NATIONAL BUREAU OF STANDARDS REPORT

10 434

A SEARCH AND RESCUE SIMULATION MODEL FOR THE UNITED STATES COAST GUARD

VOLUME V

PROGRAMMER LEVEL DOCUMENTATION FOR "POSTPROCESSOR"

Sponsored by
U. S. Coast Guard

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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[1] Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington, D.C. 20234.
[2] Located at Boulder, Colorado 80302.
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by
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PREFACE

This volume is one of a series which documents a Search and Rescue Simulation Model for the United States Coast Guard. The material reported in this documentation was developed by an interdisciplinary team at the National Bureau of Standards with representation from the U.S. Coast Guard under MIPR Z-70099-0-01935.

The complete documentation is comprised of the following:

Volume I Executive Level Documentation

Volume II Analyst Level Documentation

Volume III Programmer Level Documentation for "PREPROCESSOR"

Volume IV Programmer Level Documentation for "OPSIM"

Volume V Programmer Level Documentation for "POSTPROCESSOR"

Appendix A Flow Charts for Programmer Level Documentation

Appendix B Program Listings for Programmer Level Documentation

The study was initially conducted under the supervision of Martin J. Aronoff; subsequently efforts were supervised by Richard T. Penn, Jr. Technical Project Leadership was supplied throughout the project by Stephen S. Karp. Other participants from the National Bureau of Standards Technical Analysis Division included the following:

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POSTPRO Programmer's Documentation

I. Introduction

In order to examine the voluminous amount of data generated by a complex simulation such as SARSIM, an efficient post-processor is a definite requirement.

The reader is reminded that the Standard Output display (from OPSIM) is given for each run of OPSIM. The OPSIM Section explains this output and the calculations. The processing of data other than that presented in the Standard Output is an option to the SARSIM user. To explain further, it is recalled that the Standard Output consists mostly of summary statistics on resource and station utilizations derived and output in several ways. In contrast, the output relative to each case after being simulated in the system, can be filed, so that the simulation user can examine any aggregate of case attributes or simply the case attributes themselves. A means had to be devised such that the user can access the data fairly simply and extract it in summary form as he wishes.

A generalized information retrieval system with the additional capability to supply a variety of options such that the user can tailor the output to his requirements can be found in Quick Query.[1/]

1/ Developed for the Economic Development Administration by Consolidated Analysis Centers Inc.

Basically, Quick Query offers the user the ability to supply the criteria for selection of specific data on file; the formulae for any calculations he wishes; and the sequence in which he wishes the output to be produced.

Quick Query is used in conjunction with software necessary to define the case attributes and set-up the file. The File Definition & Maintenance (FDM) software does the file set-up and is applied to the output once. Quick Query is applied to this new file as often as the user desires. It is noted that the user may wish to batch several requests when using Quick Query, and can therefore obtain any number of special processing requests at any one time.

The next part describes the application of Quick Query and File Definition & Maintenance to SARSIM and how Quick Query can be used to fulfill the user's needs.

II. User's Guide and Description

A. FDM

This section describes the File Definition and Maintenance (FDM) Program which was developed by Consolidated Analysis Centers, Incorporated, for the Economic Development Administration (EDA).

The purpose of FDM is to define new Quick Query Program (QQP) files or to modify existing QQP files. FDM works in conjunction with QQP: FDM is a system which actively constructs or modifies the file structure which QQP passively accesses for data retrieval, manipulation, and display.

Since QQP is described in detail elsewhere, this section will concern itself solely with FDM. The standard reference manual[1/] for FDM provides more complete and detailed information and should be consulted before significant changes are made to the existing FDM program. This section will discuss only FDM as implemented for SARSIM in order to provide the user easy access to the relevant information.

The FDM program employs six types of control cards labeled A through F and a FORTRAN subroutine called USERRD. The FORTRAN routine will be discussed later. We concern ourselves now with the six types of control cards and how they were used in SARSIM. To facilitate understanding the following explanation, the reader is urged to consult the standard FDM form, Figure 1, and FDM computer printout, Figure 6. Both are contained on the next few pages. Lastly, if more than one card of a given type was used in FDM, e.g., the B card, then only the first card of the given type is explained.

1/ FILE DEFINITION AND MAINTENANCE USERS MANUAL, Bergfried, U.S., and Slack, G. G., Consolidated Analysis Centers Incorporated, December 1969.

FDM Control Cards

Card Type	Columns	Entry	Explanation
A	1	A	Card Type Identification
	3-14	Cummings LK	Requestor Identification
	16-23	12-15-70	Request Date
	26		Blank since the Custodian program which is contained in the EDA's Comprehensive Information System and Data Base is not used.
	33	X	Used for defining an entirely new QQP file, rather than modifying an existing file.
	37-38	29	This blocking factor was used to minimize processing time.
	41		Blank since this run defined rather than modified a QQP file.
	44		"
	46		"
	56	X	Must be checked for file definition.
	61-72	Case	Left justified. This is the name of the entity to which the attributes named on the B-cards belong.
B	1	B	Card Type Identification
	3-5	CRE	This name tells the FDM program that we wish to create an attribute.
	7-18	SEQNO	Name of the attribute created
	19	I	The attribute is integer data
	20-21	5	Field width of attribute. Includes two extra digits since attribute will be subtotaled.
	23	X	Indicates a sum should not be computed for this attribute when subtotaling is requested.
	27-28	1	Number of words occupied by this attribute when returned by USERRD subroutine. Integer fields require only 1 word. Right adjusted.
	29-33	1	Tells FDM program where the attribute is located in the array IA passed from USERRD. Right justified.
	34-35	6	Size of the heading field. This number must be at least as large as the longest word in the following three fields.
	36-47		First line of heading. Free form.
	48-59	SEQ	Second line of heading. Free form.
	60-71	NO	Third line of heading. Free form.

Card Type	Columns	Entry	Explanation
C	1	C	Card Type Identification
	3-14	SEQNO	This sequencing attribute determines the order of the entity cases.
	15	L	The sequencing attribute is collated low to high.
D	1	D	Card Type Identification
	3-14	OPFAC	The name of the attribute to be displayed.
	17-28	NOCAS	The name of the attribute to be displayed.
	31-42	IDLOC	"
	45-56	OCCUR	"
	59-70	BOX	"
E	1	E	Card Type Identification
	3-5	CRE	Tells FDM that the update operation is to add a new entity record to the output file. Since the attribute values of the new records are exactly the same as the values on the transaction file, CRE is the only explicit operation specified.
	10-12	FOR	A linking phrase. The file was created exactly as it came from the USERRD routine. Therefore we have specified no criterion
	16-27	NOMASTER	The only keyword recognized for CRE.
F			None used since it was not necessary to define intermediate attributes.

FORTRAN subroutine USERRD is used by FDM to read the values of attributes from data cards. These values are used by FDM to update or create a file record. Figure 2 is a hard copy of the USERRD.. Figure 3[1/] is the flow chart for USERRD and Figure 4[2/] is an example of the function of the read

[1/] Ibid., p. 83.

[2/] Ibid. p. 82

routine. Figure 5[1/] gives the deck sequence necessary for an FDM run. For a complete explanation of USERRD, the user should study pp. 79-84 of the FDM manual. A brief discussion of the routine follows:

NCOND and NSTAT are flags for passing information between FDM and USERRD. NCOND is set by FDM and indicates: 1 to open file; 2 for moving a record, or 3 to close file. Initially NCOND is set to one. NSTAT is set by USERRD as follows: 1 for normal return, -2 for end of file, or -3 for read error. IA is the data and position array, and LEN is the length of the IA array. NSTAT is set to one initially by USERRD. NOENT counts the number of entities processed, and is used only in card 39 of USERRD.

The function of each statement of USERRD should be clear to users having a working knowledge of FORTRAN. Thus only a few sections of the code will be discussed. Cards 9-12 pass the IA array to FDM informing FDM how many words of the IA array each variable will occupy when filled by the read statements. The numbers filling IA should correspond to reading down column 27 of the B-cards. Cards 16-27 fill the IA array with the attributes of a particular entity. Cards 31-33 close the file after all the entities are processed. Cards 34-41 are used to print one of two types of messages indicating normal or abnormal termination of processing.

As stated above, if the number of attributes is to be changed for the entity CASE, certain changes must be made to USERRD. First, the DIMENSION statement should reflect the number of attributes of the entity. Second, LEN should equal the number to which IA is dimensioned. Third, the read statements and their associated FORMAT statements should be changed to read the proper number of attributes.

1/ Ibid. p. 70

If the field size of an attribute is changed, the FORMAT statement associated with reading the attribute should reflect that change. Also Columns 20-21 of the B card for that attribute should be changed.

QUICK QUERY

FDM

FILE DEFINITION & MAINTENANCE

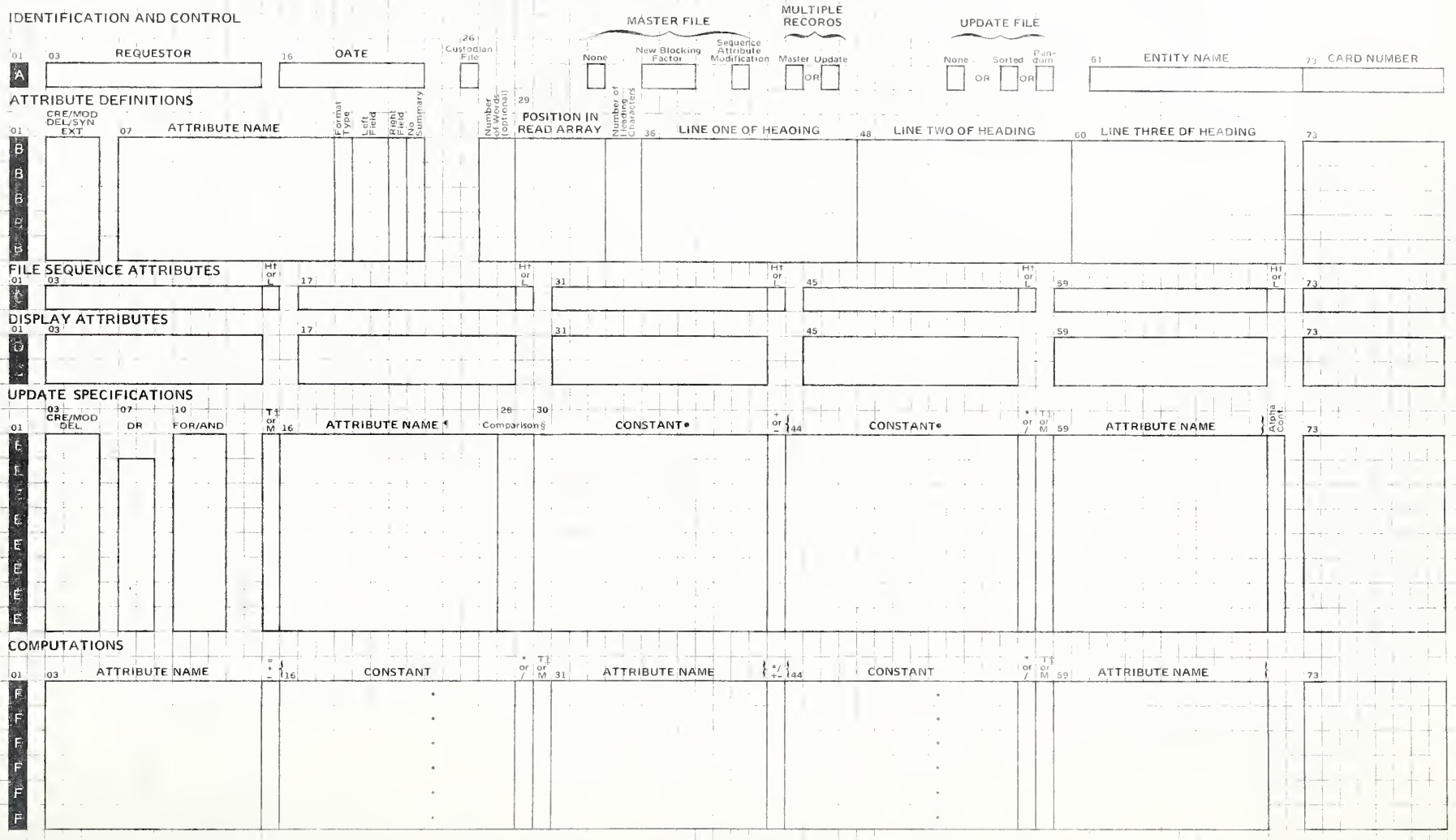


Figure 1 - Standard FDM Form

† {H: Sorted high to low / L: Sorted low to high}

‡ {T: Transaction file attribute / M: Master file attribute}

§ Comparison operators {GE (greater than or equal) / GR (greater than) / EQ (equal) / NE (not equal) / LE (less than or equal) / LS (less than) / IS (alphanumeric equal) / SN (alphanumeric not equal)}

¶ Allowable key words {ALL / NOUPDATE / EQMATCH / NOMASTER}

C.A.C.I.

```
00101     1*          SUBROUTINE USERRD (NCOND,NSTAT,IA,LEN)
00103     2*          DIMENSION IA(67)
00104     3*          NSTAT=1
00105     4*          GO TO (100,200,300),NCOND
00105     5*    C
00105     6*    C     OPEN FILE
00105     7*    C
00106     8*      100 NOENT=0
00107     9*          LEN=67
00110    10*          DO 101 I=1,LEN
00113    11*      101 IA(I)=I
00115    12*          RETURN
00115    13*    C
00115    14*    C     READ ENTITY
00115    15*    C
00116    16*      200 READ (7,201,END=302,ERR=304) (IA(I),I=1,22)
00124    17*      201 FORMAT (3F5.0,F3.0,F8.4,F5.0,F1.0,2F2.0,F6.2,F2.0,F5.0,F7.2,6F5.0,
00124    18*         1F2.0,F6.0,F6.4)
00125    19*          READ (7,202,END=302,ERR=304) (IA(I),I=23,42)
00133    20*      202 FORMAT (F5.0,F10.0,4F8.2,F5.0,F2.0,F3.0,2F1.0,F10.2,F1.0,2F2.0,
00133    21*         15F8.4)
00134    22*          READ (7,203,END=302,ERR=304) (IA(I),I=43,62)
```


Figure 2 - USERRD

```
00142    23*      203 FORMAT (5(F2.0,F6.4,F4.2,F3.0))
00143    24*          READ (7,204,END=302,ERR=304) (IA(I),I=63,67)
00151    25*      204 FORMAT (5F3.0)
00152    26*          NOENT=NOENT+1
00153    27*          RETURN
00153    28*    C
00153    29*    C     CLOSE FILE
00153    30*    C
00154    31*      300 WRITE (6,301) NOENT
00157    32*      301 FORMAT ('0',3X,'FILE CLOSED',T32,I5,' ENTITIES PROCESSED')
00160    33*          RETURN
00161    34*      302 NSTAT=-2
00162    35*          WRITE (6,303)
00164    36*      303 FORMAT ('0',3X,'END OF FILE')
00165    37*          RETURN
00166    38*      304 NSTAT=-3
00167    39*          WRITE (6,305) NOENT
00172    40*      305 FORMAT ('0***PROCESSING ABORTED***',6X,I5,' ENTITIES PROCESSED')
00173    41*          RETURN
00174    42*          END
```

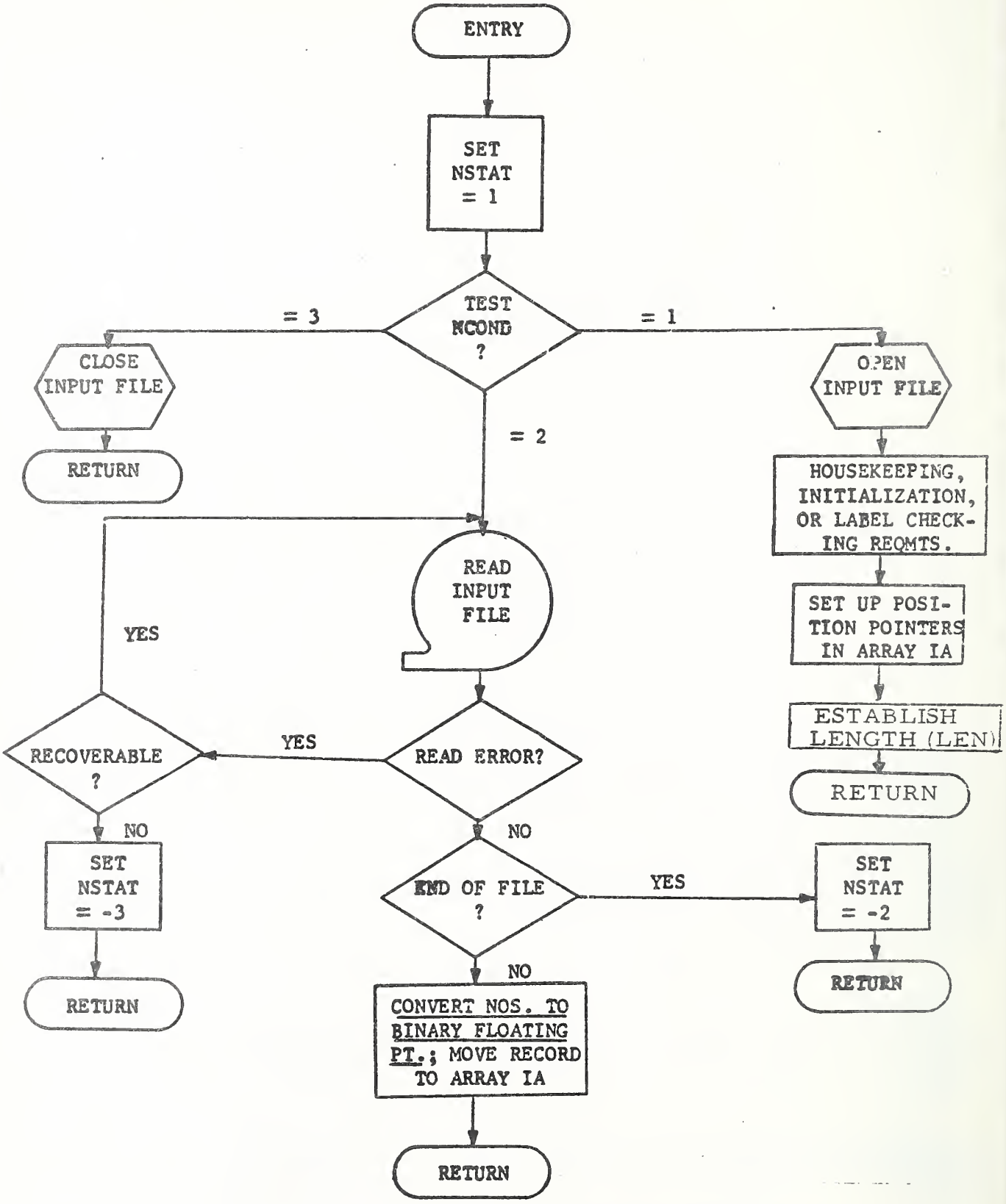


Figure 3 Flow Chart For a Read Routine

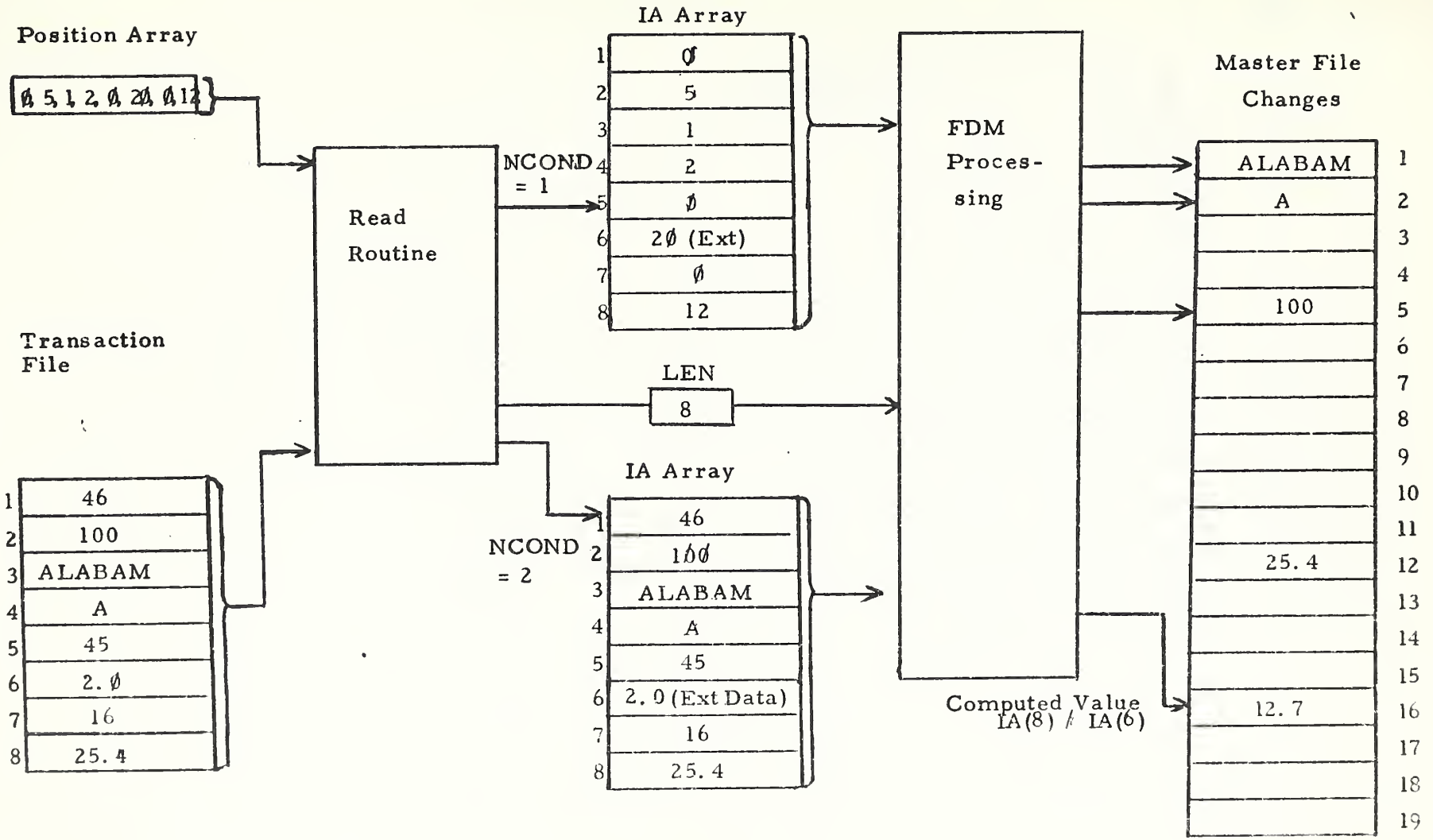


FIGURE 4

A Comprehensive Example of the Function of the Read Routine

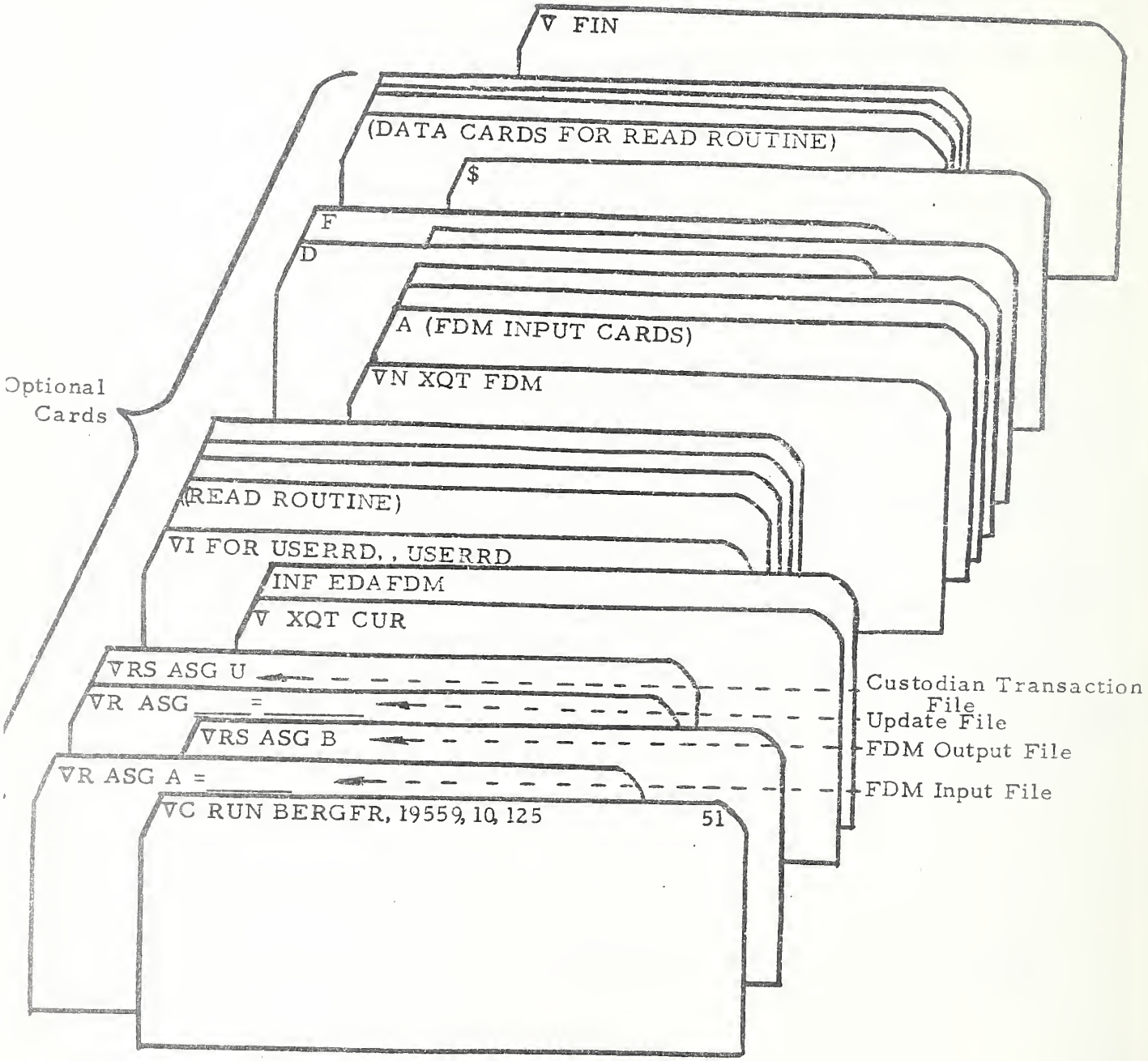


Figure 5
Deck Setup

```
IDENTIFICATION AND CONTROL
                    A CUMMINGS L K 12-15-70          X   29                    X     CASE

ATTRIBUTE DEFINITIONS
                    B CRE SEQNO        I 5 X    1    1 6                  SEQ          NO
                    B CRE OPFAC        I 5 X    1    2 6                  STA         -TION
                    B CRE NOCAS        I 5 X    1    3 6                 CASE          NO
                    B CRE IDLOC        I 3 X    1    4 7                  DIS         -TRICT
                    B CRE OCCUR        D 34X    1    5 9  TIME OF       OCCURR        -ENCE
                         o
                         o
                         o
                    B CRE RESA3        I 3 X    1   54 9  1ST RES      TO SERVE      NEED 3
                    B CRE NEED4        I 2 X    1   55 5   MR          NEED           4
                    B CRE OST4         D 44     1   5610  ON-SCENE     -TIME FOR     NEED 4
                    B CRE DELTA4       D 32     1   57 7                            DELTA
                    B CRE RESA4        I 3 X    1   58 9  1ST RES      TO SERVE      NEED 4
                    B CRE NEED5        I 2 X    1   59 5   MR          NEED           5
                    B CRE OST5         D 44     1   6010  ON-SCENE     -TIME FOR      NEED 5
                    B CRE DELTA5       D 32     1   61 7                            DELTA
                    B CRE RESA5        I 3 X    1   62 9  1ST RES      TO SERVE      NEED 5
                    B CRE RESA6        I 3 X    1   6311 1ST RES TO   SERVE NEED  1 (SEARCH)
                    B CRE RESA7        I 3 X    1   6411 1ST RES TO   SERVE NEED  2 (SEARCH)
                    B CRE RESA8        I 3 X    1   6511 1ST RES TO   SERVE NEED  3 (SEARCH)
                    B CRE RESA9        I 3 X    1   6611 1ST RES TO   SERVE NEED  4 (SEARCH)
                    B CRE RESA10       I 3 X    1   6711 1ST RES TO   SERVE NEED  5 (SEARCH)

FILE SEQUENCE ATTRIBUTES
                    C SEQNO       L

DISPLAY ATTRIBUTES
                    D OPFAC          NOCAS          IDLOC          OCCUR          BOX
                    D FPRI           MMM            NNN            GAMMA          NEED0
                    D AIP            OFSHR

UPDATE SPECIFICATIONS
                    E CRE     FOR    NOMASTER
```

Figure 6 - EDM Computer Printout

B. Quick Query

The Quick Query Program (QQP) is used in SARSIM to access and display case data which is input to or output from a simulation run. The first use of QQP in SARSIM is to display all attributes of each case and to derive cross cases statistics for each of these attributes. The second use is to compute cross case statistics where the only cases considered satisfy particular attribute selection criteria. These two uses will be described separately and more completely below.

The QQP manual[1/] contains more complete and detailed information than the following explanation and should be consulted before any major changes are made to the QQP. Since QQP passively accesses an existing file structure, all information used in building a QQP program should be compatible with the information used by FDM to build that file.

A QQP program may contain eleven types of control cards labeled A through K and a special report generator section. The special report generator option was not used in SARSIM, as the standard QQP output format satisfied the project's needs.

1. General application of QQP. This section describes the use of QQP for displaying and computing cross case statistics for attributes of all cases in a simulation run. Because the total field width of all attributes is so large, it was necessary to write five batch processed QQ programs to properly display the attributes by computer printout. Copies of programs one through five are shown in Figures 7 through 11

1/ Consolidated Analysis Centers Inc.,"Quick Query User's Manual for Economic Development Administration". January 1970

respectively. Part of the summary statistics for program one is displayed in Figure 12. An example of part of the output of programs one through five is shown in Figures 13 through 17. Figures 18 and 19 are standard QQP forms. With reference to Figures 7, 18, 19, the reader can comprehend the following chart easily. This chart contains an explanation only for program one; the others are very similar. Only the first D-card in each program will be explained as the other D-cards are filled in exactly the same manner.

CARD TYPE	COLUMN	ENTRY	EXPLANATION
A	1	A	Card Type Identification
	3-14	Cummings LK	User Identification
	17-28	TAD	Organization of User
	31-54	Demand Tape Analysis	Report Identification
	59-70	CASE	File Name as defined in FDM
B	1	B	Card Type Identification
	35	S	Requested for Summary Statistics (Mean, Standard Deviation, Sum, Minimum, Maximum) of each attribute defined on a D-card.
C	1	C	Card Type Identification
	3-67	Demand Tape Analysis	Free form heading that will appear above QQP output.
D	1	D	Card Type Identification
	4-15	SEQNO	An attribute of CASE to be displayed. This is also the attribute we use for sequencing the cases.

CARD TYPE	COLUMN	ENTRY	EXPLANATION
E	1	E	Card Type Identification
	4-15	SEQNO	The attribute of CASE that we use for sequencing.
	16	L	Informs QQP the user wishes Low-to-High sequencing.

Figure 20 shows the deck sequence necessary to run the batch processed program just mentioned.

2. Special Requests Using QQP. This section describes the use of QQP for computing cross case statistics where the only cases included in the computation are those that possess attributes satisfying certain selection criteria. Because each request has its own unique set of selection criteria, a separate program must be written for each query. Special request programs one through eight appear in Figures 21 through 28 respectively. Since cards A, B and E are exactly the same for programs one through eight, they will only be discussed for program one. Card type C will be discussed for program one since it is of free form and is used only for a header. Card D merely labels the attribute computed by the G cards for display and only need be discussed for the first program. The F and G cards differ for each of the eight special request programs and will be explained separately. For clarity and completeness, the discussion of these two card types will be different from the way card types A through E were described.

CARD TYPE	COLUMN	ENTRY	EXPLANATION
A	1	A	Card Type Identification
	3-14	Elliott WH	User Identification

CARD TYPE	COLUMN	ENTRY	EXPLANATION
	17-28	TAD	Organization of user.
	31-54	Selected Case Analysis	Report Identification
	59-70	CASE	File name as defined in FDM.
B	1	B	Card Type Identification
	33	D	Request to display all attributes listed on D cards.
C	1	C	Card type Identification
	3-67	Cross Case Analysis..	Free form heading that will appear above QQP output.
D	1	D	Card Type Identification
	4-15	PCTONE	A temporary attribute to be displayed. The value of this attribute is computed by the G-cards.
E	1	E	Card Type Identification
	4-15	Box	The name of the part sequencing attribute. Since it has a value of zero for all cases, we will get subtotaling only after all cases have been processed. This is a key to the method employed to get the percentage of cases that fit certain criterion.
	16	L	Sequence is Low-to-High
	17	P	Skip to top of next page after each subtotaling activity.
	18	S	Provide subtotals for all attributes on D cards when the sort sequence number changes value.

The purpose of program one, Figure 21, is to compute the percent of cases with the initial priority, FPRI, greater than or equal to three where the case was not served within tolerance. Symbolically, we state the conditions as: (ITOL = 0) $\wedge$ (FPRI $\geq$ 3). This is exactly what is coded on the two F cards. The simulation run for which these special requests were made had 881 cases. The reciprocal of this number is approximately 0.001135. Thus, to compute the desired percentage all that need be done is to find the number of cases satisfying the given requirements and multiply this number by 0.1135.

Let Z equal the number of cases that satisfy the selection criterion. The following equations yield the desired percentage:

$$\% = (Z/881) \times 100 = Z \times (0.001135) \times 100 = Z \times (0.1135)$$

By placing PCTONE = 0.1135 on the G card and requesting a subtotal for only this temporary attribute and by subtotaling across only those cases that satisfy the selection criteria, we compute the desired statistic.

The purpose of program two, Figure 22, is to compute the percentage of cases with the first priority equal to one is where the case was not served within tolerance. Symbolically this is stated as:

(FPRI = 1) $\wedge$ (ITOL = 0).

These selection conditions are found on the two F cards. The remainder of the program is exactly the same as program one with the exception that PCTTWO is substituted for PCTONE.

The purpose of program three, Figure 23, is to compute the average time to vector to a case. To do this (TWAIT-TQUE1)/881 is computed for each case, and then a subtotal is requested of this temporary

attribute. Since no F cards appear in this program, by default all cases are considered to have passed the selection criterion.

Program four, Figure 24, was designed to compute the average time a case must wait between its arrival into the system and the time when the first resource reaches the case. By computing (TWAIT/881) for each case and then summing these temporary attributes, the required percentage is derived. In this program no F cards are used so all cases are included in the calculation.

Program five, Figure 25, computes the percentage of cases with the number of tows, MMM, greater than zero. The selection criterion is on the F card and the temporary attribute, MGRZ, used for sub-totaling, is on the G card. The reason MGRZ equals 0.1135 has been previously explained.

The purpose of program six, Figure 26, is to compute the percentage of cases with the number of tows greater than zero and the number of non-tow needs equal to zero. Symbolically stated the selection criterion is:
$(MMM \geq 0) \wedge (NNN = 0)$. This criterion is coded on the F cards. The G card has been previously explained.

Program seven, Figure 27, computes a cross case statistic under more complicated selection criterion than before. This request is for the percentage of long search cases, completed in the simulation. Symbolically the criterion is stated:
$[(RESA6 > 0) \vee (RESA7 > 0) \vee (RESA8 > 0) \vee (RESA9 > 0) \vee (RESA10 > 0)]$

Λ[S1S = -1] Λ [TSM > 0]. Since a logical OR is dominant over a logical AND, for conciseness it is necessary to define a temporary attribute called TEMP. If at least one of the RESA6 through RESA10 is greater than zero, TEMP is considered to be TRUE because of the way it is defined on the F cards. Thus the selection criterion is reduced to:
(TEMP = TRUE) Λ (S1S = -1) Λ (TSM > 0). This criterion is coded on the F cards. The G card has been previously explained.

Program eight, Figure 28, is very similar to program seven and can be used to find the percentage of cases with a short search. In this program, however RESA(I) must equal zero for all I = 6, 7, 8, 9, 10. Symbolically written the criteria is:
(RESA6=0) Λ (RESA7=0) Λ (RESA8=0) Λ (RESA9 = 0) Λ (RESA10=0) Λ (TSM>0). These conditions are coded in the F cards. The G card has been previously described.

Figure 20 contains the deck sequence necessary for batch processing this group of special requests.

LISTING OF QUERY INPUT CARDS

```
         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

A CUMMINGS L K  TAD            DEMAND TAPE ANALYSIS        CASE

B                                    S

C DEMAND TAPE ANALYSIS

D  SEQNO
D  OPFAC
D  NOCAS
D  IDLOC
D  OCCUR
D  BOX
D  FPRI
D  MMM
D  NNN
D  GAMMA
D  NEEDO
D  AIR
D  OFSHR
D  VIS
D  WIND
D  SWELL
D  L

E  SEQNO       L
```

FIGURE 7: Program 1 of 5 Batch Processed QQ Programs

```
QUICK QUERY    CUMMINGS L K  TAD          DEMAND TAPE ANALYSIS        CASE            DECEMBER 14, 1970    19:30:24    PAGE:

                                LISTING OF QUERY INPUT CARDS

         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

A CUMMINGS L K  TAD           DEMAND TAPE ANALYSIS        CASE

B                                    S

C DEMAND TAPE ANALYSIS

D  SEQNO
D  POB
D  S1S
D  S2S
D  TSM
D  OSTO
D  UTYPE
D  VALUE
D  XCX
D  YCY
D  XC
D  YC
D  STATN

E  SEQNO       L
```

FIGURE 8: Program 2 of 5 Batch Processed QQ Programs

LISTING OF QUERY INPUT CARDS

```
         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

A CUMMINGS L K  TAD            DEMAND TAPE ANALYSIS        CASE

B                                    S

C DEMAND TAPE ANALYSIS

D  SEQNO
D  CNRES
D  RESAD
D  PRI
D  REA
D  COSTC
D  ITOL
D  NOINT
D  NQUE
D  TINT
D  TQUE
D  TQUE1
D  TSVC

E  SEQNO       L
```

FIGURE 9: Program 3 of 5 Batch Processed QQ Programs

LISTING OF QUERY INPUT CARDS

```
         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

A CUMMINGS L K  TAD            DEMAND TAPE ANALYSIS        CASE

B                                    S

C DEMAND TAPE ANALYSIS

D  SEQNO
D  TWAIT
D  NEED1
D  OST1
D  DELTA1
D  RESA1
D  NEED2
D  OST2
D  DELTA2
D  RESA2
D  NEED3
D  OST3
D  DELTA3
D  RESA3
D  NEED4

E  SEQNO       L
```

FIGURE 10: Program 4 of 5 Batch Processed QQ Programs

LISTING OF QUERY INPUT CARDS

```
         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

A CUMMINGS L K  TAD            DEMAND TAPE ANALYSIS        CASE

B                                    S

C DEMAND TAPE ANALYSIS

D  SEQNO
D  OST4
D  DELTA4
D  RESA4
D  NEEDS
D  OST5
D  DELTA5
D  RESA5
D  RESA6
D  RESA7
D  RESA8
D  RESA9
D  RESA10

E  SEQNO        L
```

FIGURE 11: Program 5 of 5 Batch Processed QQ Programs

STATISTICS

ATTRIBUTE	SUM	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1ST PRIOR -ITY	1422	1.614075	1.000000	1	5
NO OF TONS	654	.742338	.000000	0	2
NO OF NEEDS	441	.500568	1.000000	0	16
GAMMA	7.950000	.009024	.000000	.000000	.990000
AIR TEMP	64746	73.491487	7.810250	48	99
MILES OFF -SHORE	3987.544800	4.526157	24.166092	.000000	470.000000
VIS -IBIL -ITY	6464	7.337117	10.862780	0	99
WIND	7325	8.314415	5.916080	0	46
SEA SMELL	1057	1.199773	2.000000	0	50
LENGTH OF UNIT	21864	24.817253	15.329710	0	201

FIGURE 12: Summary Statistics From Program 1

DEMAND TAPE ANALYSIS

SEQ NO	STATION	CASE NO	DISTRICT	TIME OF OCCURRENCE	TYPE OF DAY	1ST PRIORITY	NO OF TOWS	NO OF NEEDS	GAMMA	SR NEED	AIR TEMP	MILES OFF SHORE	VISIBILITY	WIND	SEA SWELL	LENGTH OF UNIT
1	53	20001	1	.2299	0	1	1	0	.00	15	68	8.00	6	5	3	44
2	48	20001	1	.4861	0	4	1	0	.00	15	88	8.00	8	5	1	24
3	4	20001	1	.3979	0	5	0	1	.00	14	83	20.00	10	10	2	0
4	52	20001	1	.5382	0	1	0	1	.00	14	96	.30	4	2	1	13
5	57	20001	1	.6736	0	1	0	1	.00	7	92	.30	6	10	1	46
6	39	30001	1	.7153	0	1	2	0	.00	0	75	.25	6	5	0	23
7	52	20002	1	.7118	0	4	1	0	.00	15	92	.30	8	10	1	12
8	57	20002	1	.7583	0	2	0	1	.00	14	92	.30	6	15	1	0
9	41	20001	1	.7826	0	4	0	1	.00	14	88	.30	8	15	4	0
10	47	20001	1	.8194	0	1	1	0	.00	15	86	.30	5	1	1	20
11	50	40001	1	.8021	0	1	0	2	.00	0	70	.30	3	6	1	24
12	46	20009	1	.7431	0	1	1	0	.00	15	68	3.00	4	10	1	45
13	37	10001	1	.9896	0	1	0	3	.00	0	73	.30	10	8	2	22
14	39	10002	1	1.2465	0	1	1	3	.00	0	75	3.00	6	10	0	34
15	33	20001	1	1.3819	0	1	0	1	.00	14	78	.30	5	5	0	26
16	43	20001	1	1.4708	0	1	1	0	.00	15	68	.30	5	6	1	12
17	52	20004	1	1.5069	0	1	1	0	.00	15	96	.30	10	10	1	24
18	42	20001	1	1.5625	0	1	1	0	.00	15	91	.30	6	10	0	23
19	46	20001	1	1.3958	0	1	1	0	.00	15	90	.30	1	20	5	34
20	52	20005	1	1.5868	0	1	1	0	.00	15	90	.30	7	15	1	24
21	42	20002	1	1.6014	0	2	0	1	.00	11	92	.30	6	8	0	34
22	57	20003	1	1.6181	0	1	1	0	.00	15	89	.00	10	15	1	33
23	58	20001	1	1.6389	0	1	1	0	.00	15	80	.30	8	10	1	34
24	43	20002	1	1.7222	0	1	1	0	.00	15	73	.30	4	12	2	34
25	62	20001	1	1.6771	0	1	1	0	.00	15	80	3.00	5	5	1	36
26	44	20001	1	1.8229	0	5	0	1	.00	14	75	.30	3	10	3	0
27	39	20003	1	1.8507	0	1	1	0	.00	15	76	3.00	18	0	0	24
28	44	20002	1	1.8750	0	1	0	1	.00	14	75	3.00	3	10	3	26
29	47	20004	1	1.9687	0	1	1	0	.00	15	70	.30	7	10	2	34
30	47	20005	1	1.9722	0	1	1	0	.00	15	70	.30	7	10	2	14
31	62	20002	1	2.0187	0	2	1	0	.00	15	60	.30	3	10	1	36
32	62	20003	1	2.0118	0	2	0	1	.00	14	80	.30	8	10	1	30
33	47	10261	1	.0007	0	5	1	0	.00	15	55	315.00	0	20	3	0

FIGURE 13: Partial Output of Program 1

DEMAND TAPE ANALYSIS

SEQ NO	PEOPLE ON BOARD	PARALLEL LONG SEARCH RESOURCES	SHORT SEARCH CODE	TOTAL SEARCH MILES	ON-SCENE -TIME FOR SR CASE	TYPE OF UNIT	VALUE OF UNIT	ORIG -INAL X	ORIG -INAL Y	X	Y	STATION RECEIVING CALL
1	4	0	0	0	.0237	4	40000	-64.00	-65.00	-67.00	-67.00	30
2	4	0	0	0	.0235	4	6000	-33.00	24.00	-34.00	27.00	45
3	1	-1	0	99	.0000	61	130001	2.00	2.00	2.00	2.00	47
4	6	0	0	0	.0167	3	2000	-38.00	-11.00	-38.00	-11.00	10
5	2	0	0	0	.0417	4	15000	-31.00	-20.00	-31.00	-20.00	11
6	3	0	0	0	.0000	3	2000	-42.00	-9.00	-41.00	-12.00	10
7	2	0	0	0	.0365	3	600	-42.00	-5.00	-46.00	-9.00	3
8	0	0	1	4	.0167	70	0	-29.00	-24.00	-29.00	-24.00	11
9	0	0	0	0	.0000	70	0	-2.00	-76.00	-2.00	-76.00	16
10	0	0	0	0	.0070	8	15000	-29.00	6.00	-29.00	6.00	47
11	2	-1	0	8	.0000	2	3000	-4.00	77.00	-4.00	77.00	41
12	7	0	0	0	.3258	4	130001	2.00	2.00	-30.00	-59.00	14
13	1	-1	0	84	.0000	2	2000	-39.00	1.00	-39.00	1.00	24
14	2	-1	0	66	.0000	11	9000	-30.00	-6.00	-31.00	1.00	24
15	2	0	1	6	.0208	4	15000	-59.00	-49.00	-59.00	-49.00	27
16	2	0	0	0	.0186	2	1300	-59.00	-61.00	-61.00	-62.00	28
17	3	0	1	6	.0539	3	3000	-36.00	-12.00	-41.00	-12.00	10
18	2	0	0	0	.0144	4	3000	-22.00	-43.00	-23.00	-44.00	23
19	2	-1	0	20	.0818	11	5000	-22.00	-75.00	-37.00	-69.00	25
20	1	0	0	0	.0217	3	1000	-39.00	-10.00	-41.00	-12.00	10
21	4	0	0	0	.0125	2	18000	-25.00	-45.00	-25.00	-45.00	23
22	7	0	0	0	.0173	4	2500	-31.00	-21.00	-33.00	-20.00	11
23	1	0	0	0	.0173	11	4000	17.00	78.00	16.00	80.00	39
24	4	0	0	0	.0173	4	2800	-59.00	-61.00	-61.00	-62.00	28
25	2	0	0	0	.0509	11	12000	-40.00	-60.00	-37.00	-69.00	25
26	0	-1	0	24	.0167	70	0	-13.00	-54.00	-13.00	-54.00	7
27	5	0	1	4	.0424	4	4500	-42.00	-8.00	-46.00	-9.00	3
28	4	0	0	0	.0000	4	5000	-27.00	-75.00	-27.00	-75.00	16
29	2	0	0	0	.0261	4	12000	-30.00	10.00	-29.00	6.00	47
30	1	0	0	0	.0285	1	50	-30.00	10.00	-29.00	6.00	47
31	4	0	0	0	.0116	2	5000	-31.00	-59.00	-30.00	-59.00	14
32	0	0	0	0	.0167	4	15000	-24.00	-63.00	-24.00	-63.00	14
33	0	0	0	0	.4219	70	60000	292.00	-83.00	134.00	138.00	33
34	3	0	0	0	.0497	4	3000	-69.00	-76.00	-67.00	-67.00	30

FIGURE 14: Partial Output of Program 1

DEMAND TAPE ANALYSIS

SEQ NO	RESOURCES SERVING CASE	1ST RES TO SERVE SR CASE	FINAL PRIOR -ITY	1ST REASON IN QUE	TOTAL COST	TOLER -ANCE CODE	NO OF INTER -RUPTS	NO OF TIMES IN QUE	TIME IN INTER -RUPT	TIME IN QUE	TIME IN QUE BEFORE 1ST ARRIVAL	TIME IN SYSTEM
1	1	73	1	2	3.08	1	0	0	.0000	.0000	.0000	.0320
2	1	102	4	2	2.70	1	0	0	.0000	.0000	.0000	.0308
3	2	11	5	2	573.00	0	0	0	.0000	.0000	.0000	.1239
4	1	35	1	2	2.70	1	0	0	.0000	.0000	.0000	.0240
5	1	40	1	2	1.71	1	0	0	.0000	.0000	.0000	.0463
6	2	35	1	2	4.04	1	0	0	.0000	.0000	.0000	.0414
7	1	7	4	2	4.82	1	0	0	.0000	.0000	.0000	.0495
8	1	42	5	2	6.95	1	0	0	.0000	.0000	.0000	.0335
9	1	52	4	2	3.81	1	0	0	.0000	.0000	.0000	.0110
10	1	109	1	2	.00	1	0	0	.0000	.0000	.0000	.0070
11	3	92	1	2	27.57	1	0	0	.0000	.0000	.0000	.1140
12	1	47	1	2	58.77	1	0	0	.0000	.0000	.0000	.4852
13	4	63	1	2	127.31	1	0	0	.0000	.0000	.0000	.3457
14	5	12	1	2	643.50	1	0	0	.0000	.0000	.0000	.1478
15	1	68	5	2	11.22	1	0	0	.0000	.0000	.0000	.0513
16	1	68	1	2	1.91	1	0	0	.0000	.0000	.0000	.0238
17	1	35	5	2	4.27	1	0	0	.0000	.0000	.0000	.0654
18	1	61	1	2	1.27	1	0	0	.0000	.0000	.0000	.0180
19	2	65	1	2	54.23	1	0	0	.0000	.0000	.0000	.2131
20	1	35	1	2	2.41	1	0	0	.0000	.0000	.0000	.0283
21	1	61	1	2	2.01	1	0	0	.0000	.0000	.0000	.0183
22	1	40	1	2	1.91	1	0	0	.0000	.0000	.0000	.0225
23	1	88	1	2	2.01	1	0	0	.0000	.0000	.0000	.0232
24	1	69	1	2	2.01	1	0	0	.0000	.0000	.0000	.0232
25	1	65	1	2	11.65	1	0	0	.0000	.0000	.0000	.0791
26	2	12	4	2	124.44	1	0	0	.0000	.0000	.0000	.0774
27	1	7	5	2	3.52	1	0	0	.0000	.0000	.0000	.0519
28	1	52	1	2	19.84	1	0	0	.0000	.0000	.0000	.0575
29	1	107	1	2	3.70	1	0	0	.0000	.0000	.0000	.0368
30	1	106	1	2	3.52	1	0	0	.0000	.0000	.0000	.0380
31	1	48	2	2	.90	1	0	0	.0000	.0000	.0000	.0142
32	1	47	1	2	6.15	1	0	0	.0000	.0000	.0000	.0334
33	1	80	5	2	430.25	0	0	0	.0000	.0000	.0000	2.0625

FIGURE 15: Partial Output of Program 1

DEMAND TAPE ANALYSIS

SEQ NO	WAIT-TIME FOR 1ST ARRIVAL	MR NEED 1	ON-SCENE -TIME FOR NEED 1	DELTA	1ST RES TO SERVE NEED 1	MR NEED 2	ON-SCENE -TIME FOR NEED 2	DELTA	1ST RES TO SERVE NEED 2	MR NEED 3	ON-SCENE -TIME FOR NEED 3	DELTA	1ST RES TO SERVE NEED 3	MR NEED 4
1	.0083	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
2	.0073	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
3	.0231	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
4	.0073	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
5	.0046	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
6	.0073	15	.0152	.00	35	15	.0152	.00	34	0	.0000	.00	0	0
7	.0131	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
8	.0168	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
9	.0110	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
10	.0000	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
11	.0229	14	.0625	.00	92	18	.0375	.00	93	0	.0000	.00	0	0
12	.1594	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
13	.0208	14	.0000	.00	63	14	.0042	.00	106	14	.0000	.99	107	0
14	.0157	14	.0000	.00	55	14	.0000	.99	59	18	.0000	.99	12	15
15	.0304	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
16	.0052	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
17	.0116	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
18	.0037	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
19	.0481	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
20	.0065	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
21	.0058	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
22	.0052	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
23	.0058	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
24	.0058	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
25	.0282	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
26	.0134	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
27	.0095	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
28	.0575	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
29	.0107	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
30	.0095	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
31	.0026	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0
32	.0167	0	.0000	.00	0	0	.0000	.00	0	0	.0000	.00	0	0

FIGURE 16: Partial Output of Program 1

DEMAND TAPE ANALYSIS

SEQ NO	ON-SCENE -TIME FOR NEED 4	DELTA	1ST RES TO SERVE NEED 4	NR NEED 5	ON-SCENE -TIME FOR NEED 5	DELTA	1ST RES TO SERVE NEED 5	1ST RES TO SERVE NEED 1 (SEARCH)	1ST RES TO SERVE NEED 2 (SEARCH)	1ST RES TO SERVE NEED 3 (SEARCH)	1ST RES TO SERVE NEED 4 (SEARCH)	1ST RES T SERVE NEE 5 (SEARCH
1	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
2	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
3	.0000	.00	0	0	.0000	.00	0	11	0	0	0	0
4	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
5	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
6	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
7	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
8	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
9	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
10	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
11	.0000	.00	0	0	.0000	.00	0	92	0	0	0	0
12	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
13	.0000	.00	0	0	.0000	.00	0	63	0	0	0	0
14	.0397	.00	59	0	.0000	.00	0	12	0	0	0	0
15	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
16	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
17	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
18	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
19	.0000	.00	0	0	.0000	.00	0	65	0	0	0	0
20	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
21	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
22	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
23	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
24	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
25	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
26	.0000	.00	0	0	.0000	.00	0	12	0	0	0	0
27	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
28	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
29	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
30	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
31	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0
32	.0000	.00	0	0	.0000	.00	0	0	0	0	0	0

FIGURE 17: Partial Output of Program 1

FORM ED-617

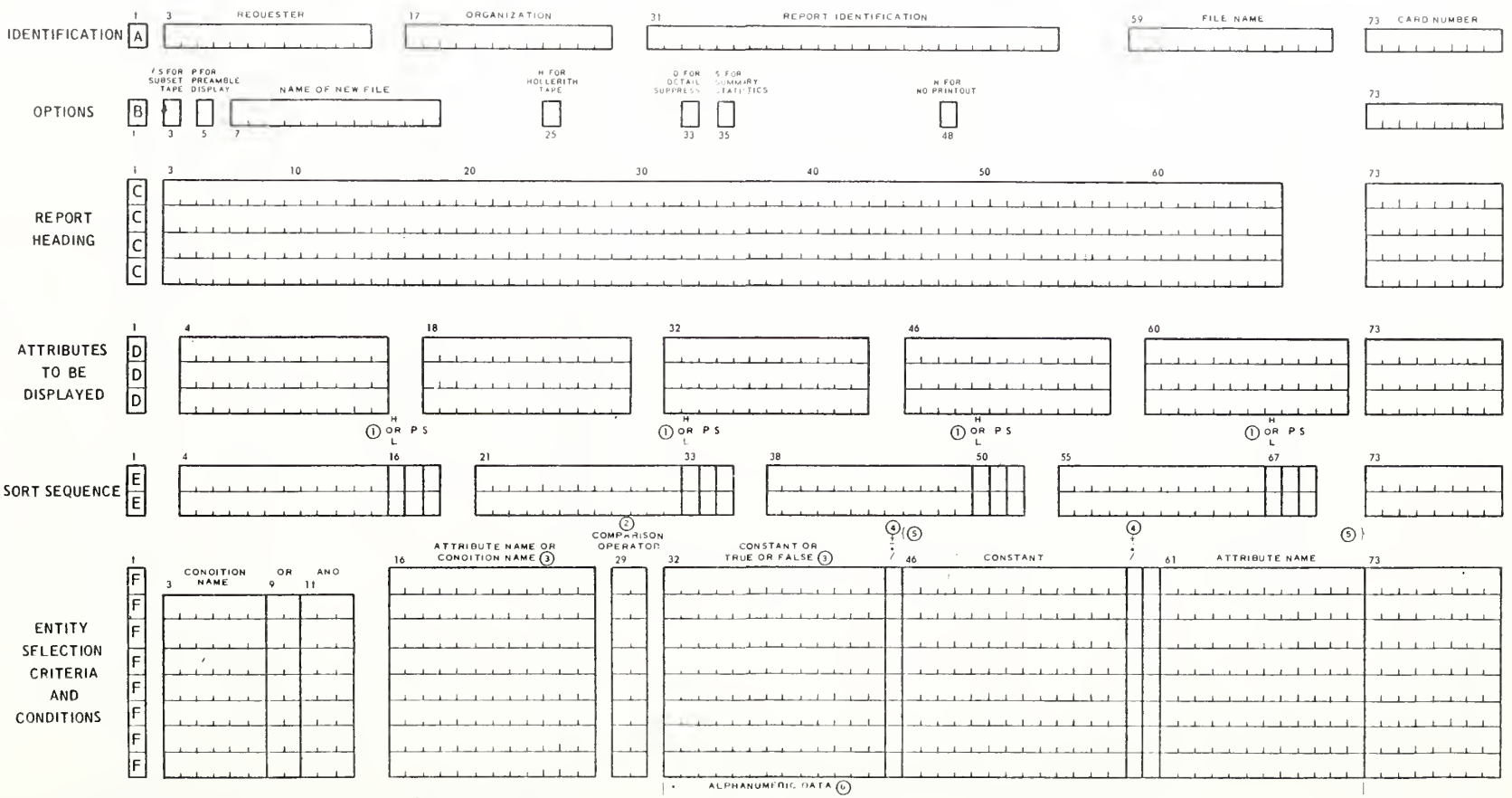
QUICK QUERY
SELECTION AND DISPLAY

U. S. DEPARTMENT OF COMMERCE
ECONOMIC DEVELOPMENT ADMINISTRATION

Q Q F 1

NAME _____

PAGE _____ OF _____



① H (Sort high to low)
L (Sort low to high)

P (Start new page whenever attribute value changes)

S (Provide subtotal whenever attribute value changes)

② Comparison operators:
GR (greater than)
GE (greater than or equal to)
EQ (equal to)
NE (not equal to)
LE (less than or equal to)
LS (less than)

③ If Condition Name starts in Column 16, insert TRUE or FALSE starting in Column 32

④ Arithmetic operators:
+ (add)
- (subtract)
· (multiply)
/ (divide)

⑤ Bracketed notations (Col. 46 thru Col. 72) are processed first

⑥ For alphanumeric data values only:
(a.) Insert asterisk, *, in Col. 32
(b.) Start alphanumeric data in Col. 33
(c.) Insert asterisk, *, after alphanumeric data which can extend thru Col. 71

Symbol standardization:
Ø for zero
O for letter O
Ƶ for letter Z
I for letter I
l for number 1

FIGURE 18

FORM ED-620

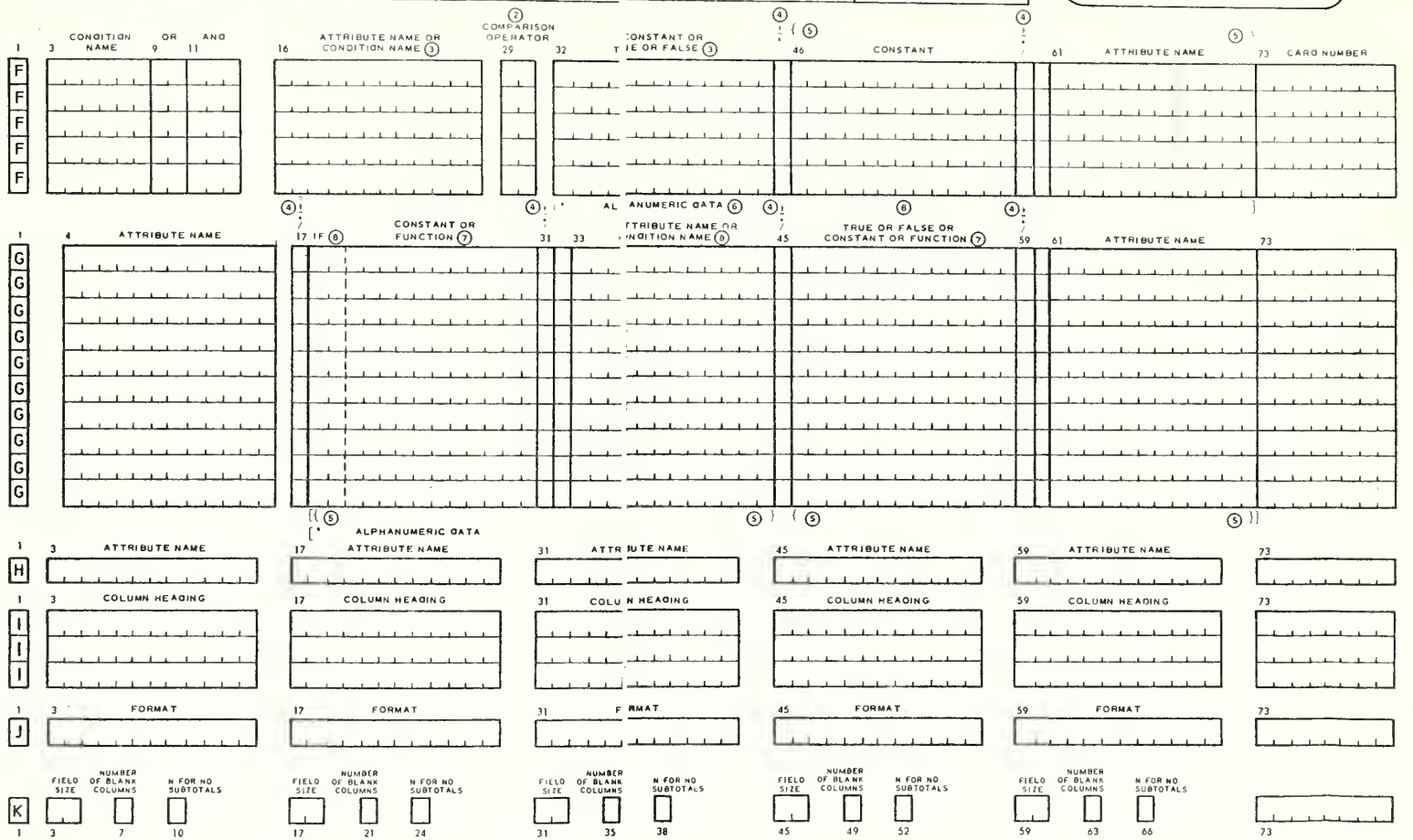
QUICK QUERY
COMPUTATIONS AND DEFINITIONS

U. S. DEPARTMENT OF COMMERCE
ECONOMIC DEVELOPMENT ADMINISTRATION

QQF 2

NAME _____

PAGE _____ OF _____



(2) Comparisan operators:
- GR (greater than)
- GE (greater than or equal ta)
- EQ (equal to)
- NE (nat equal ta)
- LE (less than ar equal ta)
- LS (less than)

(3) If Canditian Name starts in Column 16, insert TRUE or FALSE starting in Column 32

(4) Arithmetic operators:
- = (equal)
- + (add)
- * (multiply)
- - (subtract)
- / (divide)

(5) Brackets denate sequence of algebraic processing

(6) Far alphanumeric data values only:
- (a.) Insert asterisk, *, in Cal. 32
- (b.) Start alphanumeric data in Col. 33
- (c.) Insert asterisk, *, after alpha-numeric data which can extend thru Cal. 71

(7) Functions:
- LOG (Lag_{10})
- ANTILOG ($Antilag_{10}$)
- LN (Lag_e)
- EXP ($Antilog_e$)
- ABS (Absalute value)
- INT (Integer)
- SQRT (Square raot)

(8) Insert TRUE ar FALSE (starting in Cal. 46) if IF starts in Col. 18 and Canditian Name starts in Cal. 33

Symbal standardizatian
- 0 far zera
- O far letter O
- Z far letter Z
- I far letter I
- 1 far number 1

FIGURE 19

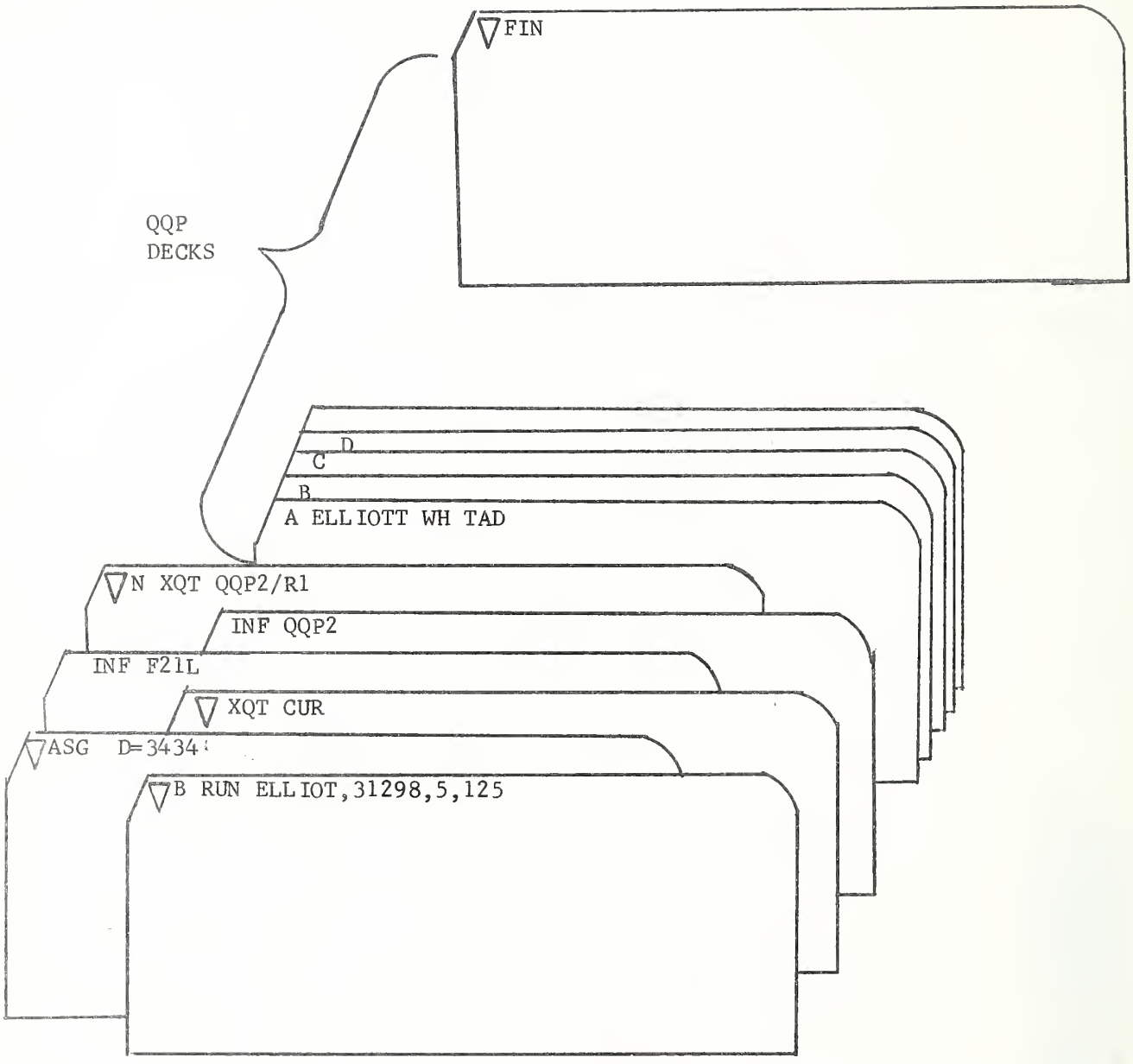


Figure 20

DECK SETUP FOR BATCH

PROCESSING QUICK QUERY JOBS

```
QUICK QUERY    ELLIOTT W H TAD              SELECTED CASE ANALYSIS      CASE              DECEMBER 29, 1970    12:50:57    PAGE

                                        LISTING OF QUERY INPUT CARDS

          1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

A ELLIOTT W H TAD              SELECTED CASE ANALYSIS      CASE

B                                    D

C CROSS CASE ANALYSIS FOR CASES WITH ITOL.EQ.0 AND FPRI.GE.3

D  PCTONE

E  BOX          LPS

F                ITOL          EQ 0
F          AND   FPRI          GE 3

G  PCTONE        =      .1135
```

```
QUICK QUERY    ELLIOTT W H TAD              SELECTED CASE ANALYSIS      CASE              DECEMBER 29, 1970    12:50:57    PAGE

CROSS CASE ANALYSIS FOR CASES WITH ITOL.EQ.0 AND FPRI.GE.3

PCTONE

        3.40
```

FIGURE 21: Program to Compute Percent of Cases With Initial Priority Greater Than or Equal to 3 and Case Not Served Within Tolerance.

```
QUICK QUERY    ELLIOTT W H TAD              SELECTED CASE ANALYSIS      CASE              DECEMBER 29, 1970    12:50:58    PAGE:

                                        LISTING OF QUERY INPUT CARDS

          1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

A ELLIOTT , H TAD              SELECTED CASE ANALYSIS      CASE

B                                  D

C CROSS CASE ANALYSIS FOR CASES WITH FPRI=1 AND ITOL =0

D  PCTTWO

E  BOX          LPS

F               FPRI          EQ 1
F         AND   ITOL          EQ 0

G  PCTTWO       =    .1135
```

```
QUICK QUERY    ELLIOTT W H TAD              SELECTED CASE ANALYSIS      CASE              DECEMBER 29, 1970    12:50:58    PAGE:

CROSS CASE ANALYSIS FOR CASES WITH FPRI=1 AND ITOL =0

PCTTWO

        1.59
```

FIGURE 22: Program to Compute Percent of Cases With Initial Priority Equal to 1 and Case Not Served Within Tolerance.

```
QUICK QUERY     ELLIOTT W H TAD              SELECTED CASE ANALYSIS       CASE              DECEMBER 29, 1970     12:50:59     PAGE:

                                        LISTING OF QUERY INPUT CARDS

                 1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678
A ELLIOTT W H TAD              SELECTED CASE ANALYSIS       CASE
B                                D
C AVERAGE TVEC
D  AVTVEC
E  BOX          LPS
G  AVTVEC       =                TWAIT       -              TQUE1
G               /   881
```

```
QUICK QUERY     ELLIOTT W H TAD              SELECTED CASE ANALYSIS       CASE              DECEMBER 29, 1970     12:50:59     PAGE:
AVERAGE TVEC
AVTVEC
        .02
```

FIGURE 23: Program to Compute Average Time To Vector to Case.

```
QUICK QUERY    ELLIOTT W H TAD              SELECTED CASE ANALYSIS      CASE              DECEMBER 29, 1970    12:51:03    PAGE:

                                        LISTING OF QUERY INPUT CARDS

                  1         2         3         4         5         6         7         8
        12345678901234567890123456789012345678901234567890123456789012345678901234567890

        A ELLIOTT W H TAD              SELECTED CASE ANALYSIS      CASE

        B                                    D

        C AVERAGE TWAIT

        D  ATWAIT

        E  BOX          LPS

        G  ATWAIT       =                    TWAIT       /   881



QUICK QUERY    ELLIOTT W H TAD              SELECTED CASE ANALYSIS      CASE              DECEMBER 29, 1970    12:51:03    PAGE:
AVERAGE TWAIT

ATWAIT

         .02
```

FIGURE 24: Program to Compute Average Wait Time Between Arrival Into System and Time First Resource Reaches Case.

```
QUICK QUERY    ELLIOTT W H TAD              SELECTED CASE ANALYSIS      CASE              DECEMBER 29, 1970    12:51:08    PAGE:

                                        LISTING OF QUERY INPUT CARDS

          1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
A ELLIOTT W H TAD              SELECTED CASE ANALYSIS      CASE
B                                    D
C PERCENT OF CASES HAVING MMM.GR.0
D  MGRZ
E  BOX          LPS
F               MMM          GR 0
G  MGRZ          =    .1135
```

```
QUICK QUERY    ELLIOTT W H TAD              SELECTED CASE ANALYSIS      CASE              DECEMBER 29, 1970    12:51:08    PAGE:

PERCENT OF CASES HAVING MMM.GR.0

MGRZ

      66.85
```

FIGURE 25: Program to Compute Percentage of Cases With Number of Tows Greater Than Zero.

```
QUICK QUERY     ELLIOTT W H TAD              SELECTED CASE ANALYSIS       CASE              DECEMBER 29, 1970     12:51:11     PAGE:

                                        LISTING OF QUERY INPUT CARDS

                1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
A ELLIOTT W H TAD                SELECTED CASE ANALYSIS       CASE
B                                      D
C PERCENT OF CASES HAVING MMM.GR.0 AND NNN.EQ.0
D  PCT3
E  BOX          LPS
F                MMM            GR 0
F           AND  NNN            EQ 0
G  PCT3          =  .1135


QUICK QUERY     ELLIOTT W H TAD              SELECTED CASE ANALYSIS       CASE              DECEMBER 29, 1970     12:51:11     PAGE:
PERCENT OF CASES HAVING MMM.GR.0 AND NNN.EQ.0
PCT3
       63.45
```

FIGURE 26: Program to Compute Percentage of Cases With Number of Non-Tow Needs Equal Zero.

LISTING OF QUERY INPUT CARDS

```
        1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
A ELLIOTT W H TAD              SELECTED CASE ANALYSIS       CASE

B                                    D

C PERCENT OF CASES HAVING TSM.GR.0 AND SIS.EQ.-1 AND
C  RESA(I).GR.0,FORI=6,7,8,9,10.

D  PCT4

E  BOX          LPS

F  TEMP         RESA6         GR 0
F       OR      RESA7         GR 0
F       OR      RESA8         GR 0
F       OR      RESA9         GR 0
F       OR      RESA10        GR 0
F               TEMP              TRUE
F         AND   SIS           EQ -1
F         AND   TSM           GR 0

G  PCT4          =    .1135
```



```
PERCENT OF CASES HAVING TSM.GR.0 AND SIS.EQ.-1 AND
 RESA(I).GR.0,FORI=6,7,8,9,10.

PCT4

       15.21
```

FIGURE 27: Program to Compute Percentage of Long Search Cases

```
QUICK QUERY    ELLIOTT A H TAD              SELECTED CASE ANALYSIS      CASE              DECEMBER 29, 1970    12:51:15    PAGE:

                                    LISTING OF QUERY INPUT CARDS

          1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

A ELLIOTT A H TAD                SELECTED CASE ANALYSIS      CASE

B                                  D

C PCT OF CASES HAVING TSM.GR.0 AND RESA(I).EQ.0,FOR I=6,7,8,9,10

D  PCTS

E  BOX          LPS

F                RESA6          EQ 0
F           AND  RESA7          EQ 0
F           AND  RESA8          EQ 0
F           AND  RESA9          EQ 0
F           AND  RESA10         EQ 0
F           AND  TSM            GR 0

G  PCTS          =    .1135


QUICK QUERY    ELLIOTT W H TAD              SELECTED CASE ANALYSIS      CASE              DECEMBER 29, 1970    12:51:15    PAGE

PCT OF CASES HAVING TSM.GR.0 AND RESA(I).EQ.0,FOR I=6,7,8,9,10

PCTS

       18.27
```

FIGURE 28: Program to Compute Percentage of Short Search Cases

III. Interpretation of QQ Output for Displayed Cases

Some of the case parameters output by QQ need explanation because they may be derived or updated by OPSIM. Due to the constraints imposed by limited storage and the FIM requirement of a fixed field format for all cases, not all the information on a case could be retained. Trade-offs were indeed necessary in light of these constraints, and were made such that the loss of information would be both minimal and infrequent.

Below is a list of the output parameters retained in every case, that is processed in the system; that is, every completed case. (Recall that exceptional cases are displayed automatically as Standard Output from OPSIM; cases being processed, but not completed at the end of the simulation are also output as part of the Standard Output.) Exceptional cases also appear on the output tape at the end of the case listing and may be used in the QQ calculations if desired.

The reader's attention is called to the OPSIM Definition discussion for a listing of these parameters and their interpretation in OPSIM. The discussion presented here sketches the ranges of these values when the case is completed and output from the system.

CASE PARAMETER	VALUE	EXPLANATION
(1) OPFAC	0	C-130 case which occurred in the district being exercised. This assignment is made in the PREPRO. Other C-130 cases are assigned to E City(East Coast).
	>0	The original station to which the case was assigned, in PREPRO. (OPSIM reassigns the primary station to the case and retains this new assignment in STATN). In the situation of multi-unit cases, PREPRO assigned the station which first received the distress call as the OPFAC. (Minimum value of C1 on SAR assistance form.)

CASE PARAMETER	VALUE	EXPLANATION
(2) NOCAS	>0	The original case identification number; together with OPFAC, these values represent the unique historical case number.
(3) IDLOC	>0	The Coast Guard District in which the case occurred.
(4) OCCUR	>0	The date and time the case entered the system. (In decimal days) For example, 26.0156 represents a case that occurred on the 27th day of the simulation at approximately 00:23. (SIMSCRIPT starts with Day = 0).
(5) BOX	$1 \leq$ BOX $\leq$	There are a total of eight categories relative to the day, time, and season, the case entered the system. These include Weekend/Peak/Day(3); Weekend/Peak/Night(4); Weekend/Non-Peak/Day(7); Weekend/Non-Peak/Night(8); Weekday/Peak/Day(1); Weekday/Peak/Night(2); Weekday/Non-Peak/Day(5); Weekday/Non-Peak/Night(6).
	0	Indicates that the exogeneous event tape (input to OPSIM) prepared in PREPRO was created using the historical times of occurrence.
(6) FPRI	$1 \leq$ FPRI ≤ 5	The first priority of the case; i.e., when it entered the system. (The case's priority is updated during the service of case and the final priority value retained in PRI.)

CASE PARAMETER	VALUE	EXPLANATION
(7) MMM	$0 \leq MMM \leq 2$	Number of resources required to tow or escort the client.
(8) NNN	≥ 0	Number of needs other than search or tow.
(9) GAMMA	$0.00 \leq GAMMA \leq 0.99$	The degree of non-parallel service of a multi resource case.
	0.00	For single resource cases
(10) NEEDO	$1 \leq NEEDO \leq 19$	Identification of the need for a single resource case.
	0	Implies the case could be a multi resource or a pure search case. (If NEED1 through NEED5 have a value greater than zero, then this is a multi-resource case. If S1S is greater than zero, then the case is search case.)
(11) AIR	$0 \leq AIR \leq 99$	Air temperature °F.
(12) OFSHR	$0 \leq OFSHR < 999$	Distance in nautical miles, off shore where case occurred
	.25	Within the simulation, hand-off tows occur at a 1/4 mile offshore. Thie value is updated from original input value of OFSHR.
	.35	Position over a 1/2 mile off shore
	3.0	Position over a 1/2 mile but less than 10 miles off shore, (open waters)
	0.95	999 miles or more.
	0	on shore

CASE PARAMETER	VALUE	EXPLANATION
(13) VIS	$0 \leq VIS < 99$	Visibility (in miles)
	99	If not known NK; not applicable, NA, or blank.
(14) WIND	$0 \leq WIND \leq 99$	Wind Force in knots
	1	If NK; NA or Blank
(15) SWELL	$0 \leq SWELL \leq 99$	Sea Height in full
	1	if NK; NA or Blank
(16) L	$0 \leq L \leq 201$	Length of Client in feet if client is a boat
	0	Client is an aircraft or some other classification
	66	If client is over 65 feet but less than or equal to 100 feet.
	101	If client is over 100 feet but less than or equal to 200 feet
	201	If client is over 200 feet
(17) POB	$0 \leq POB \leq 4095$	People on board
	4095	If greater than 4095
(18) SIS	0	No long search required
	$0 < SIS \leq 10$	Number of search resources on a long search case is input to OPSIM. Each time a resource completes its assigned search miles, SIS is reduced by 1. Therefore, in this mode, SIS can be the remaining number of resources required to fulfill the long

CASE PARAMETER	VALUE	EXPLANATION
		search needs of the case. Once the long need is fulfilled, SIS is set to this value. The number of search resources (up to five) can be found by examining the values of RESA6 through RESA10. When positive, it indicates a resource searched for the client.
(19) S2S	$-2 < S2S \leq 2$	S2S is the code input for each case describing the requirement for short search. It is updated at the completion of the short search by negating the code. 0 = no short search; -2 = short search by additional resource.; -1 = short search by first resource to scene.
(20) TSM	≥ 0	TSM represents the total number of search miles, applied to either long or short search.
(21) OSTO	>0	The on scene time for a single need case. See NEEDO.
(22) UTYPE	>0	Describes the type of client, either aircraft or surface vessed.
(23) VALUE	$0 \leq VALUE \leq 130001$ 130001	Value of the vessel in distress. Value of the vessel exceeds $130,000.
(24) XCX	$XLOW \leq XCX \leq XLMT$	Original X coordinate case location in nautical miles.

CASE PARAMETER	VALUE	EXPLANATION
	XPT	Cases with no location data at undefined OPFACs are assigned this value for XCX from the district origin.
	2	Cases whose location fall outside district limits (non C-130).
(25) YCY	YLOW $\leq$ YCY $\leq$ YLMT	Original Y coordinate
	YPT	Cases with no location data at undefined OPFACs are assigned this value for YCY.
	2	Cases whose location fall outside district limits (non C-130)
(26) XC	any signed value	Updated X coordinate case location. This value is updated when the client moves during service, such as escort or tow, and must be updated either for interrupt, hand-off or completion.
(27) YC	any signed value	Similar to XC.
(28) STATN	>0	The primary station of the case, as calculated in OPSIM.
(29) CNRES	$\geq$0	The total number of resources that responded to the case.
(30) RESAO	>0	The resource responding to the need of a case, for a single resource case.
	0	If the case is a multi-need case, this value is zero. See NEEDO and OSTO.
(31) PRI	>0	The updated priority of the case. The case's priority can change during the course of service. See FPRI.

CASE PARAMETER	VALUE	EXPLANATION
(32) REA	≥0	First Reason the case was put into the queue. See OPSIM definitions. Part II, Section II of OPSIM documentation. 0 = case interrupted 1 = no available resources 2 = case never goes into a queue
(33) COST	≥0	The cost of serving a case. Regardless of the cost option this value is calculated as the accumulated cost of vectoring to scene, and if required, searching for the client. The on scene time for serving needs other than search is not included in this calculation.
(34) ITOL	≥0	For cases completed or in the system at the end of OPSIM; the values of interest include:
	0	Case not served within tolerance
	1	Case ~~not~~ served within tolerance
	2	No resource has yet arrived on scene.
		For cases which are exceptions, the values of interest include:
	3	No capable resource types in system
	4	No capable resource types at the primary and adjacents
	5	No capable resource available to serve an air escort case when requested.

CASE PARAMETER	VALUE	EXPLANATION
	6	The case has an unacceptable set of input parameters.
(35) NOINT	≥0	Each time a case's service is interrupted, this value is updated. Total number of times a case is interrupted.
(36) NQUE	≥0	Each time a case is queued, this value is updated. Recall a case can be queued if interrupted and/or if no resource is available at that time to serve the case, i.e. the case waits. Total number of times a case is queued..
(37) TINT	≥0	When a case is interrupted, the total time spent in this status is recorded.
(38) TQUE	≥0	When a case is queued, the total time it spends queued is recorded.
(39) TQUE1	≥0	The elapsed time the case spends in the queue prior to the first resource arriving to the scene.
(40) TSVC	≥0	The total elapsed time the case spends in the system.
(41) TWAIT	≥0	The time elapsing between the case arrival to the system and the first resource arriving on scene or to the expected location of the client.

CASE PARAMETER	VALUE	EXPLANATION
(42) NEED1	≥ 0	For multi resource cases this is the first need of the case.
(43) OST1	≥ 0	For multi resource cases, this is the time spent on scene serving NEED1. This value for pure search, tow or escort cases will be zero. It is also possible that this value be zero for cases where the resource is called to scene and renders no assistance nor expends any time on scene, i.e. returns home immediately.
(44) DELTA1	$0 \leq$ DELTA1 ≤ 0.99	For multi-resourced cases, this is the fraction of time into the case, the resource is to arrive on scene, and expend the associated OST1.
(45) RESA1	≥ 0	For multi-resource cases, this is the resource assigned to the case to serve NEED1.
(46) NEED2	≥ 0	For multi - resource cases, this is the second need of the case. If the case requires two tow or escort resources, the second tow resource is recorded in RESA 2, but NEED2 will be zero.
(47) OST2	≥ 0	See OST1. (Replace OST1 with OST2)
(48) DELTA 2	$0 \leq$ DELTA2 $\leq .99$	See DELTA1
(49) RESA2	≥ 0	See RESA1.
(50) NEED3		See NEED1.

CASE PARAMETER	VALUE	EXPLANATION
(51) OST 3		See OST 1.
(52) DELTA3		See DELTA 1.
(53) RESA3		See RESA 1.
(54) NEED4		See NEED 1.
(55) OST4		See OST 1.
(56) DELTA4		See DELTA 1.
(57) RESA4		See RESA 1.
(58) NEED5		See NEED 1.
(59) OST5		See OST 1.
(60) DELTA5		See DELTA 1.
(61) RESA5		See RESA 1.
(62) RESA6	≥ 0	The first five resources assigned to each of the first five SM(i)'s of a long search case are recorded in these attributes.
(63) RESA7	≥ 0	
(64) RESA8	≥ 0	
(65) RESA9	≥ 0	
(66) RESA10	≥ 0	
(66) SEQNO	> 0	The sequence number of the case facilitates the cross referencing of parameters in the Quick Query Output. It also gives the order in which cases are completed.

Note that this information is kept for the first five resources assigned to the needs and tow portion of the case.


DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS