```

APPENDIX C

```
▷*display

 *DISPLAY

         S M A R T E   D A T A   B A S E   C O N T E N T S
 ********************************************************************************
 DATA BASE NUMBER    11                                    06/06/78   13.56.59

 SIZE OF MASTER INDEX (WORDS)----- 33000
 NEXT AVAILABLE RECORD ID--------- 17451
 RECORD ID OF LAST VOIDED RECORD-- 12107      NOTE - A PRU IS A PHYSICAL
 CAPACITY OF SUBINDEXES (RECORDS)-     0             RECORD UNIT EQUAL
 NUMBER OF INDEXES---------------      1             TO 128 WORDS.
 CAPACITY OF DATA BASE (PRU'S)---- 33000
 STORAGE ALLOCATED (PRU'S)-------- 17449
 PERCENTAGE OF DATA BASE USED----- 52.88
 LARGEST EXISTING HOLE (PRU'S)----     8
 NO. OF GOOD RECORDS IN DATA BASE-  2261
 TOTAL NO. OF DATA BASE RECORDS---  2271


 +DISPLAY COMPLETED
  ELT:     0.056     0.720

 -ENTER DIRECTIVE-
▷*saarch
 INVALID SMARTE DIRECTIVE.  TRY *HELP

 -ENTER DIRECTIVE-
▷*se

 *SEARCH

 -ENTER 1ST SUPPLEMENTARY ENTRY-
▷092.le.1600000025.and.092.ge.1600000021

  (092.LE.1600000025.AND.092.GE.1600000021)

 -ENTER NEXT SUPPLEMENTARY ENTRY-
▷

 +SEARCH COMPLETED.          6  RECORDS IN FIND FILE.
  ELT:     4.376     5.098

 -ENTER DIRECTIVE-
```

```
▷*output

 *OUTPUT

 -ENTER OUTPUT TYPE (TYPEII)-
▷type08
  (TYPE 8)

 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END OUTPUT-
▷ff
  (FF)

                                                PAGE -  1  06/06/78   14.00.47

 RECORD NAME, REEL NUMBER, RECORD ID, 2ND LINE-RECORD LABEL
 ----------------------------------------------------------
 J MFKAK1 HY 0000 SB HP (31 )        0000227        16

 J MMLIL0 EZ 0000 R5 BP (301)     1600000021        44
   EZ FIELD         BAC PT-2 10,-23,.75
 J MMLIL0 EZ 0000 R5 BP (302)     1600000022        52
   EZ FIELD         BAC PT-2 10,-23,.75
 J MMLIL0 EZ 0000 R5 BP (303)     1600000023        59
   EZ FIELD         BAC PT-2 10,-23,.75
 J MMLIL0 EZ 0000 R5 BP (304)     1600000024        67
   EZ FIELD         BAC PT-2 10,-23,.75
 J MMLIL0 EZ 0000 R5 BP (305)     1600000025        75
   EZ FIELD         BAC PT-2 10,-23,.75


 +OUTPUT DIRECTIVE PACKET COMPLETED.
  ELT:     0.130     5.237

 -ENTER DIRECTIVE-
▷*sort

 *SORT
 -ENTER ITEM NO. ON WHICH TO SORT IN COLS 1-3 RIGHT JUSTIFIED-
▷092
  ( 92)

 +SORT COMPLETED
  ELT:     0.103     5.343

 -ENTER DIRECTIVE-
▷*ou

 *OUTPUT

 -ENTER OUTPUT TYPE (TYPEII)-
```

APPENDIX C

```
▷type08
   (TYPE 8)

  -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END OUTPUT-
▷ff
   (FF)


                                                PAGE -  1  06/06/78   14.03.13

  RECORD NAME, REEL NUMBER, RECORD ID, 2ND LINE-RECORD LABEL
  ----------------------------------------------------------
  J MMLIL0 EZ 0000 R5 BP (301)     1600000021         44
    EZ FIELD         BAC PT-2 10,-23,.75
  J MMLIL0 EZ 0000 R5 BP (302)     1600000022         52
    EZ FIELD         BAC PT-2 10,-23,.75
  J MMLIL0 EZ 0000 R5 BP (303)     1600000023         59
    EZ FIELD         BAC PT-2 10,-23,.75
  J MMLIL0 EZ 0000 R5 BP (304)     1600000024         67
    EZ FIELD         BAC PT-2 10,-23,.75
  J MMLIL0 EZ 0000 R5 BP (305)     1600000025         75
    EZ FIELD         BAC PT-2 10,-23,.75
  J MFKAK1 HY 0000 SB HP (31 )     1600000227         16


  +OUTPUT DIRECTIVE PACKET COMPLETED.
   ELT:     0.121     5.466

  -ENTER DIRECTIVE-
▷*output

  *OUTPUT

  -ENTER OUTPUT TYPE (TYPEII)-
▷type06
   (TYPE 6)

  -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END OUTPUT-
▷ff
   (FF)
```

PAGE - 1 06/06/78 14.07.45

RECORD NAME	THRESHOLD RATIOS				VERSN
J MMLIL0 EZ 0000 R5 BP (301)	0.0	,0.0	,0.0	,0.0	,0.0	0
J MMLIL0 EZ 0000 R5 BP (302)	0.0	,0.0	,0.0	,0.0	,0.0	0
J MMLIL0 EZ 0000 R5 BP (303)	0.0	,0.0	,0.0	,0.0	,0.0	0
J MMLIL0 EZ 0000 R5 BP (304)	0.0	,0.0	,0.0	,0.0	,0.0	0
J MMLIL0 EZ 0000 R5 BP (305)	0.0	,0.0	,0.0	,0.0	,0.0	0
J MFKAK1 HY 0000 SB HP (31)	0.0	,0.0	,0.0	,0.0	,0.0	0

+OUTPUT DIRECTIVE PACKET COMPLETED.
ELT: 0.122 5.716

-ENTER DIRECTIVE-
▷*output

*OUTPUT

-ENTER OUTPUT TYPE (TYPEII)-
▷type07
(TYPE 7)

-ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END OUTPUT-
▷ff
(FF)

PAGE - 1 06/06/78 14.09.59

RECORD NAME	PEAK	PEAKTIME	DECAYTIME	INTENSITY	TIMETO10
J MMLIL0 EZ 0000 R5 BP (301)	0.372E+03	0.346E-07	-.100E+01	0.0	0.419E+03
J MMLIL0 EZ 0000 R5 BP (302)	0.419E+03	0.672E-07	-.100E+01	0.0	0.0
J MMLIL0 EZ 0000 R5 BP (303)	0.382E+03	0.689E-07	-.100E+01	0.0	0.0
J MMLIL0 EZ 0000 R5 BP (304)	0.351E+03	0.146E-06	0.139E-05	0.0	0.0
J MMLIL0 EZ 0000 R5 BP (305)	0.386E+03	0.517E-06	0.402E-05	0.0	0.0
J MFKAK1 HY 0000 SB HP (31)	0.338E+02	0.176E-06	0.968E-06	0.0	0.0

+OUTPUT DIRECTIVE PACKET COMPLETED.
ELT: 0.126 5.845

-ENTER DIRECTIVE-
▷*output

*OUTPUT

-ENTER OUTPUT TYPE (TYPEII)-
▷type09
(TYPE 9)

APPENDIX C

```
 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END OUTPUT-
▷ff
   (FF)

                                                    PAGE -  1  06/06/78   14.11.51

 ------------------------------------------------------------------------------
 J MMLIL0 EZ 0000 R5 BP (301)    0.0            0.0            0.0
                                 0.0            0.0                           0
 J MMLIL0 EZ 0000 R5 BP (302)    0.0            0.0            0.0
                                 0.0            0.0                           0
 J MMLIL0 EZ 0000 R5 BP (303)    0.0            0.0            0.0
                                 0.0            0.0                           0
 J MMLIL0 EZ 0000 R5 BP (304)    0.0            0.0            0.0
                                 0.0            0.0                           0
 J MMLIL0 EZ 0000 R5 BP (305)    0.0            0.0            0.0
                                 0.0            0.0                           0
 J MFKAK1 HY 0000 SB HP (31 )    0.0            0.0            0.0
                                 0.0            0.0                           0


  +OUTPUT DIRECTIVE PACKET COMPLETED.
   ELT:     0.124     5.970

  -ENTER DIRECTIVE-
▷*clear

  *CLEAR

  +CLEAR COMPLETED
   ELT:     0.006     5.980

  -ENTER DIRECTIVE-
▷*output

  *OUTPUT

  -ENTER OUTPUT TYPE (TYPEII)-
▷type08
   (TYPE 8)

  -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END OUTPUT-
▷ff
   (FF)
   NO OUTPUT GENERATED BECAUSE FIND FILE IS EMPTY.


  +OUTPUT DIRECTIVE PACKET COMPLETED.
   ELT:     0.024     6.006

  -ENTER DIRECTIVE-
▷*get

  *GET

  -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26 OR BLANK TO END GET-
▷                          2
```

```
 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26 OR BLANK TO END GET-
▷
 +GET COMPLETED
  ELT:     0.039     6.048

 -ENTER DIRECTIVE-
▷*output

 *OUTPUT

 -ENTER OUTPUT TYPE (TYPEII)-
▷typel0
  (TYPEl0)

 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END OUTPUT-
▷ff
  (FF)

                                                        (14.16.43 06/06/78)

 RECORD NAME - J MMKFL0 HY 0000 R5 BP (301)          RECORD ID =      2
 RECORD LABEL ------- HY FIELD        BAC PT-3 0,-50,.75

 HEADER INFOR..COMMT-         Bl 0 DRIVER-R    SHOT NO-1114 DR LOC-
 DR LEVEL/CONFIG -   0.4200E+04/     DATE-6254 TIME-   0 MEASURE TYPE-HY
 PROBE-        HEX NOS-H1P03YRA              IU-MAP2  SCALE =   0.4130E-01
 H/V SETS (    10,    20)(     0,     0)(     0,     0) CODE-  1 PTS-379

 ABCISSA INDICATOR--  0 SCALE -   0.1000E-07 SHIFT VALUE -  0.0
 ORDINATE INDICATOR-  1 SCALE -   0.8260E+00 SHIFT VALUE -  0.0
 ROTATION VALUE -   0.0        SOURCE INDICATOR- 1 HISTORY INDICATOR-  0
 NORMALIZATION INDICATOR-  0 FACTOR -   0.0        INTERPL INDICATOR-  0
 REEL NO.1600000011  ID REFS. 160000001,         0,         0,         0
 THRESHOLD VALUES (1ST LINE) AND THRESHOLD RATIOS (2ND LINE)
      1          2          3          4          5        VERSION
  0.0        0.0        0.0        0.0        0.0              0
  0.0        0.0        0.0        0.0        0.0

 BLKS= 7    PEAK ORDINATE VALUE-  0.4517E+01 ABSCISSA VALUE-  0.3006E-07

 DATA CHARACTERISTICS                1 =  -0.1000E+01  2 =   0.0
  3 =   0.4517E+01  4 =   0.2894E-05  5 =   0.7747E-06  6 =   0.7747E-06
  7 =   0.1355E+03  8 =   0.2605E-02  9 =   0.0          379 DATA POINTS


 +OUTPUT DIRECTIVE PACKET COMPLETED.
  ELT:     0.059     6.110

 -ENTER DIRECTIVE-
```

APPENDIX C

```
▷*print

 *PRINT
 +TABULAR AND PLOT OUTPUT FOR COMBINE,DISPLAY,EXAMINE,
  FOURIER,HISTOGRAM,LIST,OUTPUT,REPORT NOW ASSIGNED TO
  SECONDARY DEVICE ON LU 21.
  ELT:     0.010     6.123

 -ENTER DIRECTIVE-
▷*output

 *OUTPUT

 -ENTER OUTPUT TYPE (TYPEII)-
▷type03
  (TYPE 3)

 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END OUTPUT-
▷ff
  (FF)

 +OUTPUT DIRECTIVE PACKET COMPLETED.
  ELT:     0.347     6.473

 -ENTER D_RECTIVE-
▷*output

 *OUTPUT

 -ENTER OUTPUT TYPE (TYPEII)-
▷type08
  (TYPE 8)

 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END OUTPUT-
▷ff
  (FF)

 +OUTPUT DIRECTIVE PACKET COMPLETED.
  ELT:     0.041     6.516

 -ENTER DIRECTIVE-
▷*output

 *OUTPUT

 -ENTER OUTPUT TYPE (TYPEII)-
▷type10
  (TYPE10)

 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END OUTPUT-
▷ff
  (FF)

 +OUTPUT DIRECTIVE PACKET COMPLETED.
  ELT:     0.052     6.571

 -ENTER DIRECTIVE-
```

```
▷*output

 *OUTPUT

 -ENTER OUTPUT TYPE (TYPEII)-
▷typell
  (TYPEll)

 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END OUTPUT-
▷ff
  (FF)

 +OUTPUT DIRECTIVE PACKET COMPLETED.
  ELT:     0.048     6.621

 -ENTER DIRECTIVE-
▷*out

 *OUTPUT

 -ENTER OUTPUT TYPE (TYPEII)-
▷typel0
  (TYPEl0)

 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END OUTPUT-
▷                      000009
  (                         9)

 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END OUTPUT-
▷                         17
  (                        17)

 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END OUTPUT-
▷

 +OUTPUT DIRECTIVE PACKET COMPLETED.
  ELT:     0.094     6.717

 -ENTER DIRECTIVE-
▷*end


 ...NORMAL TERMINATION
    DIRECTIVE DECK EXHAUSTED


    THE FOLLOWING DATA BASE FILES WERE SPECIFIED FOR THIS JOB:

      ON LU 10  DATA BASE NO.    99
      ON LU 11  DATA BASE NO.    11
 IHO002I STOP   7777
  STOP TIME:  14:25:45 06/06/78
 READY
```

APPENDIX C (14.21.23 06/06/78)

```
RECORD NAME - J MMKFL0 HY 0000 R5 BP (301)          RECORD ID =      2
RECORD LABEL ------- HY FIELD        BAC PT-3 0,-50,.75

HEADER INFOR..COMMT-        B1 0 DRIVER-R    SHOT NO-1114 DR LOC-
DR LEVEL/CONFIG -   0.4200E+04/     DATE-6254 TIME-   0 MEASURE TYPE-HY
PROBE-       HEX NOS-H1P03YRA              IU-MAP2  SCALE =   0.4130E-01
H/V SETS (    10,    20)(     0,     0)(     0,     0) CODE-  1 PTS-379

ABCISSA INDICATOR--  0 SCALE -   0.1000E-07 SHIFT VALUE -  0.0
ORDINATE INDICATOR-  1 SCALE -   0.8260E+00 SHIFT VALUE -  0.0
ROTATION VALUE -   0.0        SOURCE INDICATOR- 1 HISTORY INDICATOR-  0
NORMALIZATION INDICATOR-  0 FACTOR -   0.0        INTERPL INDICATOR-  0
REEL NO.1600000011  ID REFS. 160000001,         0,         0,         0
THRESHOLD VALUES (1ST LINE) AND THRESHOLD RATIOS (2ND LINE)
     1          2          3          4          5        VERSION
 0.0        0.0        0.0        0.0        0.0              0
 0.0        0.0        0.0        0.0        0.0

BLKS= 7    PEAK ORDINATE VALUE-  0.4517E+01 ABSCISSA VALUE-  0.3006E-07

DATA CHARACTERISTICS                1 =  -0.1000E+01  2 =   0.0
 3 =   0.4517E+01  4 =   0.2894E-05  5 =   0.7747E-06  6 =   0.7747E-06
 7 =   0.1355E+03  8 =   0.2605E-02  9 =   0.0          379 DATA POINTS
```

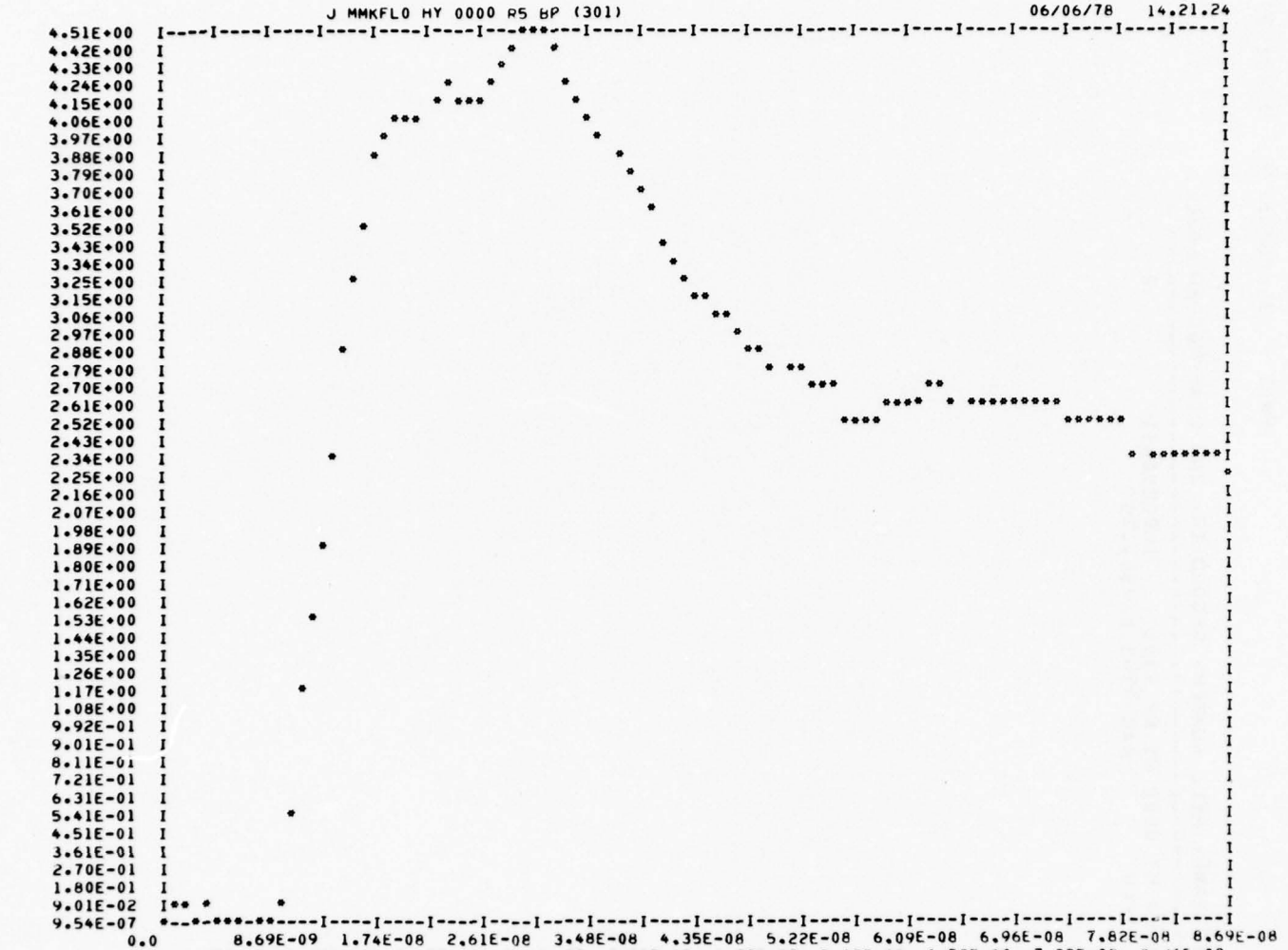
RECORD NAME J MMKFLO HY 0000 R5 BP (301) PAGE 1

1	0.0	0.0	51	0.1156E-07	0.1241E+01
2	0.2312E-09	0.9549E-02	52	0.1179E-07	0.1394E+01
3	0.4624E-09	0.1910E-01	53	0.1202E-07	0.1528E+01
4	0.6936E-09	0.9549E-02	54	0.1225E-07	0.1604E+01
5	0.9249E-09	0.5729E-01	55	0.1249E-07	0.1642E+01
6	0.1156E-08	0.6684E-01	56	0.1272E-07	0.1805E+01
7	0.1387E-08	0.7639E-01	57	0.1295E-07	0.1938E+01
8	0.1618E-08	0.6684E-01	58	0.1318E-07	0.2015E+01
9	0.1850E-08	0.5729E-01	59	0.1341E-07	0.2024E+01
10	0.2081E-08	0.4775E-01	60	0.1364E-07	0.2263E+01
11	0.2312E-08	0.3820E-01	61	0.1387E-07	0.2387E+01
12	0.2543E-08	0.9549E-02	62	0.1410E-07	0.2464E+01
13	0.2775E-08	0.3820E-01	63	0.1434E-07	0.2531E+01
14	0.3006E-08	0.3820E-01	64	0.1457E-07	0.2693E+01
15	0.3237E-08	0.3820E-01	65	0.1480E-07	0.2855E+01
16	0.3468E-08	0.4775E-01	66	0.1503E-07	0.2941E+01
17	0.3699E-08	0.4775E-01	67	0.1526E-07	0.2960E+01
18	0.3931E-08	0.4775E-01	68	0.1549E-07	0.3132E+01
19	0.4162E-08	0.3820E-01	69	0.1572E-07	0.3237E+01
20	0.4393E-08	0.3820E-01	70	0.1595E-07	0.3294E+01
21	0.4624E-08	0.3820E-01	71	0.1618E-07	0.3314E+01
22	0.4855E-08	0.3820E-01	72	0.1642E-07	0.3409E+01
23	0.5087E-08	0.3820E-01	73	0.1665E-07	0.3505E+01
24	0.5318E-08	0.3820E-01	74	0.1688E-07	0.3610E+01
25	0.5549E-08	0.3820E-01	75	0.1711E-07	0.3734E+01
26	0.5780E-08	0.9549E-02	76	0.1734E-07	0.3781E+01
27	0.6012E-08	0.9549E-02	77	0.1757E-07	0.3867E+01
28	0.6243E-08	0.1910E-01	78	0.1780E-07	0.3944E+01
29	0.6474E-08	0.1910E-01	79	0.1803E-07	0.4001E+01
30	0.6705E-08	0.1910E-01	80	0.1827E-07	0.4001E+01
31	0.6936E-08	0.1910E-01	81	0.1850E-07	0.4001E+01
32	0.7168E-08	0.1910E-01	82	0.1873E-07	0.4011E+01
33	0.7399E-08	0.1910E-01	83	0.1896E-07	0.4011E+01
34	0.7630E-08	0.1910E-01	84	0.1919E-07	0.4011E+01
35	0.7861E-08	0.1910E-01	85	0.1942E-07	0.4020E+01
36	0.8092E-08	0.1910E-01	86	0.1965E-07	0.4020E+01
37	0.8324E-08	0.1910E-01	87	0.1988E-07	0.4020E+01
38	0.8555E-08	0.1910E-01	88	0.2012E-07	0.4030E+01
39	0.8786E-08	0.1910E-01	89	0.2035E-07	0.4030E+01
40	0.9017E-08	0.1910E-01	90	0.2058E-07	0.4039E+01
41	0.9249E-08	0.4775E-01	91	0.2081E-07	0.4039E+01
42	0.9480E-08	0.7639E-01	92	0.2104E-07	0.4058E+01
43	0.9711E-08	0.2960E+00	93	0.2127E-07	0.4077E+01
44	0.9942E-08	0.3342E+00	94	0.2150E-07	0.4077E+01
45	0.1017E-07	0.5348E+00	95	0.2173E-07	0.4087E+01
46	0.1040E-07	0.7448E+00	96	0.2197E-07	0.4097E+01
47	0.1064E-07	0.9167E+00	97	0.2220E-07	0.4106E+01
48	0.1087E-07	0.1070E+01	98	0.2243E-07	0.4163E+01
49	0.1110E-07	0.1165E+01	99	0.2266E-07	0.4173E+01
50	0.1133E-07	0.1222E+01	100	0.2289E-07	0.4183E+01

101	0.2312E-07	0.4202E+01	151	0.3468E-07	0.4097E+01
102	0.2335E-07	0.4211E+01	152	0.3491E-07	0.4077E+01
103	0.2358E-07	0.4202E+01	153	0.3514E-07	0.4058E+01
104	0.2382E-07	0.4192E+01	154	0.3538E-07	0.4030E+01
105	0.2405E-07	0.4183E+01	155	0.3561E-07	0.4020E+01
106	0.2428E-07	0.4183E+01	156	0.3584E-07	0.3982E+01
107	0.2451E-07	0.4163E+01	157	0.3607E-07	0.3953E+01
108	0.2474E-07	0.4163E+01	158	0.3630E-07	0.3934E+01
109	0.2497E-07	0.4163E+01	159	0.3653E-07	0.3925E+01
110	0.2520E-07	0.4163E+01	160	0.3676E-07	0.3915E+01
111	0.2543E-07	0.4163E+01	161	0.3699E-07	0.3896E+01
112	0.2566E-07	0.4173E+01	162	0.3723E-07	0.3867E+01
113	0.2590E-07	0.4173E+01	163	0.3746E-07	0.3839E+01
114	0.2613E-07	0.4183E+01	164	0.3769E-07	0.3810E+01
115	0.2636E-07	0.4192E+01	165	0.3792E-07	0.3791E+01
116	0.2659E-07	0.4192E+01	166	0.3815E-07	0.3772E+01
117	0.2682E-07	0.4202E+01	167	0.3838E-07	0.3734E+01
118	0.2705E-07	0.4230E+01	168	0.3861E-07	0.3715E+01
119	0.2728E-07	0.4297E+01	169	0.3884E-07	0.3686E+01
120	0.2751E-07	0.4345E+01	170	0.3908E-07	0.3667E+01
121	0.2775E-07	0.4364E+01	171	0.3931E-07	0.3610E+01
122	0.2798E-07	0.4374E+01	172	0.3954E-07	0.3600E+01
123	0.2821E-07	0.4374E+01	173	0.3977E-07	0.3581E+01
124	0.2844E-07	0.4412E+01	174	0.4000E-07	0.3543E+01
125	0.2867E-07	0.4440E+01	175	0.4023E-07	0.3457E+01
126	0.2890E-07	0.4459E+01	176	0.4046E-07	0.3419E+01
127	0.2913E-07	0.4469E+01	177	0.4069E-07	0.3390E+01
128	0.2936E-07	0.4488E+01	178	0.4092E-07	0.3399E+01
129	0.2960E-07	0.4507E+01	179	0.4116E-07	0.3361E+01
130	0.2983E-07	0.4507E+01	180	0.4139E-07	0.3314E+01
131	0.3006E-07	0.4517E+01	181	0.4162E-07	0.3304E+01
132	0.3029E-07	0.4517E+01	182	0.4185E-07	0.3304E+01
133	0.3052E-07	0.4507E+01	183	0.4208E-07	0.3285E+01
134	0.3075E-07	0.4507E+01	184	0.4231E-07	0.3247E+01
135	0.3098E-07	0.4498E+01	185	0.4254E-07	0.3228E+01
136	0.3121E-07	0.4488E+01	186	0.4277E-07	0.3218E+01
137	0.3145E-07	0.4479E+01	187	0.4301E-07	0.3218E+01
138	0.3168E-07	0.4469E+01	188	0.4324E-07	0.3180E+01
139	0.3191E-07	0.4440E+01	189	0.4347E-07	0.3161E+01
140	0.3214E-07	0.4421E+01	190	0.4370E-07	0.3151E+01
141	0.3237E-07	0.4383E+01	191	0.4393E-07	0.3151E+01
142	0.3260E-07	0.4354E+01	192	0.4416E-07	0.3142E+01
143	0.3283E-07	0.4297E+01	193	0.4439E-07	0.3132E+01
144	0.3306E-07	0.4288E+01	194	0.4462E-07	0.3132E+01
145	0.3329E-07	0.4268E+01	195	0.4486E-07	0.3132E+01
146	0.3353E-07	0.4259E+01	196	0.4509E-07	0.3113E+01
147	0.3376E-07	0.4249E+01	197	0.4532E-07	0.3084E+01
148	0.3399E-07	0.4211E+01	198	0.4555E-07	0.3075E+01
149	0.3422E-07	0.4173E+01	199	0.4578E-07	0.3056E+01
150	0.3445E-07	0.4154E+01	200	0.4601E-07	0.3037E+01

201	0.4624E-07	0.3027E+01	251	0.5780E-07	0.2492E+01
202	0.4647E-07	0.3018E+01	252	0.5803E-07	0.2502E+01
203	0.4671E-07	0.2998E+01	253	0.5827E-07	0.2521E+01
204	0.4694E-07	0.2989E+01	254	0.5850E-07	0.2531E+01
205	0.4717E-07	0.2979E+01	255	0.5873E-07	0.2540E+01
206	0.4740E-07	0.2970E+01	256	0.5896E-07	0.2550E+01
207	0.4763E-07	0.2951E+01	257	0.5919E-07	0.2569E+01
208	0.4786E-07	0.2932E+01	258	0.5942E-07	0.2588E+01
209	0.4809E-07	0.2912E+01	259	0.5965E-07	0.2588E+01
210	0.4832E-07	0.2893E+01	260	0.5988E-07	0.2607E+01
211	0.4855E-07	0.2893E+01	261	0.6012E-07	0.2616E+01
212	0.4879E-07	0.2865E+01	262	0.6035E-07	0.2616E+01
213	0.4902E-07	0.2865E+01	263	0.6058E-07	0.2607E+01
214	0.4925E-07	0.2855E+01	264	0.6081E-07	0.2636E+01
215	0.4948E-07	0.2855E+01	265	0.6104E-07	0.2645E+01
216	0.4971E-07	0.2836E+01	266	0.6127E-07	0.2655E+01
217	0.4994E-07	0.2836E+01	267	0.6150E-07	0.2655E+01
218	0.5017E-07	0.2827E+01	268	0.6173E-07	0.2655E+01
219	0.5040E-07	0.2827E+01	269	0.6197E-07	0.2655E+01
220	0.5064E-07	0.2779E+01	270	0.6220E-07	0.2655E+01
221	0.5087E-07	0.2779E+01	271	0.6243E-07	0.2655E+01
222	0.5110E-07	0.2779E+01	272	0.6266E-07	0.2664E+01
223	0.5133E-07	0.2760E+01	273	0.6289E-07	0.2664E+01
224	0.5156E-07	0.2750E+01	274	0.6312E-07	0.2664E+01
225	0.5179E-07	0.2750E+01	275	0.6335E-07	0.2674E+01
226	0.5202E-07	0.2741E+01	276	0.6358E-07	0.2674E+01
227	0.5225E-07	0.2741E+01	277	0.6382E-07	0.2674E+01
228	0.5249E-07	0.2731E+01	278	0.6405E-07	0.2674E+01
229	0.5272E-07	0.2722E+01	279	0.6428E-07	0.2664E+01
230	0.5295E-07	0.2722E+01	280	0.6451E-07	0.2664E+01
231	0.5318E-07	0.2712E+01	281	0.6474E-07	0.2655E+01
232	0.5341E-07	0.2702E+01	282	0.6497E-07	0.2655E+01
233	0.5364E-07	0.2702E+01	283	0.6520E-07	0.2655E+01
234	0.5387E-07	0.2702E+01	284	0.6543E-07	0.2645E+01
235	0.5410E-07	0.2693E+01	285	0.6566E-07	0.2645E+01
236	0.5434E-07	0.2693E+01	286	0.6590E-07	0.2645E+01
237	0.5457E-07	0.2674E+01	287	0.6613E-07	0.2645E+01
238	0.5480E-07	0.2616E+01	288	0.6636E-07	0.2645E+01
239	0.5503E-07	0.2559E+01	289	0.6659E-07	0.2645E+01
240	0.5526E-07	0.2550E+01	290	0.6682E-07	0.2655E+01
241	0.5549E-07	0.2540E+01	291	0.6705E-07	0.2655E+01
242	0.5572E-07	0.2540E+01	292	0.6728E-07	0.2655E+01
243	0.5595E-07	0.2531E+01	293	0.6751E-07	0.2655E+01
244	0.5618E-07	0.2531E+01	294	0.6775E-07	0.2645E+01
245	0.5642E-07	0.2521E+01	295	0.6798E-07	0.2655E+01
246	0.5665E-07	0.2511E+01	296	0.6821E-07	0.2655E+01
247	0.5688E-07	0.2502E+01	297	0.6844E-07	0.2655E+01
248	0.5711E-07	0.2492E+01	298	0.6867E-07	0.2655E+01
249	0.5734E-07	0.2492E+01	299	0.6890E-07	0.2655E+01
250	0.5757E-07	0.2492E+01	300	0.6913E-07	0.2655E+01

301	0.6936E-07	0.2655E+01	351	0.8092E-07	0.2378E+01
302	0.6960E-07	0.2645E+01	352	0.8116E-07	0.2378E+01
303	0.6983E-07	0.2636E+01	353	0.8139E-07	0.2378E+01
304	0.7006E-07	0.2626E+01	354	0.8162E-07	0.2378E+01
305	0.7029E-07	0.2616E+01	355	0.8185E-07	0.2378E+01
306	0.7052E-07	0.2616E+01	356	0.8208E-07	0.2378E+01
307	0.7075E-07	0.2616E+01	357	0.8231E-07	0.2378E+01
308	0.7098E-07	0.2616E+01	358	0.8254E-07	0.2378E+01
309	0.7121E-07	0.2607E+01	359	0.8277E-07	0.2368E+01
310	0.7145E-07	0.2607E+01	360	0.8301E-07	0.2368E+01
311	0.7168E-07	0.2597E+01	361	0.8324E-07	0.2368E+01
312	0.7191E-07	0.2597E+01	362	0.8347E-07	0.2368E+01
313	0.7214E-07	0.2588E+01	363	0.8370E-07	0.2368E+01
314	0.7237E-07	0.2588E+01	364	0.8393E-07	0.2368E+01
315	0.7260E-07	0.2588E+01	365	0.8416E-07	0.2368E+01
316	0.7283E-07	0.2588E+01	366	0.8439E-07	0.2359E+01
317	0.7306E-07	0.2578E+01	367	0.8462E-07	0.2359E+01
318	0.7329E-07	0.2578E+01	368	0.8486E-07	0.2359E+01
319	0.7353E-07	0.2569E+01	369	0.8509E-07	0.2359E+01
320	0.7376E-07	0.2559E+01	370	0.8532E-07	0.2349E+01
321	0.7399E-07	0.2559E+01	371	0.8555E-07	0.2349E+01
322	0.7422E-07	0.2559E+01	372	0.8578E-07	0.2349E+01
323	0.7445E-07	0.2559E+01	373	0.8601E-07	0.2340E+01
324	0.7468E-07	0.2550E+01	374	0.8624E-07	0.2320E+01
325	0.7491E-07	0.2540E+01	375	0.8647E-07	0.2292E+01
326	0.7514E-07	0.2540E+01	376	0.8671E-07	0.2273E+01
327	0.7538E-07	0.2540E+01	377	0.8694E-07	0.2263E+01
328	0.7561E-07	0.2540E+01	378	0.8717E-07	0.2254E+01
329	0.7584E-07	0.2540E+01	379	0.8740E-07	0.2254E+01
330	0.7607E-07	0.2540E+01			
331	0.7630E-07	0.2540E+01			
332	0.7653E-07	0.2540E+01			
333	0.7676E-07	0.2540E+01			
334	0.7699E-07	0.2540E+01			
335	0.7723E-07	0.2531E+01			
336	0.7746E-07	0.2521E+01			
337	0.7769E-07	0.2521E+01			
338	0.7792E-07	0.2511E+01			
339	0.7815E-07	0.2502E+01			
340	0.7838E-07	0.2492E+01			
341	0.7861E-07	0.2492E+01			
342	0.7884E-07	0.2502E+01			
343	0.7908E-07	0.2502E+01			
344	0.7931E-07	0.2511E+01			
345	0.7954E-07	0.2387E+01			
346	0.7977E-07	0.2387E+01			
347	0.8000E-07	0.2387E+01			
348	0.8023E-07	0.2387E+01			
349	0.8046E-07	0.2387E+01			
350	0.8069E-07	0.2387E+01			



ID = 2 REEL NUMBER = 1600000011 379 DATA POINTS MAX VALUE = 0.4517E+01
HY FIELD BAC PT-3 0,-50,.75

APPENDIX C


```
RECORD NAME, REEL NUMBER, RECORD ID, 2ND LINE-RECORD LABEL
-----------------------------------------------------------
J MMKFLO HY 0000 R5 BP (301)     1600000011          2
  HY FIELD          BAC PT-3 0,-50,.75
```

(14.22.42 06/06/78)

```
RECORD NAME - J MMKFL0 HY 0000 R5 BP (301)          RECORD ID =      2
RECORD LABEL ------- HY FIELD        BAC PT-3 0,-50,,75

HEADER INFOR..COMMT-         B1 0 DRIVER-R    SHOT NO-1114 DR LOC-
DR LEVEL/CONFIG -   0.4200E+04/     DATE-6254 TIME-   0 MEASURE TYPE-HY
PROBE-        HEX NOS-H1P03YRA              IU-MAP2  SCALE =   0.4130E-01
H/V SETS (    10,    20)(     0,     0)(     0,     0) CODE-  1 PTS-379

ABCISSA INDICATOR--  0 SCALE -   0.1000E-07 SHIFT VALUE -  0.0
ORDINATE INDICATOR-  1 SCALE -   0.8260E+00 SHIFT VALUE -  0.0
ROTATION VALUE -   0.0         SOURCE INDICATOR- 1 HISTORY INDICATOR-  0
NORMALIZATION INDICATOR-  0 FACTOR -   0.0         INTERPL INDICATOR-  0
REEL NO.1600000011  ID REFS. 160000001,         0,         0,         0
THRESHOLD VALUES (1ST LINE) AND THRESHOLD RATIOS (2ND LINE)
     1          2          3          4          5        VERSION
 0.0        0.0        0.0        0.0        0.0              0
 0.0        0.0        0.0        0.0        0.0

BLKS= 7    PEAK ORDINATE VALUE-  0.4517E+01 ABSCISSA VALUE-  0.3006E-07

DATA CHARACTERISTICS                  1 =  -0.1000E+01  2 =   0.0
 3 =   0.4517E+01  4 =   0.2894E-05  5 =   0.7747E-06  6 =   0.7747E-06
 7 =   0.1355E+03  8 =   0.2605E-02  9 =   0.0          379 DATA POINTS
```

```
NAME(1-20): J MMKF&0 HY 0030 R5 BP (301)  ID(21):  11000002  LABEL(101-125): HY FIELD        BAC PT-3 0,-50.75
REEL(92): 1600000011  COMMT(22-27):          81 0  DVR(28): R   SHOT(29): 1114  DVR LOC(30-32):          DVR LEV(33): 0.4200E+04
DVR CONF(34,35):        DATE(36): 6254  TIME(37):     0  TY(38): HY  PB(39-41):          MISC(42-51): H1P03YRA                  BL(80):  7
IU(52,53): MAP2  SCALE(54): 0.4130E-01  H/V SETS(55-60): (     10,     20)(      0,      0)(      0,      0)  CODE(61):  1  PTS1(62): 379
ABSCISSA-IND(63): 0  SCALE(64): 0.1000E-07  SHFT(65): 0.0          ORDINATE-IND(66): 1  SCALE(67): 0.8260E+00  SHFT(68): 0.0
ROTATION(69): 0.0          PTS2(70): 379  SRC(71): 1  HIST(72): 0  NORMAL-IND(73): 0  VAL(74): 0.0          PEAK(93): 0.4517E+01
PEAK ABSC(94): 0.3006E-07  INPL(75): 0  REFS(76-79):  160000001,          0,          0,          0  THR VER(86):          0
THRESHOLD VAL&RAT(81-85,87-91): 0.0       ,0.0       ,0.0       ,0.0       ,0.0       ,0.0       ,0.0       ,0.0       ,0.0       ,0.0
CHAR(95-100,126-128): -.100E+01,0.0       ,0.452E+01,0.289E-05,0.775E-06,0.775E-06,0.136E+03,0.260E-02,0.0          (14.56 06/06/78)
```

(14.24.29 06/06/78)

```
RECORD NAME - J MMKFL0 HY 0000 R5 BP (302)          RECORD ID =      9
RECORD LABEL ------- HY FIELD        BAC PT-3 0,-50,.75

HEADER INFOR..COMMT-        B1 0 DRIVER-R    SHOT NO-1345 DR LOC-
DR LEVEL/CONFIG -   0.4200E+04/     DATE-6254 TIME-   0 MEASURE TYPE-HY
PROBE-        HEX NOS-H1P03YRA              IU-MAP2  SCALE =   0.4130E-01
H/V SETS (    20,    20)(     0,     0)(     0,     0) CODE-  1 PTS-436

ABCISSA INDICATOR--  0 SCALE -   0.2000E-07 SHIFT VALUE -  0.0
ORDINATE INDICATOR-  1 SCALE -   0.8260E+00 SHIFT VALUE -  0.0
ROTATION VALUE -   0.0         SOURCE INDICATOR- 1 HISTORY INDICATOR-  0
NORMALIZATION INDICATOR-  0 FACTOR -   0.0         INTERPL INDICATOR-  0
REEL NO.1600000012  ID REFS. 160000001,         0,         0,         0
THRESHOLD VALUES (1ST LINE) AND THRESHOLD RATIOS (2ND LINE)
     1          2          3          4          5         VERSION
 0.0        0.0        0.0        0.0        0.0                0
 0.0        0.0        0.0        0.0        0.0

BLKS= 8    PEAK ORDINATE VALUE-  0.4317E+01 ABSCISSA VALUE-  0.3163E-07

DATA CHARACTERISTICS                1 =  -0.1000E+01  2 =   0.0
 3 =   0.0          4 =   0.0          5 =   0.3783E-06  6 =   0.1153E-05
 7 =   0.0          8 =   0.0          9 =   0.0           436 DATA POINTS
```

```
RECORD NAME - J MMKFL0 HY 0000 R5 BP (303)          RECORD ID =     17
RECORD LABEL ------- HY FIELD        BAC PT-3 0,-50,.75

HEADER INFOR..COMMT-        B1 0 DRIVER-R.   SHOT NO-1350 DR LOC-
DR LEVEL/CONFIG -   0.4200E+04/     DATE-6254 TIME-   0 MEASURE TYPE-HY
PROBE-       HEX NOS-H1P03YRA             IU-MAP2  SCALE =   0.4130E-01
H/V SETS (   100,    20)(     0,     0)(     0,     0) CODE-  1 PTS-458

ABCISSA INDICATOR--  0 SCALE -   0.1000E-06 SHIFT VALUE -  0.0
ORDINATE INDICATOR-  1 SCALE -   0.8260E+00 SHIFT VALUE -  0.0
ROTATION VALUE -   0.0        SOURCE INDICATOR- 1 HISTORY INDICATOR-  0
NORMALIZATION INDICATOR-  0 FACTOR -   0.0        INTERPL INDICATOR-  0
REEL NO.1600000013  ID REFS. 160000001,         0,         0,         0
THRESHOLD VALUES (1ST LINE) AND THRESHOLD RATIOS (2ND LINE)
     1          2          3          4          5        VERSION
 0.0        0.0        0.0        0.0        0.0              0
 0.0        0.0        0.0        0.0        0.0

BLKS= 9    PEAK ORDINATE VALUE-  0.2806E+01 ABSCISSA VALUE-  0.7449E-07

DATA CHARACTERISTICS                1 =   0.8594E-06  2 =   0.0
 3 =   0.0          4 =   0.0          5 =   0.7488E-06  6 =   0.1902E-05
 7 =   0.0          8 =   0.0          9 =   0.0           458 DATA POINTS
```

EXAMPLE RUN NUMBER 6

PURPOSE:
  DEMONSTRATE CREATION OF HISTOGRAM PLOTS

MODE: BATCH

DIRECTIVES DEMONSTRATED:
  HISTOGRAM
  OUTPUT/TYPE 8
  REPORT
  SEARCH
  SORT

CPU TIME: 28.03 SECONDS

EXPLANATION OF FOLLOWING PAGES:
  FIRST PAGE - LISTING OF JOB DECK
  SUBSEQUENT PAGES - COPY OF PROGRAM OUTPUT. NOTE THAT OUTPUT FROM THIS
    RUN DID NOT EXCEED 80 COLUMNS IN WIDTH.

APPENDIX C

```
//HK1010X JOB (HK1010,,20,100,,,3,,0),ROSE,CLASS=C,MSGCLASS=A,
//              MSGLEVEL=(1,1),NOTIFY=HK1010
/*SETUP    DISK,CRICDB
/*ROUTE  PRINT RMT17
//JOBLIB DD DSN=HK1010.LOAD,DISP=SHR
//STEP1 EXEC PGM=SMARTE,TIME=20
//FT01F001 DD DUMMY
//FT02F001 DD DUMMY
//FT05F001 DD DUMMY
//FT06F001 DD SYSOUT=A
//FT07F001 DD SPACE=(CYL,(1,1)),UNIT=SYSDA
//FT09F001 DD DUMMY
//FT10F001 DD DUMMY
//FT11F001 DD DSN=HK1010.$DR.NUMBER11,DISP=SHR
//FT12F001 DD DUMMY
//FT13F001 DD DUMMY
//FT14F001 DD DUMMY
//FT20F001 DD SPACE=(CYL,(1,1)),UNIT=SYSDA
//FT21F001 DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133)
//FT22F001 DD SPACE=(TRK,(1,1)),UNIT=VIO,
//     DCB=(RECFM=FA,LRECL=133,BLKSIZE=133)
//PLOTTAPE DD SYSOUT=P,DEST=LOCAL
//FT04F001 DD *
PASSWORD=KUMQUAT
DB=00011,SIZE=033000,LU=11
*SEARCH
((008.EQ.V).OR.(008.EQ.D).OR.(008.EQ.C))
.AND.(002.NE.J).AND.(002.NE.L).AND.(020.EQ.1)

*SORT
201
*OUTPUT
TYPE08
FF
*REPORT
SCALED DATA (C2 NE J,L;C8=V,D,C)
         RECORD NAME            REEL NO.  ALT NAME PRIOR    PEAK      IN
TENSITY
 -------------------------- ---------- -------- ----- ---------- ---
-------
201
092  T31,I10
04203T42,4(A2)
026  T51,2X,A2
126  T57,E10.3
127  T68,E10.3

*SORT
126
*HISTOGRAM
 6 126 02 03 04 05 06 07
ABS PEAKS (C2 NE J,L;C8=V,D,C)          REPS NON ESS VOLTAGES-SCALED
*SORT
127
*HISTOGRAM
 6 127 02 03 04 05 06 07
INTENSITIES (C2 NE J,L;C8=V,D,C)        REPS NON ESS VOLTAGES-SCALED
*END
//
```

```
7676767676767676767676767676767676767676767676767
6767676767676767676767676767676767676767676767676
76                                                 67
67     U.S. ARMY, HARRY DIAMOND LABORATORIES       76
76      COMMUNICATIONS SURVIVABILITY BRANCH        67
67                                                 76
76                  PROGRAM SMARTE                 67
67                                                 76
76              VERSION     053178Q                67
67                                                 76
7676767676767676767676767676767676767676767676767
6767676767676767676767676767676767676767676767676
```

THE PRINTED OUTPUT BEGINNING ON THE NEXT PAGE CONFORMS TO THE FOLLOWING RULES...

1. WHEN A VALID DIRECTIVE IS READ IT IS PRINTED IN ITS ENTERED FORM COMPLETE WITH THE ASTERISK (*) CHARACTER.

2. WHEN A DIRECTIVE MODIFIER CARD IS READ (IF DIRECTIVE PACKET HAS MODIFIER CARDS) IT IS PRINTED ENCLOSED IN PARENTHESES.

3. AS EXECUTION OF THE DIRECTIVE PACKET PROCEEDS THE REQUESTED INFORMATION IS PRINTED. ALSO ANY APPROPRIATE PROGRAM MESSAGES ARE PRINTED. ANY TIME AN ADDITIONAL DIRECTIVE MODIFIER CARD IS READ IT IS PRINTED AS DESCRIBED IN NO. 2 ABOVE AND PROCESSING OF THE DIRECTIVE PACKET PROCEEDS.

4. WHEN THE DIRECTIVE PACKET HAS BEEN SUCCESSFULLY COMPLETED A MESSAGE CONFIRMING THAT FACT IS PRINTED. THIS MESSAGE BEGINS WITH A PLUS (+) CHARACTER.

DEFINITIONS...

DIRECTIVE - ONE OF THE SET OF SMARTE COMMANDS ENTERED ON A CARD IN THE DIRECTIVE DECK. AN ASTERISK IS PUNCHED IN COLUMN 1. THE KEYWORD BEGINS IN COLUMN 2.

DIRECTIVE MODIFIER CARD - A CARD WHICH FOLLOWS A DIRECTIVE CARD OR ANOTHER DIRECTIVE MODIFIER CARD. IT CONTAINS ONE OR MORE WORDS OR NUMBERS WHICH FURTHER DESCRIBE THE PROCESSING REQUESTED BY THE LATTER DIRECTIVE CARD.

DIRECTIVE PACKET - ONE DIRECTIVE CARD FOLLOWED BY ALL OF ITS ASSOCIATED DIRECTIVE MODIFIER CARDS (IF ANY). DIRECTIVE PACKETS ARE GROUPED TOGETHER TO FORM THE DIRECTIVE DECK.

DIRECTIVE DECK - THE STACK OF CARDS WHICH IS PROVIDED TO THE SMARTE PROGRAM AS INPUT IN ORDER TO CONTROL THE ACTIONS OF THE PROGRAM.

APPENDIX C

```
PRIMARY DATA BASE SPECIFICATION:  DB=    11,SIZE= 33000,LU=11
ELT:      0.0         0.002

*SEARCH

 (((008.EQ.V).OR.(008.EQ.D).OR.(008.EQ.C)))

 (.AND.(002.NE.J).AND.(002.NE.L).AND.(020.EQ.1))

+SEARCH COMPLETED.          21  RECORDS IN FIND FILE.
 ELT:      5.854       5.858

*SORT
 (201)

+SORT COMPLETED
 ELT:      1.343       7.203

*OUTPUT
 (TYPE 8)
 (FF)
```

```
RECORD NAME, REEL NUMBER, RECORD ID, 2ND LINE-RECORD LABEL
-----------------------------------------------------------
J KC3HTS DL 0000 R5 BP (301)     1600001491       5332
  DIF VOLT   A21/CC0-3
J KC3HTS DL 0000 R5 BP (301)     1600002911      10328
  DIF VOLT/CC03-CABLE DRIVER XFMR A21
J KC4HTS DL 0000 R5 BP (301)     1600002921      10355
  DIF VOLT/CC13- CABLE DRIVER XFMR A21
J KC7HTS DL 0000 R5 BP (301)     1600001501       5359
  DIF VOLT   A21/CC1-3
J KC7HTS DL 0000 R5 BP (301)     1600001841       6894
  DIF VOLT   A21/CC1-3
J KC7HTU DL 0000 R5 BP (301)     1600001821       6833
  DIF VOLT   A21/CC1-3
J KM0H2E DL 0000 R5 BP (301)     1600020451      11787

J KM0H2V VL 0000 R5 BP (301)     1600020461      11808

J KM0H2W VL 0000 R5 BP (301)     1600020481      11865

J PF113  VL 0000 R5 BP (301)     1600001771       6631
  VOLT PHA TO MDP FRAME/AC SWTGR
J PF123  VL 0000 R5 BP (301)     1600001741       6456
  VOLT INCOMING PHA B CABLE TO FRAME AT MDP/AC SWTGR
J PF133  VL 0000 R5 BP (301)     1600001751      10562
  VOLT PHA C TO MDP FRAME/AC SWTGR
J PXBE   VL 0000 R5 BP (301)     1600001591       5728
  VOLT  PHA A VOLT/BAY 143-18 G1
J PXBL00 DL 0000 R5 BP (301)     1600001241       4295
  DIF VOLT/143.18 DC PWR 24V ESS SUPPLY
J PXGE   VL 0000 R5 BP (301)     1600001601       5809
  VOLT  PHA A VOLT TO FRAME/INCOMMING AC SUPPLY
J PXHG00 VL 0000 R5 BP (301)     1600002501       8705
  VOLT/BDFB,124.24, 24V PWR CABLE
J P4E000 DL 0000 R5 BP (301)     1600001301       4642
  DIF VOLT/DC PWR,-48V ESS SUP,143.12
J TF1022 DL 0000 R5 BP (301)     1600020441      11762

J TL%%%% DL 0000 R5 BP (301)     1600002191       6512
  DV/T1 LEAD SIGCOM @TSF3 GRID1 STAGE0 SW6 FR LEV3
J TT001B DL 0000 R5 BP (301)     1600001351       4855
  DV T1 LEAD TO E4B SFU CHASSIS/TOLL INTER DIST FRM
J TT001B DL 0000 R5 BP (301)     1600001361       4882
  DV T1 LEAD TO E4B SFU CHASSIS/TOLL INTER DIST FRM
```

APPENDIX C

```
*OUTPUT DIRECTIVE PACKET COMPLETED.
 ELT:      0.305      7.510

*REPORT
 (SCALED DATA (C2 NE J,L;C8=V,D,C)                    500)
 (          RECORD NAME                 REEL NO.   ALT NAME PRIOR     PEAK      IN)
 (TENSITY                                                                )
 ( ------------------------------ ---------- -------- ----- ---------- ---)
 (-------                                                                )
 (201 0                          )
 ( 92 0T31,I10                   )
 ( 42 3T42,4(A2)                 )
 ( 26 0T51,2X,A2                 )
 (126 0T57,E10.3                 )
 (127 0T68,E10.3                 )
```

SCALED DATA (C2 NE J,L$C8=V,D,C) PAGE 1 06/06/78 12.04.33
DATA BASE NOS 11

RECORD NAME	REEL NO.	ALT NAME	PRIOR	PEAK	INTENSITY
J KC3HTS DL 0000 R5 BP (301)	1600001491	B7116VRA	B2	-0.151E+02	0.163E-04
J KC3HTS DL 0000 R5 BP (301)	1600002911	B7116VRA	B2	0.385E+01	0.816E-06
J KC4HTS DL 0000 R5 BP (301)	1600002921	B7119VRA	B2	0.306E+01	0.339E-06
J KC7HTS DL 0000 R5 BP (301)	1600001501	B7119VRA	B2	-0.127E+02	0.945E-05
J KC7HTS DL 0000 R5 BP (301)	1600001841	B7116VRA	B2	0.457E+01	0.101E-05
J KC7HTU DL 0000 R5 BP (301)	1600001821	B7119VRA	B2	0.418E+01	0.924E-06
J KM0H2E DL 0000 R5 BP (301)	1600020451		H1	-0.705E+02	0.320E-03
J KM0H2V VL 0000 R5 BP (301)	1600020461		H1	-0.239E+03	0.865E-02
J KM0H2W VL 0000 R5 BP (301)	1600020481		H1	-0.225E+03	0.976E-03
J PF113 VL 0000 R5 BP (301)	1600001771	B0006VRA	B2	0.924E+03	0.101E+01
J PF123 VL 0000 R5 BP (301)	1600001741	B0007VRA	B2	0.686E+03	0.849E+00
J PF133 VL 0000 R5 BP (301)	1600001751	B0008VRA	B2	0.815E+03	0.568E+00
J PXBE VL 0000 R5 BP (301)	1600001591	B1352VRA	B2	-0.499E+03	0.444E+00
J PXBL00 DL 0000 R5 BP (301)	1600001241	B2082VRA	B2	0.329E+03	0.449E-01
J PXGE VL 0000 R5 BP (301)	1600001601	B1302VRA	B2	-0.633E+03	0.924E+00
J PXHG00 VL 0000 R5 BP (301)	1600002501	B2202VRA	B3	0.365E+02	0.210E-03
J P4E000 DL 0000 R5 BP (301)	1600001301	B2032VRA	B2	-0.546E+03	0.166E-01
J TF1022 DL 0000 R5 BP (301)	1600020441		H1	-0.134E+03	0.571E-02
J TL%%%% DL 0000 R5 BP (301)	1600002191	B6053VRA	B3	-0.217E+02	0.870E-05
J TT001B DL 0000 R5 BP (301)	1600001351	B6012VRA	B2	0.246E+02	0.139E-03
J TT001B DL 0000 R5 BP (301)	1600001361	B6012VRA	B2	-0.122E+02	0.278E-04

APPENDIX C

```
*REPORT COMPLETED
 ELT:     12.965     20.476

*SORT
 (126)

*SORT COMPLETED
 ELT:      0.267     20.744

*HISTOGRAM
 ( 6 126  2  3  4  5  6  7  0  0)
 (ABS PEAKS (C2 NE J,L$C8=V,D,C)          REPS NON ESS VOLTAGES-SCALED     )
```

TABLE (SHEET 1) 06/06/78 12.05.00

ABS PEAKS (C2 NE J,L;C8=V,D,C)
REPS NON ESS VOLTAGES-SCALED

J	PXGE	VL	0000	R5	BP	(301) -0.6327E+03
J	P4E000	DL	0000	R5	BP	(301) -0.5457E+03
J	PXBE	VL	0000	R5	BP	(301) -0.4992E+03
J	KM0H2V	VL	0000	R5	BP	(301) -0.2395E+03
J	KM0H2W	VL	0000	R5	BP	(301) -0.2254E+03
J	TF1022	DL	0000	R5	BP	(301) -0.1339E+03
J	KM0H2E	DL	0000	R5	BP	(301) -0.7047E+02
J	TL%%%%	DL	0000	R5	BP	(301) -0.2167E+02
J	KC3HTS	DL	0000	R5	BP	(301) -0.1506E+02
J	KC7HTS	DL	0000	R5	BP	(301) -0.1270E+02
J	TT001B	DL	0000	R5	BP	(301) -0.1220E+02
J	KC4HTS	DL	0000	R5	BP	(301) 0.3063E+01
J	KC3HTS	DL	0000	R5	BP	(301) 0.3846E+01
J	KC7HTU	DL	0000	R5	BP	(301) 0.4176E+01
J	KC7HTS	DL	0000	R5	BP	(301) 0.4566E+01
J	TT001B	DL	0000	R5	BP	(301) 0.2461E+02
J	PXHG00	VL	0000	R5	BP	(301) 0.3651E+02
J	PXBL00	DL	0000	R5	BP	(301) 0.3291E+03
J	PF123	VL	0000	R5	BP	(301) 0.6861E+03
J	PF133	VL	0000	R5	BP	(301) 0.8154E+03
J	PF113	VL	0000	R5	BP	(301) 0.9240E+03

APPENDIX C

```
MIN. VALUE   =   3.0630
MAX. VALUE   =   924.00
MEAN         =   249.52
VARIANCE     =   93580.
STAND. DEV.  =   305.91
```

```
20 I
   I
   I
   I
   I
   I
   I
   I
   I PXHG00
   I TT001B
10 I KC7HTS
   I KC7HTU
   I KC3HTS
   I KC4HTS
   I TT001B
   I KC7HTS
   I KC3HTS
   I TL%%%% PXBL00          PF123
   I KM0H2E KM0H2W          P4E000
   I TF1022 KM0H2V PXBE     PXGE    PF133  PF113
 0 I-------I------I------I------I------I------I------I------I
       0.174E+03      0.516E+03      0.858E+03      0.120E+04
0.306E+01      0.345E+03      0.687E+03      0.103E+04      0.137E+04
```

FIGURE ABS PEAKS (C2 NE J,L;C8=V,D,C)
REPS NON ESS VOLTAGES-SCALED
(LIN. SCALED WITH INTERVAL = 171.00)

MIN. VALUE	=	3.0630
MAX. VALUE	=	924.00
*MEAN	=	65.803
*VARIANCE	=	5.8390
*STAND. DEV.	=	7.5060

*=CALCULATED FROM LOG DISTRIBUTION

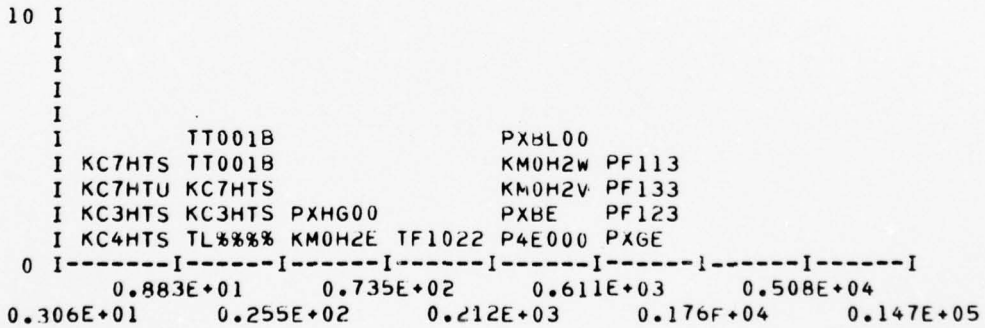


FIGURE ABS PEAKS (C2 NE J,L;C8=V,D,C)
REPS NON ESS VOLTAGES-SCALED
(LOG. SCALED WITH INTERVAL = 2.8840)

APPENDIX C

```
+HISTOGRAM COMPLETED
 ELT:      2.310     23.055

*SORT
 (127)

+SORT COMPLETED
 ELT:      0.268     23.326

*HISTOGRAM
 ( 6 127  2  3  4  5  6  7  0  0)
 (INTENSITIES (C2 NE J,L;C8=V,D,C)          REPS NON ESS VOLTAGES-SCALED     )
```

TABLE (SHEET 1) 06/06/78 12.05.12

INTENSITIES (C2 NE J,L;C8=V,D,C)
REPS NON ESS VOLTAGES-SCALED

J	KC4HTS	DL	0000	R5	BP	(301) 0.3393E-06
J	KC3HTS	DL	0000	R5	BP	(301) 0.8158E-06
J	KC7HTU	DL	0000	R5	BP	(301) 0.9243E-06
J	KC7HTS	DL	0000	R5	BP	(301) 0.1009E-05
J	TL%%%%	DL	0000	R5	BP	(301) 0.8699E-05
J	KC7HTS	DL	0000	R5	BP	(301) 0.9450E-05
J	KC3HTS	DL	0000	R5	BP	(301) 0.1629E-04
J	TT001B	DL	0000	R5	BP	(301) 0.2779E-04
J	TT001B	DL	0000	R5	BP	(301) 0.1394E-03
J	PXHG00	VL	0000	R5	BP	(301) 0.2096E-03
J	KM0H2E	DL	0000	R5	BP	(301) 0.3200E-03
J	KM0H2W	VL	0000	R5	BP	(301) 0.9765E-03
J	TF1022	DL	0000	R5	BP	(301) 0.5707E-02
J	KM0H2V	VL	0000	R5	BP	(301) 0.8647E-02
J	P4E000	DL	0000	R5	BP	(301) 0.1655E-01
J	PXBL00	DL	0000	R5	BP	(301) 0.4493E-01
J	PXBE	VL	0000	R5	BP	(301) 0.4436E+00
J	PF133	VL	0000	R5	BP	(301) 0.5683E+00
J	PF123	VL	0000	R5	BP	(301) 0.8492E+00
J	PXGE	VL	0000	R5	BP	(301) 0.9243E+00
J	PF113	VL	0000	R5	BP	(301) 0.1010E+01

APPENDIX C

MIN. VALUE = .33930E-06
MAX. VALUE = 1.0098
MEAN = .18441
VARIANCE = .12015
STAND. DEV. = .34663

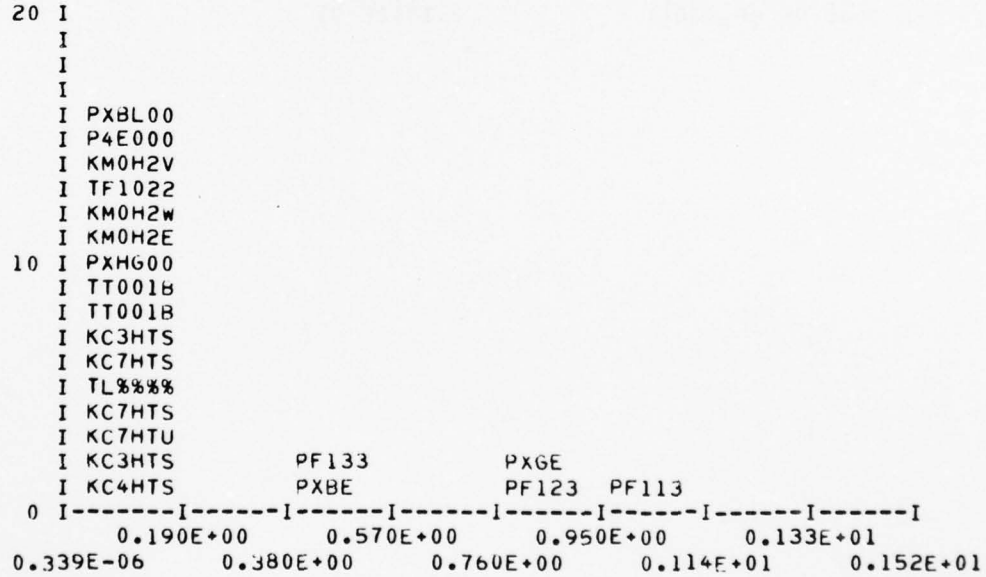


FIGURE INTENSITIES (C2 NE J,L;C8=V,D,C)
REPS NON ESS VOLTAGES-SCALED
(LIN. SCALED WITH INTERVAL = .19000)

MIN. VALUE = .33930E-06
MAX. VALUE = 1.0098
*MEAN = .70473E-03
*VARIANCE = .11660E+06
*STAND. DEV. = 178.21

*=CALCULATED FROM LOG DISTRIBUTION

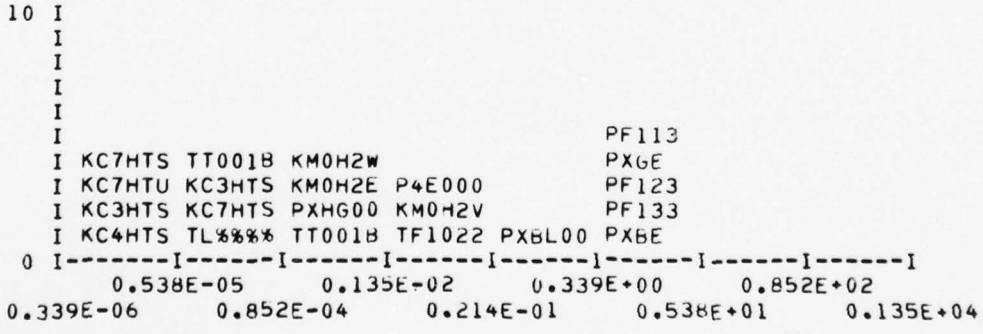


FIGURE INTENSITIES (C2 NE J,L;C8=V,D,C)
REPS NON ESS VOLTAGES-SCALED
(LOG. SCALED WITH INTERVAL = 15.849)

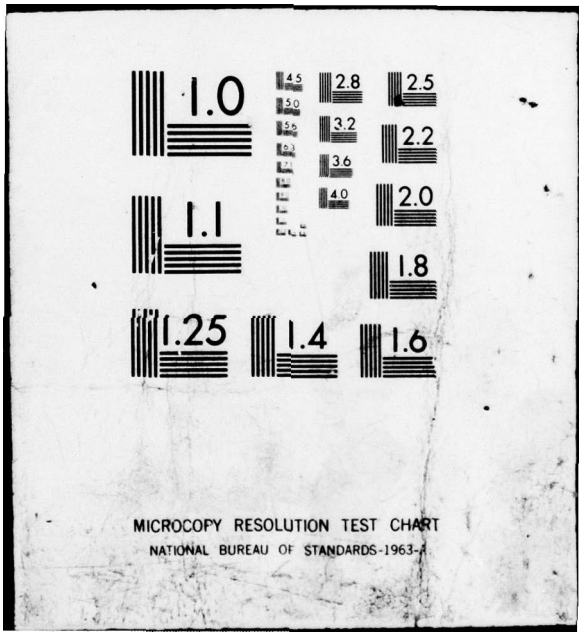
APPENDIX C

```
+HISTOGRAM COMPLETED
 ELT:      2.355     25.683
```

AD-A063 079 HARRY DIAMOND LABS ADELPHI MD F/G 9/2
SMARTE-A COMPUTER PROGRAM FOR MANAGEMENT AND ANALYSIS OF ELECTR--ETC(U)
NOV 78 T A ROSE
UNCLASSIFIED HDL-TR-1869 NL

3 OF 3
AD
AD63079

END
DATE FILMED
3--79
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

```
...NORMAL TERMINATION
   DIRECTIVE DECK EXHAUSTED

   THE FOLLOWING DATA BASE FILES WERE SPECIFIED FOR THIS JO

     ON LU 11  DATA BASE NO.    11
```

APPENDIX C

EXAMPLE RUN NUMBER 7

PURPOSE:
  DEMONSTRATE THE RETRIEVAL AND DUMPING OF DATA TO A DISC DATA SET FOR
    LATER USE BY A USER PROGRAM.

MODE: INTERACTIVE

DIRECTIVES DEMONSTRATED:
  DUMP
  OUTPUT/TYPE 8
  SEARCH
  SORT

CPU TIME: 5.24 SECONDS

EXPLANATION OF FOLLOWING PAGES:
  THE FOLLOWING PAGES CONTAIN A FULL COPY OF USER INPUT AND PROGRAM
    OUTPUT. THE TRIANGLE SYMBOL (▷) HAS BEEN DRAWN IN AT THE BEGINNING
    OF EACH USER SUPPLIED ENTRY.

```
 READY
▷attrib x recfm(v,s,b) blksize(5120)
 READY
▷allocate dsname(test.data) new catalog space(1,1) cylinders-
  volume(work50) using(x) file(ft09f001)
 READY
▷exec 'hk1010.clist(smarte)' 'lu09(n) pref(f) lu11(hk1010.$db.number11)'

 SMARTE PROGRAM CLIST VERSION 060578Q
   START TIME:  14:29:47 06/06/78
   LU04 = TERMINAL
   LU09 = NEW
   LU11 = HK1010.$DB.NUMBER11
   SMARTE FILES ALLOCATED; EXECUTION PROCEEDING.
   ENTER ACCESS PASSWORD
▷password=manx

 PROGRAM SMARTE VERSION   053178Q
 EMP DATA MANAGEMENT AND ANALYSIS PROGRAM



 -ENTER DATA BASE SPECIFICATION (DB=IIIII,SIZE=IIIIII,LU=II)-
▷db=00011,size=033000,lu=11
  PRIMARY DATA BASE SPECIFICATION:  DB=   11,SIZE= 33000,LU=11
  ELT:     0.0       0.002

 -ENTER DIRECTIVE-
▷*search

 *SEARCH

 -ENTER 1ST SUPPLEMENTARY ENTRY-
▷092.le.1600000354.and.092.ge.1600000351

  (092.LE.1600000354.AND.092.GE.1600000351)

 -ENTER NEXT SUPPLEMENTARY ENTRY-


 +SEARCH COMPLETED.          4  RECORDS IN FIND FILE.
  ELT:     4.920     4.925

 -ENTER DIRECTIVE-
▷*sort

 *SORT
 -ENTER ITEM NO. ON WHICH TO SORT IN COLS 1-3 RIGHT JUSTIFIED-
▷092
  ( 92)

 +SORT COMPLETED
  ELT:     0.091     5.021

 -ENTER DIRECTIVE-
```

APPENDIX C

```
▷*output

 *OUTPUT

 -ENTER OUTPUT TYPE (TYPEII)-
▷type08
  (TYPE 8)

 -ENTER REC NAME IN COLS 1-20, ID IN COLS 21-26, FF OR BLANK TO END OUTPUT-
▷ff
  (FF)

                                                PAGE -  1  06/06/78   14.34.03

 RECORD NAME, REEL NUMBER, RECORD ID, 2ND LINE-RECORD LABEL
 ----------------------------------------------------------
 J MMKCL0 HY 0000 R5 BP (301)    1600000351      1097
   HY FIELD         BAC PT-6 0,-85,.75
 J MMKCL0 HY 0000 R5 BP (302)    1600000352      1106
   HY FIELD         BAC PT-6 0,-85,.75
 J MMKCL0 HY 0000 R5 BP (303)    1600000353      1114
   HY FIELD         BAC PT-6 0,-85,.75
 J MMKCL0 HY 0000 R5 BP (304)    1600000354      1123
   HY FIELD         BAC PT-6 0,-85,.75


 +OUTPUT DIRECTIVE PACKET COMPLETED.
  ELT:     0.096     5.120

 -ENTER DIRECTIVE-
▷*dump

 *DUMP

 -ENTER TYPE OF DUMP (TYPEII)-
▷type02
 (TYPE 2)

 +DUMP COMPLETED.         4 RECORDS WERE DUMPED.
  ELT:     0.117     5.240

 -ENTER DIRECTIVE-
▷*end


 ...NORMAL TERMINATION
    DIRECTIVE DECK EXHAUSTED


    THE FOLLOWING DATA BASE FILES WERE SPECIFIED FOR THIS JOB:

      ON LU 11  DATA BASE NO.    11
 IHO002I STOP   7777
  STOP TIME:  14:36:57 06/06/78
 READY
```

DISTRIBUTION

ADMINISTRATOR
DEFENSE DOCUMENTATION CENTER
ATTN DDC-TCA (12 COPIES)
CAMERON STATION, BUILDING 5
ALEXANDRIA, VA 22314

COMMANDER
US ARMY RSCH & STD GP (EUR)
ATTN LTC JAMES M. KENNEDY, JR.
CHIEF, PHYSICS & MATH BRANCH
FPO NEW YORK 09510

COMMANDER
US ARMY MATERIEL DEVELOPMENT &
READINESS COMMAND
ATTN DRXAM-TL, HQ TECH LIBRARY
5001 EISENHOWER AVENUE
ALEXANDRIA, VA 22333

COMMANDER
US ARMY MISSILE & MUNITIONS
CENTER & SCHOOL
ATTN ATSK-CTD-F
REDSTONE ARSENAL, AL 35809

DIRECTOR
US ARMY MATERIEL SYSTEMS ANALYSIS
ACTIVITY
ATTN DRXSY-MP
ABERDEEN PROVING GROUND, MD 21005

COMMANDING OFFICER
NAVAL TRAINING EQUIPMENT CENTER
ATTN TECHNICAL LIBRARY
ORLANDO, FL 32813

DIRECTOR
DEFENSE COMMUNICATION ENGINEERING CENTER
1860 WIEHLE AVENUE
ATTN CODE R720, C. STANSBERRY (25 COPIES)
RESTON, VA 22090

DIRECTOR
DEFENSE NUCLEAR AGENCY
ATTN VLIS, MAJ E. BURKETT
ATTN VLIS, CAPT KING
WASHINGTON, DC 20305

DIRECTOR
US ARMY BALLISTIC RESEARCH LABORATORY
ATTN DRDAR-TSB-S (STINFO)
ABERDEEN PROVING GROUND, MD 21005

US ARMY ELECTRONICS RESEARCH
& DEVELOPMENT COMMAND
ATTN WISEMAN, ROBERT S., DR., DRDEL-CT
ATTN PAO

HARRY DIAMOND LABORATORIES
ATTN 00100, COMMANDER/TECHNICAL DIR/TSO
ATTN CHIEF, 00210
ATTN CHIEF, DIV 10000
ATTN CHIEF, DIV 20000
ATTN CHIEF, DIV 30000
ATTN CHIEF, DIV 40000
ATTN CHIEF, LAB 11000
ATTN CHIEF, LAB 13000
ATTN CHIEF, LAB 15000
ATTN CHIEF, LAB 22000
ATTN CHIEF, LAB 21000
ATTN CHIEF, LAB 34000
ATTN CHIEF, LAB 36000
ATTN CHIEF, LAB 47000
ATTN CHIEF, LAB 48000
ATTN RECORD COPY, 94100
ATTN HDL LIBRARY, 41000 (5 COPIES)
ATTN HDL LIBRARY, 41000 (WOODBRIDGE)
ATTN CHAIRMAN, EDITORIAL COMMITTEE
ATTN TECHNICAL REPORTS BRANCH, 41300
ATTN LEGAL OFFICE, 97000
ATTN LANHAM, C., 00210
ATTN WILLIS, B., 47400
ATTN WIMENITZ, F., 20240
ATTN CORRIGAN, J., 20240
ATTN GORNAK, G., 21200
ATTN SPOHN, D., 21300
ATTN DANDO, J., 21400 (5 COPIES)
ATTN PETTY, W., 21500
ATTN PFEFFER, R., 21100
ATTN MILETTA, J., 21100
ATTN JOHNSON, A., 21100
ATTN PENAR, J., 21100
ATTN BEILFUSS, J., 21400
ATTN MUELLER, H., 21400
ATTN LEPOER, K., 22100
ATTN ROSE, T., 21100 (30 COPIES)