# DEVELOPMENT OF A MICROMETEOROLOGICAL AND TRACER DATA ARCHIVE

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## ABSTRACT

The purpose of this project was to develop and test a means for archiving invaluable data sets in a timely fashion before the necessary supporting information becomes lost forever. This archive for micrometeorological and tracer dispersion data was developed by Battelle, Pacific Northwest Laboratories for the U.S. Environmental Protection Agency (EPA). The archive is to be used by EPA in ongoing model testing, development, and verification efforts.

During the course of this project, a series of reports for the user of the archive were prepared. Archive survey and introduction reports contain the information necessary to access and use the data archive. The structure and form of the micrometeorological and tracer data archive are documented in the archive introduction report. In addition, three individual documentation reports provide detailed information on the three data sets, which have been entered into the archive.

The archive structure that was developed includes both documentation and data. The documentation includes data description as well as additional sources of information. The archive is contained in five or more files on a magnetic tape. The five files consist of a header file, three documentation files, and one or more data files. The data structure is designed so that selected portions may be loaded into the user's data base system, or it may be accessed using a custom computer program.

This final project report documents efforts related to the development and implementation of the archive that were not covered in previous reports. The emphasis in this report is on the activities related to creation of data archive sets. Starting with the selection of a computer and software, and ending with the final quality assurance checks on the archived data, this information is presented to provide guidance to those wishing to add additional data sets to the micrometeorological and tracer data archive.

CONTENTS

## ACKNOWLEDGMENT

The author wishes to acknowledge the foresight of the U.S. Environmental Protection Agency's Atmospheric Sciences Research Laboratory in initiating a project with the intent of preserving valuable data bases in a form that is readily available to the technical community. John S. Irwin's contribution in conceiving and guiding the effort as Project Officer is gratefully acknowledged.

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# SECTION 1

# INTRODUCTION

The Meteorology and Assessment Division of the U.S. Environmental Protection Agency's (EPA's) Atmospheric Sciences Research Laboratory initiated a project to develop and establish an archive of original experimental data and documentation for use by atmospheric dispersion and boundary layer researchers. The main objective was to develop and test a means for archiving invaluable data sets in a timely fashion before the necessary supporting information becomes lost forever. Battelle, Pacific Northwest Laboratories developed an archieve that will be useful for evaluating and improving dispersion models, ensuring the retention of these data for the future, and making them more readily available to the research community.

This report documents project-related activities for development and implementation of the micrometeorological and tracer (M&T) data archive. Earlier companion reports provide guidance to the user of archived data; this report provides guidance on the process of assembling a data set for entry into the M&T data archive.

A survey was made of micrometeorological and tracer field studies conducted before 1980 to identify what data sets are of significant value and whether or not they would be worthwhile to preserve. The survey results and recommendations are given in Woodruff and Glantz (1985).

The following sections document project efforts not covered in previous reports. Section 2 provides a brief description of the M&T data archive along with references to pertinent reports. The contents of Section 2 is similar to the archive description provided in each data set documentation reports. Section 3 contains detailed information on the processes that were used in assembling the three data sets that were entered into the M&T data archive. Section 3 also contains a discussion of methods of accessing the archived data. Section 4 summarizes quality assurance procedures that were used during data archiving.

## SECTION 2

## THE MICROMETEOROLOGICAL AND TRACER DATA ARCHIVE

The M&T data archive consists of a series of data sets archived in a consistent self-documenting format. Each data set is assigned an archive number and is referred to as an archive data set. Each archive data set includes both documentation and data. A data set documentation report is prepared for each archived data set.

The archive for each data set is contained in five or more files on magnetic tape. These files consist of a header file, three documentation files, and one or more data files.

The data are entered into the archive in as close to original form as possible to maintain a clear link with original records. The archived data are contained within a well-defined structure called a data map. The data map allows data to be entered in original formats while providing the user with a machine-readable pathway for accessing the diverse data formats.

Detailed information that the user will find useful, if not essential, is contained in the data archive introduction report, Introduction to Micrometeorological and Tracer Data Archive Procedures (Droppo and Watson, 1985). That report provides an overview of the archive and specific guidance for using it. In addition, the survey report (Woodruff and Glantz, 1985) provides a survey of the characteristics of actual and potential data sets.

Questions about the archive that are not answered in this report or the data archive introduction report (Droppo and Watson, 1985) should be directed to

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# SECTION 3

# CREATION OF DATA ARCHIVE SETS

Three data sets were archived during this project. A listing of the contents and documentation for these sets is given in Appendix A. Detailed information on these archiving activities is provided in this section as guidance for possible future archiving efforts.

The data sets selected included a mixture of data archiving requirements to provide a wider base of archiving experience. The first data set, Minnesota 1973 (Woodruff, Droppo, and Glantz, 1985), was mainly in the format of published materials but included unpublished rawinsonde data. For both sources, the data were in hard-copy tables and had to be entered into a computer file format. The second data set, Hanford 1964 (Glantz, Woodruff, and Droppo, 1985), was a data set wherein both data tapes and FORTRAN programs used to generate published tables were available. The third set, Hanford-67 series (Droppo, 1986), consisted of a data tape with copies of the published tables.

The first two archive data sets were small enough for convenient handling during the development of the archiving procedures. The third set, which was considerably larger, was archived without major problems using the lessons learned with the smaller data sets.

## SELECTION OF COMPUTER AND SOFTWARE

The selection of the computer and software used to create archive data entries depends on (1) the form and location of the data to be archived; (2) the editors, computer languages, and data base programs available; and (3) the training/background of the archiver. Each of these factors played a role in selecting hardware and software for archiving the three data sets.

Tables 1 and 2 summarize the computers and software used to create M&T data archive sets 001 (Minnesota 1973) and 002 (Hanford 1964), respectively. The majority of the archiving effort for archive set 001 was on a desktop computer (IBM-PC), whereas the majority of the effort for archive set 002 was on a minicomputer (DIGITAL VAX). Archive set 003 (Hanford-67 series) was created using a process similar to archive set 001. The desktop computer, selected mainly for convenience and the availability of powerful text manipulation tools, was used in the last stages of creating all archives.

TABLE 1. SUMMARY OF COMPUTERS AND SOFTWARE USED FOR M&T DATA ARCHIVE 001

| Data Set Name | Data Component | Computer | Task Performed | Software | Product |
|---|---|---|---|---|---|
| Minnesota 1973 | Published tables | PDP11/70 | Data entry and verification | Data entry program | Computer tape |
| | Unpublished rawinsonde data | PDP11/70 | Data entry and verification | Data entry program | Computer tape |
| | | VAX | Data check | Text editor, EDI | Corrected computer files |
| | | | Data transfer to IBM-PC | VMS operating system | Computer file on floppy diskette |
| | | IBM-PC | Creation and insertion of data map and data prefixes | Wordstar, BASIC, and FORTRAN programs | File on diskette |
| | | VAX | Data transfer from IBM-PC to computer tape | VMS operating system | Computer tape |

Each data set presented different archiving challenges. Professional data entry staff entered and verified the tabular hard copy data in archive set 001. Checking data reduction computations of unpublished rawinsonde data required the services of a trained meteorologist. These computations were checked using a rawinsonde data reduction computer program.

Both sets 002 and 003 had data already available in a computer-readable form. In archive set 002, the original program code was run to create the computer copy of published tables in archive set 002. Although the published tabular data entries for archive set 003 were all available on a computer tape, considerable effort was necessary to insert labels and crosswind integrated values.

Table 3 summarizes the main custom programs used in various stages of creating the archive data sets. These codes demonstrate tasks performed on all the archive data sets. Additional special purpose codes were written for special tasks for individual data sets.

TABLE 2. SUMMARY OF COMPUTERS AND SOFTWARE USED FOR M&T DATA ARCHIVE 002

| Data Set Name | Data Component | Computer | Task Performed | Software | Product |
|---|---|---|---|---|---|
| Hanford 1964 | Computer tape copies of programs and data used to generate published data tables | VAX | Creation of tables in computer files | FORTRAN programs | Computer file |
| | | | Data check | Text editor, EDI | Corrected computer files |
| | | | Creation and insertion of data map and data prefixes | FORTRAN programs | File on disk |
| | | | Data transfer to IBM-PC | VMS operating system | Computer file on floppy diskette |
| | | IBM-PC | Final check of data map and archived data | Wordstar, BASIC, and FORTRAN programs | File on floppy diskette |
| | | VAX | Data transfer from IBM-PC to computer tape | VMS operating system | Computer tape |

With the exception of the ACCESS program, all of the codes listed in Table 3 are utility programs used in some stage of the creation of a data archive set. These codes perform operations, such as renumbering the archive records (FIXLN), stripping off trailing blanks to make a more workable size for intermediate archiving activities (STRIP), and adding trailing blanks to make an archive file with fixed record lengths (FILL). These types of operations may also be accomplished using text editors and data base programs.

TABLE 3. CUSTOM PROGRAMS FOR M&T DATA ARCHIVE

| Name of Program | Computer/ Language | Task Performed | Product |
|---|---|---|---|
| ACCESS[a] | VAX and IBM-PC/ FORTRAN | Data map check | Labeled listing of all data in archive set |
| CHECKS[b] | IBM-PC/ BASIC | Compute archive checksums | Archive set checksum value |
| FIXLN[b] | VAX and IBM-PC/ FORTRAN | Record number check and fix | New archive file with consecutive record numbers and fixed line (record) lengths |
| STRIP[b] | IBM-PC/ BASIC | Strip trailing blanks from the right of each archive entry | New minimum size archive file with variable line (record) lengths |
| FILL[b] | IBM PC/ BASIC | Add trailing blanks to the right of each archive entry | New archive file with fixed line (record) lengths |

(a) Listing in Droppo and Watson (1985)
(b) Listing in Appendix B

The trade-off between BASIC and FORTRAN was mainly in the preparation and execution times. Programs can more quickly be written and debugged with interpretive BASIC, whereas complied FORTRAN generally has a much faster execution. In general, BASIC has the additional advantage of having easier-to-use character manipulation functions.

Program code listings of the IBM-PC versions are provided in Appendix B to illustrate approaches for accomplishing various data archive creation tasks. The scope of the work effort did not include developing general purpose codes for data archive creation, maintenance, or access. The listings are codes as they were used in some phase of the archiving of data; users will need to carefully adapt the codes for their specific application.

## DOCUMENTATION

Several reports were prepared for this project under the constraint that in addition to a camera-ready copy for standard distribution, the report should also be storable in a computer data file. In each of the archive data sets, a data file is provided that contains the applicable documentation report encoded in a ready-to-print ASCII format. A printable copy of the archive introduction report was included in a data file on the archive master tape.

The text for the reports were written using a desktop computer with a text editor program. Only standard printable ASCII characters were used. All figures and illustrations were made using standard characters. All codes for special text handling were avoided; for example, superscripts were made by placing the symbol on the line directly over the current line. Greek symbols were entered with text equivalents (i.e., sigma-z for $\sigma_z$, rho for $\rho$). The format for EPA tables requires that solid double lines appear at the top and bottom of each table; to do this we used a series of equal signs (=) to form the required lines. Other than these minor problems, providing the reports as printable computer files was relatively simple.

For the final copy of these reports, the draft double-spaced text from the desktop computers was transferred to a professional word processing system where the reports were formatted to single spacing and printed. The text for the reports was then sent back to the desktop computer where a file copy of the report was prepared. A printed camera-ready and computer file copies of each report were submitted to EPA. This process was relatively straightforward, even though some text manipulation was necessary after each transfer between computer systems.

## DATA ENTRY PROCEDURES

The methods selected for data entry depends mainly on the form and format of data. Typical data entry, data verification, and documentation procedures for several data sources were detailed in Droppo and Watson (1985). These procedures are not fixed but are given as examples for archiving data.

## METHODS OF ACCESSING ARCHIVE DATA

The methods of accessing the data in a data archive, as discussed in Droppo and Watson (1985), are also relevant to the process of creating a data archive set. First, once the main elements of the data structure are in place, the data structure can then be advantageously used for operations, such as correcting or sorting information. For example, in archive set 003 with multiple tracer releases, the data organization of separate data files for each tracer type was maintained until near completion of the archive processing. After completing the archiving process, the prefix information was used to sort the data by experiments. Second, the codes for accessing the data provide an invaluable functional check on the structure of the data archive set. Without such a computer access check, it would be very difficult to be certain that the data structure is correct.

## MANAGEMENT AND MAINTENANCE

The M&T data archive is managed and maintained by EPA. Questions, corrections, or comments concerning the archive should be directed to

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Meteorology Assessment Division
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Each archive set is assigned a version number. A new version number is assigned whenever the archive is updated, enlarged, or corrected. The user should always be certain to obtain the most recent version.

As data sets are added to the M&T data archive, the files on the master tape will be updated to include the new documentation files.

## SECTION 4

## QUALITY ASSURANCE

The quality assurance required to verify and document the accuracy of the data entered in the archive is described in this section. The procedures for data set input, documentation, and archive usage are outlined in this report as well as in Droppo and Watson (1985). These procedures provide the quality assurance framework for archiving.

Quality assurance covers both bookkeeping and decision processes. The former is mainly the formalized mechanics for documenting the steps in the data archiving processes. The latter involves the use of qualified personnel to ensure proper formulation and definition of the archive.

The archiving documents/products that are described in detail in this report and in Droppo and Watson (1985) are listed below.

1. Notebook
2. Original Data Tape
3. Original Data Hard Copy Listings (Item 2 contents)
4. Archival Data Tape
   a. Documentation Files
   b. Data Files
5. Data Set Documentation Report (Hard copy of Item 4a)
6. Hard Copy Listings of Contents of Archival Data Tape

Each of the steps in the data archiving process should be recorded in the notebook along with dates and names. Any problems or questions should be entered as they are encountered. The notebook then becomes a source of input for the documentation files (Item 4a) at the final stages of the archiving process.

The entry of data into the archive requires steps to ensure the accurate replication of original data. In the sample procedures given in the following sections, duplicate data transfer is recommended for data transfer processes that could corrupt data integrity. A machine comparison of the duplicate files provides a check for possible data transfer errors. In addition, it is very important that visual checks be made of the data at each stage of data transfer to ensure that the data are correct, complete, and in the correct order.

Copies of all of these items are to be stored in a quality assurance file for a reasonable period following the archiving process. This file

provides a means to rapidly check the archive should questions or problems arise.

The definition of a reasonable period for storage of all items depends partly on the importance of maintaining a specific data set. In general, a period of 2 years is recommended for storage of these items. This is considered a reasonable time period for the restarting of a specific archiving activity. After 2 years, the data tapes should be released from the quality assurance file. The other items may be maintained for an extended period beyond the 2 years.

Storing tape beyond several years will require maintenance of tape files. Archiving procedures for long-term tape storage will depend on the tape library facility selected.

Items 4 and 5 are the archive. Item 4 should be placed in an EPA tape library for long-term storage and maintenance. Copies should be distributed from this tape. Item 5 should be submitted to the National Technical Information Service (NTIS) for distribution.

The data structures, definitions, assumptions, problems, limitations, publications, and revision records are documented in Item 4a. The structure of the data within the archive is as near to that of the original tables (in publications, reports, notebooks, or field notes) as possible for help in verifying data both in the final stages of the archiving process and during subsequent usage of archival data.

## SECTION 5

## CONCLUSIONS AND RECOMMENDATIONS

The results of the survey of meteorological and tracer field studies conducted before 1980 suggest that there are data sets containing information of significant value that would be worthwhile to preserve. As evidenced by the data donated by Yutaka Izumi, it is important to establish the archive before the original participants are no longer available and before the original notes of the experiments are lost. The use of the data map to define the storage format and structure of the data values proved successful. As part of the development and demonstration of the archive, the data from three field studies were entered in a form that was close to the form of the original records. The data map was successfully used to retrieve and access these values from the archive. It is anticipated that the archive procedures developed and tested are flexible enough to accommodate most data sets. The archive procedures require minimal changes to the data format from that provided in the original records. The preservation of field data has obvious benefits to ongoing and future research and model development efforts.

## REFERENCES

Droppo, J. G., and C. R. Watson. Introduction to Micrometeorological and Tracer Data Archive Procedures. EPA-600/3-85/053, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1985.

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Glantz, C. S., R. K. Woodruff, and J. G. Droppo. The Hanford 1964 Atmospheric Dispersion Experiment. EPA-600/3-85/055, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1985.

Woodruff, R. K., J. G. Droppo, and C. S. Glantz. The Minnesota 1973 Atmospheric Boundary Layer Experiment. EPA-600/3-85/054, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1985.

Woodruff, R. K., and C. S. Glantz. Survey of Meteorological and Tracer Data for Demonstrating a Data Archive. EPA-600/3-85/052, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1985.

# APPENDIX A

## ARCHIVE STATUS

The M&T data archive status as of date of this report is given in this appendix. The user should contact the U.S. Environmental Protection Agency to obtain the current status of the archive.

The M&T data archive sets are summarized in Table A-1. Additional details may be obtained on each set from the cited individual documentation reports.

TABLE A-1. LIST OF M&T DATA ARCHIVE SETS

| Archive Set Number | Revision Number | Name of Archived Data Set | Data Archive Report Number | Documentation Date |
|---|---|---|---|---|
| 001 | 001 | Minnesota 1973 atmospheric boundary layer experiment | EPA-600/3-600/054 | 6-5-85 |
| 002 | 001 | The Hanford 1964 atmospheric dispersion experiment | EPA-600/3-600/055 | 6-5-85 |
| 003 | 001 | The Hanford 67-series: atmospheric field diffusion experiments | EPA-600/ - / | |

## APPENDIX B

## CUSTOM ARCHIVE PROGRAM LISTINGS

```
1 REM CHECKS - PROGRAM TO GENERATE FILE CHECK NUMBERS
2 REM NUM# = NUMBER OF CHARACTERS IN FILE
4 REM CSUM = CHECKSUM OF CHARACTERS IN FILE
5 REM JGDROPPO 3-85, 5-85
6 REM IBM PC BASIC
7 REM   GIVES CKSUM FOR BOTH ASCII PRINTABLE CHARACTER (CSUM)
8 REM   AND FOR OTHER IMBEDED CONTROL CHARC (BSUM); BSUM SHOULD
9 REM   BE EQUAL TO 0 FOR VALID M&T DATA FILES. RESULTS ARE
10 REM   BOTH DISPLAYED AND WRITTEN TO A FILE (CK + USERFILE NAME).
11 PRINT DATE$
12 INPUT "File Name >",B$
13 IF B$="" THEN 12
15 OPEN "I",#3,B$
16 LINES=0 : NUM#=0 : CSUM=0 :CSOD=0:CSEV=0
17 J$="CK"+B$
18 OPEN "O",#2,J$:PRINT "OUTPUT FILE = ";J$
19 PRINT#2, DATE$,B$
20 IF EOF(3)  THEN PRINT "Lines=";LINES;", Char=";NUM#;", Csum=";CSUM;BSUM
21 IF EOF(3)  THEN PRINT "CKodd=";CSOD ;", CKeven=";CSEV
22 IF EOF(3)  THEN PRINT#2, "Lines=";LINES;", Char=";NUM#;", Csum=";CSUM;BSUM
23 IF EOF(3)  THEN PRINT#2, "CKodd=";CSOD ;", CKeven=";CSEV:STOP
25 LINE INPUT #3,A$
26 LINES=LINES+1:REM  PRINT LINES;NUM#;BSUM;" / ";
30 GOSUB 100
40 GOTO 20
100 REM ASCII CHECKSUM ROUTINE+
110 LENGTH = LEN(A$)
112 IF LENGTH=255 THEN PRINT "POSSIBLE TRUNCATION ERROR - LINE MAY HAVE EXCEEDED
    255 CHAR.";A$
114 IF LENGTH=255 THEN PRINT#2,"ERROR - LINE >= 255 CHAR.";A$:ERC=ERC+1
116 IF ERC>100 THEN PRINT "ERROR COUNT EXCEEDED":END
120 NUM#=NUM#+LENGTH
130 FOR J = 1 TO LENGTH STEP 2
140 CS=ASC(MID$(A$,J,1))
142 IF (CS>31 AND CS<128) THEN CSUM=CSUM+CS
143 IF (CS>31 AND CS<128) THEN CSOD=CSOD+CS
144 IF (CS<32 OR CS>127) THEN BSUM=BSUM+CS
148 IF J=LENGTH THEN 160
150 CS=ASC(MID$(A$,J+1,1))
152 IF (CS>31 AND CS<128) THEN CSUM=CSUM+CS
153 IF (CS>31 AND CS<128) THEN CSEV=CSEV+CS
```

```
154 IF (CS<32 OR CS>127) THEN BSUM=BSUM+CS
160 NEXT J
170 IF CSUM > 100000! THEN CSUM=CSUM-100000!
171 IF CSEV > 100000! THEN CSEV=CSEV-100000!
172 IF CSOD > 100000! THEN CSOD=CSOD-100000!
175 PRINT LINES;
200 RETURN
```

```
C       PROGRAM FIXLN.FOR
C       VERSION:  850531-000
C       M&T DATABASE - INSERTS NEW RECORD NUMBERS IN FILE
C       LANGUAGE: MICROSOFT FORTRAN
C       COMPUTER: IBM PC
C       AUTHOR(S) JG DROPPO 3-85
C
CURRENT OUTPUT LENGTH = 112
C
         CHARACTER*1 B1,B2,I1
         CHARACTER*2 I2
         CHARACTER*3 SET,LINE,LSET
         CHARACTER*4 I4
         CHARACTER*5 SUBSET
         CHARACTER*112 INFO
         OPEN(1,FILE=' ',STATUS='OLD')
         OPEN(2,FILE='REV.DAT',STATUS='NEW')
         B1=' '
         B2=' '
         I1='0'
         I2='00'
         I4='0000'
CINT FLAGS AND COUNTERS
      IREC=0
      IRD=0
CREAD LOOP
1      CALL READC(SET,SUBSET,IRECNUM,LINE,INFO,IRD)
               IREC=IREC+1
C
C              CHECK FOR BLANK IN 18TH POSITION - THIS VERSION
C              REPLACES ANY NON-BLANK CHAR WITH A BLANK
               IF (S2.NE.' ') THEN
                     WRITE(*,*) IREC, S2
                     S2=' '
C                    IRD=6
               ENDIF
C
C      CHECK SEQUENTIAL RECORD NUMBERS
               IF(IREC.NE.IRECNUM) WRITE(*,1090) IREC,IRECNUM
C              CHECK ARCHIVE SET NUMBER
               IF (IREC.GT.1) THEN
                    IF(LSET.NE.SET) IRD=0
               ELSE
                    WRITE(*,1001) SET
                    LSET=SET
               ENDIF
               IF (IRD.NE.0) GOTO 2
      IF (IREC.GT.999999) IREC=0
               IORD=ALOG10(FLOAT(IREC))+1
               GOTO (10,20,30,40,50,60),IORD
```

```
10      WRITE(2,1010) SET,I4,I1,IREC,SUBSET,LINE,B2,INFO
              GOTO 1
20      WRITE(2,1020) SET,I4,IREC,SUBSET,LINE,B2,INFO
              GOTO 1
30      WRITE(2,1030) SET,I2,I1,IREC,SUBSET,LINE,B2,INFO
              GOTO 1
40      WRITE(2,1040) SET,I2,IREC,SUBSET,LINE,B2,INFO
              GOTO 1
50      WRITE(2,1050) SET,I1,IREC,SUBSET,LINE,B2,INFO
              GOTO 1
60      WRITE(2,1060) SET,IREC,SUBSET,LINE,B2,INFO
              GOTO 1
1000     FORMAT(I7,A3,A112)
1001     FORMAT(' DATASET CHECK PROGRAM STARTED ON ARC# ',A3)
1010     FORMAT(A3,A4,A1,I1,A5,A3,A1,A112)
1020     FORMAT(A3,A4,I2,A5,A3,A1,A112)
1030     FORMAT(A3,A2,A1,I3,A5,A3,A1,A112)
1040     FORMAT(A3,A2,I4,A5,A3,A1,A112)
1050     FORMAT(A3,A1,I5,A5,A3,A1,A112)
1060     FORMAT(A3,I6,A5,A3,A1,A112)
1080     FORMAT(1X,I7,'TH RECORD: LINE SKIPPED (',I7,')')
1090     FORMAT(1X,I7,'TH RECORD: NEW RECORD NUMBER (',I7,')')
2        IREC=IREC-1
         IF(IREC.LT.1) IREC=1
         WRITE(*,1080) IREC,IRD
         IF(IRD.GT.2) GOTO 1
         CLOSE(2)
         CLOSE(1)
         STOP
         END
         SUBROUTINE READC(SET,SUBSET,IRECNUM,LINE,INFO,IRD)
         CHARACTER*1 B1,B2,S2
         CHARACTER*3 SET,LINE
         CHARACTER*5 SUBSET
         CHARACTER*112 INFO
         IRD=0
         READ(1,1000,END=98,ERR=99) SET,IRECNUM,SUBSET,LINE,S2,INFO
         RETURN
98       WRITE(*, 1001) SET,SUBSET,IRECNUM,LINE,INFO
         IRD=1
         RETURN
99       WRITE(*, 1002) SET,SUBSET,IRECNUM,LINE,INFO
         IRD=2
         RETURN
1000     FORMAT(A3,I6,A5,A3,A1,A112)
1001     FORMAT(' EOF READ ',A3,A5,I6,A3,A112)
1002     FORMAT(' READ ERR ',A3,A5,I6,A3,A112)
         END
```

```
1  ON ERR GOTO 170
10 REM STRIP - character stripper
20 REM JGD 5/85 BASIC
30 INPUT "file name ",A$
40 OPEN  "I",#1,A$
50 B$="A"+A$
60 OPEN "O",#2,B$
62 REM          .
63 LINE INPUT #1,C$
65 L=LEN(C$)
66 IF L=0 THEN 160
67 P=1
100 FOR I = L TO 1 STEP -1
110 REM ? I;P;"<"MID$(C$,I,1);">/";
111 REM ? P;I+1;"  ";
115 IF P>I THEN 140
120 IF MID$(C$,I,1) = " " THEN GOTO 140
130 P=I
140 NEXT I
150 PRINT MID$(C$,1,P)
155 PRINT#2,MID$(C$,1, P)
160 GOTO 62
170 CLOSE #1
180 CLOSE #2
200 END
```

```
10 REM FILL - SETS FIXED LINE LENGTHS BY FILLING trailing blanks on lines
20 REM JGD 6/85 IBM BASIC
25 INPUT "WORKING DRIVE>",D$
30 INPUT "file name ",A$:A$=D$+A$
35 INPUT "LINE LENGTH ";P:IF P>125 THEN 35
40 OPEN  "I",#1,A$
50 B$=D$+"FILL.DAT"
60 OPEN "O",#2,B$
61 F$="                                                                "
62 REM
70 IF EOF(1)<>0 THEN 170
80 LINE INPUT #1,C$
90 L=LEN(C$)
100 C$=C$+F$
120 IF  L>P THEN PRINT "LINE LENGTH MAY BE TOO SHORT":PRINT C$;L
150 REM PRINT MID$(C$,1, P)
155 PRINT#2, MID$(C$,1, P)
160 GOTO 62
170 CLOSE #1
180 CLOSE #2
200 END
```