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RESEARCH TO DEVELOP IMPROVED MODELS OF CLIMATOLOGY THAT WILL ASSIST THE METEOROLOGIST IN THE TIMELY OPERATION OF THE AIR FORCE WEATHER DETACHMENTS

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Scientific Report No. 2
(Addendum to the Final Report)

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AIR FORCE GEOPHYSICS LABORATORY
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
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A documentation of the computer programs which commence with processing the hourly history tapes for any given station and end up with climatic forecast aids ~~such as those shown in Figs. 12 and 13 on pages 85 and 86~~ is presented. The procedure is as follows: 1) the hourly history tapes for any given station are stratified by wind direction; 2) the hourly observations in each of these respective wind-stratified subsets are further partitioned according to the latest observed temperature dew-point spread, 3) Type I and Type II unconditionals

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~~(see Report No. 1, page 17)~~ are produced for each subset of 2 above, 4) the products of step 3 are computer smoothed, 5) Type I smoothed unconditionals are entered on the ordinate and Type II on the abscissa of a Stochastic model to produce conditional probability estimates, 6) these conditional probabilities are assessed to determine the height/distance at which the cumulated conditional probabilities attain a value of 50%, and 7) the data of steps 5 and 6 are formatted ~~(see Figs. 12 and 13 of this addendum)~~.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS

PERSONNEL

James A. Wilson, Captain, USAF prepared this addendum to Scientific Report No. 1 in conjunction with the Principal Investigator, Professor Donald E. Martin.

A special thanks is extended to Mike Streib for lettering the flowcharts and to Frances Brummell for typing the manuscript.

I. INTRODUCTION

The first part of this report will present flowcharts, sample outputs, listings and descriptions of the computer programs used to produce 2- and 4- hour climatic conditional probabilities in the format shown in Figs. 12 and 13 on pages 85 and 86 . Limitations imposed by Saint Louis University's CDC-3300 computer system required us to devise five separate programs for producing the climatic tables of this research. In so doing each successive program uses as its input the magnetic tape output from a previous one. Each program also produces an audit listing to provide an intermediate check on the products of the system.

Program names are usually acronyms conceived by combining words which indicate a general purpose for the program. Table 1 indicates the program acronyms used in this research and the meaning of each.

PGM	NAME	MEANING
1	EXTRACTS	- Extract data
2	COMPUNCD	- Compute unconditional probabilities
3	SMTHUNCD	- Smooth unconditional probabilities
4	COMPCOND	- Compute conditional probabilities
5	PRINTALL	- Print all conditional probabilities

Table 1. Program Acronyms

In this documentation an attempt has been made to standardize nomenclatures. For example, the array, XPROB, designates either the taped output of program, COMPUNCD, or the taped input to the next successive program, SMTHUNCD. To designate whether the output from the two-or four-hour version of a prior program is being read by a subsequent one, a suffix of either 2HR or 4HR is appended to the variable name to define the time interval involved. Ceiling and visibility data are distinguished in each case by the suffix CIG or VIS.

The following information concerning the CDC-3300 unique routines BUFFER IN, UNITSTF, EOFCKF and DECODE are provided. One or more of these routines may be found at various places in each program.

1) BUFFER IN (i,p) (a,b)

   i Logical tape unit being read.

   p Direction and mode of read.

p = 0 Forward read, BCD mode
  1 Forward read, Binary mode
  2 Reverse read, BCD mode
  3 Reverse read, Binary mode

a First variable of the block to be transmitted

b Last variable of the block to be transmitted

The BUFFER IN statement transmits one physical record of information in mode p from file i to storage locations a through b.

2) UNITSTF (i)

i Indicates the Logical Unit.
For the function UNITSTF, the value returned is as follows:

1 Buffer operation not complete

2 Buffer operation complete and no errors occurred.

3 Buffer operation complete, but an end-of-file has been sensed.

4 Buffer operation complete, but a parity error has occurred.

3) EOFCKF (i)

i Indicates the Logical Unit.
EOFCKF checks the status of the previous I/O request on logical unit i to determine if an end-of-file was encountered. The value returned is as follows:

1 An end-of-file was encountered on the last read operation

2 No end-of-file was encountered.

NOTE: The Computed GO TO statement provides a convenient method for checking the value returned by UNITSTF and EOFCKF.

4) DECODE (c,n,v) list

The DECODE statement converts and edits information from records consisting of c consecutive BCD characters (starting at address v) according to format list n and stores it in the I/O list indicated.

Each program used in the procedure is discussed on the following pages where a purpose and description, flowchart, program listing and sample output listing are given. Finally, a flowchart of the entire system is shown and discussed.

Portions of the system which result from the Saint Louis University's CDC-3300 computer limitations are cited as well as uniqueness of notation. For example, the special character (≠) as listed in the program FORMAT statements is the CDC-3300 printer character for the character (').

II. PROGRAM EXTRACTS

The first requirement is to select those elements needed to produce the Climatic Tables from the hourly history tapes. This program is designed to access the data base and select the following items.

ELEMENT	CONTENT
1	Initial Observation Time
2	Initial Wind Category
3	Initial Dew-Point Spread Category
4	Initial Ceiling Category
5	Final Ceiling Category
6	Initial Visibility Category
7	Final Visibility Category

Table 2. Individual observation elements required for Stochastic process

The word 'initial' denotes the observation at the time of the forecast. The word 'final' designates the observation two-or four-hours later depending upon the length of forecast. The data card variable IHOUR is used to establish the final time (See Table 17, page 88).

EXTRACTS is designed to access the ETAC TDF-14 data base. With minor modifications other data bases such as the ETAC DATA SAVE or ARPA DATA BASE may be used. Only hourly observations should be used since no final categories could be obtained from special observations.

Each of the seven fields contain coded values which are used to correspond to actual category values as follows:

1) Initial Time: The coded values, 0 to 23, represent the actual hour of the observation expressed as Local Standard Time. Care must be taken when using this value as an index to insure the values used are 1 to 24.

2) Initial Wind Category: The values, 1 to 9, are used to express the wind fields as follows:

CODE	DIRECTION
1	0-3 KTS
2	327-11
3	12-56
4	57-101
5	102-146
6	147-191
7	192-236
8	237-281
9	282-326

Table 3. Wind directions and corresponding wind category codes.

3) Initial Dew-Point Spread: The 17 dew-point spread categories are separated as follows:

CODE	D.P.S.	CODE	D.P.S.
1	0	10	11-12
2	1	11	13-14
3	2	12	15-16
4	3	13	17-18
5	4	14	19-21
6	5	15	22-24
7	6	16	25-30
8	7-8	17	+30

Table 4. Dew-point spreads and corresponding dew-point category codes.

The card input variable ITEMP is used to indicate whether the values of Table 4 are Centigrade or Fahrenheit.

4) Initial and Final Ceiling Categories: A total of 30 coded values are used to express the ceiling categories as follows:

CODE	CIG HT	CODE	CIG HT
1	0 ft	16	2000 ft
2	100 ft	17	2200 ft
3	200 ft	18	2400 ft
4	300 ft	19	2600 ft
5	400 ft	20	2800 ft
6	500 ft	21	3000 ft
7	600 ft	22	3500 ft
8	700 ft	23	4000 ft
9	800 ft	24	5000 ft
10	900 ft	25	6000 ft
11	1000 ft	26	8000 ft
12	1200 ft	27	10000 ft
13	1400 ft	28	14000 ft
14	1600 ft	29	20000 ft
15	1800 ft	30	+30000 ft

Table 5. Ceiling height values and corresponding ceiling category codes.

5) Initial and Final Visibility Categories: The 30 values used to represent the Initial and Final Visibility categories are given in Table 6.

CODE	VISBY	CODE	VISBY
1	0 mi	16	1 5/8 mi
2	1/16 mi	17	1 3/4 mi
3	1/8 mi	18	2 mi
4	3/16 mi	19	2 1/4 mi
5	1/4 mi	20	2 1/2 mi
6	5/16 mi	21	3 mi
7	3/8 mi	22	3 1/2 mi
8	1/2 mi	23	4 mi
9	5/8 mi	24	5 mi
10	3/4 mi	25	6 mi
11	1 mi	26	7 mi
12	1 1/8 mi	27	9 mi
13	1 1/4 mi	28	14 mi
14	1 3/8 mi	29	25 mi
15	1 1/2 mi	30	+30 mi

Table 6. Ceiling height values and corresponding visibility category codes.

Places for 1000 observations containing each of the 7 elements are allowed. When an output array is full, all observations are written to tape. Since the last array may not contain 1000 observations a counter, NUM, is output to indicate how many observations are contained in each array output. (The limiting factor of 1000 is used so as not to generate an array too large for the CDC-3300. For larger computers a larger limiting factor should be used).

The program requires the use of two separate subroutines. A discussion of each follows.

1) LTRNR (Letter-Number): This subroutine is used to decode the over-punched fields of temperature and dew-point. All TDF-14 temperature fields contain three digits. Each field is stored such that the units digit has a plus or minus sign punched over the digit to indicate whether the temperature is positive or negative. Thus the fields must be broken down into a two digit numeric field and a one digit alpha field. This subroutine separates the alpha digit from the overpunch and computes the desired correct temperature value.

2) RDTAPE (Read Tape): This subroutine is used to access the data tapes. As previously stated EXTRACTS is designed to use the ETAC TDF-14 data base. If other data bases are used, this subroutine would require modification to handle the new data base format. Two points of caution are to be noted. First, the main program is designed such that one call to RDTAPE returns one full day's data. Any revision must take this into account. Second, the TDF-14 data base is such that all hours are accounted for. (Missing observations are zero filled.) Should another data base, such as the ETAC DATA SAVE be used, a provision to handle missing observations must be included.

The following tape unit assignments are used by this program.

UNIT	CONTENTS
1	Output
2	Input Data Base Tape 1
3	Input Data Base Tape 2
4	Input Data Base Tape 3

Table 7. Program EXTRACTS Input/Output Tape Unit assignments.

The card input variable IEOF is used to indicate the total number of input data tapes to be used (See Table 17, page 88).

The following 11 pages contain the flowchart, program listing and audit listing for this program. The audit listing indicates the DTG of the first and last observations on each input tape and total count of observations output.

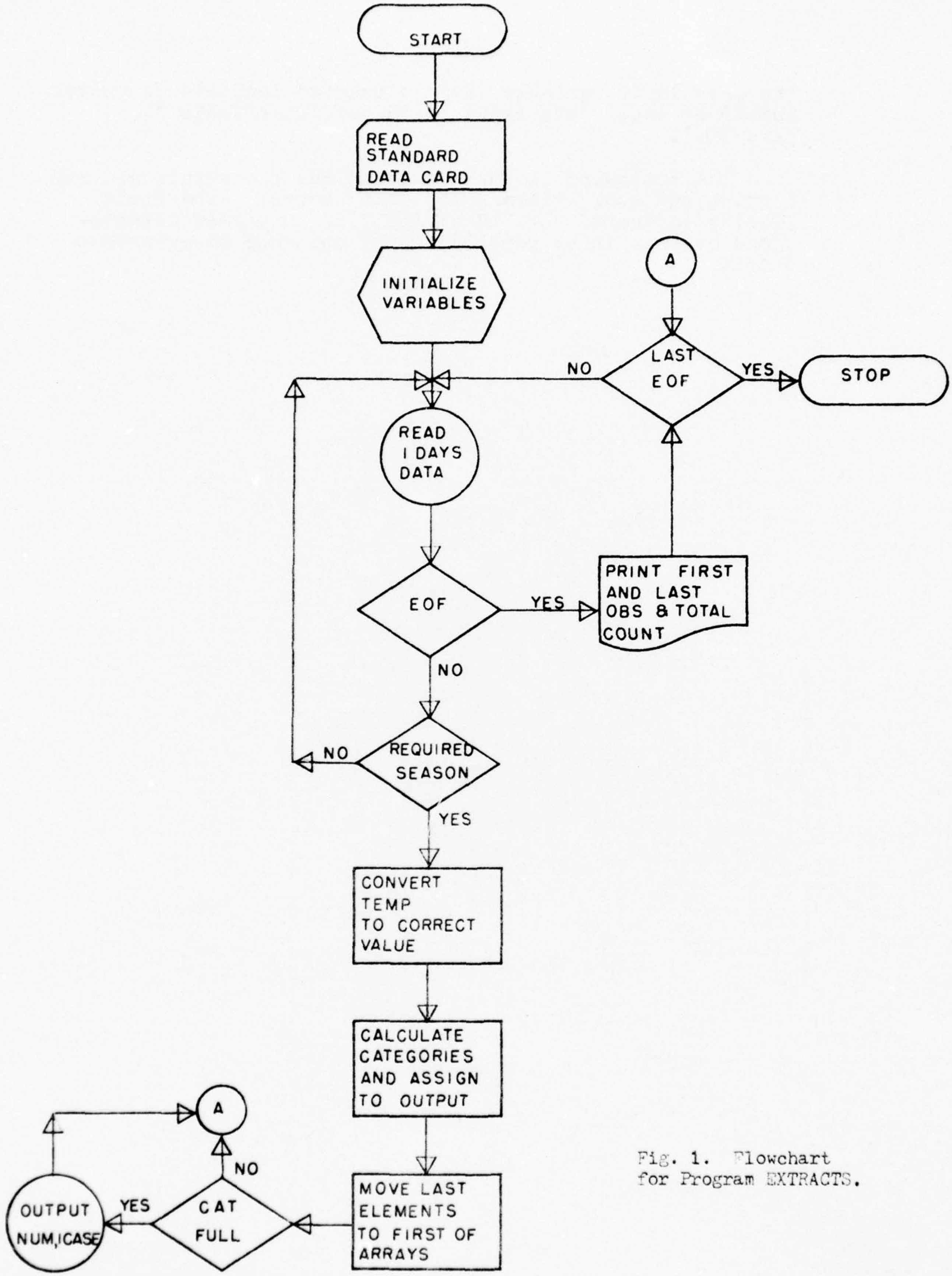

Fig. 1. Flowchart for Program EXTRACTS.

```
      PROGRAM EXTRACTS
C
C     SEE PROGRAM DOCUMENTATION FOR DESCRIPTION OF PROGRAM FLOW.
C
C     BELOW LIST THE USES FOR SPECIFIC VARIABLES USED IN THIS PROGRAM.
C
C     IYR       - YEAR OBTAINED FROM OBSERVATION ON TAPE.
C     NUM       - COUNTER FOR NUMBER OF OBS IN ARRAY ICASE.
C     ICAT      - ARRAY USED TO HOLD VALUES OF CIG/VIS FOR CHECKING.
C     ICIG      - ARRAY TO HOLD ONE DAYS CEILING CODES.
C     IDAY      - DAY OBTAINED FROM OBSERVATION ON TAPE.
C     IDDN      - ARRAY TO HOLD ONE DAYS NUMERIC WIND DIRECTION CODE.
C     IEOF      - INDICATES TOTAL NUMBER OF INPUT TAPES TO BE USED.
C     IERR      - HOLDS VALUE FOR TOTAL PARITY ERRORS FOUND ON TAPE.
C     IFFL      - ARRAY TO HOLD ONE DAYS ALPHA WIND SPEED CODE.
C     IFFN      - ARRAY TO HOLD ONE DAYS NUMERIC WIND SPEED CODE.
C     IMON      - MONTH OBTAINED FROM OBSERVATION ON TAPE.
C     IOBS      - COUNTER FOR TOTAL OBS OUTPUT.
C     ITDL      - ARRAY TO HOLD ONE DAYS ALPHA DEW-POINT CODE.
C     ITDN      - ARRAY TO HOLD ONE DAYS NUMERIC DEW-POINT CODE.
C     ITTL      - ARRAY TO HOLD ONE DAYS ALPHA TEMPERATURE CODE.
C     ITTN      - ARRAY TO HOLD ONE DAYS NUMERIC TEMPERATURE CODE.
C     ISTN      - ARRAY USED TO HOLD NAME OF STATION BEING PROCESSED.
C     IVIS      - ARRAY TO HOLD ONE DAYS VISIBILITY CODES.
C     LDAY      - LAST DAY PROCESSED ON A TAPE.
C     LMON      - LAST MONTH PROCESSED ON A TAPE.
C     NEND      - INDICATES WHERE THE LAST ELEMENT IS TO BE FOUND.
C     NOBS      - CONTAINS COUNTER OF TOTAL OBS INPUT.
C     ICASE     - ARRAY USED TO OUTPUT DATA COLLECTED.
C     IHOUR     - INPUT FROM DATA CARD TO INDICATE FINAL HOUR BEING PROCESSED.
C     INPUT     - ARRAY USED TO HOLD DATA BUFFERED IN FROM TAPE (RDTAPE).
C     ITEMP     - INPUT FROM DATA CARD TO INDICATE IF TEMPERATURE IS (C) OR (F).
C     LUNIT     - UNIT FROM WHICH THE INPUT DATA ARE TO BE READ.
C     NDSPD     - ARRAY USED TO ESTABLISH VALUES OF DEW-POINT SPREADS DESIRED.
C     IFSTDY    - FIRST DAY ON EACH TAPE.
C     IFSTMO    - FIRST MONTH ON EACH TAPE.
C     IFSTYR    - FIRST YEAR ON EACH TAPE.
C     ISEASN    - INPUT FROM DATA CARD TO INDICATE SEASON BEING PROCESSED.
C     LSEASN    - ARRAY USED TO OUTPUT CORRECT SEASON PROCESSED.
C     ISWTCH    - USED TO SKIP CODING IN RDTAPE TO OBTAIN FIRST DTG.
C     NSEASN    - ARRAY USED TO ESTABLISH DESIRED SEASON.
C     NSTART    - INDICATES WHERE IN EACH ARRAY DATA ARE TO BE PLACED.
C     IWINDSG   - ARRAY USED TO ESTABLISH VALUES OF WIND CATEGORIES DESIRED.
C     ICIGCATS  - ARRAY USED TO ESTABLISH VALUES OF CEILINGS DESIRED.
C     IVISCATS  - ARRAY USED TO ESTABLISH VALUES FOR VISIBILITIES DESIRED.
C
      COMMON NSTART,NEND,IEOF,LUNIT,ISWTCH,NOBS,IYR,IMON,IDAY,IFSTYR,
     *       IFSTMO,IFSTDY,ICIG(30),IVIS(30),IDDN(30),IFFN(30),IFFL(30),
     *       ITTN(30),ITTL(30),ITDN(30),ITDL(30),IERR
      DIMENSION ICASE(1000,7),ICIGCATS(30),IVISCATS(30),IWINDSG(18),
     *          NDSPD(18),NSEASN(12),LSEASN(4,2),ISTN(8),ICAT(2)
C
C     BELOW ARE LISTED THE CODED VALUES FOR CEILING AND VISIBILITY,
C     AND THE DATA STATEMENTS USED TO PRINT THE HEADINGS.
```

```
C     CHECK THE TDF-14 MANUAL FOR CODE CONVERSIONS.
C
      DATA ((NSEASN(I),I=1,12)=12(0))
      DATA ((ICIGCATS(I),I=1,30)=000,001,002,003,004,005,
     *                           006,007,008,009,010,012,
     *                           014,016,018,020,022,024,
     *                           026,028,030,035,040,050,
     *                           060,080,100,140,200,300)
      DATA ((IVISCATS(I),I=1,30)=000,001,002,003,004,005,
     *                           006,007,008,009,010,012,
     *                           014,016,017,018,019,020,
     *                           024,027,030,037,040,050,
     *                           060,070,090,140,250,300)
      DATA ((IWINDSG(I),I=1,18)=00,99,12,22,32,33,34,44,54,
     *                         55,56,66,76,77,78,88,18,11)
      DATA ((NDSPD(I),I=1,18)=000,001,002,003,004,005,006,007,009,
     *                       011,013,015,017,019,022,025,031,999)
      DATA (((LSEASN(I,J),J=1,2),I=1,4)=4HSPRI,4HNG  ,4HSUMM,4HER  ,
     *                                  4HAUTU,4HMN  ,4HWINT,4HER  )
C
C     READ STANDARD DATA CARD.  VALUES UNDERLINED WITH *** ARE THOSE USED.
C
      READ 19,IEOF,IHOUR,ISEASN,ITYPE,IMODE,ITEMP,IPRT,ILIM,ISTN
C             **** ***** ******             *****           ****
C
C     INITIALIZE NECESSARY VALUES.
C
      NUM = 1
      NOBS = 0
      IOBS = 0
      IERR = 0
      LUNIT = 2
      LMON = 99
      LDAY = 99
      ISWTCH = 1
      NSTART = IHOUR + 1
C
C     PUT SOMETHING OUT SO WE KNOW WHAT WE ARE DOING.
C
      PRINT 21,IHOUR,(LSEASN(ISEASN,N),N=1,2),ISTN
C
C     SET MONTHS FOR SEASON DESIRED TO ONE (1).
C
      I = ISEASN * 3
      NSEASN(I) = 1
      IF (I .EQ. 12) I = 0
      NSEASN(I+1) = 1
      NSEASN(I+2) = 1
C
C     READ A DAYS WORTH OF OBS, CHECK FOR EOF, AND SEE IF RIGHT SEASON.
C
    1 CALL RDTAPE
      IF (IEOF .EQ. 0) GO TO 18
      IF (NSEASN(IMON) .NE. 1) GO TO 1
```

```
C
C     CONVERT TEMPERATURES AND DEW POINTS TO CORRECT VALUES.
C
      CALL LTRNR(ITTN,ITTL)
      CALL LTRNR(ITDN,ITDL)
C
C     DETERMINE AT WHICH OBS TO START CHECKING.
C     IF LAST OBS PROCESSED WAS PREVIOUS DAY ISTART=NSTART, IF NOT
C     RECOMPUTE ISTART TO 5 FOR 2HR MODE OR 9 FOR 4HR MCDE.
C
      ISTART = NSTART
      IF (LDAY .EQ. (IDAY-1)) GO TO 2
      IF (LMON .EQ. (IMON-1)) GO TO 2
      ISTART = ISTART + IHOUR
    2 LMON = IMON
      LDAY = IDAY
C
C     LOOP THROUGH ALL 24 OBS CONVERTING DESIRED ELEMENTS.
C     KF (K-FINAL) INDICATES THE FINAL HOUR.
C     KI (K-INITIAL) INDICATES THE INITIAL HOUR.
C
C     ICASE(N,1) = INITIAL TIME (0-23).
C     ICASE(N,2) = INITIAL WIND CATEGORY (1-9).
C     ICASE(N,3) = INITIAL DEW-POINT SPREAD CATEGORY (1-17).
C     ICASE(N,4) = INITIAL CEILING CATEGORY (1-30).
C     ICASE(N,5) = FINAL   CEILING CATEGORY (1-30).
C     ICASE(N,6) = INITIAL VISIBILITY CATEGORY (1-30).
C     ICASE(N,7) = FINAL   VISIBILITY CATEGORY (1-30).
C
      DO 16 KF=ISTART,NEND
      KI = KF - IHOUR
      N = NUM
C
C     CHECK FCR OBS WITH PARITY ERROR.
C
      IF (ICIG(KI) .EQ. 999999) GO TO 16
      IF (ICIG(KF) .EQ. 999999) GO TO 16
C
C     CHECK FCR MISSING INITIAL OBS.
C
      IF (ICIG(KI) .NE. 0) GO TO 3
      IF (IVIS(KI) .NE. 0) GO TO 3
      IF (IDDN(KI) .NE. 0) GO TO 3
      IF (IFFN(KI) .NE. 0) GO TO 3
      IF (ITTN(KI) .NE. 0) GO TO 3
      IF (ITDN(KI) .NE. 0) GO TO 3
      GO TO 16
C
C     CHECK FCR MISSING FINAL OBS.
C
    3 IF (ICIG(KF) .NE. 0) GO TO 4
      IF (IVIS(KF) .NE. 0) GO TO 4
      IF (IDDN(KF) .NE. 0) GO TO 4
      IF (IFFN(KF) .NE. 0) GO TO 4
```

```
      IF (ITTN(KF) .NE. 0) GO TO 4
      IF (ITDN(KF) .NE. 0) GO TO 4
      GO TO 16
C
C     DETERMINE REAL INITIAL TIME (0-23).
C
    4 ITIME = KI - NSTART
      IF (ITIME .LT. 0) ITIME = ITIME + 24
      ICASE(N,1) = ITIME
C
C     IF WIND SPEED IS 0-3 KTS WIND CATEGORY IS (1).
C     THE VALUE 20 IS THE DECIMAL CODE FOR THE LETTER D.
C     CHECK TDF-14 MANUAL FOR METHOD OF STORING WIND SPEED.
C
      IF (IFFN(KI) .NE. 0) GO TO 5
      IF (IFFL(KI) .LT. 20) IDDN(KI) = 0
C
C     DETERMINE INITIAL WIND CATEGORY (1-9).
C
    5 DO 6 I=1,18
      IF (IDDN(KI) .EQ. IWINDSG(I)) GO TO 7
    6 CONTINUE
      GO TO 16
    7 ICASE(N,2) = (I+1) / 2
C
C     COMPUTE INITIAL DEW POINT SPREAD (0-99).
C
      IF (ITTN(KI) .EQ. 999999) GO TO 16
      ISPD = ITTN(KI) - ITDN(KI)
      IF (ISPD .LT. 0) GO TO 16
C
C     IF DESIRED, CHANGE ISPD(F) TO ROUNDED ISPD(C).
C
      IF (ITEMP .EQ. 2) ISPD = .55556 * ISPD + 0.5
C
C     DETERMINE INITIAL DEW-POINT SPREAD CATEGORY (1-17).
C
      DO 8 I=2,18
      IF (ISPD .LT. NDSPD(I) .AND. ISPD .GE. NDSPD(I-1)) GO TO 9
    8 CONTINUE
      GO TO 16
    9 ICASE(N,3) = I-1
C
C     DETERMINE VALUES FOR INITIAL AND FINAL CEILING CATEGORY (1-30).
C
      ICAT(1) = ICIG(KI)
      ICAT(2) = ICIG(KF)
C
      DO 12 I=1,2
      DO 10 J=1,30
      K = 31 - J
      IF (ICAT(I) .GE. ICIGCATS(K)) GO TO 11
   10 CONTINUE
      GO TO 16
```

```
   11 ICASE(N,I+3) = K
   12 CONTINUE
C
C     DETERMINE VALUES FOR INITIAL AND FINAL VISIBILITY CATEGORY (1-30).
C
      ICAT(1) = IVIS(KI)
      ICAT(2) = IVIS(KF)
C
      DO 15 I=1,2
      DO 13 J=1,30
      K = 31 - J
      IF (ICAT(I) .GE. IVISCATS(K)) GO TO 14
   13 CONTINUE
      GO TO 16
   14 ICASE(N,I+5) = K
   15 CONTINUE
C
C     IF WE MADE IT THIS FAR BUMP TOTAL OBS OUTPUT BY 1.
C
      IOBS = IOBS + 1
C
C     IF WE HAVE FILLED THE BUFFER WRITE IT OUT AND START OVER.
C     NUM IS WRITTEN ALSO SO WE WILL KNOW HOW MANY ARE IN THE LAST BUFFER.
C
      NUM = NUM + 1
      IF (NUM .LE. 1000) GO TO 16
      NUM = 1000
      WRITE (01) NUM,ICASE
      NUM = 1
   16 CONTINUE
C
C     MOVE PRESENT DATA TO BEGINNING OF ARRAYS FOR CHECKING NEXT DAYS DATA.
C
      DO 17 I=1,IHOUR
      ICIG(I) = ICIG(I+24)
      IVIS(I) = IVIS(I+24)
      IDDN(I) = IDDN(I+24)
      IFFN(I) = IFFN(I+24)
      IFFL(I) = IFFL(I+24)
      ITTN(I) = ITTN(I+24)
      ITDN(I) = ITDN(I+24)
   17 CONTINUE
      GO TO 1
C
C     IF LAST INPUT EOF WRITE LAST BUFFER AND EOF.
C
   18 NUM = NUM - 1
      WRITE (01) NUM,ICASE
      ENDFILE 01
C
C     PRINT TOTAL OBS AND STOP.
C
      PRINT 20,IOBS
      STOP
```

```
C
C     THESE ARE THE FORMAT STATEMENTS USED.
C
   19 FORMAT (8I2,1X,8A4)
   20 FORMAT (//,1X,≠TOTAL OBSERVATIONS OUTPUT≠,I6)
   21 FORMAT (1H1,≠DATA PROCESSED IS FOR HOUR:≠,I2,3X,≠SEASON: ≠,2A4,
     *        ≠  STATION: ≠,8A4,//)
      END
```

FORTRAN DIAGNOSTIC RESULTS FOR EXTRACTS

NO ERRORS

```
      SUBROUTINE LTRNR(NR,LTR)
C
C     THIS SUBROUTINE IS USED TO CONVERT EITHER THE TEMPERATURE OR
C     DEW POINT TEMPERATURE TO ACTUAL VALUES.
C     CHECK TDF-14 MANUAL FOR METHOD OF STORING THESE VALUES.
C
C     NR INDICATES THE ARRAY CONTAINING THE NUMERIC DIGITS.
C     LTR INDICATES THE ARRAY CONTAINING THE ALPHA CHARACTER.
C
      COMMON NSTART,NEND
      DIMENSION NR(30),LTR(30)
C
C     NSTART AND NEND ARE USED TO SET THE LIMITS OF THE 24 OBS.
C
      DO 5 I=NSTART,NEND
C
C     CHECK FOR LETTERS A - I.
C
      IF (LTR(I) .GE. 17 .AND. LTR(I) .LE. 25) GO TO 4
C
C     CHECK FOR LETTERS J - R.
C
      IF (LTR(I) .GE. 33 .AND. LTR(I) .LE. 41) GO TO 2
C
C     CHECK FOR < (SIGNED POSITIVE ZERO).
C
      IF (LTR(I) .EQ. 26) GO TO 3
C
C     CHECK FOR v (SIGNED NEGATIVE ZERO).
C
      IF (LTR(I) .EQ. 42) GO TO 1
C
C     CHECK FOR BLANK OR 0 (ZERO).
C
      IF (LTR(I) .EQ. 48 .OR. LTR(I) .EQ. 0) GO TO 5
C
C     INVALID CODE.
C
      NR(I) = 999999
      GO TO 5
    1 NR(I) = -1 * (NR(I) * 10)
      GO TO 5
    2 NR(I) = -1 * (NR(I) * 10 + (LTR(I) - 32))
      GO TO 5
    3 NR(I) = NR(I) * 10
      GO TO 5
    4 NR(I) = NR(I) * 10 + (LTR(I) -16)
    5 CONTINUE
      RETURN
      END

              FORTRAN DIAGNOSTIC RESULTS  FOR    LTRNR

NO ERRORS
```

```
      SUBROUTINE RDTAPE
C
C     THIS SUBROUTINE IS USED TO READ THE ETAC SUPPLIED TDF-14 TAPES.
C     CHECK TDF-14 MANUAL FOR METHOD OF STORING OBS ON TAPE.
C     ONE CALL RDTAPE RETURNS A FULL DAYS OBS.
C
      COMMON NSTART,NEND,IEOF,LUNIT,ISWTCH,NOBS,IYR,IMON,IDAY,IFSTYR,
     *       IFSTMO,IFSTDY,ICIG(30),IVIS(30),IDDN(30),IFFN(30),IFFL(30),
     *       ITTN(30),ITTL(30),ITDN(30),ITDL(30),IERR
      DIMENSION INPUT(124)
C
C     NOW FILL UP OUR BUFFERS WITH ONE DAYS DATA.
C     CHECK INTRODUCTION TO DOCUMENTATION FOR
C     SPECIFICS ON BUFFER IN AND UNITSTF.
C
      DO 9 I=NSTART,26,6
    1 BUFFER IN (LUNIT,0) (INPUT(1),INPUT(124))
    2 GO TO (3,7,4,5) UNITSTF(LUNIT)
    3 GO TO 2
C
C     WE HAVE AN EOF SO PRINT INFORMATION ON TAPE JUST FINISHED.
C
    4 NTAPE = LUNIT - 1
      LUNIT = LUNIT + 1
      PRINT 11,NTAPE,IERR,NOBS,IFSTYR,IFSTMO,IFSTDY,IYR,IMON,IDAY
C
C     IF LAST EOF WE RETURN.
C
      IEOF = IEOF - 1
      IF (IEOF .EQ. 0) RETURN
      ISWTCH = 1
      NOBS = 0
      IERR = 0
      GO TO 1
C
C     IF WE HAVE A PARITY ERROR SET FLAG FOR MISSING.
C
    5 IERR = IERR + 1
      NEND = I + 5
      DO 6 N=I,NEND
      ICIG(N) = 999999
    6 CONTINUE
      GO TO 9
C
C     CHECK INTRODUCTION TO DOCUMENTATION FOR SPECIFICS ON DECODE.
C
    7 NOBS = NOBS + 6
      NEND = I + 5
      DECODE (496,10,INPUT)  (IYR,IMON,IDAY,((ICIG(N),IVIS(N),IDDN(N),
     *                        IFFN(N),IFFL(N),ITTN(N),ITTL(N),ITDN(N),
     *                        ITDL(N)),N=I,NEND))
C
C     ISWTCH IS USED TO ISOLATE OUR FIRST YEAR, MONTH AND DAY FOR EACH TAPE.
C
```

```
      GO TO (8,9) ISWTCH
    8 IFSTYR = IYR
      IFSTMO = IMON
      IFSTDY = IDAY
      ISWTCH = 2
    9 CONTINUE
      RETURN
C
C     THESE ARE THE FORMAT STATEMENTS USED.
C
   10 FORMAT (9X,3I2,6(3X,I3,1X,I3,2I2,R1,I2,R1,3X,I2,R1,56X),1X)
   11 FORMAT (//,1X,≠INPUT TAPE≠,I2,≠ CONTAINS≠,I5,≠ ERRORS AND≠,I7,
     *        ≠ OBSERVATIONS FROM≠,I3,2(1H/,I2),≠ TO ≠,I2,2(1H/,I2))
      END

              FORTRAN DIAGNOSTIC RESULTS FOR    RDTAPE

NO ERRORS
00H01M19S
10H57M39S  228,CAIN62345108 04/30/76
```

```
DATA PROCESSED IS FOR HOUR: 2    SEASON: SUMMER     STATION: 725540 OFFUTT AFB - OMAHA, NE


INPUT TAPE 1 CONTAINS     3 ERRORS AND 120798 OBSERVATIONS FROM 48/ 1/ 1 TO 61/10/12

INPUT TAPE 2 CONTAINS     1 ERRORS AND  76380 OBSERVATIONS FROM 61/10/12 TO 70/ 6/30

TOTAL OBSERVATIONS OUTPUT 49245
```

Fig. 2. Sample output for program EXTRACTS

III. PROGRAM COMPUNCD

Once the required elements have been extracted from the observations and the appropriate category values assigned (See Tables 3, 4, 5 and 6) the frequency of occurrences for the various categories can be computed.

The observations are stratified by wind category, hour, dew-point spread and ceiling/visibility category in this order. Because of computer limitations a search is made of the entire input tape for those observations which belong to a single wind category. A 3-dimensional array (hour, dew-point spread, ceiling/visibility) containing the frequency of occurrence values is computed. After one category is computed the input tape is rewound and the next category is considered. (Larger computers which may use 4-dimensional arrays need only pass the tape once.)

After one wind category is complete the total number of cases of each dew-point spread category by hour is computed. Values are cumulated for each of the 30 ceiling/visibility categories to insure that all totals are increasing with height/distance. The frequencies in each ceiling/visibility category indicate cumulative occurrences at and below the category level. Next the probabilities are computed by hour for each dew-point spread and ceiling/visibility category. The frequency of occurrences for each dew-point spread category and the stratified probabilities for each given hour are written to tape. After all 24 hours have been written to tape for one wind sector an end-of-file is written and the program continues to the next subset. A single output tape contains a total of nine files.

The following output tapes are created from the aforementioned input tapes.

TAPE	TYPE
1	2 HR Initial Ceiling
2	2 HR Final Ceiling
3	2 HR Initial Visibility
4	2 HR Final Visibility
5	4 HR Initial Ceiling
6	4 HR Final Ceiling
7	4 HR Initial Visibility
8	4 HR Final Visibility

Table 8. The eight different type of runs required by this program for the Stochastic process.

The tape unit assignments for this program are as follows:

UNIT	CONTENTS
1	Input (EXTRACTS Output)
2	Output

Table 9. Input/Output tape unit assignments for program COMPUNCD.

The next seven pages contain the flowchart, program listing and a sample audit listing for this program. The audit listing indicates the total number of observations by hour for the indicated wind category and dew-point spread.

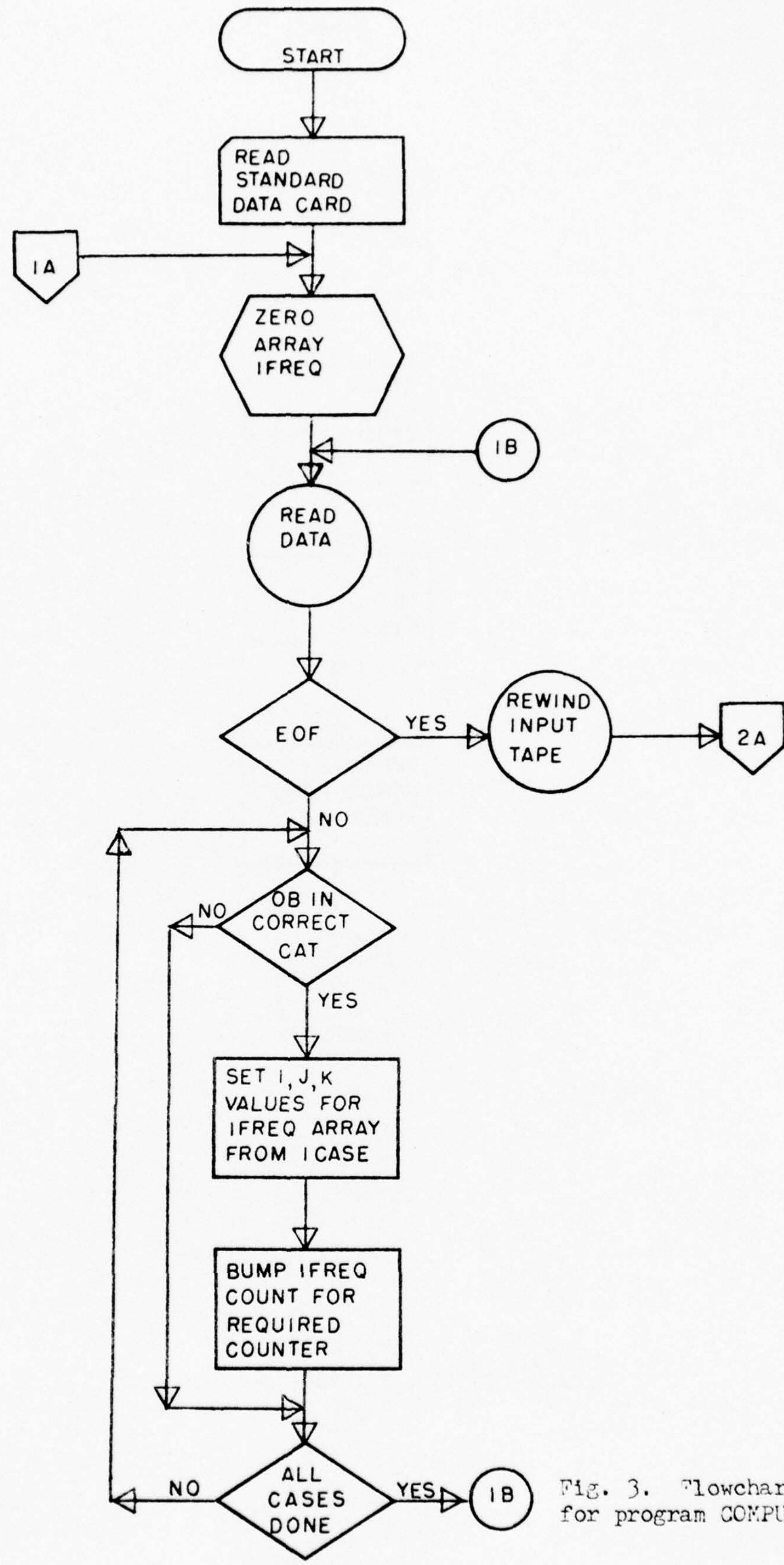

Fig. 3. Flowchart for program COMPUNCD.

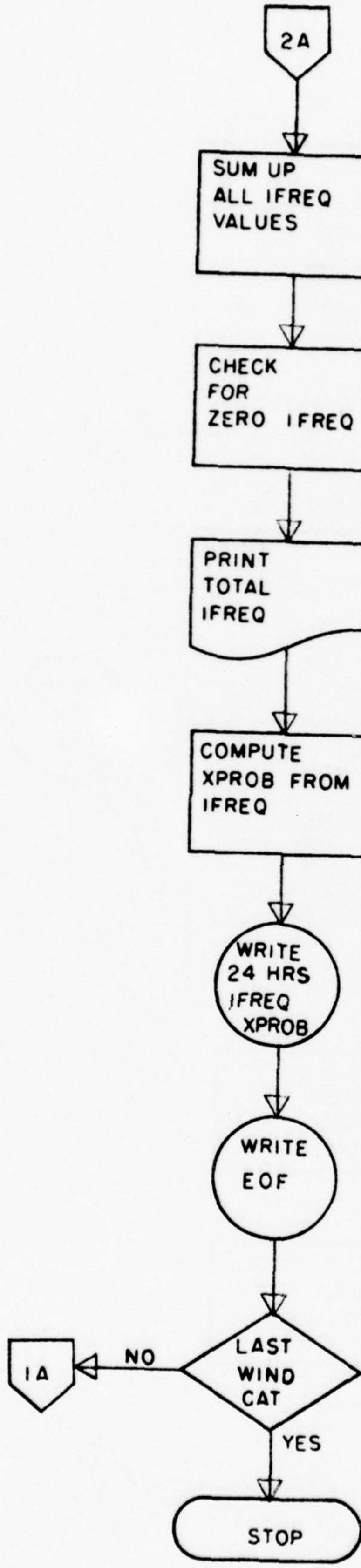

Fig. 3a. Flowchart for program COMPUNCD continued.

```
      PROGRAM COMPUNCD
C
C     SEE PROGRAM DOCUMENTATION FOR DESCRIPTION OF PROGRAM FLOW.
C
C     BELOW LIST THE USES FOR SPECIFIC VARIABLES USED IN THIS PROGRAM.
C
C     NUM      - VALUE COMPUTED IN EXTRACTS TO INDICATE TOTAL OBS IN ONE READ.
C     IOBS     - COUNTER FOR TOTAL OBS PROCESSED FOR ALL WIND CATEGORIES.
C     ISTN     - NAME OF THE STATION BEING PROCESSED.
C     NOBS     - COUNTER FOR TOTAL OBS PROCESSED FOR ONE WIND CATEGORY.
C     ICASE    - ARRAY OUTPUT FROM EXTRACTS CONTAINING OBS ELEMENTS.
C     IFREQ    - ARRAY USED TO COLLECT TOTALS BY HOUR,SPREAD,CATEGORY.
C     IHOUR    - INPUT FROM DATA CARD TO INDICATE FINAL HOUR BEING PROCESSED.
C     IMODE    - INPUT FROM DATA CARD TO INDICATE IF INITIAL OR FINAL.
C     ITEMP    - INPUT FROM DATA CARD TO INDICATE IF TEMPERATURE IS (C) OR (F).
C     ITYPE    - INPUT FROM DATA CARD TO INDICATE IF CEILING OR VISIBILITY.
C     LDSPD    - INDICATES ON LISTING THE DEW-POINT CATEGORIES.
C     LMODE    - INDICATES ON LISTING IF DATA IS INITIAL OR FINAL.
C     LTEMP    - INDICATES ON LISTING IF DEW-POINT IS (C) OR (F).
C     LTYPE    - INDICATES ON LISTING THE TYPE (CEILING/VISIBILITY).
C     LWIND    - INDICATES ON LISTING THE CURRENT WIND CATEGORY.
C     XPROB    - ARRAY USED TO COMPUTE THE PROBABILITIES FROM THE FREQUENCIES.
C     ISEASN   - INPUT FROM DATA CARD TO INDICATE SEASON BEING PROCESSED.
C     LSEASN   - INDICATES ON LISTING THE SEASON BEING PROCESSED.
C
      COMMON ICASE(1000,7),IFREQ(24,17,31)
      DIMENSION ISTN(8),LMODE(2,2),LTEMP(2),LDSPD(34),LTYPE(2,3),
     *          XPROB(17,30),LWIND(9,2),LSEASN(4,2)
C
C     BELOW ARE LISTED THE DATA STATEMENTS USED TO PRINT THE HEADINGS.
C
      DATA ((LTEMP(I),I=1,2)=4H (F),4H (C))
      DATA (((LMODE(I,J),J=1,2),I=1,2)=4HINIT,4HIAL ,
     *                                 4HFINA,4HL   )
      DATA (((LWIND(I,J),J=1,2),I=1,9)=4H0-3 ,4HKTS ,
     *                                 4H327-,4H11  ,
     *                                 4H 12-,4H56  ,
     *                                 4H 57-,4H101 ,
     *                                 4H102-,4H146 ,
     *                                 4H147-,4H191 ,
     *                                 4H192-,4H236 ,
     *                                 4H237-,4H281 ,
     *                                 4H282-,4H326 )
      DATA (((LTYPE(I,J),J=1,3),I=1,2)=4HCEIL,4HING ,4H    ,
     *                                 4HVISI,4HBILI,4HTY  )
      DATA (((LSEASN(I,J),J=1,2),I=1,4)=4HSPRI,4HNG  ,4HSUMM,4HER  ,
     *                                  4HAUTU,4HMN  ,4HWINT,4HER  )
      DATA ((LDSPD(I),I=1,34)=4H  0 ,4H    ,4H  1 ,4H    ,4H  2 ,4H    ,
     *                        4H  3 ,4H    ,4H  4 ,4H    ,4H  5 ,4H    ,
     *                        4H  6 ,4H    ,4H7-8 ,4H    ,4H9-10,4H    ,
     *                        4H11-1,4H2   ,4H13-1,4H4   ,4H15-1,4H6   ,
     *                        4H17-1,4H8   ,4H19-2,4H1   ,4H22-2,4H4   ,
     *                        4H25-3,4H0   ,4H >30,4H    )
C
```

```
C     START WITH CORRECT VALUES.
C
      NOBS = 0
      IOBS = 0
C
C     READ STANDARD DATA CARD.  VALUES UNDERLINED WITH *** ARE THOSE USED.
C
      READ 13,IEOF,IHOUR,ISEASN,ITYPE,IMODE,ITEMP,IPRT,ILIM,ISTN
C              ***** ****** ***** ***** *****             ****
C
C     SET INDICATOR FOR DESIRED INPUT PARAMETER TO USE FOR CATEGORY.
C     M = 4 IS FOR INITIAL CEILING.       M = 5 IS FOR FINAL CEILING.
C     M = 6 IS FOR INITIAL VISIBILITY.    M = 7 IS FOR FINAL VISIBILITY.
C
      M = IMODE + 2*ITYPE + 1
C
C     NOW LOOP FOR EACH NEW WIND CATEGORY (1-9).
C
      DO 12 IWIND=1,9
C
C     ZERO THE ARRAY IFREQ(24,17,30).
C
      DO 1 I=1,24
      DO 1 J=1,17
      DO 1 K=1,30
      IFREQ(I,J,K) = 0
    1 CONTINUE
C
C     PRINT HEADING SO WE WILL KNOW WIND CATEGORY.
C
      PRINT 17,(LWIND(IWIND,N),N=1,2),(LSEASN(ISEASN,N),N=1,2),
     *         (ISTN(N),N=1,8),IHOUR,(LMODE(IMODE,N),N=1,2),
     *         (LTYPE(ITYPE,N),N=1,3),LTEMP(ITEMP),(LDSPD(N),N=1,34)
C
C     READ DATA OUTPUT FROM EXTRACTS.
C
    2 READ (01) NUM,ICASE
C
C     IF WE HAVE THE LAST EOF REWIND TAPE AND GO OUTPUT SOME VALUES.
C
      GO TO (3,4) EOFCKF(01)
    3 REWIND 01
      GO TO 6
C
C     LOOP THROUGH ALL OBS TO COMPUTE TOTALS.
C
    4 DO 5  N=1,NUM
C
C     SKIP IF THIS IS NOT THE CURRENT WIND CATEGORY.
C
      IF (ICASE(N,2) .NE. IWIND) GO TO 5
C
C     I IS THE INITIAL HOUR + 1 (1-24).
C     J IS THE DEW POINT SPREAD CATEGORY.
```

```
MS FORTRAN  (4.2) / MSOS                          04/30/76           PAGE 003
C     K IS THE CEILING/VISIBILITY CATEGORY.
C
      I = ICASE(N,1) + 1
      J = ICASE(N,3)
      K = ICASE(N,M)
C
C     CHECK FOR POSSIBLE TAPE ERROR GIVING WRONG DATA.
C
      IF (I.GT.24 .OR. J.GT.17 .OR. K.GT.30) GO TO 5
C
C     BUMP COUNTER FOR IFREQ(HOUR,SPREAD,CATEGORY) BY 1
C
      IFREQ(I,J,K) = IFREQ(I,J,K) + 1
C
C     BUMP COUNTER FOR THIS CATEGORY.
C
      NOBS = NOBS + 1
    5 CONTINUE
      GO TO 2
C
C     NOW SUM UP COUNT BY CEILING/VISIBILITY TO MAKE TOTALS
C     INCREASE WITH INCREASING HEIGHT/DISTANCE.
C
    6 DO 9  I=1,24
      DO 8  J=1,17
      DO 7  K=2,30
      IFREQ(I,J,K) = IFREQ(I,J,K) + IFREQ(I,J,K-1)
    7 CONTINUE
C
C     THIS WILL BE THE GRAND TOTAL.  MAKE SURE WE DO NOT DIVIDE BY ZERO.
C
      IFREQ(I,J,31) = IFREQ(I,J,30)
      IF (IFREQ(I,J,30) .EQ. 0) IFREQ(I,J,30) = 1
    8 CONTINUE
C
C     PRINT THE TOTALS FOR CHECKING.
C
      IHR = I - 1
      PRINT 14,IHR,(IFREQ(I,J,31),J=1,17)
    9 CONTINUE
C
C     PRINT TOTAL OBS FOR THIS CATEGORY.
C
      PRINT 15,NOBS
      IOBS = IOBS + NOBS
      NOBS = 0
C
C     NOW COMPUTE THE PROBABILITIES AND WRITE TOTALS AND PROBABILITIES TO TAPE.
C
      DO 11 I=1,24
      DO 10 J=1,17
      DO 10 K=1,30
      XPROB(J,K) = FLOAT(IFREQ(I,J,K)) / FLOAT(IFREQ(I,J,30))
   10 CONTINUE
```

```
      WRITE (02) ((IFREQ(I,J,K),J=1,17),K=1,31),XPROB
   11 CONTINUE
C
C     WRITE AN EOF AFTER EACH WIND CATEGORY.
C
      ENDFILE 02
   12 CONTINUE
C
C     BEFORE WE STOP PRINT TOTAL OBS FOR ALL CATEGORIES.
C
      PRINT 16,IOBS
      STOP
C
C     THESE ARE THE FORMAT STATEMENTS USED.
C
   13 FORMAT (8I2,1X,8A4)
   14 FORMAT (8X,I2,17I7)
   15 FORMAT (1H0,≠TOTAL OBSERVATIONS FOR THIS CATEGORY IS ≠,I7)
   16 FORMAT (1H0,≠TOTAL OBSERVATIONS FOR ALL CATEGORIES IS≠,I7)
   17 FORMAT (1H1,≠WIND DIRECTION: ≠,2A4,≠ SEASON: ≠,2A4,3X,≠STATION: ≠,
     *        8A4,7X,≠ HOUR:≠,I2,≠  MODE: ≠,2A4,≠ TYPE: ≠,3A4,
     *        ///,60X,≠DEW POINT SPREAD≠,A4,/,8X,≠HR≠,4X,17(A4,A3)/)
      END

              FORTRAN DIAGNOSTIC RESULTS  FOR    COMPUNCC

NO ERRORS
LOAD,56
RUN,,NM
   7001 PRG USD   14531 PRG LFT   19648 COM USD  -14488 COM LFT
00H00M51S
```

WIND DIRECTION: 0-3 KTS SEASON: WINTER STATION: 725540 OFFUTT AFB - OMAHA, NE HOUR: 3 MODE: INITIAL TYPE: CEILING

	DEW POINT SPREAD (F)																
HR	0	1	2	3	4	5	6	7-8	9-10	11-12	13-14	15-16	17-18	19-21	22-24	25-30	>30
0	11	11	34	43	48	54	47	68	71	47	37	23	18	17	8	10	3
1	13	19	29	43	63	63	66	93	82	54	24	21	20	15	7	7	2
2	13	22	32	61	66	65	55	107	84	42	31	20	14	12	3	8	0
3	14	22	37	61	58	85	59	120	69	39	22	18	12	9	4	3	0
4	17	26	40	60	80	79	85	115	56	39	24	14	6	7	3	1	0
5	17	31	49	73	74	96	75	111	47	37	20	12	5	4	2	1	0
6	20	31	57	78	85	89	78	104	56	26	12	7	7	0	1	1	0
7	16	20	60	62	110	92	68	93	58	37	18	8	3	1	0	1	0
8	14	27	41	77	95	110	59	93	55	35	14	8	6	3	0	0	0
9	8	21	48	70	93	93	64	105	50	29	17	11	2	0	2	0	0
10	7	15	40	52	83	66	71	89	56	28	18	10	5	2	0	0	0
11	5	15	35	54	66	53	54	75	52	36	20	13	8	2	3	1	0
12	3	15	37	55	58	65	37	70	54	38	29	15	6	7	2	1	0
13	5	11	33	43	58	72	50	67	49	31	17	12	10	9	2	0	2
14	2	14	27	42	56	44	37	70	50	20	17	10	9	5	5	4	1
15	2	5	23	40	46	53	33	55	46	25	18	10	4	6	4	2	0
16	3	4	21	24	19	44	34	49	48	30	22	20	7	3	5	3	2
17	0	10	16	12	19	32	24	62	53	37	33	16	6	11	8	7	1
18	4	7	9	23	12	27	36	74	53	34	36	21	16	18	8	6	2
19	4	11	14	17	25	39	43	68	60	35	20	30	13	14	3	5	4
20	8	9	16	19	25	55	45	55	47	39	31	22	16	13	6	3	1
21	9	9	15	21	38	42	41	66	39	43	17	18	5	14	5	4	4
22	13	12	18	25	33	50	41	53	40	37	27	10	6	13	4	5	2
23	8	16	19	52	39	43	37	68	50	45	30	15	13	11	12	10	4

TOTAL OBSERVATIONS FOR THIS CATEGORY IS 12212

Fig. 4. Sample output Audit listing from program COMPUNCD. Indicates by hour/dew-point spread the total frequency of occurrence for wind category.

IV. PROGRAM SMTHUNCD

This program is designed to smooth the unconditional probabilities output by program COMPUNCD. Each day's data are read into an array similar to that used in COMPUNCD except the hour dimension is now 26. Each hour's data are read into elements 2 through 25, leaving elements 1 and 26 unfilled.

The frequencies are stored in a 3-dimensional array with the x-direction being the 24 hours, the y-direction the 17 dew-point spread categories and the z-direction the 30 ceiling/visibility categories. All smoothing is done in the x-y plane for each of the 30 ceiling/visibility categories of the z-plane. As a natural result of the hour dimension being cyclic in nature, the probabilities along the hour edges are exchanged to perform better smoothing (e.g., the values for hour 24 which are stored in element 25 are placed in element 1 and those for hour 1 which are stored in element 2 are placed in element 26).

Each data point is assigned a weighting factor for the x-direction (hour) and the y-direction (dew-point spread). The dew-point weighting factor is determined as follows:

$$\text{DPWGHFAC} = (0.1143*\text{N} + 1.0)^{\frac{1}{2}},$$

where N is the total observations for the particular spread. The hour weighting factor is

$$\text{HRWGHFAC} = 0.6667*(\text{DPWGHFAC} - 1.0) + 1.0$$

Each ceiling/visibility category is processed in such a way that the probability at each point uses eight surrounding probabilities to obtain a smoothed probability value. As an illustration of the smoothing scheme, data point (2,2) would be smoothed as follows:

$$P(2,2) = \frac{\begin{array}{l} P(1,1) + H(1,2)*P(1,2) + P(1,3) + \\ D(2,1)*P(2,1) + D(2,2)*H(2,2)*P(2,2) + D(2,3)*P(2,3) + \\ P(3,1) + H(3,2)*P(3,2) + P(3,3) \end{array}}{\begin{array}{l} 1.0 + H(1,2) + 1.0 + \\ D(2,1) + D(2,2)*H(2,2) + D(2,3) + \\ 1.0 + H(3,2) + 1.0 \end{array}}$$

Where P represents the probability of the point, D the dew-point spread weighting factor and H the hourly weighting factor. The formula shows that each new probability is based upon the summation of the probabilities of each point times a weighting factor divided by the sum of the weighting factors. The weighting of each corner is taken to be one. The edges are smoothed using only the five surrounding points.

The program does a preliminary smoothing in those areas of the array where the initial probability is zero. The initial smoothing cycles a maximum of ten times or until all values are non-zero. All probabilities are converted to exponential form before entering the main smoothing scheme. The main smoothing scheme cycles for a variable number of times as set by the input variable ILIM. (Investigation has shown that ILIM = 8 produces the optimum smoothing.)

Finally, when all 30 ceiling/visibility categories have been smoothed, the probabilities for each hour are written to tape along with the frequencies at each dew-point spread, ceiling/visibility intersection. Note sample output in Fig. 7. The frequencies written are those which have been smoothed and not the unsmoothed input frequencies. This is done so as to have the smoothed values which are to be used to compute the unconditional probabilities in program COMPCOND and displayed in the rubric of the Climatic Tables.

This program uses one subroutine, PRTDATA (Print Data), to list either the input unsmoothed unconditionals (Fig. 6) or the output smoothed unconditionals (Fig. 7). The card input variable IHOUR, ISEASN, ITYPE, IMODE,ITEMP and ISTN select the correct heading to be printed. The card input variable IPRT selects how many hours of each day's data are to be printed. A maximum of 24 x 9 x 12 = 432 separate matrices could be printed. This includes 2 matrices (unsmoothed and smoothed) for each 24 hours and 9 wind categories. Since one matrix output requires 2 pages, the total listing would contain 864 pages.

The following tape unit assignments are used by this program.

UNIT	CONTENT
1	Input (COMPUNCD Output)
2	Output

Table 10. Input/Output tape unit assignments for program SMTHUNCD.

The next 14 pages contain the flowchart, program listing and a sample output of the smoothed and unsmoothed probabilities computed by this program.

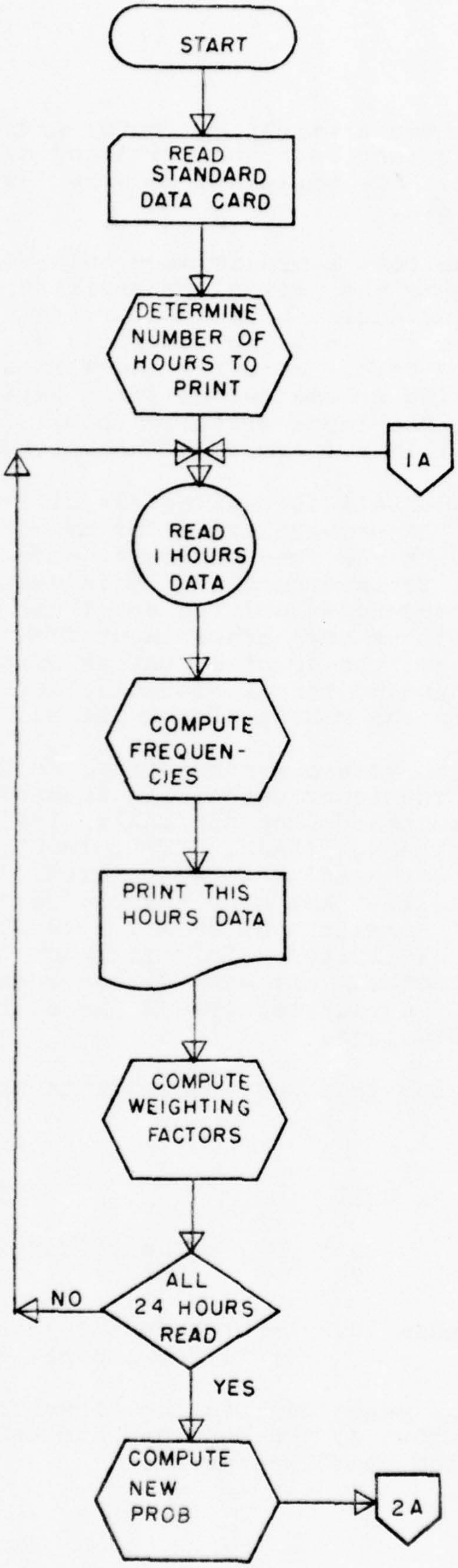

Fig. 5. Flowchart for program SMTHUNCD.

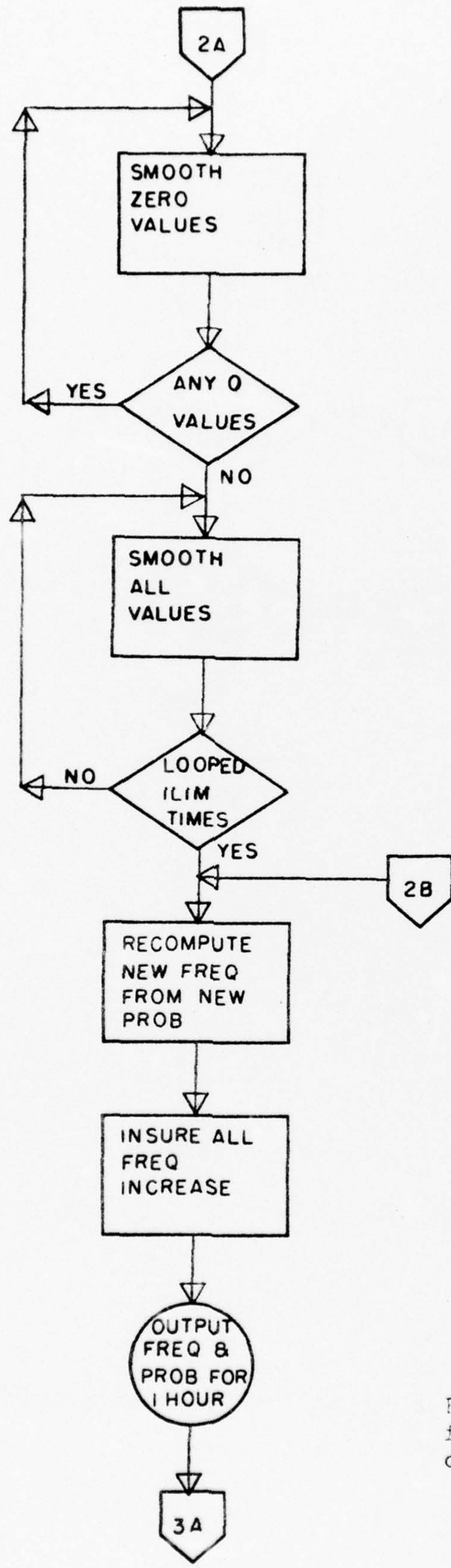

Fig. 5a. Flowchart for program SMTHUNCD continute.

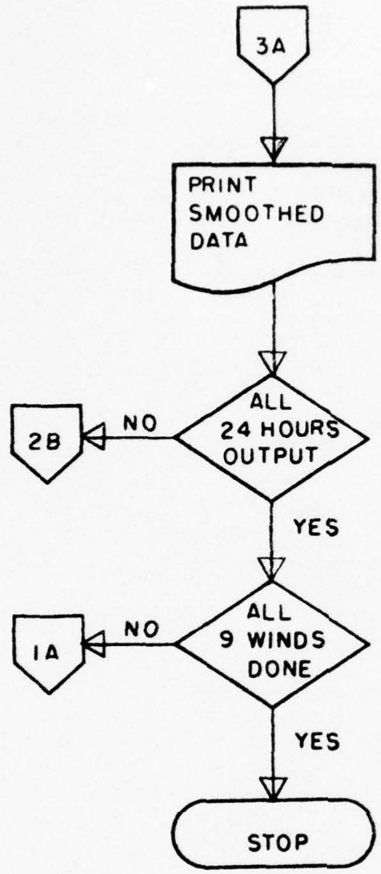

Fig. 5b. Flowchart for program SMTHUNCD continued.

```
      PROGRAM SMTHUNCD
C
C     SEE PROGRAM DOCUMENTATION FOR DESCRIPTION OF PROGRAM FLOW.
C
C     BELOW LIST THE USES FOR SPECIFIC VARIABLES USED IN THIS PROGRAM.
C
C     LUN       - ARRAY USED TO LIST EITHER SMOOTHED OR UNSMOOTHED.
C     ILIM      - VALUE INPUT FROM DATA CARD TO SET SMOOTHING CYCLE.
C     IPRT      - VALUE INPUT FROM DATA CARD TO DETERMINE HOW MANY HOURS TO LIST.
C     ISTN      - ARRAY INPUT FROM DATA CARD TO INDICATE STATION NAME.
C     IFREQ     - ARRAY USED TO HOLD FREQUENCIES INPUT FROM TAPE.
C     IHOUR     - VARIABLE INPUT FROM DATA CARD TO INDICATE HOUR BEING PROCESSED.
C     IMODE     - VALUE INPUT FROM DATA CARD TO INDICATE INITIAL OR FINAL.
C     ITEMP     - INPUT FROM DATA CARD TO INDICATE IF TEMPERATURE IS (C) OR (F).
C     ITYPE     - VALUE INPUT FROM DATA CARD TO INDICATE CEILING OR VISIBILITY.
C     LDSPD     - ARRAY USED TO LIST DEW-POINT SPREAD CATEGORIES.
C     LMODE     - ARRAY USED TO LIST EITHER INITIAL OR FINAL.
C     LTEMP     - ARRAY USED TO LIST TEMPERAGURE IN (C) OR (F).
C     LTYPE     - ARRAY USED TOLLIST CEILING/VISIBILITY CATEGORIES.
C     LWIND     - ARRAY USED TO LIST WIND CATEGORIES.
C     NFREQ     - ARRAY USED TO HOLD NEWLY COMPUTED FREQUENCIES.
C     NHOUR     - ARRAY USED TO INDICATE HOURS TO BE LISTED.
C     NTYPE     - ARRAY USED TO INDICATE CEILING OR VISIBILITY.
C     XPROB     - ARRAY USED TO HOLD UNCONDITIONAL PROBABILITIES INPUT FROM TAPE.
C     ISEASN    - VALUE INPUT FROM DATA CARD TO INDICATE SEASON BEING PROCESSED.
C     LSEASN    - ARRAY USED TO LIST SEASON BEING PROCESSED.
C     XXPROB    - ARRAY USED TO HOLD SMOOTHED PROBABILITIES.
C     DPWGHFAC - ARRAY USED TO HOLD DEW-POINT WEIGHTING FACTORS.
C     HRWGHFAC - ARRAY USED TO HOLD HOURLY WEIGHTING FACTORS.
C
      COMMON IHOUR,ISEASN,ITYPE,IMODE,ITEMP,ISTN(8),
     *       NHOUR(24),XPROB(17,30),IFREQ(17,31),NFREQ(24,17,31)
      DIMENSICN XXPROB(17,25),DPWGHFAC(17,26),HRWGHFAC(17,26)
C
C     TURN OFF AUTOMATIC PAGE EJECT.
C
      PRINT 37
C
C     READ STANDARD DATA CARD.  VALUES UNDERLINED WITH *** ARE THOSE USED.
C
      READ 38,IEOF,IHOUR,ISEASN,ITYPE,IMODE,ITEMP,IPRT,ILIM,ISTN
C             ***** ****** ***** ***** ***** **** **** ****
C
C     SET THE INDICATORS TO DETERMINE PRINT
C
      IF (IPRT .EQ. 0) GO TO 2
      IPRT = 24 / IPRT
      DO 1 I=1,24,IPRT
      NHOUR(I) = 1
    1 CONTINUE
C
C     LOOP THROUGH ALL WIND CATEGORIES.
C
    2 DO 35 IWIND=1,9
```

```
C
C     READ DATA FOR ONE HOUR.  CARE MUST BE TAKEN WITH THE HOUR VARIABLE
C     TO INSURE THAT NFREQ ARRAY IS PROPERLY INDEXED.
C
      DO 6 I=2,25
      READ (01) IFREQ,XPROB
C
C     NOW COMPUTE THE FREQUENCIES FOR OUTPUT.
C
      DO 3 J=1,17
      DO 3 K=1,31
      NFREQ(I-1,J,K) = IFREQ(J,K)
    3 CONTINUE
C
C     GO PRINT UNSMOOTHED PROBABILITIES.
C
      CALL PRTDATA(I,IWIND,1)
C
C     SET UP THE DEW POINT AND HOURLY WEIGHTING FACTORS.
C
      DO 5 J=1,17
      IF (NFREQ(I-1'J'31) .NE. 0) GO TO 4
      DPWGHFAC(J,I) = 0.0
      HRWGHFAC(J,I) = 0.0
      GO TO 5
    4 DPWGHFAC(J,I) = SQRTF(.1143 * NFREQ(I-1,J,31) + 1.0)
      HRWGHFAC(J,I) = .6667 * (DPWGHFAC(J,I) - 1.0) + 1.0
    5 CONTINUE
    6 CONTINUE
C
C     SWITCH EDGES FOR SMOOTHING.  HRWAGFAC NEED NOT BE SWITCHED.
C
      DO 7 J=2,16
      DPWGHFAC(J' 1) = DPWGHFAC(J'25)
      DPWGHFAC(J,26) = DPWGHFAC(J, 2)
    7 CONTINUE
C
C     LOOP DOWN THROUGH ALL 30 CEILING/VISIBILITY CATEGCRIES.
C     COMPUTE PROBABILITIES FOR EACH CATEGORY.
C
      DO 29 K=1,30
      DO  9 J=1,17
      DO  9 I=2,25
      IF (NFREQ(I-1,J,31) .NE. 0) GO TO 8
      XPROB(J,I) = 0.0
      GO TO 9
    8 XPROB(J,I) = FLOAT(NFREQ(I-1,J,K)) / FLOAT(NFREQ(I-1,J,31))
    9 CONTINUE
C
C     DO INITIAL SMOOTHING TO ELIMINATE ZEROES.
C     ICYCLE IS USED TO LIMIT LOOP TO 10 TIMES.
C
      ICYCLE = 0
C
```

```
C     SWITCH PROBABILITY EDGES FOR SMOOTHING.
C
   10 DO 11 J=1,17
      XPROB(J,26) = XPROB(J, 2)
      XPROB(J, 1) = XPROB(J,25)
   11 CONTINUE
C
C     SMOOTH EACH ZERO DATA POINT BASED UPON HOURLY AND DEW POINT WEIGHTING
C     FACTORS.  SEE PROGRAM DOCUMENTATION FOR SMOOTHING SCHEME.  EDGES WITH ZERO
C     VALUES ARE HANDLED AS SPECIAL CASES.
C
      DO 17 I=2,25
      IF (XPROB(1,I) .NE. 0.0) GO TO 12
      XXPROB(1,I) = (XPROB(1,I-1) + HRWGHFAC(1,I) * XPROB(1,I) +
     *               XPROB(1,I+1)) / (HRWGHFAC(1,I) + 2.0)
      GO TO 13
   12 XXPROB(1,I) = XPROB(1,I)
   13 DO 15 J=2,16
      IF (XPROB(J,I) .NE. 0.0) GO TO 14
      XXPROB(J,I) = (XPROB(J-1,I-1) + DPWGHFAC(J,I-1)*XPROB(J,I-1) +
     *               XPROB(J+1,I-1) + HRWGHFAC(J-1,I)*XPROB(J-1,I) +
     *               DPWGHFAC(J,I)*HRWGHFAC(J,I)*XPROB(J,I) +
     *               HRWGHFAC(J+1,I)*XPROB(J+1,I) + XPROB(J-1,I+1) +
     *               DPWGHFAC(J,I+1)*XPROB(J,I+1) + XPROB(J+1,I+1)) /
     *               (4.0 + DPWGHFAC(J,I-1) + HRWGHFAC(J-1,I) +
     *               DPWGHFAC(J,I)*HRWGHFAC(J,I) + HRWGHFAC(J+1,I) +
     *               DPWGHFAC(J,I+1))
      GO TO 15
   14 XXPROB(J,I) = XPROB(J,I)
   15 CONTINUE
      IF (XPROB(17,I) .NE. 0.0) GO TO 16
      XXPROB(17,I) = (XPROB(17,I-1) + HRWGHFAC(17,I)*XPROB(17,I) +
     *                XPROB(17,I+1)) / (HRWGHFAC(17,I) + 2.0)
      GO TO 17
   16 XXPROB(17,I) = XPROB(17,I)
   17 CONTINUE
C
C     LOOP THROUGH ALL NEW PROBABILITIES TO CHECK FOR ANY REMAINING ZEROES.
C
      ITIME = 0
      DO 18 I=2,25
      DO 18 J=2,16
      IF (XXPROB(J,I) .NE. 0.0) GO TO 18
      ITIME = 1
      GO TO 19
   18 CONTINUE
C
C     RESET NEW PROBABILITIES ARRAY INTO OLD ARRAY FOR FUTURE SMOOTHING.
C
   19 DO 20 I=2,25
      DO 20 J=1,17
      XPROB(J,I) = XXPROB(J,I)
   20 CONTINUE
C
```

```
C     IF ANY PROBABILITIES WERE ZERO GO THROUGH SMOOTHING AGAIN.
C
      ICYCLE = ICYCLE + 1
      IF (ITIME .EQ. 1 .AND. ICYCLE .LE. 10) GO TO 10
C
C     NOW SET ALL PROBABILITIES TO AN EXPONENTIAL FORM.
C     ANY PROBABILITY STILL ZERO IS SET TO .00001.
C
      DO 22 J=1,17
      DO 22 I=2,25
      IF (XPROB(J,I) .NE. 0.0) GO TO 21
      XPROB(J,I) = .00001
   21 XPROB(J,I) = SQRTF(ABS(-ALOG(XPROB(J,I))))
   22 CONTINUE
C
C     NOW LOOP THROUGH THIS FOR ILIM CYCLES.  ILIM IS A VARIABLE WHICH IS READ
C     FROM THE DATA CARD.
C
      DO 27 M=1,ILIM
C
C     SWITCH EDGES FOR SMOOTHING.
C
      DO 23 J=1,17
      XPROB(J,26) = XPROB(J, 2)
      XPROB(J, 1) = XPROB(J,25)
   23 CONTINUE
C
C     SMOOTH EACH DATA POINT BASED UPON HOURLY AND DEW POINT WEIGHTING FACTORS.
C     SEE PROGRAM DOCUMENTATION FOR SMOOTHING SCHEME.
C
      DO 25 I=2,25
      XXPROB(1,I) = (XPROB(1,I-1) + HRWGHFAC(1,I)*XPROB(1,I) +
     *              XPROB(1,I+1)) / (HRWGHFAC(1,I) + 2.0)
      DO 24 J=2,16
      XXPROB(J,I) = (XPROB(J-1,I-1) + DPWGHFAC(J,I-1)*XPROB(J,I-1) +
     *              XPROB(J+1,I-1) + HRWGHFAC(J-1,I)*XPROB(J-1,I) +
     *              DPWGHFAC(J,I)*HRWGHFAC(J,I)*XPROB(J,I) +
     *              HRWGHFAC(J+1,I)*XPROB(J+1,I) + XPROB(J-1,I+1) +
     *              DPWGHFAC(J,I+1)*XPROB(J,I+1) + XPROB(J+1,I+1)) /
     *              (4.0 + DPWGHFAC(J,I-1) + HRWGHFAC(J-1,I) +
     *              DPWGHFAC(J,I)*HRWGHFAC(J,I) + HRWGHFAC(J+1,I) +
     *              DPWGHFAC(J,I+1))
   24 CONTINUE
      XXPROB(17,I) = (XPROB(17,I-1) + HRWGHFAC(17,I)*XPROB(17,I) +
     *               XPROB(17,I+1)) / (HRWGHFAC(17,I) + 2.0)
   25 CONTINUE
C
C     IF THIS IS LAST CYCLE NO NEED TO RESET XPROB.
C
      IF (M .EQ. ILIM) GO TO 27
      DO 26 J=1,17
      DO 26 I=2,25
      XPROB(J,I) = XXPROB(J,I)
   26 CONTINUE
```

```
MS FORTRAN  (4.2) / MSOS                    04/30/76          PAGE 005
   27 CONTINUE
C
C     NOW COMPUTE FREQUENCIES AT EACH POINT SUCH THAT THEY CAN BE STORED IN
C     INTEGER FORM.
C
      DO 28 I=2,25
      DO 28 J=1,17
      NFREQ(I-1,J,K) = EXP(-(XXPROB(J,I)*XXPROB(J,I)))*1000000.0
   28 CONTINUE
   29 CONTINUE
C
C     NOW LOOP THROUGH ALL DATA POINTS TO CALCULATE PROBABILITY FOR OUTPUT.
C
      DO 34 I=2,25
      DO 33 J=1,17
      DO 30 K=1,30
      XPROB(J,K) = FLOAT(NFREQ(I-1,J,K)) / 1000000.0
   30 CONTINUE
C
C     NOW INSURE THAT FREQUENCIES INCREASE FOR EACH CATEGORY.
C
      DO 32 K=2,30
      IF (XPROB(J*K) .GE. XPROB(J*K-1)) GO TO 31
      XPROB(J,K) = XPROB(J,K-1)
   31 NFREQ(I-1,J,K) = XPROB(J,K) * NFREQ(I-1,J,31) + 0.5
      IFREQ(J,K) = NFREQ(I-1,J,K)
   32 CONTINUE
      NFREQ(I-1,J,1) = XPROB(J,1) * NFREQ(I-1,J,31) + 0.5
      IFREQ(J,1) = NFREQ(I-1,J,1)
   33 CONTINUE
C
C     WRITE THE SMOOTHED DATA TO TAPE AND PRINT FOR CHECKING.
C
      WRITE (02) IFREQ,XPROB
      CALL PRTDATA(I,IWIND,2)
   34 CONTINUE
C
C     WRITE AN EOF ON OUTPUT TAPE AND CHECK INPUT FOR EOF.
C
      ENDFILE 02
      READ (01)
      GO TO (35,36) EOFCKF(01)
   35 CONTINUE
      STOP
C
C     PRINT ERROR MESSAGE.
C
   36 PRINT 39
      STOP
C
C     THESE ARE THE FORMAT STATEMENTS USED.
C
   37 FORMAT (1H0)
   38 FORMAT (8I2,1X,8A4)
```

```
MS FORTRAN  (4.2) / MSOS                        04/30/76           PAGE 006
    39 FORMAT (1H1,*ERROR ON INPUT TAPE - PROGRAM TERMINATED *)
       END
                  FORTRAN DIAGNOSTIC RESULTS  FOR    SMTHUNCC
 NO ERROR
```

```
      SUBROUTINE PRTDATA(I,IWIND,M)
C
C     THIS SUBROUTINE IS USED TO PRINT EITHER THE UNSMOOTHED (M=1) OR
C     SMOOTHED (M=2) UNCONDITIONAL PROBABILITIES.
C
C     I IS THE HOUR+1. IWIND IS THE WIND CATEGORY.
C
      COMMON IHOUR,ISEASN,ITYPE,IMODE,ITEMP,ISTN(8),
     *     NHOUR(24),XPROB(17,30),IFREQ(17,31),NFREQ(24,17,31)
      DIMENSION LTYPE(2,60),LDSPD(34),LWIND(9,2),LTEMP(2),
     *          LSEASN(4,2),NTYPE(2,4),LUN(2),LMODE(2,2)
C
C     BELOW ARE LISTED THE ARRAYS USED TO PRINT THE VARIOUS HEADINGS.
C
      DATA ((LUN(I),I=1,2)=2HUN,2H  )
      DATA ((LTEMP(I),I=1,2)=4H (F),4H (C))
      DATA (((LMODE(I,J),J=1,2),I=1,2)=4HINIT,4HIAL ,
     *                                 4HFINA,4HL   )
      DATA (((LWIND(I,J),J=1,2),I=1,9)=4H0-3 ,4HKTS ,
     *                                 4H327-,4H11  ,
     *                                 4H 12-,4H56  ,
     *                                 4H 57-,4H101 ,
     *                                 4H102-,4H146 ,
     *                                 4H147-,4H191 ,
     *                                 4H192-,4H236 ,
     *                                 4H237-,4H281 ,
     *                                 4H282-,4H326 )
      DATA (((NTYPE(I,J),J=1,4),I=1,2)=4HCEIL,4HING ,4HHEIG,4HHT  ,
     *                                 4HVISI,4H-   ,4HBILI,4HTY  )
      DATA (((LSEASN(I,J),J=1,2),I=1,4)=4HSPRI,4HNG  ,4HSUMM,4HER  ,
     *                                  4HAUTU,4HMN  ,4HWINT,4HER  )
      DATA (((LTYPE(I,J),J=1,60),I=1,2)=4H    ,4H 0  ,4H   1,4H00  ,
     *                                  4H   2,4H00  ,4H   3,4H00  ,
     *                                  4H   4,4H00  ,4H   5,4H00  ,
     *                                  4H   6,4H00  ,4H   7,4H00  ,
     *                                  4H   8,4H00  ,4H   9,4H00  ,
     *                                  4H  10,4H00  ,4H  12,4H00  ,
     *                                  4H  14,4H00  ,4H  16,4H00  ,
     *                                  4H  18,4H00  ,4H  20,4H00  ,
     *                                  4H  22,4H00  ,4H  24,4H00  ,
     *                                  4H  26,4H00  ,4H  28,4H00  ,
     *                                  4H  30,4H00  ,4H  35,4H00  ,
     *                                  4H  40,4H00  ,4H  50,4H00  ,
     *                                  4H  60,4H00  ,4H  80,4H00  ,
     *                                  4H 100,4H00  ,4H 140,4H00  ,
     *                                  4H 200,4H00  ,4HNC C,4HIG  ,
     *                                  4H    ,4H 0  ,4H  1/,4H16  ,
     *                                  4H   1,4H/8  ,4H  3/,4H16  ,
     *                                  4H   1,4H/4  ,4H  5/,4H16  ,
     *                                  4H   3,4H/8  ,4H   1,4H/2  ,
     *                                  4H   5,4H/8  ,4H   3,4H/4  ,
     *                                  4H    ,4H 1  ,4H 1 1,4H/8  ,
     *                                  4H 1 1,4H/4  ,4H 1 3,4H/8  ,
     *                                  4H 1 1,4H/2  ,4H 1 5,4H/8  ,
```

```
      *                                 4H 1 3,4H/4  ,4H     ,4H 2  ,
      *                                 4H 2 1,4H/2  ,4H     ,4H 3  ,
      *                                 4H 3 1,4H/2  ,4H     ,4H 4  ,
      *                                 4H    ,4H 5  ,4H     ,4H 6  ,
      *                                 4H    ,4H 7  ,4H     ,4H 8  ,
      *                                 4H    ,4H10  ,4H     ,4H15  ,
      *                                 4H    ,4H30  ,4H    >,4H30  )
       DATA ((LDSPD(I),I=1,34)=4H   0 ,4H    ,4H   1 ,4H    ,4H   2 ,4H    ,
      *                       4H   3 ,4H    ,4H   4 ,4H    ,4H   5 ,4H    ,
      *                       4H   6 ,4H    ,4H 7-8,4H    ,4H 9-1,4H0   ,
      *                       4H11-1,4H2    ,4H13-1,4H4    ,4H15-1,4H6    ,
      *                       4H17-1,4H8    ,4H19-2,4H1    ,4H22-2,4H4    ,
      *                       4H25-3,4H0    ,4H >30,4H     )
C
C      IF WE DO NOT WANT TO PRINT THIS HOUR RETURN.
C
       IHR = I - 1
       IF (NHOUR(IHR) .NE. 1) RETURN
C
C      MAKE IHR ACTUAL HOUR (0-23).
C
       IHR = I - 2
C
C      VALUES READ FROM THE DATA CARD ARE USED TO PRINT CORRECT HEADINGS.
C
       PRINT 8,(LWIND(IWIND,N),N=1,2),(LSEASN(ISEASN,N),N=1,2),IHR,
      *        ISTN,IHOUR,LUN(M)
       PRINT 7,(NTYPE(ITYPE,N),N=1,2),LTEMP(ITEMP),
      *        (LMODE(IMODE,N),N=1,2),(NTYPE(ITYPE,N),N=3,4),LDSPD
C
C      LOOP THROUGH ONLY 29 CATEGORIES FOR PRINTING.
C
       DO 3 K=1,29
       N = (K*2) - 1
C
C      CHECK EACH FREQUENCY FOR ZERO FROM RIGHT TO LEFT TO SET AMOUNT TO PRINT.
C
       DO 1 J=1,17
       L = 18 - J
       IF (NFREQ(I-1,L,K) .NE. 0) GO TO 2
     1 CONTINUE
C
C      PRINT FREQUENCIES FOR EACH DEW POINT SPREAD THEN CATEGORY AND PROBABILITY.
C
     2 PRINT 4,(NFREQ(I-1,J,K),J=1,L)
       PRINT 5,LTYPE(ITYPE,N),LTYPE(ITYPE,N+1),(XPROB(J,K),J=1,L)
     3 CONTINUE
C
C      FINALLY PRINT TOTAL FREQUENCIES.
C
       PRINT 6,(NFREQ(I-1,J,31),J=1,17)
       RETURN
C
C      THESE ARE THE FORMAT STATEMENTS USED.
```

```
C
    4 FORMAT (/,12X,17(I4,3X))
    5 FORMAT (3X,2A4,17(F7.5))
    6 FORMAT (/,2X,≠TOTAL≠,/,2X,≠OBSERVED≠,2X,17(I4,3X))
    7 FORMAT (/,1X,2A4,52X,≠DEW POINT SPREAD≠,A4,38X,≠MODE: ≠,2A4,
     *        /,1X,2A4,4X,17(A4,A3))
    8 FORMAT (1H1,≠WIND DIRECTION: ≠,2A4,≠  SEASON: ≠,2A4,≠  HOUR:≠,I3,
     *        ≠ (LST)   STATION: ≠,8A4,I2,≠HR ≠,A2,
     *        ≠SMOOTHED UNCONDITIONALS≠)
      END

              FORTRAN DIAGNOSTIC RESULTS  FOR    PRTDATA

NO ERRORS
LOAD,56
RUN,,NM
   9831 PRG USD   11529 PRG LFT   14232 COM USD   -8900 COM LFT
00H01M25S
```

WIND DIRECTION: 0-3 KTS SEASON: WINTER HOUR: 0 (LST) STATION: 725540 OFFUTT AFB - OMAHA, NE 3HR UNSMOOTHED UNCONDITIONALS

DEW POINT SPREAD (F) MODE: INITIAL

CEILING HEIGHT	0	1	2	3	4	5	6	7-8	9-10	11-12	13-14	15-16	17-18	19-21	22-24	25-30	>30
0	2 .18182	1 .09091	1 .02941														
100	5 .45455	2 .18182	3 .08824	0 0	1 .02083												
200	5 .45455	6 .54545	5 .14706	0 0	1 .02083												
300	5 .45455	6 .54545	6 .17647	1 .02326	1 .02083												
400	5 .45455	6 .54545	9 .26471	1 .02326	1 .02083												
500	5 .45455	6 .54545	12 .35294	4 .09302	1 .02083												
600	6 .54545	6 .54545	13 .38235	4 .09302	1 .02083												
700	6 .54545	6 .54545	14 .41176	4 .09302	1 .02083												
800	6 .54545	7 .63636	14 .41176	4 .09302	2 .04167												
900	6 .54545	7 .63636	14 .41176	4 .09302	2 .04167												
1000	6 .54545	7 .63636	14 .41176	4 .09302	5 .10417	0 0	1 .02128										
1200	6 .54545	7 .63636	15 .44118	4 .09302	5 .10417	2 .03704	1 .02128										
1400	6 .54545	8 .72727	15 .44118	4 .09302	5 .10417	3 .05556	2 .04255	1 .01471									
1600	6 .54545	9 .81818	15 .44118	4 .09302	6 .12500	4 .07407	2 .04255	2 .02941									
1800	6 .54545	9 .81818	15 .44118	5 .11628	7 .14583	4 .07407	3 .06383	3 .04412	1 .01408								
2000	6 .54545	9 .81818	15 .44118	5 .11628	7 .14583	5 .09259	3 .06383	3 .04412	1 .01408								
2200	6 .54545	9 .81818	15 .44118	6 .13953	7 .14583	5 .09259	5 .10638	4 .05882	1 .01408								
2400	6 .54545	9 .81818	15 .44118	6 .13953	8 .16667	5 .09259	6 .12766	6 .08824	1 .01408	1 .02128							
2600	6 .54545	9 .81818	15 .44118	6 .13953	8 .16667	5 .09259	6 .12766	6 .08824	1 .01408	1 .02128							
2800	6 .54545	9 .81818	15 .44118	6 .13953	8 .16667	5 .09259	6 .12766	7 .10294	1 .01408	2 .04255							
3000	6 .54545	9 .81818	16 .47059	7 .16279	8 .16667	7 .12963	6 .12766	7 .10294	2 .02817	3 .06383	0 0	1 .04348					
3500	6 .54545	9 .81818	16 .47059	7 .16279	8 .16667	7 .12963	6 .12766	7 .10294	3 .04225	4 .08511	0 0	1 .04348					
4000	7 .63636	9 .81818	17 .50000	7 .16279	8 .16667	8 .14815	9 .19149	8 .11765	3 .04225	4 .08511	0 0	1 .04348					
5000	7 .63636	9 .81818	17 .50000	7 .16279	10 .20833	10 .18519	9 .19149	8 .11765	4 .05634	4 .08511	2 .05405	1 .04348	0 0	1 .05882			
6000	7 .63636	9 .81818	17 .50000	7 .16279	10 .20833	12 .22222	9 .19149	9 .13235	4 .05634	4 .08511	2 .05405	2 .08696	1 .05556	1 .05882	0 0	0 0	1 .33333
8000	7 .63636	9 .81818	17 .50000	7 .16279	10 .20833	13 .24074	9 .19149	11 .16176	5 .07042	6 .12766	2 .05405	2 .08696	2 .11111	2 .11765	0 0	0 0	1 .33333
10000	7 .63636	9 .81818	17 .50000	8 .18605	14 .29167	17 .31481	14 .29787	16 .23529	11 .15493	8 .17021	5 .13514	2 .08696	3 .16667	2 .11765	0 0	1 .10000	1 .33333
14000	7 .63636	9 .81818	17 .50000	9 .20930	15 .31250	19 .35185	15 .31915	19 .27941	13 .18310	8 .17021	6 .16216	2 .08696	3 .16667	2 .11765	0 0	1 .10000	1 .33333
20000	7 .63636	9 .81818	17 .50000	12 .27907	16 .33333	21 .38889	15 .31915	21 .30882	13 .18310	8 .17021	7 .18919	2 .08696	3 .16667	2 .11765	0 0	1 .10000	1 .33333
TOTAL OBSERVED	11	11	34	43	48	54	47	68	71	47	37	23	18	17	8	10	3

Fig. 6. Sample output for program SMTHUNCD. Indicates frequency and probability for each ceiling category and Dew-point spread before smoothing.

WIND DIRECTION: 0-3 KTS SEASON: WINTER HOUR: 0 (LST) STATION: 725550 OFFUTT AFB - OMAHA, NE 3HR SMOOTHED UNCONDITIONAL

MODEL: INITIAL

CEILING HEIGHT	DEW POINT SPREAD (F) 0	1	2	3	4	5	6	7-8	9-10	11-12	13-14	15-16	17-18	19-21	22-24	25-30	>30
	2	1	1														
0	.16740	.07230	.02832														
	4	2	2	1													
100	.33783	.15914	.06775	.02761													
	5	2	3	2	1												
200	.44038	.22317	.09977	.04145	.01468												
	5	3	4	2	1												
300	.46509	.24778	.11630	.05029	.01856												
	5	3	5	3	1												
400	.48676	.27342	.13522	.06029	.02225												
	5	3	5	3	1												
500	.49721	.29636	.15513	.07075	.02561												
	6	4	6	4	1												
600	.56581	.34681	.18546	.08583	.03117												
	6	4	7	4	2	1											
700	.57658	.36272	.19893	.09441	.03530	.01030											
	6	4	7	5	2	1											
800	.58429	.37536	.21307	.10598	.04259	.01369											
	6	4	8	5	2	1											
900	.58652	.38220	.22083	.11263	.04793	.01744											
	7	4	9	6	3	2	1										
1000	.59978	.40660	.25099	.14315	.07273	.03337	.01336										
	7	5	9	7	4	2	1										
1200	.61736	.42579	.26902	.15845	.08410	.04068	.01742										
	7	5	10	8	5	3	1	1									
1400	.64300	.45129	.29213	.17876	.10110	.05352	.02566	.01135									
	7	5	10	8	5	3	2	1									
1600	.65290	.46456	.30596	.19175	.11291	.06377	.03325	.01578									
	7	5	11	9	6	4	2	1	1								
1800	.65496	.47107	.31521	.20200	.12322	.07309	.04066	.02076	.00936								
	7	5	11	9	6	4	2	2	1								
2000	.65496	.47409	.32066	.20901	.13083	.08011	.04610	.02424	.01118								
	7	5	11	9	7	5	3	2	1								
2200	.65496	.47938	.32937	.21914	.14142	.09065	.05570	.03165	.01574								
	8	6	12	10	8	6	3	3	2	1							
2400	.68999	.50671	.34973	.23638	.15812	.10743	.07187	.04567	.02610	.01213							
	8	6	12	10	8	6	3	3	2	1							
2600	.68999	.51090	.35616	.24289	.16343	.11128	.07428	.04692	.02661	.01228							
	8	6	12	11	8	6	4	3	2	1							
2800	.68999	.51334	.36027	.24771	.16827	.11588	.07866	.05105	.03020	.01481							
	8	6	13	11	9	7	5	5	4	2	1						
3000	.68999	.52281	.37627	.26641	.18699	.13370	.09617	.06949	.05039	.03515	.02273						
	8	6	13	12	10	8	5	5	4	2	1	1					
3500	.69746	.53242	.38708	.27783	.19864	.14517	.10728	.08016	.06097	.04632	.03493	.02509					
	8	6	14	13	10	9	6	6	5	3	2	1					
4000	.73234	.56149	.40980	.29718	.21729	.16375	.12476	.09524	.07307	.05563	.04174	.02969					
	8	6	14	13	11	9	6	7	6	3	2	1	1				
5000	.73235	.56465	.41589	.30538	.22650	.17331	.13471	.10616	.08543	.06899	.05521	.04279	.03023				
	8	6	14	14	12	10	7	8	7	4	3	2	1	1	1	1	
6000	.73256	.56932	.42471	.31758	.24112	.18911	.15059	.12152	.10041	.08457	.07337	.06717	.06552	.06851	.07593	.08583	
	8	6	15	14	12	11	8	10	9	5	4	2	2	2	1	1	
8000	.73256	.57425	.43384	.32966	.25596	.20672	.17105	.14372	.12287	.10680	.09595	.09072	.09009	.09258	.09619	.09773	
	8	7	16	16	15	14	11	14	12	7	5	3	2	2	1	1	
10000	.74336	.59667	.46696	.37226	.30631	.26192	.22761	.19895	.17554	.15668	.14303	.13475	.13097	.12893	.12430	.11294	
	9	7	17	17	16	15	12	15	14	8	6	3	3	2	1	1	
14000	.77564	.62446	.48969	.39279	.32666	.28258	.24769	.21737	.19191	.17158	.15746	.14912	.14501	.14150	.13364	.11764	
	9	7	17	18	17	16	12	16	14	9	6	4	3	2	1	1	
20000	.78042	.64099	.51448	.42035	.35199	.30348	.26373	.22991	.20250	.18085	.16522	.15495	.14887	.14375	.13475	.11803	
TOTAL OBSERVED	11	11	34	43	48	54	47	68	71	47	37	23	18	17	8	10	3

Fig. 7. Sample output for program SMTHUNCD. Indicates frequency and probability for each ceiling category and Dew-point spread after smoothing.

The frequencies listed in the smoothed output (Fig. 7) were recomputed from the smoothed probabilities. Hence the frequency values for specific indices for the unsmoothed (Fig. 6) and smoothed (Fig. 7) probabilities may not be the same. Areas of the display which are not printed have either frequencies of zero occurrence before smoothing or truncate to zero after smoothing.

V. PROGRAM COMPCOND

Procedures to this point have pertained to unconditional probabilities. Observations were selected from a given season (hour, dew-point spread, wind direction, ceiling and visibility categories) for both an initial and two-or four-hour final time to define these probabilities. They were then subjected to smoothing procedures. We shall now proceed to deduce conditional probability estimates using the initial and final (2 or 4 hours) unconditional probabilities and the gridded representations of the universal graphs for estimating conditional climatologies, i.e., the Stochastic model contained in the appendix of the original report.

The smoothed unconditional probabilities provided by program, SMTHUNCD, are read from tape for the initial and final hours. Twelve of the seventeen dew-point spreads and sixteen of the thirty initial ceiling/visibility categories contained on these tapes are required to produce the Climatic Tables. (See discussion of subroutine SELTINT on page 47.) Table 11 lists the required dew-point spread categories and Table 12 lists the sixteen initial ceiling and visibility categories processed. The five categories selected from the array of Table 12 which are contained in the format for field usage are shown in Table 13 (See SELTFIN).

OUTPUT CATEGORY	D.P.S.	INPUT CATEGORY
1	0	1
2	1	2
3	2	3
4	3	4
5	4	5
6	5	6
7	6	7
8	8	8
9	10	9
10	15	12
11	20	14
12	+30	17

Table 11. The 17 input dew-point spread category codes and the corresponding output dew-point spread category codes.

CIG/VIS OUTPUT CATEGORY	CIG VALUE	CIG INPUT CATEGORY	VIS VALUE	VIS INPUT CATEGORY
1	0 ft	1	0 mi	1
2	100 ft	2	1/16 mi	2
3	200 ft	3	1/8 mi	3
4	300 ft	4	1/4 mi	5
5	400 ft	5	1/2 mi	8
6	500 ft	6	3/4 mi	10
7	600 ft	7	1 mi	11
8	800 ft	10	1 1/2 mi	15
9	1000 ft	11	2 mi	18
10	1500 ft	13	3 mi	21
11	2000 ft	16	4 mi	23
12	2500 ft	18	5 mi	24
13	3000 ft	21	6 mi	25
14	5000 ft	24	7 mi	26
15	10000 ft	27	10 mi	28
16	NO CIG	30	15 mi	29

Table 12. The input ceiling/visibility category codes and the corresponding 16 output ceiling/visibility category codes.

CIG/VIS OUTPUT CATEGORY	CIG LETTER CODE	CIG VALUE (FT)	CIG INPUT CATEGORY	VIS LETTER CODE	VIS VALUE (MI)	VIS INPUT CATEGORY
1	A	0- 199	2	J	0 - ½	7
2	B	200- 499	5	K	½ - 1	10
3	C	500- 999	10	L	1 - 2	17
4	D	1000-2999	20	M	2 - 3	20
5	E	3000-9999	26	N	3 - 6	24

Table 13. The five final output ceiling and visibility category codes.

The conditional probabilities can be computed once the data for one hour has been read and the required initial and final unconditional probability values are known. To do this, a gridded display stored in the computer is accessed in which the initial unconditional probability defines the ordinate, the final unconditional probability the abscissa and the corresponding conditional probability value it read-off at the intersections of these coordinate values. As a result of the packing of these gridded displays (Universal Graphs) care must be taken to insure that the right values are used. (See appendix for packing scheme.) Because the graphs only contain values from 0 to 100 in increments of 02 an interpolation scheme is used to obtain intermediate values. A check is made to insure that none of the computed values are larger than 100.

In this interpolation scheme, the conditional probability values corresponding to the next highest and next lowest even integer values (IXY1, IXY2, IXY3, IXY4) with respect to a given coordinate intersection along the ordinate and abscissa are first obtained from the graphs. The differences (CX, DX, CY, DY) between the required values and the unconditional values are computed and used to weight each of the conditional probability values to obtain the required conditional probability (See Fig. 8 for example).

IXY3 IXY4

CY

DX CX

DY

IXY1 IXY2

Fig. 8. Values used in the interpolation scheme for computing the conditional probability from the Universal Graph.

Once the conditional probabilities for all dew-point spreads and initial categories have been computed for one hour, a check is made to make sure that the cumulated value in each final category is equal to or larger than that of the preceding category. Next the cumulated value for the immediately lower category is subtracted to obtain the actual probability for that category. The probability values for the topmost category (F or 0) is found by subtracting the cumulated value of the 5 lower categories from 100. Prior to writing the values to tape, one last check is made to insure that all probabilities decrease with increasing dew-point spread. Finally all conditional probabilities for one hour are written to tape with the unconditional probabilities for the 12 dew-point spreads and specific wind direction (See discussion on subroutine COMPUNCD). The same procedure is used for all hours and wind subsets.

Program COMPCOND requires four separate subroutines. Each is discussed below.

1) SELTINT (Select Initial): This subroutine selects the 12 dew-point spreads and 16 initial categories which comprise the initial values of the Climatic Tables from the 17 dew-point spread and 30 initial categories of the program SMTHUNCD. For dew-points, the array, KCAT, is used to select the 12 spread categories. The array is composed of 17 elements, one each for the 17 original dew-point spread categories. Those dew-point spreads which are input and are to be used as an output category from this program contain a consecutive value to indicate the output category value. Those categories which are not to be output contain a zero value and are skipped. The array, ICAT, is a two dimensional array containing 30 elements. Each corresponds to the original 30 ceiling and visibility categories. Similar logic is used for the ICAT array to that just discussed for KCAT. Those category elements of program SMTHUNCD which are to be used as an input to a later program contain a designation value corresponding to the category to be output. Categories which are not to be used contain a zero designator. Note Table 12 on page 45 which gives a cross reference between the input and output category values and the corresponding ceiling/visibility values.

2) SELTFIN (Select Final): This subroutine selects those dew-point spread and ceiling/visibility categories which are to be used as the final categories (see Table 13 on page 45 of this report). The procedure by which the array, KCAT, is used to select the final 12 dew-point spread categories was previously discussed under section 1 above. The same logic is used in this subroutine. The array, JCAT, in this subroutine is similar to ICAT in the subroutine SELTINT differing only in the number of final categories that are output. The five categories of JCAT are indicated in Table 13 on page 45.

3) COMPUNCD (Compute Unconditionals): This subroutine is used to compute 1) the unconditional probabilities of the final categories and the 12 dew-point spreads occurring in the specific wind direction, 2) final ceiling probability when dew-point stratification is not considered, and 3) final ceiling probability when neither dew-point and wind stratification are not considered for the rubric. Note the values at the bottom of Figs. 12 and 13 on pages 85 and 86. In the rubric information the unconditional probabilities for wind direction are not stratified by dew-point spread. They are computed by summing all frequency of occurrence values for the required ceiling/visibility category and dividing by the total occurrence for that hour and wind direction. The computation of the probabilities in the ALL WINDS category is simply the summation of the frequency of occurrence for each given temperature dew-point spread category for each of the individual wind directions divided by the number of observations of that temperature dew-point spread irrespective of wind direction. The ALL WINDS values are computed subsequent to the wind and temperature dew-point spread stratified ones. The array IUNPRBAW is written as the tenth file on the output tape to output these values.

4) PRTDATA (Print Data): This subroutine lists the computed conditional probabilities prior to outputting them to tape. See the sample output for this program in Fig. 10 on page 65. Similar to previous programs the card input variable, IPRT, is used to set the array NHOUR which determines how many hours of data are to be printed. A total of two pages are required to list one hour's output of conditional probabilities.

The tape unit assignments required by this program are indicated in Table 14.

UNIT	CONTENTS
1	2/4 Hour Initial Ceiling/Visibility data
2	2/4 Hour Final Ceiling/Visibility data
3	Appropriate Universal Graphs tape
4	Output data tape

Table 14. Input/output tape unit assignments required by program COMPCOND.

The next 17 pages contain the program flowchart, sample program listing and sample program output for the program COMPCOND.

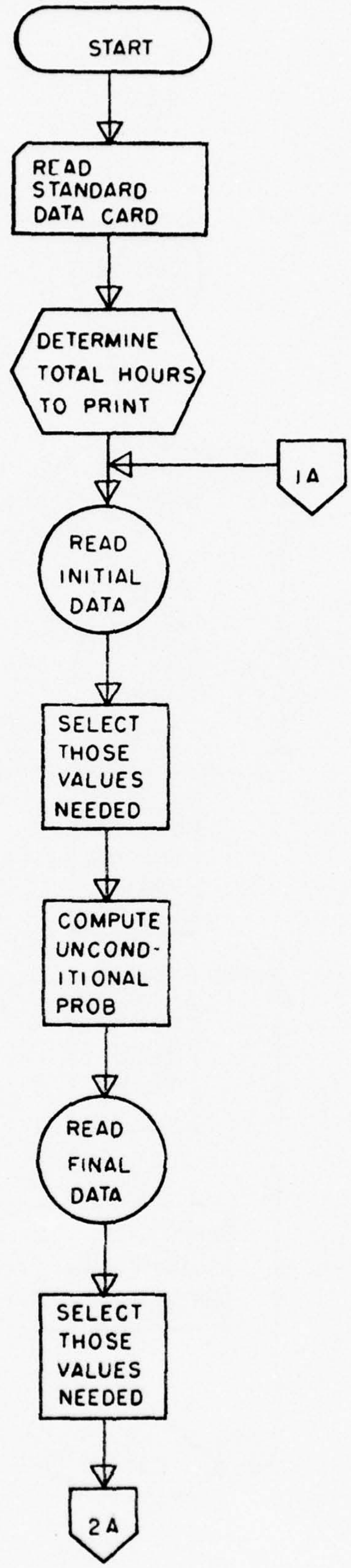

Fig. 9. Flowchart for program COMPCOND.

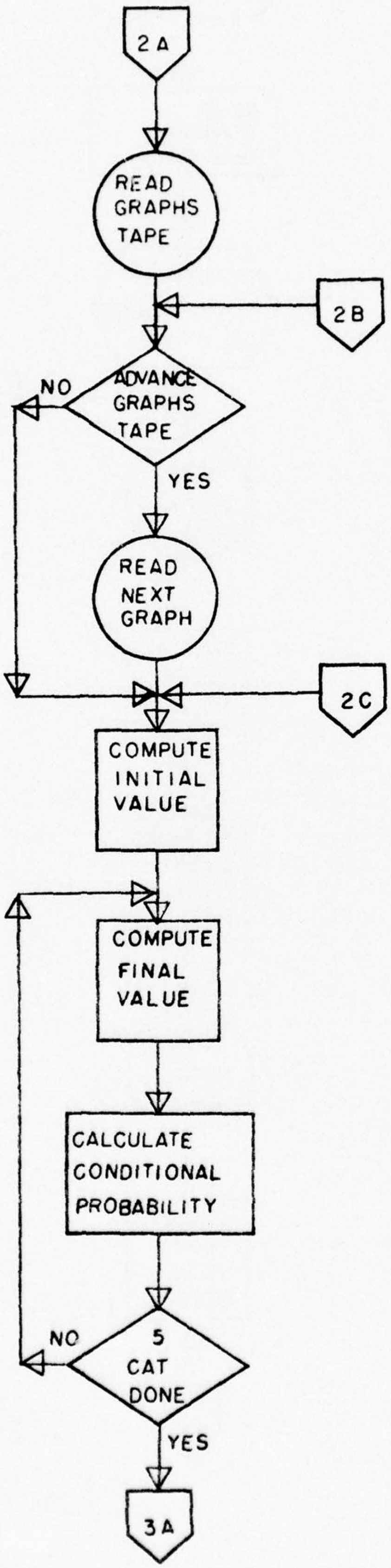

Fig. 9a. Flowchart for program COMPCOND continued.

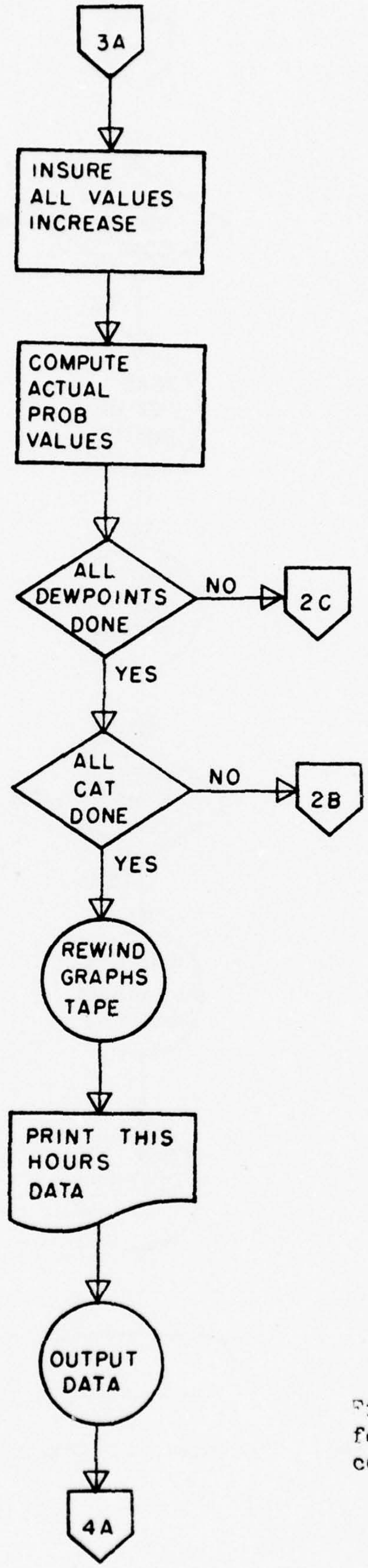

Fig. 9b. Flowchart for program COMPCOND continued.

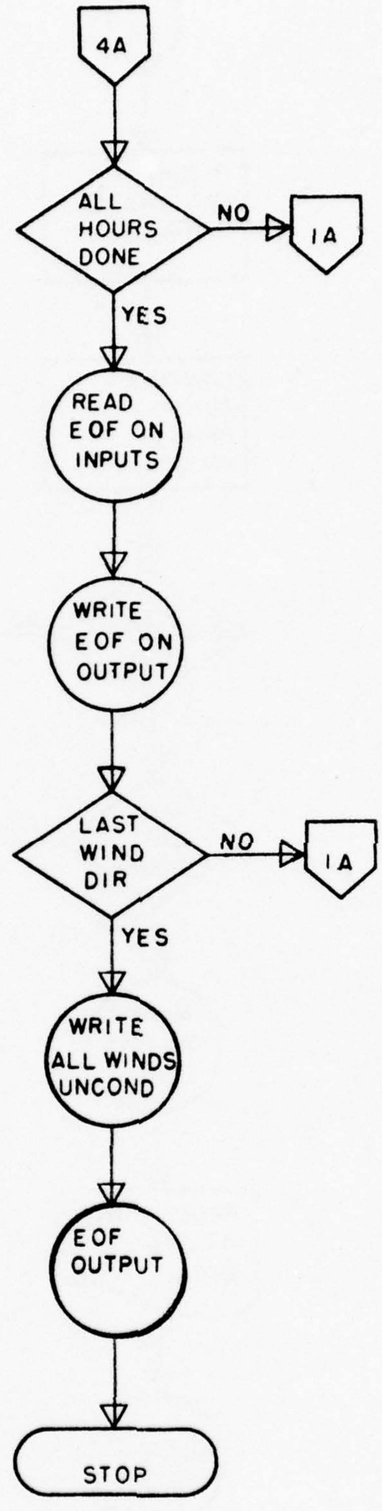

Fig. 9c. Flowchart for program COMPCOND continued.

```
      PROGRAM COMPCOND
C
C     SEE PROGRAM DOCUMENTATION FOR DESCRIPTION OF PROGRAM FLOW.
C
C     BELOW LIST THE USES FOR SPECIFIC VARIABLES USED IN THIS PROGRAM.
C
C     X         - VALUE USED TO DETERMIND INITIAL PROBABILITY FROM GRAPH.
C     Y         - VALUE USED TO DETERMINE FINAL PROBABILITY FROM GRAPH.
C     CX        - INCREMENT FROM X TO NEXT EVEN INTEGER.
C     CY        - INCREMENT FROM Y TO NEXT EVEN INTEGER.
C     DX        - INCREMENT FROM LAST EVEN INTEGER TO X.
C     DY        - INCREMENT FROM LAST EVEN INTEGER TO Y.
C     ICAT      - ARRAY USED TO INDICATE WHICH INITIAL CATEGORIES ARE DESIRED.
C     JCAT      - ARRAY USED TO INDICATE WHICH FINAL CATEGORIES ARE DESIRED.
C     KCAT      - ARRAY USED TO INDICATE WHICH DEW-POINT CATEGORIES ARE DESIRED.
C     LCAT      - ARRAY WHICH INDICATES WHEN IGRAPH TAPE MUST BE ADVANCED.
C     IPRT      - INPUT FROM DATA CARD TO INDICATE NUMBER OF HOURS TO PRINT.
C     ISTN      - ARRAY INPUT FROM DATA CARD TO INDICATE NAME OF STATION.
C     IXY1      - VALUE COMPUTED FROM GRAPH USING LOW X AND LOW Y.
C     IXY2      - VALUE COMPUTED FROM GRAPH USING LOW Y AND HIGH X.
C     IXY3      - VALUE COMPUTED FROM GRAPH USING LOW X AND HIGH Y.
C     IXY4      - VALUE COMPUTED FROM GRAPH USING HIGH X AND HIGH Y.
C     ICOND     - ARRAY GENERATED WHICH HOLDS THE CONDITIONAL PROBABILITIES.
C     IFREQ     - THE FREQUENCIES AS COMPUTED BY THE PROGRAM COMPUNCD.
C     IHOUR     - INPUT FROM DATA CARD TO INDICATE HOUR BEING PROCESSED.
C     ITEMP     - INPUT FROM DATA CARD TO INDICATE IF TEMPERATURE IS (C) OR (F).
C     ITYPE     - INPUT FROM DATA CARD TO INDICATE IF CEILING OR VISIBILITY.
C     LDSPD     - ARRAY USED TO LIST VARIOUS DEW-POINT SPREADS USED.
C     LTEMP     - ARRAY USED TO LIST TEMPERATURE AS (C) OR (F).
C     LTYPE     - ARRAY USED TO LIST CURRENT CEILING/VISIBILITY CATEGORY.
C     LWIND     - ARRAY USED TO LIST CURRENT WIND CATEGORY.
C     NHOUR     - ARRAY USED TO INDICATE HOURS TO PRINT ON LISTING.
C     NTYPE     - ARRAY USED TO LIST CEILING OR VISIBILITY.
C     XPROB     - ARRAY READ FROM TAPE WHICH HOLDS UNCONDITIONAL PROBABILITIES.
C     IFINAL    - ARRAY USED TO LIST THE FINAL CATEGORIES.
C     IGRAPH    - ARRAR TO HOLD THE REQUIRED UNIVERSAL GRAPH.
C     ISEASN    - INPUT FROM DATA CARD TO INDICATE SEASON BEING PROCESSED.
C     LSEASN    - ARRAY USED TO LIST CURRENT SEASON.
C     IINTPROB  - ARRAY WHICH HOLDS THE INITIAL PROBABILITIES.
C     IFINPROB  - ARRAY WHICH HOLDS THE FINAL PROBABILITIES.
C     IUNPRBAW  - ARRAY WHICH HOLDS UNCONDITIONAL PROBABILITIES FOR ALL WINDS.
C     IUNPRBDP  - ARRAY WHICH HOLDS UNCONDITIONAL PROBABILITIES FOR DEW-POINT.
C     IUNPRBWD  - ARRAY WHICH HOLDS UNCONDITIONAL PROBABILITIES FOR THIS WIND.
C     XSUMALWD  - ARRAY TO HOLD FREQUENCIES FOR EACH FINAL CATEGORY ALL WINDS.
C     XTOTALWD  - ARRAY TO HOLD FREQUENCIES FOR ALL CATEGORIES ALL WINDS.
C
C
      DIMENSION IGRAPH(17,51,5),LCAT(2,16)
      COMMON IHOUR,ISEASN,ITYPE,ITEMP,ISTN(8),NHOUR(24),XPROB(17,30),
     *       IUNPRBWD(6),IUNPRBDP(12,6),IUNPRBAW(24,6),IFREQ(17,31),
     *       ICOND(16,12,6),IINTPROB(16,12),IFINPROB(12,5)
C
      DATA (((LCAT(I,J),J=1,16),I=1,2)=2,2,1,2,2,1,2,2,1,2,2,2,1,2,1,2,
     *                                 2,2,2,2,1,2,1,2,1,1,2,2,1,2,2,2)
```

```
C
C      TURN OFF AUTOMATIC PAGE EJECT.
C
       PRINT 25
C
C      READ STANDARD DATA CARD.  VALUES UNDERLINED WITH *** ARE THOSE USED.
C
       READ 26,IEOF,IHOUR,ISEASN,ITYPE,IMODE,ITEMP,IPRT,ILIM,ISTN
C                  ***** ****** *****       ***** ****      ****
C
C      DETERMINE HOW MANY HOURS DATA TO PRINT.
C
       IF (IPRT .EQ. 0) GO TO 2
       IPRT = 24 / IPRT
       DO 1 N=1,24,IPRT
       NHOUR(N) = 1
     1 CONTINUE
C
C      LOOP THROUGH ALL NINE WIND CATEGORIES.
C
     2 DO 23 IWIND=1,9
C
C      LOOP THROUGH ALL 24 HOURS.
C
       DO 20 N=1,24
C
C      READ INITIAL AND FINAL UNCONDITIONAL PROBABILITIES AND COMPUTE
C      THE UNCONDITIONAL PROBABILITIES FOR OUTPUT FROM THE INITIAL VALUES.
C
       READ (01) IFREQ,XPROB
       CALL SELTINT
       CALL COMPUNCD(N)
       READ (02) IFREQ,XPROB
       CALL SELTFIN
C
C      NOW READ PROPER UNIVERSAL GRAPH.
C
       READ (03) IGRAPH
C
C      LOOP THROUGH ALL 16 CEILING/VISIBILITY CATEGORIES.
C
       DO 19 I=1,16
C
C      SEE PROGRAM DOCUMENTATION FOR USE OF LCAT.
C
       GO TO (3,4) LCAT(ITYPE,I)
C
     3 CALL SKIPFWD (03)
       READ (03) IGRAPH
C
C      LOOP THROUGH ALL 12 DEW POINT SPREADS.
C
     4 DO 16 J=1,12
C
```

```
C     THE UNCONDITIONAL VALUES ARE NOW USED TO INDEX INTO THE UNIVERSAL GRAPH
C     FOR THE REQUIRED CONDITIONAL PROBABILITY.
C     SEE APPENDIX C FOR METHOD OF STORING UNIVERSAL GRAPHS.
C     SEE PROGRAM DOCUMENTATION FOR INTERPOLATION SCHEME.
C
      X = IINTPROB(I,J) / 10.0
      IX1 = IFIX(X)/2 + 1
      IX2 = IX1 + 1
      XI1 = (IX1-1)*2
      XI2 = XI1 + 2.0
      CX = XI2 - X
      DX = X - XI1
C
C     CHECK EACH INITIAL CATEGORY AGAINST ALL 5 FINAL CATEGORIES.
C
      DO 13 K=1,5
      Y = IFINPROB(J,K) / 10.0
      IY1 = IFIX(Y)/2 + 1
      IY2 = IY1 + 1
      YI1 = (IY1-1)*2
      YI2 = YI1 + 2.0
      CY = YI2 - Y
      DY = Y - YI1
C
C     THIS TELLS WHERE VALUE IS PACKED.
C
      IYY1 = (IY1+2)/3
      I123 = IYY1*3 - IY1 + 1
      GO TO (5,6,7) I123
C
C     UNPACK VALUE NN----.
C
    5 IXY1 = IGRAPH(IYY1,IX1,K) / 10000
      IXY2 = IGRAPH(IYY1,IX2,K) / 10000
      GO TO 8
C
C     UNPACK VALUE --NN--.
C
    6 IXY1 = IGRAPH(IYY1,IX1,K) / 10000
      IXYN = IGRAPH(IYY1,IX1,K) / 100
      IXY1 = IXYN - IXY1*100
      IXY2 = IGRAPH(IYY1,IX2,K) / 10000
      IXYN = IGRAPH(IYY1,IX2,K) / 100
      IXY2 = IXYN - IXY2*100
      GO TO 8
C
C     UNPACK VALUE ----NN.
C
    7 IXYN = IGRAPH(IYY1,IX1,K) / 100
      IXY1 = IGRAPH(IYY1,IX1,K) - IXYN*100
      IXYN = IGRAPH(IYY1,IX2,K) / 100
      IXY2 = IGRAPH(IYY1,IX2,K) - IXYN*100
C
C     THIS TELLS WHERE VALUE IS PACKED.
```

```
C
    8 IYY2 = (IY2+2)/3
      I123 = IYY2*3 - IY2 + 1
      GO TO (9,10,11) I123
C
C     UNPACK VALUE NN----.
C
    9 IXY3 = IGRAPH(IYY2,IX1,K) / 10000
      IXY4 = IGRAPH(IYY2,IX2,K) / 10000
      GO TO 12
C
C     UNPACK VALUE --NN--.
C
   10 IXY3 = IGRAPH(IYY2,IX1,K) / 10000
      IXYN = IGRAPH(IYY2,IX1,K) / 100
      IXY3 = IXYN - IXY3*100
      IXY4 = IGRAPH(IYY2,IX2,K) / 10000
      IXYN = IGRAPH(IYY2,IX2,K) / 100
      IXY4 = IXYN - IXY4*100
      GO TO 12
C
C     UNPACK VALUE ----NN.
C
   11 IXYN = IGRAPH(IYY2,IX1,K) / 100
      IXY3 = IGRAPH(IYY2,IX1,K) - IXYN*100
      IXYN = IGRAPH(IYY2,IX2,K) / 100
      IXY4 = IGRAPH(IYY2,IX2,K) - IXYN*100
C
   12 ICOND(I,J,K) = (CY*(CX*IXY1+DX*IXY2) + DY*(CX*IXY3+DX*IXY4))/4.0
      IF (ICOND(I,J,K) .GT. 100) ICOND(I,J,K) = 100
   13 CONTINUE
C
C     CHECK TC INSURE ALL PROBABILITIES INCREASE BY FINAL CATEGORY.
C
      DO 14 K=1,4
      IF (ICOND(I,J,K+1).LE.ICOND(I,J,K)) ICOND(I,J,K+1)=ICOND(I,J,K)+1
   14 CONTINUE
C
C
C     WE CAN NOW REPRESENT EACH PROBABILITY VALUE BY ITS INCREASE ABOVE THE NEXT
C     LOWER VALUE.  THUS ALL SIX VALUES MUST SUM TO 100.
C
      ISUMCOND = ICOND(I,J,1)
      DO 15 K=1,4
      M = 6 - K
      ICOND(I,J,M) = ICOND(I,J,M) - ICOND(I,J,M-1)
      ISUMCOND = ISUMCOND + ICOND(I,J,M)
   15 CONTINUE
      ICOND(I,J,6) = 100 - ISUMCOND
   16 CONTINUE
C
C     NOW DO A CHECK TO INSURE THAT ALL PROBABILITIES DECREASE
C     WITH INCREASING DEW-POINT SPREAD.  LOOP FROM HIGHEST TO LOWEST.
C
```

```
      DO 18 K=1,5
      DO 18 J=1,11
      M = 13 - J
      ISUM1 = 0
      ISUM2 = 0
      DO 17 L=1,K
      ISUM1 = ISUM1 + ICOND(I,M-1,L)
      ISUM2 = ISUM2 + ICOND(I,M,L)
   17 CONTINUE
      IF (ISUM2 .LE. ISUM1) GO TO 18
      IDIFF = ISUM2 - ISUM1
      ICOND(I,M-1,K) = ICOND(I,M-1,K) + IDIFF
      ICOND(I,M-1,K+1) = ICOND(I,M-1,K+1) - IDIFF
   18 CONTINUE
   19 CONTINUE
C
C     REWIND THE UNIVERSAL GRAPHS TAPE.
C
      REWIND 03
C
C     NOW GO SEE IF WE WANT TO PRINT THE DATA FOR THIS HOUR.
C
      CALL PRTDATA(IWIND,N)
      WRITE (04) ICOND,IUNPRBWD,IUNPRBDP
   20 CONTINUE
C
C     AFTER EACH WIND CATEGORY WE SHOULD HAVE AN EOF.
C
      READ (01)
      GO TO (21,24) EOFCKF(01)
   21 READ (02)
      GO TO (22,24) EOFCKF(02)
C
C     WRITE AN EOF ON OUR OUTPUT TAPE.
C
   22 ENDFILE 04
   23 CONTINUE
C
C     NOW WE CAN COMPUTE THE UNCONDITIONALS FOR ALL WINDS.
C
      CALL COMPUNCD(0)
C
C     NOW OUTPUT THE UNCONDITIONAL PROBABILITIES FOR ALL WINDS.
C
      WRITE (04) IUNPRBAW
      ENDFILE 04
      STOP
C
C     WE HAVE AN ERROR ON OUR TAPE.
C
   24 PRINT 27,IWIND
      STOP
C
C     THESE ARE THE FORMAT STATEMENTS USED.
```

```
MS FORTRAN  (4.2) / MSOS                          04/30/76           PAGE 006

C
    25 FORMAT (1HQ)
    26 FORMAT (8I2,1X,8A4)
    27 FORMAT (≠ NO EOF FOUND AFTER FILE≠,I2)
       END
              FORTRAN DIAGNOSTIC RESULTS  FOR     COMPCONC

NO ERRORS
```

```
      SUBROUTINE SELTINT
C
C     THIS SUBROUTINE IS USED TO SELECT THOSE CEILING/VISIBILITY CATEGORIES
C     AND DEW-POINT SPREADS WHICH MAKE UP THE INITIAL CATEGORIES.
C
C     THE ARRAYS ICAT(2,30) AND KCAT(17) ARE USED TO INDICATE THE INITIAL
C     CATEGORY VALUES TO BE USED.
C     SEE PROGRAM DOCUMENTATION FOR USE OF ICAT AND KCAT.
C
      COMMON IHOUR,ISEASN,ITYPE,ITEMP,ISTN(8),NHOUR(24),XPROB(17,30),
     *       IUNPRBWD(6),IUNPRBDP(12,6),IUNPRBAW(24,6),IFREQ(17,31),
     *       ICOND(16,12,6),IINTPROB(16,12),IFINPROB(12,5)
      DIMENSION ICAT(2,30),KCAT(17)
C
      DATA ((KCAT(I),I=1,17)=01,02,03,04,05,06,07,08,09,
     *                       00,00,10,00,11,00,00,12)
      DATA (((ICAT(I,J),J=1,30),I=1,2)=01,02,03,04,05,06,07,00,00,08,
     *                                  09,00,10,00,00,11,00,12,00,00,
     *                                  13,00,00,14,00,00,15,00,00,16,
     *                                  01,02,03,00,04,00,00,05,00,06,
     *                                  07,00,00,00,08,00,00,09,00,00,
     *                                  10,00,11,12,13,14,00,15,16,00)
C
      DO 2 J=1,17
      M = KCAT(J)
      IF (M .EQ. 0) GO TO 2
      DO 1 I=1,30
      L = ICAT(ITYPE,I)
      IF (L .EQ. 0) GO TO 1
      IINTPROB(L,M) = XPROB(J,I)*1000.0 + 0.5
      IF (IINTPROB(L,M) .GT. 999) IINTPROB(L,M) = 999
    1 CONTINUE
    2 CONTINUE
      RETURN
      END

              FORTRAN DIAGNOSTIC RESULTS  FOR    SELTINT

NO ERRORS
```

```
MS FORTRAN  (4.2) / MSOS                               04/30/76          PAGE 001
          SUBROUTINE SELTFIN
C
C         THIS SUBROUTINE IS USED TO SELECT THOSE CEILING/VISIBILITY CATEGORIES
C         AND DEW-POINT SPREADS WHICH MAKE UP THE FINAL CATEGCRIES.
C
C         THE ARRAYS JCAT(2,30) AND KCAT(17) ARE USED TO INDICATE THE FINAL
C         CATEGORY VALUES TO BE USED.
C         SEE PROGRAM DOCUMENTATION FOR USE OF JCAT AND KCAT.
C
          COMMON IHOUR,ISEASN,ITYPE,ITEMP,ISTN(8),NHOUR(24),XPROB(17,30),
         *       IUNPRBWD(6),IUNPRBDP(12,6),IUNPRBAW(24,6),IFREQ(17,31),
         *       ICOND(16,12,6),IINTPROB(16,12),IFINPROB(12,5)
          DIMENSICN JCAT(2,30),KCAT(17)
C
          DATA ((KCAT(I),I=1,17)=01,02,03,04,05,06,07,08,09,
         *                 00,00,10,00,11,00,00,12)
          DATA (((JCAT(I,J),J=1,30),I=1,2)=00,01,00,00,02,00,00,00,00,03,
         *                                 00,00,00,00,00,00,00,00,00,04,
         *                                 00,00,00,00,00,05,00,00,00,00,
         *                                 00,00,00,00,00,00,01,00,00,02,
         *                                 00,00,00,00,00,00,03,00,00,04,
         *                                 00,00,00,05,00,00,00,00,00,00)
C
          DO 2 J=1,17
          M = KCAT(J)
          IF (M .EQ. 0) GO TO 2
          DO 1 I=1,30
          L = JCAT(ITYPE,I)
          IF (L .EQ. 0) GO TO 1
          IFINPROB(M,L) = XPROB(J,I)*1000.0 + 0.5
          IF (IFINPROB(M,L) .GT. 999) IFINPROB(M,L) = 999
        1 CONTINUE
        2 CONTINUE
          RETURN
          END
                FORTRAN DIAGNOSTIC RESULTS  FOR    SELTFIN

NO ERRORS
```

```
      SUBROUTINE COMPUNCD(N)
C
C     THIS SUBROUTINE IS USED TO COMPUTE THE UNCONDITIONAL PROBABILITIES
C     AS LISTED AT THE BOTTOM OF THE FINAL OUTPUT LISTING.  AN N VALUE OF
C     OTHER THAN ZERO WILL COMPUTE THE PROBABILITIES FOR THE SPECIFIC
C     WIND CATEGORY AND THE 12 DEW-POINT SPREAD CATEGORIES REQUIRED.
C     AN N VALUE OF ZERO WILL COMPUTE THE PROBABILITIES FOR THE ALL WINDS
C     CATEGORY FOR EACH HOUR.  THE FIRST PART WILL COMPUTE THE FREQUENCIES
C     REQUIRED TO DETERMINE THE PROBABILITIES IN THE LAST PART.
C
      COMMON IHOUR,ISEASN,ITYPE,ITEMP,ISTN(8),NHOUR(24),XPROB(17,30),
     *       IUNPRBWD(6),IUNPRBDP(12,6),IUNPRBAW(24,6),IFREQ(17,31),
     *       ICOND(16,12,6),IINTPROB(16,12),IFINPROB(12,5)
      DIMENSION XSUMALWD(24,5),XTOTALWD(24),JCAT(2,30),KCAT(17)
C
      DATA ((XTOTALWD(I),I=1,24)=24(0.0))
      DATA (((XSUMALWD(I,J),I=1,24),J=1,5)=120(0.0))
      DATA ((KCAT(I),I=1,17)=01,02,03,04,05,06,07,08,09,
     *                        00,00,10,00,11,00,00,12)
      DATA (((JCAT(I,J),J=1,30),I=1,2)=00,01,00,00,02,00,00,00,00,03,
     *                                 00,00,00,00,00,00,00,00,00,04,
     *                                 00,00,00,00,00,05,00,00,00,00,
     *                                 00,00,00,00,00,00,01,00,00,02,
     *                                 00,00,00,00,00,00,03,00,00,04,
     *                                 00,00,00,05,00,00,00,00,00,00)
C
C     CHECK TO SEE IF THIS IS FOR THE ALL WINDS CATEGORY.
C
      IF (N .EQ. 0) GO TO 8
C
C     FIRST COMPUTE TOTAL FREQUENCIES.
C
      XTOTFREQ = 0.0
      DO 1 I=1,17
      XTOTFREQ = XTOTFREQ + IFREQ(I,31)
    1 CONTINUE
      XTOTALWD(N) = XTOTALWD(N) + XTOTFREQ
C
      DO 4 J=1,30
C
C     MAKE SURE THIS IS DESIRED FINAL LEVEL.
C
      L = JCAT(ITYPE,J)
      IF (L .EQ. 0) GO TO 4
      XSUMFREQ = 0.0
C
      DO 3 I=1,17
C
C     NOW MAKE SURE THIS IS DESIRED DEW-POINT SPREAD.
C
      M = KCAT(I)
      IF (M .EQ. 0) GO TO 2
C
C     COMPUTE THE UNCONDITIONAL PROBABILITY FOR THE SPECIFIC DEW-POINT SPREAD.
```

```
C
      IUNPRBDP(M,L) = (FLOAT(IFREQ(I,J)) / FLOAT(IFREQ(I,30)))*100.0+0.5
C
C     COMPUTE THE FREQUENCIES FOR ALL DEW-POINT SPREADS.
C
    2 XSUMFREQ = XSUMFREQ + IFREQ(I,J)
    3 CONTINUE
C
C     COMPUTE PROBABILITY FOR FINAL CATEGORY.
C
      IUNPRBWC(L) = (XSUMFREQ/XTOTFREQ)*100.0 + 0.5
C
C     COMPUTE FREQUENCIES FOR ALL WINDS CATEGORY.
C
      XSUMALWD(N,L) = XSUMALWD(N,L) + XSUMFREQ
    4 CONTINUE
C
C     BEFORE LEAVING COMPUTE ACTUAL PROBABILITY FOR EACH CATEGORY.
C
      DO 6 J=1,12
      ISUMDWPT = IUNPRBDP(J,1)
      DO 5 K=1,4
      M = 6 - K
      IUNPRBDP(J,M) = IUNPRBDP(J,M) - IUNPRBDP(J,M-1)
      ISUMDWPT = ISUMDWPT + IUNPRBDP(J,M)
    5 CONTINUE
      IUNPRBDP(J,6) = 100 - ISUMDWPT
    6 CONTINUE
      ISUMWIND = IUNPRBWD(1)
      DO 7 K=1,4
      M = 6 - K
      IUNPRBWD(M) = IUNPRBWD(M) - IUNPRBWD(M-1)
      ISUMWIND = ISUMWIND + IUNPRBWD(M)
    7 CONTINUE
      IUNPRBWC(6) = 100 - ISUMWIND
      RETURN
C
C     THE ABOVE CODING COMPUTED THE FREQUENCIES SO NOW WE CAN COMPUTE
C     THE PROBABILITIES FOR THE ALL WINDS CATEGORY BY HCUR.
C
    8 DO 11 N=1,24
      DO 9 K=1,5
      IUNPRBAW(N,K)= (XSUMALWD(N,K)/XTOTALWD(N))*100.0 + 0.5
    9 CONTINUE
      ISUMWIND = IUNPRBAW(N,1)
      DO 10 K=1,4
      M = 6 - K
      IUNPRBAW(N,M) = IUNPRBAW(N,M) - IUNPRBAW(N,M-1)
      ISUMWIND = ISUMWIND + IUNPRBAW(N,M)
   10 CONTINUE
      IUNPRBAW(N,6) = 100 - ISUMWIND
   11 CONTINUE
      RETURN
      END

            FORTRAN DIAGNOSTIC RESULTS  FOR     COMPUNCD

NO ERRORS
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MS FORTRAN  (4.2) / MSOS                           04/30/76            PAGE 001

      SUBROUTINE PRTDATA(IWIND,N)
C
C     THIS IS THE SUBROUTINE WE USE TO OUTPUT OUR DATA.
C
C     IWIND INDICATES THE WIND CATEGORY.
C     N INDICATES THE HOUR + 1.
C
      COMMON IHOUR,ISEASN,ITYPE,ITEMP,ISTN(8),NHOUR(24),XPROB(17,30),
     *       IUNPRBWD(6),IUNPRBDP(12,6),IUNPRBAW(24,6),IFREQ(17,31),
     *       ICOND(16,12,6),IINTPROB(16,12),IFINPROB(12,5)
      DIMENSION LSEASN(4,2),LWIND(9,2),NTYPE(2,4),LTYPE(2,32),
     *          LTEMP(2),LDSPD(12),IFINAL(2,6)
C
      DATA ((LTEMP(I),I=1,2)=4H (F),4H (C))
      DATA (((LWIND(I,J),J=1,2),I=1,9)=4H0-3 ,4HKTS  ,
     *                                  4H327-,4H11   ,
     *                                  4H 12-,4H56   ,
     *                                  4H 57-,4H101  ,
     *                                  4H102-,4H146  ,
     *                                  4H147-,4H191  ,
     *                                  4H192-,4H236  ,
     *                                  4H237-,4H281  ,
     *                                  4H282-,4H326  )
      DATA (((NTYPE(I,J),J=1,4),I=1,2)=4HCEIL,4HING ,4HHEIG,4HHT   ,
     *                                  4HVISI,4H-   ,4HBILI,4HTY   )
      DATA (((IFINAL(I,J),J=1,6),I=1,2)=1HA,1HB,1HC,1HD,1HE,1HF,
     *                                  1HJ,1HK,1HL,1HM,1HN,1HO)
      DATA (((LSEASN(I,J),J=1,2),I=1,4)=4HSPRI,4HNG  ,4HSUMM,4HER   ,
     *                                  4HAUTU,4HMN  ,4HWINT,4HER   )
      DATA (((LTYPE(I,J),J=1,32),I=1,2)=4H    ,4H 0  ,4H   1,4H00   ,
     *                                  4H   2,4H00  ,4H   3,4H00   ,
     *                                  4H   4,4H00  ,4H   5,4H00   ,
     *                                  4H   6,4H00  ,4H   8,4H00   ,
     *                                  4H  10,4H00  ,4H  15,4H00   ,
     *                                  4H  20,4H00  ,4H  25,4H00   ,
     *                                  4H  30,4H00  ,4H  50,4H00   ,
     *                                  4H 100,4H00  ,4HNO C,4HIG   ,
     *                                  4H    ,4H 0  ,4H  1/,4H16   ,
     *                                  4H   1,4H/8  ,4H   1,4H/4   ,
     *                                  4H   1,4H/2  ,4H   3,4H/4   ,
     *                                  4H    ,4H 1  ,4H 1 1,4H/2   ,
     *                                  4H    ,4H 2  ,4H    ,4H 3   ,
     *                                  4H    ,4H 4  ,4H    ,4H 5   ,
     *                                  4H    ,4H 6  ,4H    ,4H 7   ,
     *                                  4H    ,4H10  ,4H    ,4H15   )
      DATA ((LDSPD(I),I=1,12)=4H  0 ,4H  1 ,4H  2 ,4H  3 ,4H  4 ,4H  5 ,
     *                        4H  6 ,4H  8 ,4H 10 ,4H 15 ,4H 20 ,4H>30 )
C
      IF (NHOUR(N) .NE. 1) RETURN
      IHR = N - 1
      PRINT 7,IHOUR,(LWIND(IWIND,M),M=1,2),ISTN,(LSEASN(ISEASN,M),M=1,2)
     *        ,IHR,(NTYPE(ITYPE,M),M=1,2),LTEMP(ITEMP),
     *        (NTYPE(ITYPE,M),M=3,4),(LDSPD(M),M=1,12)
      DO 3 I=1,16
```

```
      M = (I*2) - 1
      DO 2 K=1,6
      IF (K .NE. 3) GO TO 1
      PRINT 6,LTYPE(ITYPE,M),LTYPE(ITYPE,M+1),IFINAL(ITYPE,K),
     *       (ICOND(I,J,K),J=1,12)
      GO TO 2
    1 PRINT 5,IFINAL(ITYPE,K),(ICOND(I,J,K),J=1,12)
    2 CONTINUE
      PRINT 4
    3 CONTINUE
      RETURN
C
C     THESE ARE THE FORMAT STATEMENTS USED.
C
    4 FORMAT (4H    )
    5 FORMAT (9X,A1,6X,11(I4,6X),I4)
    6 FORMAT (1X,2A4,A1,6X,11(I4,6X),I4)
    7 FORMAT (1H1,54X,I2,≠HR CONDITIONAL PROBABILITIES≠,//,1X,
     *       ≠WIND DIRECTION: ≠,2A4,12X,≠STATION: ≠,8A4,11X,≠SEASON: ≠,
     *       2A4,11X,≠HOUR:≠,I3,≠ (LST)≠,//,1X,2A4,51X,
     *       ≠DEW POINT SPREAD≠,A4,/,1X,2A4,8X,11(A4,6X),A4,/)
      END

              FORTRAN DIAGNOSTIC RESULTS  FOR    PRTDATA

NO ERRORS
LOAD,56
RUN,,NM
  12304 PRG USD    9084 PRG LFT    3209 COM USD    2095 COM LFT
00H01M36S
```

WIND DIRECTION: 0-3 KTS   STATION: 725540 OFFUTT AFB - OMAHA, NE   SEASON: WINTER   HOUR: 0 (LST)

CEILING HEIGHT		DEW POINT SPREAD (F) 0	1	2	3	4	5	6	8	10	15	20	>30
	A	59	52	43	36	27	13	6	3	1	0	0	0
	B	16	18	24	26	30	31	14	7	4	1	1	1
0	C	8	10	10	13	13	21	38	24	18	7	1	1
	D	4	2	2	2	5	8	11	30	37	29	4	1
	E	2	5	5	5	4	1	1	1	1	3	34	31
	F	11	13	16	18	21	26	30	35	39	60	60	66
	A	45	44	38	32	26	13	5	3	1	0	0	0
	B	24	19	24	27	28	30	14	7	4	1	1	1
100	C	10	13	13	14	15	21	38	24	18	7	1	1
	D	6	3	2	2	5	8	11	30	37	29	4	1
	E	1	4	5	5	4	2	1	1	1	3	34	31
	F	14	17	18	20	22	26	31	35	39	60	60	66
	A	16	16	13	9	5	2	1	0	0	0	0	0
	B	46	43	44	43	42	35	16	8	4	1	1	1
200	C	17	17	17	20	20	25	40	26	19	7	1	1
	D	9	11	13	15	19	23	27	48	57	51	8	1
	E	2	2	2	1	2	2	3	4	4	20	69	73
	F	10	11	11	12	12	13	13	14	16	21	21	24
	A	16	15	12	9	5	2	1	0	0	0	0	0
	B	44	42	44	41	41	34	16	8	4	1	1	1
300	C	17	18	17	21	21	25	40	26	19	7	1	1
	D	10	12	14	16	19	24	27	48	57	51	8	1
	E	3	2	1	1	2	2	3	4	4	20	69	73
	F	10	11	12	12	12	13	13	14	16	21	21	24
	A	15	14	12	8	5	2	1	0	0	0	0	0
	B	44	40	41	41	40	33	16	8	4	1	1	1
400	C	17	19	19	21	21	26	39	26	19	7	1	1
	D	11	13	14	16	19	24	28	48	57	51	8	1
	E	2	2	2	2	2	2	3	4	4	20	69	73
	F	11	12	12	12	13	13	13	14	16	21	21	24
	A	8	7	5	4	3	1	0	0	0	0	0	0
	B	29	27	24	18	12	8	4	2	1	1	1	1
500	C	34	32	34	36	38	40	41	25	17	5	1	1
	D	14	18	20	23	27	30	34	51	60	58	9	1
	E	5	6	6	7	8	9	9	10	8	19	72	78
	F	10	10	11	12	12	12	12	12	14	17	17	19
	A	7	6	5	3	3	1	0	0	0	0	0	0
	B	24	23	21	17	11	8	4	2	1	1	1	1
600	C	36	34	33	36	38	39	41	25	17	5	1	1
	D	16	20	23	25	28	31	34	51	60	58	9	1
	E	6	6	6	7	8	9	9	10	8	19	72	78
	F	11	11	12	12	12	12	12	12	14	17	17	19
	A	7	5	4	3	2	1	0	0	0	0	0	0
	B	23	20	18	14	11	6	4	2	1	1	1	1
800	C	36	35	33	35	35	38	39	24	17	5	1	1
	D	17	21	26	28	32	34	36	52	59	58	9	1
	E	6	7	7	8	8	9	8	9	8	19	72	78
	F	11	12	12	12	12	12	13	13	15	17	17	19
	A	4	4	2	1	1	0	0	0	0	0	0	0
	B	16	11	9	7	4	3	1	1	1	1	1	1
1000	C	23	23	21	16	11	7	5	3	1	1	1	1
	D	34	37	41	47	53	57	59	59	57	38	5	1
	E	11	10	11	12	13	14	16	18	21	39	72	75
	F	12	15	16	17	18	19	19	19	20	21	21	22
	A	4	4	2	1	0	0	0	0	0	0	0	0
	B	14	9	8	5	4	2	1	1	1	1	1	1
1500	C	22	22	18	14	10	7	5	2	1	1	1	1
	D	35	37	43	49	53	57	58	59	57	38	5	1
	E	11	12	13	13	15	15	17	18	21	39	72	75
	F	14	16	16	18	18	19	19	20	20	21	21	22
	A	4	3	2	1	0	0	0	0	0	0	0	0
	B	14	10	7	5	4	1	1	1	1	1	1	1
2000	C	21	19	16	12	8	6	4	2	1	1	1	1
	D	36	39	44	49	53	56	57	56	56	38	5	1
	E	11	13	14	15	17	18	18	21	21	39	72	75
	F	14	16	17	18	18	19	20	20	21	21	21	22
	A	4	3	2	1	0	0	0	0	0	0	0	0
	B	12	8	6	5	3	1	1	1	1	1	1	1
2500	C	21	20	15	10	8	6	3	2	1	1	1	1
	D	36	38	44	49	52	54	55	54	53	38	5	1
	E	13	15	15	17	18	19	21	23	24	39	72	75
	F	14	16	18	18	19	20	20	20	21	21	21	22

Fig. 10. Conditional probabilities as computed by the program COMPCOND. Values shown are for the indicated wind direction and hour. Left margin indicates the initial ceiling category and final letter categories. Initial dew-point spread categories are indicated along the top margin

VI. PROGRAM PRINTALL

This program is used to list the conditional and unconditional probabilities computed by program COMPCOND in the format of Figs. 12 and 13. The two-and four-hour ceiling and visibility values are simultaneously input into the program for printing.

The program first reads through the nine wind categories of program COMPCOND to obtain the unconditional probabilities for the respective ceiling and visibility occurrences.

The two- and four-hour data for ceiling are processed first. The four-hour values must first be read since the array used to hold the unconditional probabilities for the specific wind direction and each of the 12 dew-point spread categories are used to hold both the two- and four-hour data. Thus the valid two-hour data overlay the previously read invalid four-hour values in the arrays.

Once the values for the medians have been computed and all probabilities rounded to one digit the data are listed. The output is arranged such that the conditional probabilities are printed for each wind direction for all hours in sequence. For one hour's display the ceiling data are listed followed by the visibility data. When nine wind categories are considered for each hour of the day, the total number of output pages is 432 for ceiling and visibility inclusive.

A total of five separate subroutines are required by this program. A discussion of each follows.

1) MEDVALUE (Medium Value): This subroutine is used to compute the MED values for the conditional probabilities for both the two-and four-hour final categories. The MED value is defined as that level where the cumulative probability of lower ceiling is the same as that of higher ceilings, i.e., the 50th percentile level. The probabilities for each final category is summed until a value greater than 50 is obtained. Once found the amount of the current category needed to make the 50 percentile is divided by the probability of the category. This value is then multiplied by the layer increment and added to the lower level of the layer. The same routines apply when visibility categories rather than ceilings are under consideration.

2) ROUNDOFF (Round Off): This subroutine is used to round all conditional probabilities such that they can be output as a single digit. All rounded values are obtained by first adding 5 and then dividing by 10. In this way an initial value of 54 would round to 5 and a value of 55 would be rounded to 6. No attempt is made to force the values to add up to 10. Should a value of 95 or greater be found for any given category, that category is rounded down to 9.

3) UNCDEWPT (Unconditional Dew-Point): This subroutine is used to compute the MED value and round all unconditional probabilities for each of the 12 dew-point spread categories. The same procedure as outlined in the subroutines MEDVALUE and ROUNDOFF is used.

4) UNCWINDS (Unconditional Winds): This subroutine is used to compute the MED value and round the unconditional probabilities for the two wind values listed. The first being the ALL WINDS category and the second the specific wind direction. The same procedure as outlined in the subroutines MEDVALUE and ROUNDOFF is used.

5) PRTDATA (Print Data): This subroutine is used to list the conditional, unconditional and MED values as computed in the prior subroutines (see Figs. 12 and 13). Care must be taken in listing the data since the MED values for ceiling are integer and the MED values for visibility are floating point.

This program requires the following tape unit assignments.

UNIT	CONTENTS
1	2 HR Ceiling Conditional Values
2	2 HR Visibility Conditional Values
3	4 HR Ceiling Conditional Values
4	4 HR Visibility Conditional Values

Table 15. Input/Output tape unit assignments for program PRINTALL.

The next 19 pages contain the program flowchart, program listing and two sample output listings.

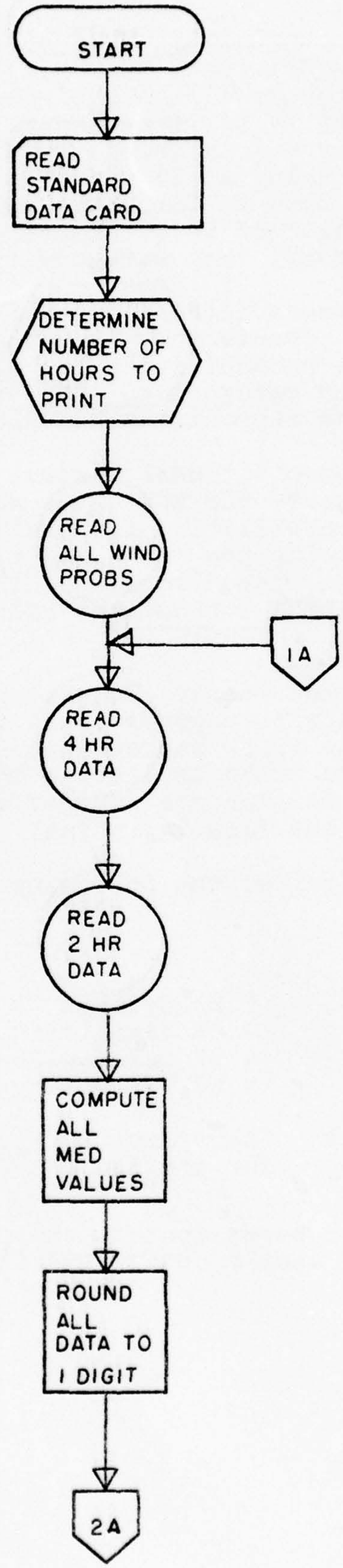

Fig. 11. Flowchart for program PRINTALL.

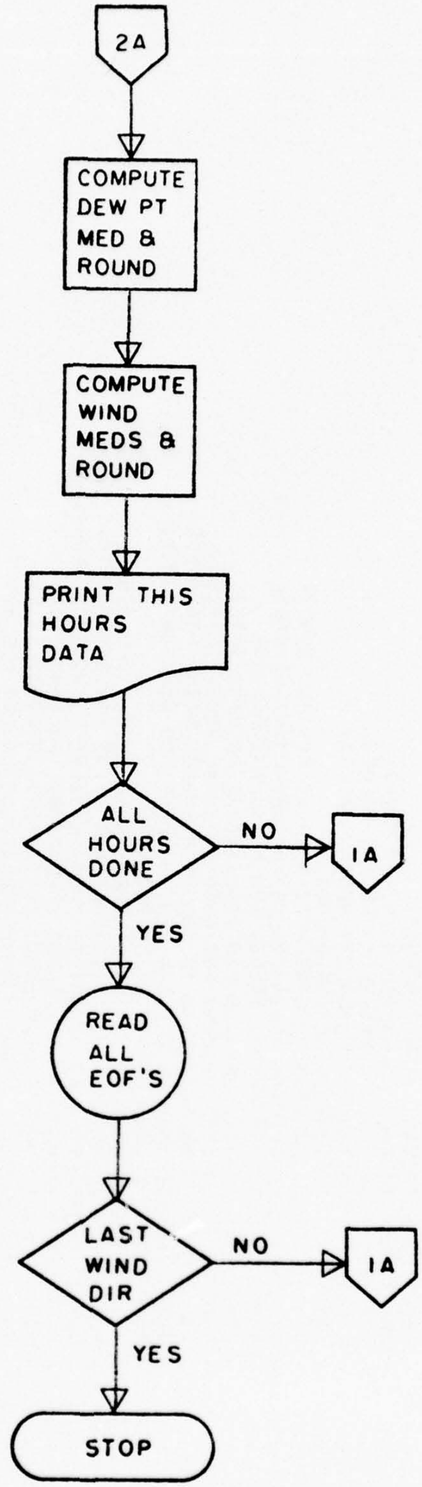

Fig. 11a. Flowchart for program PRINTALL continued.

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MS FORTRAN  (4.2) / MSOS                                 04/30/76          PAGE 001

      PROGRAM PRINTALL
C
C     SEE PROGRAM DOCUMENTATION FOR SPECIFICS ON PROGRAM FLOW.
C
C     BELOW LIST THE USES FOR SPECIFIC VARIABLES USED IN THIS PROGRAM.
C
C     IPRT      - VALUE INPUT FROM DATA CARD 2NDICATE NUMBER OF HOURS TO PRINT.
C     ISTN      - ARRAY INPUT FROM DATA CARD TO INDICATE STATION NAME.
C     IHOUR     - VARIABLE INPUT FORM DATA CARD TO INDICATE HOUR BEING PROCESSED.
C     IMED2     - ARRAY TO HOLD 2 HOUR CEILING MEDIAN VALUES.
C     IMED4     - ARRAY TO HOLD 4 HOUR CEILING MEDIAN VALUES.
C     LDSPD     - ARRAY USED TO LIST DEW-POINT SPREADS.
C     LHOUR     - VALUE COMPUTED FROM IHOUR WHICH INDICATES LAST HOUR PROCESSED.
C     LTYPE     - ARRAY USED TO LIST CEILING/VISIBILITY CATEGORIES.
C     LWIND     - ARRAY USED TO LIST WIND CATEGORY.
C     NHOUR     - ARRAY USED TO INDICATE WHICH HOURS TO PRINT.
C     XMED2     - ARRAY TO HOLD 2 HOUR VISIBILITY MEDIAN VALUES.
C     XMED4     - ARRAY TO HOLD 4 HOUR VISIBILITY MEDIAN VALUES.
C     DELTAZ    - ARRAY USED TO COMPUTE MEDIAN VALUES.
C     IAWMED    - VARIABLE USED TO HOLD CEILING MEDIAN VALUE FOR ALL WINDS.
C     IDPMED    - ARRAY TO HOLD CEILING MEDIAN VALUE FOR DEW-POINT SPREADS.
C     IFINAL    - ARRAY USED TO LIST ALPHA VALUES FOR FINAL CATEGORIES.
C     IHEAD1    - ARRAY USED TO LIST HEADING FOR CONDITIONAL PROBABILITIES.
C     IHEAD2    - ARRAY USED TO LIST HEADING FOR UNCONDITIONAL PROBABILITIES.
C     ISEASN    - VALUE INPUT FROM DATA CARD TO INDICATE SEASON BEING PROCESSED.
C     IWDMED    - VARIABLE USED TO HOLD CEILING MEDIAN VALUE FOR WIND CATEGORY.
C     LSEASN    - ARRAY USED TO LIST SEASON BEING PROCESSED.
C     XAWMED    - VARIABLE USED TO HOLD VISIBILITY MEDIAN VALUE FOR ALL WINDS.
C     XDPMED    - VARIABLE USED TO HOLD VISIBILITY MEDIAN VALUE FOR DEW-POINTS.
C     XWDMED    - VARIABLE USED TO HOLD VISIBILITY MEDIAN VALUE BY WIND CATEGORY.
C     ICOND2HR  - ARRAY USED TO HOLD 2 HOUR INPUT CONDITIONAL PROBABILITIES.
C     ICOND4HR  - ARRAY USED TO HOLD 4 HOUR INPUT CONDITIONAL PROBABILITIES.
C     IUNCIGAW  - ARRAY FOR CEILING UNCONDITIONAL PROBABILITIES FOR ALL WINDS.
C     IUNPRBWD  - ARRAY TO HOLD WIND CATEGORY UNCONDITIONAL PROBABILITIES.
C     IUNPRBDP  - ARRAY TO HOLD DEW-POINT UNCONDITIONAL PROBABILITIES.
C     IUNVISAW  - ARRAY FOR VISIBILITY UNCONDITIONAL PROBABILITIES FOR ALL WINDS.
C
      COMMON ISEASN,NHOUR(24),XWDMED,IWDMED,XAWMED(24),IAWMED(24),
     *       IDPMED(12),XDPMED(12),IMED2(16,12),IMED4(16,12),
     *       XMED2(16,12),XMED4(16,12),ICOND2HR(16,12,6),
     *       ICOND4HR(16,12,6),IUNPRBWD(6),IUNPRBDP(12,6),
     *       IUNCIGAW(24,6),IUNVISAW(24,6),IHOUR,LHOUR,ISTN(8)
C
C     TURN OFF AUTOMATIC PAGE EJECT.
C
      PRINT 11
C
C     READ STANDARD DATA CARD.  VALUES UNDERLINED WITH *** ARE THOSE USED.
C
      READ 10,IEOF,IHOUR,ISEASN,ITYPE,IMODE,ITEMP,IPRT,ILIM,ISTN
C                 ***** ******                   ****      ****
C
      LHOUR = 2*IHOUR
C
```

```
C     DETERMINE HOW MANY HOURS TO PRINT.
C
      IF (IPRT .EQ. 0) GO TO 2
      IPRT = 24/IPRT
      DO 1 N=1,24,IPRT
      NHOUR(N) = 1
    1 CONTINUE
C
C     FIRST LOOP THROUGH ALL 9 WIND CATEGORIES AND 24 HOURS TO FIND
C     THE UNCONDITIONAL PROBABILITIES FOR ALL WINDS.
C
    2 DO 5 IWIND=1,9
      DO 3 N=1,24
      READ (01)
      READ (02)
    3 CONTINUE
      DO 4 I=1,2
      READ (I)
      GO TO (4,9) EOFCKF(I)
    4 CONTINUE
    5 CONTINUE
C
      READ (01) IUNCIGAW
      CALL UNCWINDS(3)
      REWIND 01
C
      READ (02) IUNVISAW
      CALL UNCWINDS(4)
      REWIND 02
C
C     LOOP THROUGH ALL 9 WIND CATEGORIES AND 24 HOURS.
C
      DO 8 IWIND=1,9
      DO 6 N=1,24
      DO 6 M=1,2
C
C     NOW FIRST READ THE IHOUR AND JHOUR CEILING DATA AND THEN THE VIS DATA.
C     THE IHOUR DATA MUST BE READ LAST SINCE THE SAME ARRAYS ARE USED TO HOLD
C     THE VALUES FOR IUNPRBWD AND IUNPRBDP.
C
      L = M + 2
      READ (L) ICOND4HR,IUNPRBWD,IUNPRBDP
      READ (M) ICOND2HR,IUNPRBWD,IUNPRBDP
C
C     WE MUST COMPUTE THE MEDIAN VALUES.
C
      CALL MEDVALUE(M,ICOND2HR,XMED2,IMED2)
      CALL MEDVALUE(M,ICOND4HR,XMED4,IMED4)
C
C     ALL PROBABILITIES MUST BE SUCH THAT THEY CAN BE EXPRESSED BY ONE DIGIT.
C
      CALL ROUNDOFF(ICOND2HR)
      CALL ROUNDOFF(ICOND4HR)
C
```

```
C     NOW WE HAVE TO COMPUTE MEDIAN VALUES AND ROUND DEW-POINT AND WIND
C     UNCONDITIONALS.
C
      CALL UNCDEWPT(M)
      CALL UNCWINDS(M)
C
C     FINALLY GO SEE IF WE PRINT THIS HOURS DATA.
C
      CALL PRTDATA(IWIND,M,N)
    6 CONTINUE
C
C     ALL TAPES SHOULD HAVE AN EOF NOW.
C
      DO 7 I=1,4
      READ (I)
      GO TO (7,9) EOFCKF(I)
    7 CONTINUE
    8 CONTINUE
      STOP
C
C     WE COME HERE IF NO EOF IS FOUND.
C
    9 PRINT 12,I,IWIND
      STOP
C
C     THESE ARE THE FORMAT STATEMENTS USED.
C
   10 FORMAT (8I2,1X,8A4)
   11 FORMAT (1H1,/,1HQ,64(/))
   12 FORMAT (≠ NO EOF FOUND ON TAPE≠,I2,≠ FILE≠,I2)
      END
```

FORTRAN DIAGNOSTIC RESULTS FOR PRINTALL

NO ERRORS

```
MS FORTRAN  (4.2) / MSOS                          04/30/76          PAGE 001
          SUBROUTINE ROUNDOFF(ICOND)
C
C         THIS SUBROUTINE IS USED TO ROUND OFF ALL INTEGER CONDITIONAL
C         PROBABILITIES SUCH THAT THEY CAN BE EXPRESSED AS A SINGLE DIGIT.
C
C         ICOND INDICATES EITHER THE 2HR OR 4HR CIG OR VIS DATA.
C
          COMMON ISEASN,NHOUR(24),XWDMED,IWDMED,XAWMED(24),IAWMED(24),
         *       IDPMED(12),XDPMED(12),IMED2(16,12),IMED4(16,12),
         *       XMED2(16,12),XMED4(16,12),ICOND2HR(16,12,6),
         *       ICOND4HR(16,12,6),IUNPRBWD(6),IUNPRBDP(12,6),
         *       IUNCIGAW(24,6),IUNVISAW(24,6),IHOUR,LHOUR,ISTN(8)
          DIMENSION ICOND(16,12,6)
C
          DO 1 I=1,16
          DO 1 J=1,12
          DO 1 K=1,6
          ICOND(I,J,K) = (ICOND(I,J,K) + 5.0) / 10.0
          IF (ICOND(I,J,K) .GT. 9) ICOND(I,J,K) = 9
        1 CONTINUE
          RETURN
          END

                FORTRAN DIAGNOSTIC RESULTS  FOR    ROUNDOFF

NO ERRORS
```

```
      SUBROUTINE MEDVALUE(ITYPE,ICOND,XMEDS,IMEDS)
C
C     THIS SUBROUTINE IS USED TO DETERMINE THE MEDIAN VALUE FOR ALL
C     CONDITICNAL PROBABILITIES.
C
C     ITYPE INDICATES EITHER CIG OR VIS DATA.
C     ICOND INDICATES EITHER 2HR OR 4HR CIG OR VIS DATA.
C     XMEDS INDICATES THE ARRAY FOR THE VIS MEDIAN VALUES.
C     IMEDS INDICATES THE ARRAY FOR THE CIG MEDIAN VALUES.
C
      COMMON ISEASN,NHOUR(24),XWDMED,IWDMED,XAWMED(24),IAWMED(24),
     *       IDPMED(12),XDPMED(12),IMED2(16,12),IMED4(16,12),
     *       XMED2(16,12),XMED4(16,12),ICOND2HR(16,12,6),
     *       ICOND4HR(16,12,6),IUNPRBWD(6),IUNPRBDP(12,6),
     *       IUNCIGAW(24,6),IUNVISAW(24,6),IHOUR,LHOUR,ISTN(8)
      DIMENSION ICOND(16,12,6),XMEDS(16,12),IMEDS(16,12),DELTAZ(2,7)
C
      DATA (((DELTAZ(I,J),J=1,7),I=1,2)=    0.0,  200.0,  500.0, 1000.0,
     *                                   3000.0,10000.0,20000.0,
     *                                      0.0,    0.5,    1.0,    2.0,
     *                                      3.0,    6.0,   15.0)
C
C     LOOP THROUGH ALL 16 LEVELS AND 12 DEW-POINT CATEGCRIES.
C
      DO 6 I=1,16
      DO 5 J=1,12
C
C     SUM VALUES UNTIL 50 PERCENTILE IS FOUND.
C
      ISUM = 0
      ITOT = 0
      DO 1 K=1,6
      ISUM = ISUM + ICOND(I,J,K)
      IF (ISUM .GE. 50) GO TO 2
      ITOT = ITOT + ICOND(I,J,K)
    1 CONTINUE
      GO TO 7
C
C     IF THIS IS LAST CATEGORY FORCE MED VALUE.
C
    2 IF (K .NE. 6) GO TO 3
      IF (ICOND(I,J,6) .LT. 80) GO TO 3
      XMEDS(I,J) = DELTAZ(ITYPE,7)
      GO TO 4
C
C     DETERMINE HOW FAR INTO CATEGORY WE ARE FOR COMPUTATION.
C
    3 A = 50 - ITOT
      B = ISUM - ITOT
      X = A / B
      XMEDS(I,J) = X*(DELTAZ(ITYPE,K+1)-DELTAZ(ITYPE,K))+DELTAZ(ITYPE,K)
C
C     IF THIS IS CEILING WE WANT INTEGER.
C
```

```
    4 IF (ITYPE .EQ. 1) IMEDS(I,J) = XMEDS(I,J)
    5 CONTINUE
    6 CONTINUE
      RETURN
C
C     SOMETHING WRONG - PRINT ERROR MESSAGE.
C
    7 PRINT 8,I,J,K
      STOP
C
C     THIS IS THE FORMAT STATEMENT USED.
C
    8 FORMAT (≠ CONDITIONAL VALUES DO NOT SUM TO 100≠,3I3)
      END
              FORTRAN DIAGNOSTIC RESULTS FOR    MEDVALUE

NO ERRORS
```

```
MS FORTRAN  (4.2) / MSOS                              04/30/76            PAGE 001
          SUBROUTINE UNCDEWPT(ITYPE)
C
C         THIS SUBROUTINE IS USED TO COMPUTE THE MEDIAN VALUE AND ROUND THE
C         UNCONDITIONAL PROBABILITIES FOR THE 12 DEW-POINT SPREADS.
C         THE SAME LOGIC AS USED IN MEDVALUE AND ROUNDOFF IS USED HERE.
C
C         ITYPE INDICATES EITHER CIG OR VIS DATA.
C
          COMMON ISEASN,NHOUR(24),XWDMED,IWDMED,XAWMED(24),IAWMED(24),
         *       IDPMED(12),XDPMED(12),IMED2(16,12),IMED4(16,12),
         *       XMED2(16,12),XMED4(16,12),ICOND2HR(16,12,6),
         *       ICOND4HR(16,12,6),IUNPRBWD(6),IUNPRBDP(12,6),
         *       IUNCIGAW(24,6),IUNVISAW(24,6),IHOUR,LHOUR,ISTN(8)
          DIMENSION DELTAZ(2,7)
          DATA (((DELTAZ(I,J),J=1,7),I=1,2)=    0.0,  200.0,  500.0, 1000.0,
         *                                   3000.0,10000.0,20000.0,
         *                                      0.0,    0.5,    1.0,    2.0,
         *                                      3.0,    6.0,   15.0)
C
C         LOOP THROUGH ALL 12 DEW-POINT SPREADS.
C
          DO 6 J=1,12
C
C         FIND MEDIAN VALUE.
C
          ISUM = 0
          ITOT = 0
          DO 1 K=1,6
          ISUM = ISUM + IUNPRBDP(J,K)
          IF (ISUM .GE. 50) GO TO 2
          ITOT = ITOT + IUNPRBDP(J,K)
        1 CONTINUE
          GO TO 7
        2 IF (K .NE. 6) GO TO 3
          IF (IUNPRBDP(J,6) .LT. 80) GO TO 3
          XDPMED(J) = DELTAZ(ITYPE,7)
          GO TO 4
        3 A = 50 - ITOT
          B = ISUM - ITOT
          X = A / B
          XDPMED(J) = X*(DELTAZ(ITYPE,K+1)-DELTAZ(ITYPE,K))+DELTAZ(ITYPE,K)
        4 IF (ITYPE .EQ. 1) IDPMED(J) = XDPMED(J)
C
C         ROUND ALL VALUES TO ONE DIGIT.
C
          DO 5 K=1,6
          IUNPRBDP(J*K) = (IUNPRBDP(J*K) + 5.0) / 10.0
          IF (IUNPRBDP(J,K) .GT. 9) IUNPRBDP(J,K) = 9
        5 CONTINUE
        6 CONTINUE
          RETURN
C
C         SOMETHING WRONG PRINT ERROR MESSAGE.
C
```

```
MS FORTRAN  (4.2) / MSOS                        04/30/76          PAGE 002

      7 PRINT 8,J,K
        STOP
C
C       THIS IS THE FORMAT STATEMENT USED.
C
      8 FORMAT (* DEW POINT VALUES DO NOT SUM TO 100*,2I3)
        END

               FORTRAN DIAGNOSTIC RESULTS  FOR    UNCDEWPT

NO ERRORS
```

```
MS FORTRAN  (4.2) / MSOS                            04/30/76            PAGE 001

      SUBROUTINE UNCWINDS(ITYPE)
C
C     THIS SUBROUTINE IS USED TO COMPUTE THE MEDIAN VALUE AND ROUND THE
C     UNCONDITIONAL PROBABILITIES FOR THE SPECIFIC WIND DIRECTION AND THE
C     ALL WINDS CATEGORY.  THE SAME LOGIC AS USED IN MEDVALUE AND ROUNDOFF
C     IS USED HERE.
C
C     ITYPE INDICATES EITHER CIG OR VIS DATA.  FOR ALL WINDS ITYPE = 3 OR 4.
C
      COMMON ISEASN,NHOUR(24),XWDMED,IWDMED,XAWMED(24),IAWMED(24),
     *        IDPMED(12),XDPMED(12),IMED2(16,12),IMED4(16,12),
     *        XMED2(16,12),XMED4(16,12),ICOND2HR(16,12,6),
     *        ICOND4HR(16,12,6),IUNPRBWD(6),IUNPRBDP(12,6),
     *        IUNCIGAW(24,6),IUNVISAW(24,6),IHOUR,LHOUR,ISTN(8)
      DIMENSION DELTAZ(2,7)
C
      DATA (((DELTAZ(I,J),J=1,7),I=1,2)=     0.0,  200.0,  500.0, 1000.0,
     *                                  3000.0,10000.0,20000.0,
     *                                     0.0,    0.5,    1.0,    2.0,
     *                                     3.0,    6.0,   15.0)
C
C     SEE IF THIS IS FOR ALL WINDS VALUES.
C
      IF (ITYPE .GT. 2) GO TO 6
C
C     FIND MEDIAN VALUE.
C
      ISUM = 0
      ITOT = 0
      DO 1 K=1,6
      ISUM = ISUM + IUNPRBWD(K)
      IF (ISUM .GE. 50) GO TO 2
      ITOT = ITOT + IUNPRBWD(K)
    1 CONTINUE
      GO TO 21
    2 IF (K .NE. 6) GO TO 3
      IF (IUNPRBWD(6) .LT. 80) GO TO 3
      XWDMED = DELTAZ(ITYPE,7)
      GO TO 4
    3 A = 50 - ITOT
      B = ISUM - ITOT
      X = A / B
      XWDMED = X*(DELTAZ(ITYPE,K+1)-DELTAZ(ITYPE,K))+DELTAZ(ITYPE,K)
    4 IF (ITYPE .EQ. 1) IWDMED = XWDMED
C
C     ROUND EACH PROBABILITY TO ONE DIGIT.
C
      DO 5 K=1,6
      IUNPRBWD(K) = (IUNPRBWD(K) + 5.0) / 10.0
      IF (IUNPRBWD(K) .GT. 9) IUNPRBWD(K) = 9
    5 CONTINUE
      RETURN
C
C     MUST COMPUTE DIFFERENT VALUES DEPENDING ON ITYPE.
```

```
C
    6 JTYPE = ITYPE - 2
      GO TO (7,14) JTYPE
C
C     USE THIS CODING TO COMPUTE CIG VALUES.
C
    7 DO 13 N=1,24
C
C     FIND MEDIAN VALUE.
C
      ISUM = 0
      ITOT = 0
      DO 8 K=1,6
      ISUM = ISUM + IUNCIGAW(N,K)
      IF (ISUM .GE. 50) GO TO 9
      ITOT = ITOT + IUNCIGAW(N,K)
    8 CONTINUE
      GO TO 22
    9 IF (K .NE. 6) GO TO 10
      IF (IUNCIGAW(N,6) .LT. 80) GO TO 10
      XAWMED(N) = DELTAZ(JTYPE,7)
      GO TO 11
   10 A = 50 - ITOT
      B = ISUM - ITOT
      X = A / B
      XAWMED(N) = X*(DELTAZ(JTYPE,K+1)-DELTAZ(JTYPE,K))+DELTAZ(JTYPE,K)
   11 IAWMED(N) = XAWMED(N)
C
C     ROUND EACH VALUE TO ONE DIGIT.
C
      DO 12 K=1,6
      IUNCIGAW(N*K) = (IUNCIGAW(N*K) + 5.0) / 10.0
      IF (IUNCIGAW(N,K) .GT. 9) IUNCIGAW(N,K) = 9
   12 CONTINUE
   13 CONTINUE
      RETURN
C
C     USE THIS CODING FOR VIS VALUES.
C
   14 DO 20 N=1,24
C
C     FIND MEDIAN VALUES.
C
      ISUM = 0
      ITOT = 0
      DO 15 K=1,6
      ISUM = ISUM + IUNVISAW(N,K)
      IF (ISUM .GE. 50) GO TO 16
      ITOT = ITOT + IUNVISAW(N,K)
   15 CONTINUE
      GO TO 22
   16 IF (K .NE. 6) GO TO 17
      IF (IUNVISAW(N,6) .LT. 80) GO TO 17
      XAWMED(N) = DELTAZ(JTYPE,7)
```

```
      GO TO 18
   17 A = 50 - ITOT
      B = ISUM - ITOT
      X = A / B
      XAWMED(N) = X*(DELTAZ(JTYPE,K+1)-DELTAZ(JTYPE,K))+DELTAZ(JTYPE,K)
C
C     ROUND EACH VALUE TO ONE DIGIT.
C
   18 DO 19 K=1,6
      IUNVISAW(N,K) = (IUNVISAW(N,K) + 5.0) / 10.0
      IF (IUNVISAW(N,K) .GT. 9) IUNVISAW(N,K) = 9
   19 CONTINUE
   20 CONTINUE
      RETURN
C
C     SOMETHING WRONG PRINT ERROR MESSAGE.
C
   21 PRINT 24,ITYPE,N
      STOP
   22 PRINT 23,ITYPE,N
      STOP
C
C     THESE ARE THE FORMAT STATEMENTS USED.
C
   23 FORMAT (≠ ALL WIND VALUES DO NOT SUM TO 100≠,2I2)
   24 FORMAT (≠ WIND CATEGORY VALUES DO NOT SUM TO 100≠,2I2)
      END

                FORTRAN DIAGNOSTIC RESULTS FOR    UNCWINDS

NO ERRORS
```

```
      SUBROUTINE PRTDATA(IWIND,ITYPE,N)
C
C     THIS IS THE SUBROUTINE WHICH IS USED TO LIST THE CONDITIONAL
C     AND UNCONDITIONAL PROBABILITIES AS MODIFIED BY THE PREVIOUS SUBROUTINES.
C
C     IWIND INDICATES THE WIND CATEGORY.
C     ITYPE INDICATES EITHER CIG OR VIS DATA.
C     N INDICATES THE HOUR + 1.
C
      COMMON ISEASN,NHOUR(24),XWDMED,IWDMED,XAWMED(24),IAWMED(24),
     *       IDPMED(12),XDPMED(12),IMED2(16,12),IMED4(16,12),
     *       XMED2(16,12),XMED4(16,12),ICOND2HR(16,12,6),
     *       ICOND4HR(16,12,6),IUNPRBWD(6),IUNPRBDP(12,6),
     *       IUNCIGAW(24,6),IUNVISAW(24,6),IHOUR,LHOUR,ISTN(8)
      DIMENSION LWIND(9,2),LSEASN(4,2),LDSPD(12),LTYPE(2,32),
     *          IHEAD1(2,28),IHEAD2(2,26),IFINAL(2,6)
C
      DATA (((LWIND(I,J),J=1,2),I=1,9)=4H0-3 ,4HKTS ,
     *                                 4H327-,4H11  ,
     *                                 4H 12-,4H56  ,
     *                                 4H 57-,4H101 ,
     *                                 4H102-,4H146 ,
     *                                 4H147-,4H191 ,
     *                                 4H192-,4H236 ,
     *                                 4H237-,4H281 ,
     *                                 4H282-,4H326 )
      DATA (((IFINAL(I,J),J=1,6),I=1,2)=1HA,1HB,1HC,1HD,1HE,1HF,
     *                                  1HJ,1HK,1HL,1HM,1HN,1HO)
      DATA (((LSEASN(I,J),J=1,2),I=1,4)=4HSPRI,4HNG  ,4HSUMM,4HER  ,
     *                                  4HAUTU,4HMN  ,4HWINT,4HER  )
      DATA (((LTYPE(I,J),J=1,32),I=1,2)=4H    ,4H OF ,4H   1,4H00F ,
     *                                  4H   2,4H00F ,4H   3,4H00F ,
     *                                  4H   4,4H00F ,4H   5,4H00F ,
     *                                  4H   6,4H00F ,4H   8,4H00F ,
     *                                  4H  10,4H00F ,4H  15,4H00F ,
     *                                  4H  20,4H00F ,4H  25,4H00F ,
     *                                  4H  30,4H00F ,4H  50,4H00F ,
     *                                  4H 100,4H00F ,4H NO ,4HCIG ,
     *                                  4H    ,4H 0M ,4H  1/,4H16M ,
     *                                  4H   1,4H/8M ,4H   1,4H/4M ,
     *                                  4H   1,4H/2M ,4H   3,4H/4M ,
     *                                  4H    ,4H 1M ,4H 1 1,4H/2M ,
     *                                  4H    ,4H 2M ,4H    ,4H 3M ,
     *                                  4H    ,4H 4M ,4H    ,4H 5M ,
     *                                  4H    ,4H 6M ,4H    ,4H 7M ,
     *                                  4H    ,4H10M ,4H    ,4H15M )
      DATA(((IHEAD1(I,J),J=1,28),I=1,2)=4H HOU,4HR CL,4HIMAT,4HIC C,
     *                                  4HONDI,4HTION,4HAL P,4HROBA,
     *                                  4HBILI,4HTIES,4H (RO,4HUNDE,
     *                                  4HD TO,4H NEA,4HREST,4H TEN,
     *                                  4HS OF,4H PER,4HCENT,4H) AN,
     *                                  4HD TH,4HE ME,4HDIAN,4H CEI,
     *                                  4HLING,4H (FE,4HET) ,4H    ,
     *                                  4H HOU,4HR CL,4HIMAT,4HIC C,
```

```
     *                                     4HONDI,4HTION,4HAL P,4HROBA,
     *                                     4HBILI,4HTIES,4H (RO,4HUNDE,
     *                                     4HD TO,4H NEA,4HREST,4H TEN,
     *                                     4HS OF,4H PER,4HCENT,4H) AN,
     *                                     4HD TH,4HE ME,4HDIAN,4H VIS,
     *                                     4HIBIL,4HITY ,4H(MIL,4HES) )
      DATA(((IHEAD2(I,J),J=1,26),I=1,2)=4HUNCO,4HNDIT,4HIONA,4HL PR,
     *                                     4HOBAB,4HILIT,4HIES ,4H(ROU,
     *                                     4HNDED,4H TO ,4HTHE ,4HNEAR,
     *                                     4HEST ,4HTENS,4H OF ,4HPERC,
     *                                     4HENT),4H AND,4H MED,4HIAN ,
     *                                     4HCEIL,4HING ,4HHEIG,4HHT (,
     *                                     4HFEET,4H)    ,
     *                                     4HUNCO,4HNDIT,4HIONA,4HL PR,
     *                                     4HOBAB,4HILIT,4HIES ,4H(ROU,
     *                                     4HNDED,4H TO ,4HTHE ,4HNEAR,
     *                                     4HEST ,4HTENS,4H OF ,4HPERC,
     *                                     4HENT),4H AND,4H MED,4HIAN ,
     *                                     4HVISI,4HBILI,4HTY I,4HN (M,
     *                                     4HILES,4H)    )
      DATA ((LOSPD(I),I=1,12)=4H  0 ,4H  1 ,4H  2 ,4H  3 ,4H  4 ,4H  5 ,
     *                        4H  6 ,4H  8 ,4H 10 ,4H 15 ,4H 20 ,4H>30 )
C
      IF (NHOUR(N) .NE. 1) RETURN
      IHR = N - 1
C
C     PRINT CONDITIONAL HEADINGS.
C
      PRINT 14,ISTN,(LSEASN(ISEASN,M),M=1,2),(LWIND(IWIND,M),M=1,2),
     *         IHOUR,LHOUR,(IHEAD1(ITYPE,M),M=1,28),IHR,IHOUR,LHOUR
C
C     LOOP 3 TIMES PRINTING 4 DEW-POINT SPREADS AT A TIME.
C
      DO 4 M=1,3
      IEND = M*4
      IBEG = IEND - 3
C
C     SET UP DEW-POINT AND FINAL CATEGORIES.
C
      PRINT 11,(LDSPD(J),J=IBEG,IEND),(LDSPD(J),J=IBEG,IEND),
     *         (IFINAL(ITYPE,K),K=1,6),(IFINAL(ITYPE,K),K=1,6),
     *         (IFINAL(ITYPE,K),K=1,6),(IFINAL(ITYPE,K),K=1,6),
     *         (IFINAL(ITYPE,K),K=1,6),(IFINAL(ITYPE,K),K=1,6),
     *         (IFINAL(ITYPE,K),K=1,6),(IFINAL(ITYPE,K),K=1,6)
C
C     LOOP THROUGH ALL 16 INITIAL CATEGORIES.
C
      DO 3 I=1,16
      L = (I*2) - 1
C
C     CIG MEDS ARE INTEGER, VIS MEDS ARE FLOATING POINT.
C
      GO TO (1,2) ITYPE
    1 PRINT  8,LTYPE(ITYPE,L),LTYPE(ITYPE,L+1),
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     *          (((ICOND2HR(I,J,K),K=1,6),IMED2(I,J)),J=IBEG,IEND),
     *          LTYPE(ITYPE,L),LTYPE(ITYPE,L+1),
     *          (((ICOND4HR(I,J,K),K=1,6),IMED4(I,J)),J=IBEG,IEND)
      GO TO 3
    2 PRINT  9,LTYPE(ITYPE,L),LTYPE(ITYPE,L+1),
     *          (((ICOND2HR(I,J,K),K=1,6),XMED2(I,J)),J=IBEG,IEND),
     *          LTYPE(ITYPE,L),LTYPE(ITYPE,L+1),
     *          (((ICOND4HR(I,J,K),K=1,6),XMED4(I,J)),J=IBEG,IEND)
    3 CONTINUE
      IF (M .EQ. 3) GO TO 4
      PRINT 7
    4 CONTINUE
C
C     PRINT UNCONDITIONAL HEADINGS.
C
      PRINT 10,(IHEAD2(ITYPE,M),M=1,26),(IFINAL(ITYPE,K),K=1,6),
     *         (IFINAL(ITYPE,K),K=1,6),(IFINAL(ITYPE,K),K=1,6),
     *         (IFINAL(ITYPE,K),K=1,6),(IFINAL(ITYPE,K),K=1,6)
C
C     CIG MEDS ARE INTEGER, VIS MEDS ARE FLOATING POINT.
C
      GO TO (5,6) ITYPE
    5 PRINT 12,(IUNCIGAW(N,K),K=1,6),IAWMED(N),
     *         ((LDSPD(J),(IUNPRBDP(J,K),K=1,6),IDPMED(J)),J=1,10,3),
     *         ((LDSPD(J),(IUNPRBDP(J,K),K=1,6),IDPMED(J)),J=2,11,3),
     *         (LWIND(IWIND,M),M=1,2),(IUNPRBWD(K),K=1,6),IWDMED,
     *         ((LDSPD(J),(IUNPRBDP(J,K),K=1,6),IDPMED(J)),J=3,12,3)
      RETURN
    6 PRINT 13,(IUNVISAW(N,K),K=1,6),XAWMED(N),
     *         ((LDSPD(J),(IUNPRBDP(J,K),K=1,6),XDPMED(J)),J=1,10,3),
     *         ((LDSPD(J),(IUNPRBDP(J,K),K=1,6),XDPMED(J)),J=2,11,3),
     *         (LWIND(IWIND,M),M=1,2),(IUNPRBWD(K),K=1,6),XWDMED,
     *         ((LDSPD(J),(IUNPRBDP(J,K),K=1,6),XDPMED(J)),J=3,12,3)
      RETURN
C
C     THESE ARE THE FORMAT STATEMENTS USED.
C
    7 FORMAT (66X,≠*≠)
    8 FORMAT (1X,A4,A3,1X,4(6I1,I6,2X),≠ *  ≠,A4,A3,1X,3(6I1,I6,2X),
     *        6I1,I6)
    9 FORMAT (1X,A4,A3,1X,4(6I1,F6.1,2X),≠ *  ≠,A4,A3,1X,3(6I1,F6.1,2X),
     *        6I1,F6.1)
   10 FORMAT (1X,131(≠*≠),/,16X,26A4,/,16X,6A1,1X,≠MEDIAN≠,
     *        4(2X,≠SPREAD≠,1X,6A1,1X,≠MEDIAN≠))
   11 FORMAT (8X,4(≠  SPREAD ≠,A3,2X),≠  *≠,9X,4(≠  SPREAD ≠,A3,2X),/,
     *        9X,4(6A1,3X,≠MED≠,2X),≠ *≠,10X,3(6A1,3X,≠MED≠,2X),
     *        6A1,3X,≠MED≠)
   12 FORMAT (7X,≠ALL WIND≠,1X,6I1,1X,I5,4(4X,A3,3X,6I1,1X,I5),/,
     *        28X,4(4X,A3,3X,6I1,1X,I5),/,3X,≠WIND:≠2A4,6I1,1X,I5,
     *        4(4X,A3,3X,6I1,1X,I5),/)
   13 FORMAT (7X,≠ALL WIND≠,1X,6I1,1X,F5.1,4(4X,A3,3X,6I1,1X,F5.1),/,
     *        28X,4(4X,A3,3X,6I1,1X,F5.1),/,3X,≠WIND:≠2A4,6I1,1X,F5.1,
     *        4(4X,A3,3X,6I1,1X,F5.1),/)
   14 FORMAT (≠ STATION: ≠,8A4,18X,≠SEASON: ≠,2A4,32X,≠WIND DIRECTION:≠
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MS FORTRAN  (4.2) / MSOS                          04/30/76            PAGE 004
      *        ,2X,2A4,/,1X,I1,≠-≠,I1,2RA4,2X,≠HOUR:≠,I3,≠ (LST)≠,/,30X,
      *        I1,≠HR FORECAST≠,56X,I1,≠HR FORECAST≠)
       END

                 FORTRAN DIAGNOSTIC RESULTS  FOR    PRTDATA

NO ERRORS
LOAD,56
RUN,,NM
   8144 PRG USD   13260 PRG LFT    3968 COM USD    1320 COM LFT
00H01M52S
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STATION: [illegible] OFFUTT AFB - OMAHA, NE   SEASON: WINTER   WIND DIRECTION: 0-3 KTS

3-6 HOUR CLIMATIC CONDITIONAL PROBABILITIES (ROUNDED TO NEAREST TENS OF PERCENT) AND THE MEDIAN CEILING (FEET)   HOUR: 3 (LST)

3HR FORECAST

	SPREAD 0 ABCDEF	MED	SPREAD 1 ABCDEF	MED	SPREAD 2 ABCDEF	MED	SPREAD 3 ABCDEF	MED
0F	621001	181	521011	200	421012	300	431012	368
100F	431001	293	421002	322	421012	362	322012	412
200F	252101	410	252101	433	142101	458	142201	492
300F	152101	446	142101	470	142101	478	142201	545
400F	142101	465	142101	492	142101	500	142201	565
500F	134211	743	134211	771	124211	828	024211	905
600F	134211	756	124211	814	024211	871	014311	921
800F	124211	810	023211	897	023311	955	014311	1000
1000F	012411	1571	012412	1756	012412	1952	012512	2148
1500F	012411	1685	012412	1894	012412	2090	001522	2276
2000F	012411	1685	012412	1947	012422	2227	001522	2333
2500F	012411	1742	012422	2076	011422	2272	001522	2416
3000F	111242	4135	011242	4925	001242	5333	001242	5767
5000F	011242	4289	011242	5099	001242	5604	001252	6043
10000F	111116	12063	100127	12424	000127	12857	000127	13055
NO CIG	111018	13589	000009	20000	000019	20000	000009	20000

	SPREAD 4 ABCDEF	MED	SPREAD 5 ABCDEF	MED	SPREAD 6 ABCDEF	MED	SPREAD 8 ABCDEF	MED
0F	331002	422	232103	529	124103	857	013204	1909
100F	332002	46[illegible]	232103	558	124103	871	013204	1909
200F	142201	57[illegible]	042201	704	024201	891	013402	1487
300F	142201	613	042201	729	024301	891	013402	1487
400F	142201	630	042201	750	024301	891	013402	1487
500F	014311	948	014311	1000	004311	1250	003511	1826
600F	014311	961	014311	1066	004311	1303	003511	1826
800F	014311	1187	014311	1352	004411	1444	003511	1851
1000F	001512	2269	001522	2407	001622	2500	000622	2614
1500F	001522	2372	001522	2471	001622	2535	000622	2642
2000F	001522	2450	001522	2547	001522	2629	000522	2735
2500F	001522	2551	001522	2647	000522	2730	000522	2807
3000F	000252	6127	000253	6500	000253	6843	000253	7094
5000F	000253	6500	000253	6780	000253	7094	000163	7327
10000F	000128	13333	000028	13421	000028	13589	000028	13670
NO CIG	000009	20000	000009	20000	000009	20000	000009	20000

	SPREAD 10 ABCDEF	MED	SPREAD 15 ABCDEF	MED	SPREAD 20 ABCDEF	MED	SPREAD >30 ABCDEF	MED
0F	002404	2542	000406	10909	000127	12753	000009	20000
100F	002404	2542	000406	10909	000127	12753	000009	20000
200F	002612	1981	000712	2411	000253	6830	000009	20000
300F	002612	1981	000712	2411	000253	6830	000009	20000
400F	002612	1981	000712	2411	000253	6830	000009	20000
500F	002612	2084	000712	2297	000262	6379	000009	20000
600F	002612	2084	000712	2297	000262	6379	000009	20000
800F	002612	2084	000712	2297	000262	6379	000009	20000
1000F	000622	2714	000532	3451	000162	6937	000009	20000
1500F	000622	2745	000532	3451	000162	6937	000009	20000
2000F	000522	2811	000532	3451	000162	6937	000009	20000
2500F	000532	2882	000532	3656	000162	6937	000009	20000
3000F	000163	7250	000163	7666	000073	7910	000009	20000
5000F	000163	7543	000063	7888	000073	8061	000009	20000
10000F	000028	20000	000028	20000	000018	20000	000009	20000
NO CIG	000009	20000	000009	20000	000009	20000	000009	20000

6HR FORECAST

	SPREAD 0 ABCDEF	MED	SPREAD 1 ABCDEF	MED	SPREAD 2 ABCDEF	MED	SPREAD 3 ABCDEF	MED
0F	133103	700	132113	812	123113	880	122113	937
100F	123103	896	122113	1250	122113	1250	123113	1250
200F	123212	923	123212	980	123212	1000	023203	1090
300F	023212	1173	023212	1173	023212	1173	023203	1250
400F	023212	1333	023212	1333	023203	1333	013303	1400
500F	013212	1571	013212	1727	012212	1909	012213	2043
600F	013212	1571	012212	1916	012212	2000	012312	2039
800F	013212	1909	012322	2185	012322	2214	012313	2259
1000F	012214	2714	012214	2833	012314	2846	012314	2851
1500F	012214	2900	012214	3538	012314	3538	011314	3583
2000F	012214	2900	012214	5000	011224	5333	001324	5625
2500F	012214	4272	011224	6266	001224	6500	001224	6888
3000F	011224	5800	001224	6000	001324	6000	001324	6000
5000F	011224	6315	001224	6818	001324	6818	001324	7083
10000F	011116	11525	001126	11525	001126	11525	001126	11666
NO CIG	001008	13589	001009	20000	000019	20000	000019	20000

	SPREAD 4 ABCDEF	MED	SPREAD 5 ABCDEF	MED	SPREAD 6 ABCDEF	MED	SPREAD 8 ABCDEF	MED
0F	022113	1500	022213	2125	022213	2368	012214	2714
100F	022113	1833	022213	2250	022213	2473	012214	2714
200F	023203	1363	013303	1640	013313	1962	013313	2266
300F	023203	1500	013303	1640	013313	1962	012313	2290
400F	023203	1500	013303	1692	013313	2000	012313	2290
500F	012323	2199	012223	2416	003223	2652	003223	2739
600F	012322	2199	012223	2416	003223	2652	003223	2739
800F	012323	2384	012323	2481	002323	2680	003223	2750
1000F	012314	2866	011314	2941	011414	3000	001414	5153
1500F	001314	3636	001314	4166	001314	5000	001314	6000
2000F	001324	6062	001324	6266	001324	6500	001324	6705
2500F	001324	6888	001324	7052	001324	7277	001324	7277
3000F	001324	6791	001334	7038	001334	7433	000244	7799
5000F	001334	7307	001234	7586	000234	8031	000244	8250
10000F	000126	11935	000126	12063	000126	12187	000136	12187
NO CIG	000009	20000	000009	20000	000009	20000	000009	20000

	SPREAD 10 ABCDEF	MED	SPREAD 15 ABCDEF	MED	SPREAD 20 ABCDEF	MED	SPREAD >30 ABCDEF	MED
0F	012214	2913	001315	9000	000217	12647	000009	20000
100F	012214	2913	001315	9000	000217	12647	000009	20000
200F	002313	2470	001414	2947	000325	9363	000009	20000
300F	002313	2470	001414	2947	000325	9363	000009	20000
400F	002313	2470	001414	2947	000325	9363	000009	20000
500F	003223	2826	002323	3000	000333	5483	000009	20000
600F	003223	2826	002323	3000	000333	5483	000009	20000
800F	003223	2913	002323	3000	000333	5483	000009	20000
1000F	001424	5800	000424	7052	000234	8727	000009	20000
1500F	001424	6266	000424	7052	000234	8727	000009	20000
2000F	001324	6705	000424	7052	000234	8727	000009	20000
2500F	001324	7277	000424	7277	000234	8727	000009	20000
3000F	000244	7918	000244	8292	000154	9000	000009	20000
5000F	000244	8564	000144	8697	000054	9160	000009	20000
10000F	000136	12187	000037	12424	000027	13243	000009	20000
NO CIG	000009	20000	000009	20000	000009	20000	000009	20000

UNCONDITIONAL PROBABILITIES (ROUNDED TO THE NEAREST TENS OF PERCENT) AND MEDIAN CEILING HEIGHT (FEET)

	ABCDEF	MEDIAN	SPREAD	ABCDEF	MEDIAN	SPREAD	ABCDEF	MEDIAN	SPREAD	ABCDEF	MEDIAN	SPREAD	ABCDEF	MEDIAN
ALL WIND	000217	12307	0	441111	320	3	001108	13596	6	000118	13589	15	000028	20000
			1	131204	1526	4	001117	13243	8	000109	20000	20	000019	20000
WIND:0-3 KTS	000118	13670	2	121115	10196	5	000118	20000	10	000019	20000	>30	000009	20000

Fig. 12. A page of the final format for ceiling climatologies at Offutt AFB when the initial forecast time is 0300 and the wind is 0-3 KTS.

STATION: 725540 OFFUTT AFB - OMAHA, NE SEASON: WINTER WIND DIRECTION: 0-3 KTS

3-6 HOUR CLIMATIC CONDITIONAL PROBABILITIES (ROUNDED TO NEAREST TENS OF PERCENT) AND THE MEDIAN VISIBILITY (MILES) HOUR: 3 (LST)

3HR FORECAST

	SPREAD 0 JKLMNO	MED	SPREAD 1 JKLMNO	MED	SPREAD 2 JKLMNO	MED	SPREAD 3 JKLMNO	MED
0M	711010	.4	611011	.4	511011	.5	411011	.8
1/16M	621010	.4	511111	.5	511011	.6	421012	.8
1/8M	621011	.4	521111	.5	411011	.7	421012	.9
1/4M	431111	.6	421111	.7	421011	.8	421022	.9
1/2M	242111	.9	232111	1.0	232111	1.2	232111	1.4
3/4M	232111	.9	232111	1.2	232211	1.4	122112	1.6
1M	232111	1.1	222112	1.7	212122	1.9	212122	1.9
1 1/2M	232111	1.1	212112	1.9	212122	2.3	212222	2.3
2M	122221	2.1	112322	2.6	112332	2.8	012332	2.9
3M	111142	3.6	111142	3.8	101242	4.0	101242	4.2
4M	111143	4.1	011143	4.4	001153	4.5	001153	4.7
5M	111133	4.3	011143	4.7	001143	4.8	001153	4.9
6M	000136	6.8	001136	6.8	001136	6.8	000136	7.0
7M	000027	8.1	001027	8.1	000027	8.6	000028	9.1
10M	000018	15.0	000019	15.0	000009	15.0	000009	15.0
15M	000018	15.0	000019	15.0	000009	15.0	000009	15.0

	SPREAD 4 JKLMNO	MED	SPREAD 5 JKLMNO	MED	SPREAD 6 JKLMNO	MED	SPREAD 8 JKLMNO	MED
0M	421012	.9	321012	1.2	222123	2.1	111133	3.6
1/16M	321012	1.0	321122	1.4	222123	2.3	111133	3.6
1/8M	321012	1.1	321112	1.4	222123	2.3	111133	3.8
1/4M	321112	1.2	321122	1.5	222123	2.4	111133	3.8
1/2M	123112	1.6	123122	1.8	023122	1.9	012223	2.9
3/4M	123122	1.6	123122	1.8	023122	2.0	012223	2.9
1M	212122	2.0	212222	2.3	112122	2.8	111233	3.5
1 1/2M	212222	2.4	212222	2.5	112132	2.9	111233	3.6
2M	002332	3.1	001332	3.5	001243	4.0	001243	4.4
3M	001153	4.5	000153	4.9	000154	5.2	000154	5.5
4M	000153	4.8	000153	5.1	000154	5.3	000054	5.5
5M	000153	5.0	000154	5.2	000154	5.5	000055	5.8
6M	000136	7.4	000137	8.2	000027	8.9	000018	15.0
7M	000018	15.0	000018	15.0	000019	15.0	000019	15.0
10M	000009	15.0	000009	15.0	000009	15.0	000009	15.0
15M	000009	15.0	000009	15.0	000009	15.0	000009	15.0

	SPREAD 10 JKLMNO	MED	SPREAD 15 JKLMNO	MED	SPREAD 20 JKLMNO	MED	SPREAD >30 JKLMNO	MED
0M	011143	4.7	001054	5.6	000028	15.0	000009	15.0
1/16M	011143	4.7	001054	5.6	000028	15.0	000009	15.0
1/8M	011143	4.7	001054	5.6	000028	15.0	000009	15.0
1/4M	011143	4.7	001054	5.6	000028	15.0	000009	15.0
1/2M	012143	4.3	001054	5.4	000028	9.3	000009	15.0
3/4M	012143	4.3	001054	5.4	000028	9.3	000009	15.0
1M	001143	4.5	001054	5.3	000028	9.3	000009	15.0
1 1/2M	001143	4.5	001054	5.3	000028	9.3	000009	15.0
2M	001153	4.8	000163	5.2	000028	9.2	000009	15.0
3M	000054	5.5	000055	5.9	000018	15.0	000009	15.0
4M	000055	5.7	000055	6.0	000018	15.0	000009	15.0
5M	000055	5.9	000055	6.2	000018	15.0	000009	15.0
6M	000019	15.0	000019	15.0	000009	15.0	000009	15.0
7M	000019	15.0	000019	15.0	000009	15.0	000009	15.0
10M	000009	15.0	000009	15.0	000009	15.0	000009	15.0
15M	000009	15.0	000009	15.0	000009	15.0	000009	15.0

6HR FORECAST

	SPREAD 0 JKLMNO	MED	SPREAD 1 JKLMNO	MED	SPREAD 2 JKLMNO	MED	SPREAD 3 JKLMNO	MED
0M	222022	1.3	222022	1.6	222023	1.9	112023	3.1
1/16M	232022	1.3	222022	1.8	122023	3.3	112023	3.6
1/8M	132022	1.6	122032	2.0	112023	3.4	112023	3.6
1/4M	132032	1.8	122033	3.1	112023	3.6	112024	3.8
1/2M	112132	3.0	112123	3.0	112123	3.0	112133	3.1
3/4M	112133	3.3	112123	3.4	112123	3.4	112133	3.5
1M	012232	2.8	012232	2.8	013232	2.8	003223	3.1
1 1/2M	012232	2.8	012232	2.9	013232	2.9	003223	3.1
2M	112034	4.3	111134	4.5	111134	4.5	101134	4.6
3M	011134	5.2	001144	5.2	001144	5.2	001144	5.2
4M	011035	5.7	001035	5.7	001135	5.7	001135	5.7
5M	011035	6.2	001135	6.2	001035	6.2	001135	6.2
6M	001026	7.7	001026	7.7	001126	7.7	000126	7.7
7M	001018	9.0	001018	9.0	000028	9.0	000028	9.0
10M	000009	15.0	000009	15.0	000009	15.0	000009	15.0
15M	000009	15.0	000009	15.0	000009	15.0	000009	15.0

	SPREAD 4 JKLMNO	MED	SPREAD 5 JKLMNO	MED	SPREAD 6 JKLMNO	MED	SPREAD 8 JKLMNO	MED
0M	112024	3.9	113015	5.3	013016	6.8	002016	7.9
1/16M	112024	4.1	012015	5.5	012016	7.0	002016	7.9
1/8M	112024	4.2	012015	5.8	012016	7.0	002016	8.0
1/4M	112024	4.4	012015	5.8	012016	7.0	002016	8.0
1/2M	013133	3.3	013133	3.8	013024	4.6	003025	5.7
3/4M	013133	3.6	013133	4.0	003024	4.8	003025	5.8
1M	003133	3.9	002234	4.2	002124	5.2	002225	6.3
1 1/2M	003223	3.8	002224	4.4	002125	5.3	002225	6.3
2M	101134	4.9	101134	5.2	001135	5.6	001135	6.0
3M	000144	5.3	000145	5.6	000145	6.0	000136	7.2
4M	001145	5.8	000145	5.8	000145	6.3	000136	7.4
5M	001135	6.2	000145	6.2	000136	7.0	000036	7.4
6M	000036	7.7	000036	8.0	000127	8.7	000028	9.1
7M	000028	9.1	000028	9.3	000028	15.0	000019	15.0
10M	000009	15.0	000009	15.0	000009	15.0	000009	15.0
15M	000009	15.0	000009	15.0	000009	15.0	000009	15.0

	SPREAD 10 JKLMNO	MED	SPREAD 15 JKLMNO	MED	SPREAD 20 JKLMNO	MED	SPREAD >30 JKLMNO	MED
0M	002017	8.5	001018	15.0	000009	15.0	000009	15.0
1/16M	002017	8.5	001018	15.0	000009	15.0	000009	15.0
1/8M	002017	8.5	001018	15.0	000009	15.0	000009	15.0
1/4M	002017	8.6	001018	15.0	000009	15.0	000009	15.0
1/2M	002026	7.0	001027	8.4	000019	15.0	000009	15.0
3/4M	002026	7.0	001027	8.4	000019	15.0	000009	15.0
1M	001216	7.2	001127	8.4	000019	15.0	000009	15.0
1 1/2M	001216	7.2	001127	8.4	000019	15.0	000009	15.0
2M	001136	6.8	000027	8.5	000019	15.0	000009	15.0
3M	000037	8.1	000028	9.1	000019	15.0	000009	15.0
4M	000037	8.1	000028	9.1	000019	15.0	000009	15.0
5M	000037	8.4	000028	9.2	000019	15.0	000009	15.0
6M	000018	15.0	000019	15.0	000009	15.0	000009	15.0
7M	000019	15.0	000019	15.0	000009	15.0	000009	15.0
10M	000009	15.0	000009	15.0	000009	15.0	000009	15.0
15M	000009	15.0	000009	15.0	000009	15.0	000009	15.0

UNCONDITIONAL PROBABILITIES (ROUNDED TO THE NEAREST TENS OF PERCENT) AND MEDIAN VISIBILITY IN (MILES)

	JKLMNO	MEDIAN	SPREAD	JKLMNO	MEDIAN	SPREAD	JKLMNO	MEDIAN	SPREAD	JKLMNO	MEDIAN	SPREAD	JKLMNO	MEDIAN
ALL WIND	000018	15.0	0	341111	.8	3	001117	8.5	6	000009	15.0	15	000009	15.0
			1	121122	2.0	4	000027	8.9	8	000009	15.0	20	000009	15.0
WIND:0-3 KTS	000018	15.0	2	212114	2.7	5	000019	15.0	10	000009	15.0	>30	000009	15.0

Fig. 13. A page of the final format for visibility climatologies at Offutt AFB when the initial forecast time is 0300 and the wind 0-3 KTS.

VII. SUMMARY OF COMPLETE SYSTEM

The production of Climatic Tables such as those illustrated in Figs. 12 and 13 for an entire season for both the wind and dew-point stratification presented requires that the five previously described programs be run a total of 23 times. To simplify this routine, an attempt has been made to generalize the data cards which are required by a program. Although some programs may not require all the information, each program reads the same formatted data card. Table 17 describes each of the input variables and the numeric values used to indicate the various parameters. Also indicated are the program (see Table 16) which requires each of the parameters.

The chart in Fig. 14 depicts the flow for the entire system. As can be seen, each program is required to be run various number of times as indicated in Table 16.

PGM#	NAME	RUNS
1	EXTRACTS	2
2	COMPUNCD	8
3	SMTHUNCD	8
4	COMPCOND	4
5	PRINTALL	1

Table 16. Program number, program name and number of runs required by each program.

The main difference between the runs of the same program is in the input tapes. In the case of the program COMPUNCD the main difference is in the data card which is input.

Some of the variables, such as ISEASN and ISTN, will remain constant for all runs of the programs. Others, such as IHOUR and ITYPE, will vary systematically. A discussion of each program and the card input values which vary follows. (NOTE: PGM# in the following Tables refers to the number found in the upper right hand corner of the box containing the program name in the system flowchart.)

AD-A032 317 SAINT LOUIS UNIV MO DEPT OF EARTH AND ATMOSPHERIC S--ETC F/G 4/2
RESEARCH TO DEVELOP IMPROVED MODELS OF CLIMATOLOGY THAT WILL AS--ETC(U)
AUG 76 D E MARTIN F19628-74-C-0004
UNCLASSIFIED AFGL-TR-76-0248 NL

2 OF 2
ADA032317

END
DATE
FILMED
1 -77

NAME	CONTENTS	PGM #
IEOF	Number of input tape(s)	1
IHOUR	2 for 2-HR increment 4 for 4-HR increment	1 2 3 4 5
ISEASN	1 for Spring 2 for Summer 3 for Autumn 4 for Winter	1 2 3 4 5
ITYPE	1 for Ceiling 2 for Visibility	2 3 4
IMODE	1 for Initial 2 for Final	2 3
ITEMP	1 for Temperatures in ^{o}F 2 for Temperatures in ^{o}C	1 2 3 4
IPRT	Number of hours to be printed per day (Must be factor of 24)	3 4 5
ILIM	Number of cycles desired in smoothing (ILIM=8 is suggested)	3
ISTN	Name of station being processed (Maximum of 32 Characters)	1 2 3 4 5

Table 17. Data card input variables, the numeric values which each can have, and sequential number of each program which uses the various input variables.

1) EXTRACTS: This is the only program which uses the variable IEOF. IEOF is used to indicate how many data base input tapes are to be used. This program is run twice— once to output the two-hour final categories and once to output the four-hour final categories. The data card input variable, IHOUR, changes for the two runs as indicated in Table 18.

PGM #	IHOUR
1	2
2	4

Table 18. System flowchart program number and the values IHOUR obtains for each of the two runs.

2) COMPUNCD: The system flowchart shows that this program uses the two output tapes from EXTRACTS and processes each of them a total of four times. The card input variables, IHOUR, ITYPE and IMODE are used to indicate whether the data to be processed is two or four hour, ceiling or visibility and initial or final data. Table 19 depicts the systematic variation of the input parameters indicated.

PGM #	IHOUR	ITYPE	IMODE
3	2	1	1
4	2	1	2
5	2	2	1
6	2	2	2
7	4	1	1
8	4	1	2
9	4	2	1
10	4	2	2

Table 19. System flowchart program number and the values IHOUR, ITYPE and IMODE obtain for each of the eight runs .

3) SMTHUNCD: Due to the paucity of data, each set of the unconditional probabilities must be smoothed to make them sufficiently reliable for producing conditional probabilities by the methods of this report. Therefore, each of the eight previous output tapes of program COMPUNCD are to be used as an input to this program. The card input variables IHOUR, ITYPE and IMODE are likewise used to indicate the type of data being processed. Table 20 depicts the systematic variation of the input parameters indicated.

PGM #	IHOUR	ITYPE	IMODE
11	2	1	1
12	2	1	1
13	2	2	1
14	2	2	2
15	4	1	1
16	4	1	2
17	4	2	1
18	4	2	2

Table 20. System flowchart program number and the values IHOUR, ITYPE and IMODE obtain for each of the eight runs.

NOTE: In this program and those to follow the variable IPRT indicates the number of hours for which the data is to be printed (e.g. a value of IPRT = 2 would print HOUR: 0 and HOUR: 12, or a total of two of the 24 hours, a value of IPRT = 3 would print HOUR: 0, HOUR: 9 and HOUR: 18, or a total of three of the 24 hours).

4) COMPOUND: This program is run a total of four times to combine like output (2/4 hour-Ceiling/Visibility) tapes from the previous program. As shown in Table 21, the card input variables IHOUR and ITYPE indicate whether the data is two- or four-hour, ceiling or visibility.

PGM #	IHOUR	ITYPE
19	2	1
20	2	2
21	4	1
22	4	2

Table 21. System flowchart program number and the values IHOUR and ITYPE obtain for each of the four runs.

5) PRINTALL: Finally, the four output tapes from the previous program are ready for printing. The input variables ISEASN and ISTN indicate on the Climatic Tables the season and station for which the data was processed. The variable IHOUR indicates the first hour of the two hour group. In this way either 2-4 HR or 3-6 HR values may be output without modification to the program. The variable IPRT should be set to 24 so as to output all hours.

Reference the numbers inside the tape symbols on the system flowchart (Fig. 14). The top number indicates the output tape unit assignment for the previous program and the bottom one indicates the input tape unit assignment to the next program.

Fig. 14 on the next page contains the complete system flowchart to produce the output for one season. Other seasons are produced by repeating the procedure for a different value of ISEASN.

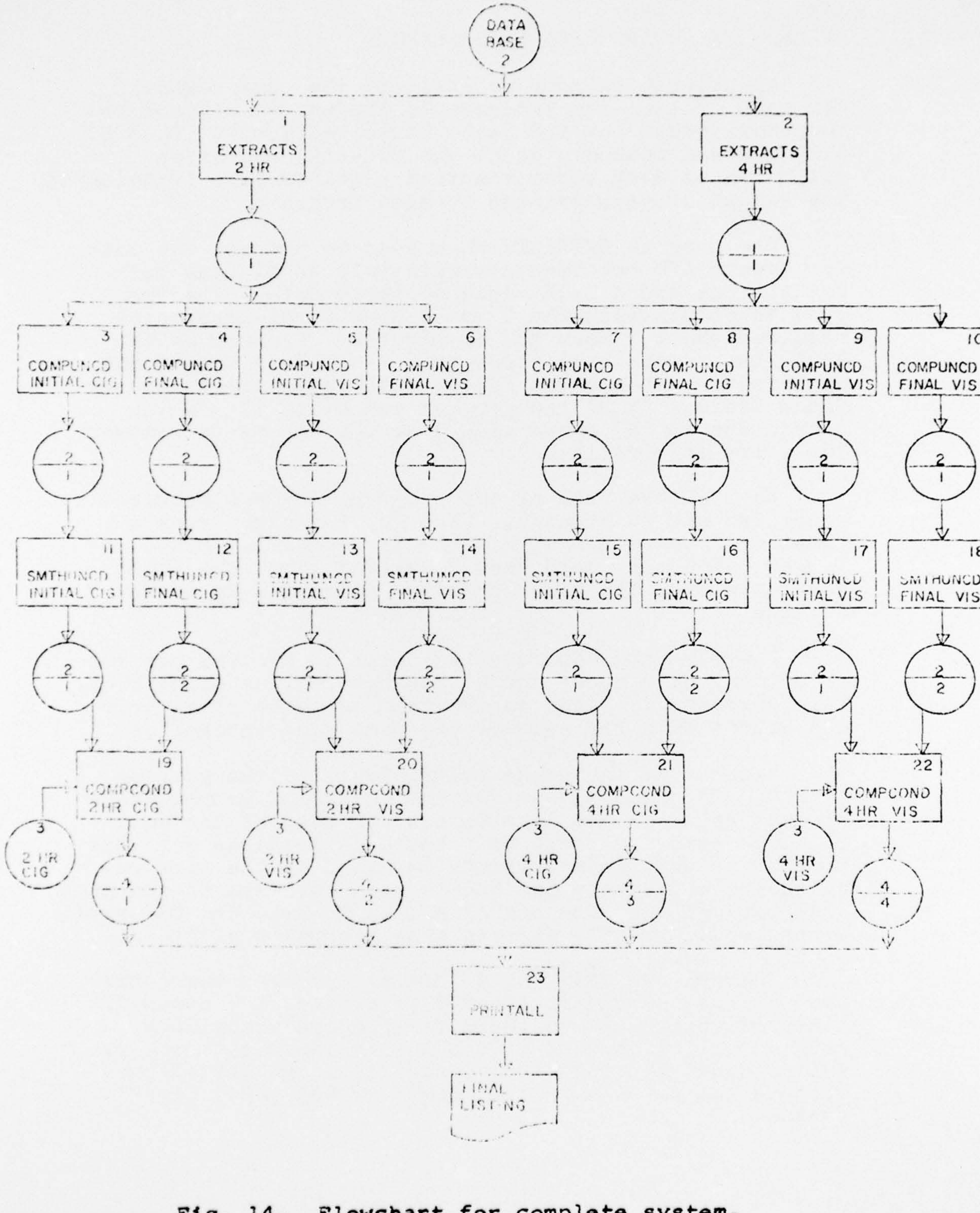

Fig. 14. Flowchart for complete system.

VIII. PROGRAM EXECUTION TIME REQUIREMENTS

No attempt is made to estimate the time required for each of the five programs to execute on a specific computer except for the Saint Louis University CDC-3300. Only general comments as to the CDC-3300 execution speed can be made since the time required is a function of the amount of data printed by each program.

The program EXTRACTS when used to process the data for Offutt AFB required approximately 38 minutes each for the one and a half reels of input data. The two runs to obtain both the 2 and 4 hour final categories required about 1 hour and 20 minutes. Systems which would use a data base other than the TDF-14 should run much faster. Since the TDF-14 data tapes are in Binary Coded Decimal (3CD) the program execution is greatly slowed due to the conversion from BCD values to integer for every observation.

Each of the runs of the program COMPUNCD required approximately 20 minutes. Thus for the eight runs a total of 2 hours and 40 minutes is required. Since larger computers would need to read through the input tape only once the time should be decreased by a factor of nine.

Program SMTHUNCD requires about 20 minutes per run or a total of 2 hours and 40 minutes for the eight runs. This estimate is based on the time taken to print only one hour's data for each of the nine wind categories.

Because of the gross inefficiency of the program COMPCOND in using a tape for the Universal Graphs, this program requires one hour to run for each of the four required runs. A total of 4 hours is required for this program. Again this estimate is based on the time required to print only one hour's data for each of the nine wind categories. The use of a disk to hold the Universal Graphs would greatly improve this program's efficiency.

The program PRINTALL is the one program where the amount of data printed greatly determines the execution time. To print all 24 hours ceiling and visibility data for all nine wind categories in their entirety requires about 65 minutes computer time. As stated previously the total output consists of 432 pages per season.

Totaling the above execution times indicates that approximately 11 3/4 hours of computer time on a CDC-3300 is required per station per season. This value might appear to be excessive if it weren't for the fact that larger computers and increased program efficiencies would decrease this execution time substantially.

IX. APPENDIX

1) Introduction

This appendix details the format of the magnetic tape which contains the matrix values of the Universal Graphs. It is assumed that the reader has some knowledge of magnetic tape storage characteristics.

2) General Comments

Contained on the tape are the matrix values used to produce the 120 2-4 HOUR Universal Climatic graphs and the 120 3-6 HOUR Universal Climatic graphs. As used in this project the tape was written at 556 BPI, Binary mode (7-track). The CDC-3300 is a 4 byte per word, 6 bit per byte computer. Each matrix contains data values from .00 to 1.00 in increments of .02. Thus each unpacked matrix (see Appendix Section D) contains a total of 51 x 51 = 2601 data points. The graphs are naturally subdivided into six groups of five each as follows:

A TO (A)	A TO (A-B)	A TO (A-C)	A TO (A-D)	A TO (A-E)
B TO (A)	B TO (A-B)	B TO (A-C)	B TO (A-D)	B TO (A-E)
C TO (A)	C TO (A-B)	C TO (A-C)	C TO (A-D)	C TO (A-E)
D TO (A)	D TO (A-B)	D TO (A-C)	D TO (A-D)	D TO (A-E)
E TO (A)	E TO (A-B)	E TO (A-C)	E TO (A-D)	E TO (A-E)
F TO (A)	F TO (A-B)	F TO (A-C)	F TO (A-D)	F TO (A-E)

Table 22. Combinations possible from one set of the universal graphs.

The same subdivided groups are valid for the visibility categories J, K, L, M, N and O.

3) File Format

In order to calculate the Climatic Conditional Probabilities as reproduced in the sample output for program

COMPCOND (Fig. 10), it is necessary to have all five matrix of one category available in the computer at one time. Thus each set of five matrix are placed on the tape such that a single READ will transfer all 13005 data point values into the computer memory. An end-of-file was written after each series to facilitate searching for the required set of data. Thus the tape contains six files for each of the eight types or a total of 48 files. The eight different types are contained on the tape in the following order.

HOUR	TYPE
2	Ceiling
4	Ceiling
2	Visibility
4	Visibility
3	Ceiling
6	Ceiling
3	Visibility
6	Visibility

Table 23. The order of the individual universal graphs on the master tape.

The program COMPCOND requires that only the graphs for one type be on the Universal Graphs input tape.

4) Date Packing

Because of the limited memory capacity of the Saint Louis University CDC-3300, all 13005 matrix values could not be transferred into memory if one location was used for one value. Thus, the values are packed in such a way that three values occupy the same location. In this way the resulting 4335 locations are within the memory size limitations of the computer. As a result of the packing the previous (51 x 51 x 5) matrix is transformed into a (17 x 51 x 5) matrix.

The data values are packed in the following order. Input matrix points (1,1,1), (2,1,1) and 3,1,1) are placed in the output matrix point (1,1,1). Matrix values (4,1,1), (5,1,1) and (6,1,1) go into (2,1,1). This system is carried throughout all 51 rows and columns of the five initial category matrix.

The following logic is used to place the three values into one. Input matrix point (3,1,1) is multiplied by 10,000 and placed in the above indicated output point. Next point (2,1,1) is multiplied by 100 and added to the output point. Finally, point (1,1,1) is added to the output point. Again this scheme is used throughout all 51 rows and columns.

5) Sample Listings

The next four pages contain a sample listing and sample output for the program which can be used to list the data values from the Universal Graphs Master Tape. Because of printer limitations and the desire to produce a readily useable output, increments of .04 are listed for the abscissa. Values of intermediate increments can be assumed to be linear between listed values.

```
MS FORTRAN  (4.2) / MSOS                          04/30/76         PAGE 001
      PROGRAM GRPHDATA
C                                                                          C
C                                                                          C
C**************************************************************************C
C                                                                          C
C                                                                          C
C     GRPHDATA                                     BY CAPT JAMES A. WILSON C
C                                                                          C
C                                                                          C
C     THIS PROGRAM IS DESIGNED TO READ THE UNIVERSAL GRAPHS TAPE           C
C     AND PRINT THE MATRIX FOR THE DESIRED SERIES OF GRAPHS.               C
C                                                                          C
C     A DATA CARD IS USED TO INDICATE THE HOUR INCREMENT AND TYPE OF THE   C
C     GRAPHS WHICH ARE TO BE PRINTED. VALUES FOR EACH ARE GIVEN BELOW      C
C                                                                          C
C                                                                          C
C     IHOUR = 2 FOR 2 HOUR INCREMENT                                       C
C             3 FOR 3 HOUR INCREMENT                                       C
C             4 FOR 4 HOUR INCREMENT                                       C
C             6 FOR 6 HOUR INCREMENT                                       C
C                                                                          C
C     ITYPE = 1 FOR CEILING                                                C
C             2 FOR VISIBILITY                                             C
C                                                                          C
C                                                                          C
C     DATA CARD IS IN THE FORMAT (2I2)                                     C
C                                                                          C
C     MORE THAN ONE DATA CARD MAY BE INPUT AT ANY ONE TIME TO OBTAIN       C
C     MULTIPLE COPIES OF A MATRIX OR THE MATRIX VALUES OF DIFFERENT GRAPHS.C
C                                                                          C
C     A DATA CARD WITH IHOUR = 99 IS USED TO TERMINATE NORMAL PROCESSING.  C
C                                                                          C
C**************************************************************************C
C                                                                          C
C                                                                          C
      DIMENSION ISTUFF(17,51,5),ICON(51,51),YCORDHD(51),
     *          XCORD(26),XHD(2,6),YHD(2,5),JTYPE(2,3)
      DATA (XTOY=4HTO ()
      DATA (((JTYPE(I,J),J=1,3),I=1,2)=4HCEIL,4HING ,4H    ,
     *                                 4HVISI,4HBILI,4HTY  )
      DATA (((XHD(I,J),J=1,6),I=1,2)=2HA ,2HB ,2HC ,2HD ,2HE ,2HF ,
     *                               2HJ ,2HK ,2HL ,2HM ,2HN ,2HO )
      DATA (((YHD(I,J),J=1,5),I=1,2)=4HA)  ,4HA-B),4HA-C),4HA-D),4HA-E),
     *                               4HJ)  ,4HJ-K),4HJ-L),4HJ-M),4HJ-N))
      DATA ((YCORDHD(I),I=1,51)=1H ,1H ,1H ,1H ,1H ,1HI,1HN,1HI,1HT,1HI,
     *                    1HA,1HL,1H ,1HU,1HN,1HC,1HO,1HN,1HD,1HI,
     *                    1HT,1HI,1HO,1HN,1HA,1HL,1H ,1HP,1HR,1HO,
     *                    1HB,1HA,1HB,1HI,1HL,1HI,1HT,1HY,1H ,1HA,
     *                    1HT,1HY,1HP,1HE,1H ,1HI,1HV,1H ,1H ,1H ,
     *                    1H )
C
C     SET UP OUR X-AXIS AND VALUES
C
      DO 1 M=1,26
```

```
      X = M
      XCORD(M) = ((X - 1.0) * 4.0) / 100.0
    1 CONTINUE
      PRINT 12
C
C     READ DATA CARD TO TELL WHICH OF THE GRAPHS WE DESIRE.
C
    2 READ 13,IHOUR,ITYPE
      IF (IHOLR .EQ. 99) GO TO 11
C
C     COMPUTE NUMBER OF FILES TO SKIP BEFORE READING
C
      M = 2
      IF (IHOLR.EQ.3 .OR. IHOUR.EQ.6) M = 3
      ISKIP = (((IHOUR/M) + 2*ITYPE) - 3) * 6
      IF (ISKIP .EQ. 0) GO TO 4
      IF (IHOUR.EQ.3 .OR. IHOUR.EQ.6) ISKIP = ISKIP + 24
      DO 3 I=1,ISKIP
      READ (01)
      READ (01)
      GO TO (3,10) EOFCKF (01)
    3 CONTINUE
C
C     SEE TAPE DOCUMENTATION TO UNDERSTAND HOW DATA IS PLACED ON TAPE.
C
    4 DO 9 N=1,6
      READ (01) ISTUFF
      DO 8 K=1,5
      DO 6 I=1,17
      L = (3 * I) - 2
      DO 5 J=1,51
      ICON(L+2,J) = ISTUFF(I,J,K) / 10000
      ICON(L+1,J) = (ISTUFF(I,J,K) / 100) - ICON(L+2,J) * 100
      ICON(L  ,J) = ISTUFF(I,J,K) - (ICON(L+2,J) * 10000)
     *                            - (ICON(L+1,J) * 100)
    5 CONTINUE
    6 CONTINUE
C
C     NOW WE START TO PRINT OUR RESULTS.
C
      PRINT 18,IHOUR,(JTYPE(ITYPE,I),I=1,3),
     *            XHD(ITYPE,N),XTOY,YHD(ITYPE,K)
      DO 7 M=1,51
      J = 52 - M
      IF (ICON(51,J) .EQ. 99) ICON(51,J) = 100
      Y = J
      Y = ((Y - 1.0) * 2.0) / 100.0
      PRINT 16,(YCORDHD(M),Y,(ICON(L,J),L=1,51,2))
    7 CONTINUE
      PRINT 14
      PRINT 17,((XCORD(M),M=1,26),IHOUR)
      PRINT 12
    8 CONTINUE
C
```

```
C     THIS SHOULD BE AN END-OF-FILE.
C
      READ (01)
      GO TO (9,10) EOFCKF(01)
    9 CONTINUE
C
C     REWIND OUR TAPE AND SEE IF MORE IS DESIRED
C
      REWIND 01
      GO TO 2
C
C     PRINT ERROR MESSAGE
C
   10 PRINT 15
   11 STOP
C
C     THESE ARE THE FORMAT STATEMENTS.
C
   12 FORMAT (1H1)
   13 FORMAT (3I2)
   14 FORMAT (22X,104(≠*≠))
   15 FORMAT (1H1,≠ERROR ON INPUT TAPE≠)
   16 FORMAT (13X,A1,3X,F4.2,1X,≠*≠,I2,24I4,I5)
   17 FORMAT (21X,25F4.2,F5.2,//,46X,≠FINAL UNCONDITIONAL ≠,
     *         ≠PROBABILITY   <TYPE II>≠,I4,≠HRS LATER≠)
   18 FORMAT (1H ,16X,I1,≠HR CLIMATIC CONDITIONAL PROBABILITY FOR ≠,
     *         3A4,46X,A2,A4,A4,//)
      END

             FORTRAN DIAGNOSTIC RESULTS  FOR    GRPHDATA

NO ERRORS
LOAD,56
RUN,,NM
  13063 PRG USD    8381 PRG LFT       0 COM USD    5248 COM LFT
00H00M34S
```

2HR CLIMATIC CONDITIONAL PROBABILITY FOR CEILING — A TO (A)

INITIAL UNCONDITIONAL PROBABILITY <TYPE I> (rows) / FINAL UNCONDITIONAL PROBABILITY <TYPE II> 2HRS LATER (columns)

	0	.04	.08	.12	.16	.20	.24	.28	.32	.36	.40	.44	.48	.52	.56	.60	.64	.68	.72	.76	.80	.84	.88	.92	.96	1.00
1.00	0	4	7	10	14	18	23	28	32	37	43	48	53	58	62	67	71	75	79	82	86	89	91	94	97	100
.98	0	3	6	10	14	18	23	28	32	37	43	48	53	58	62	67	71	75	79	82	86	89	91	94	97	100
.96	0	3	7	10	14	18	23	28	33	38	43	49	54	59	63	67	72	76	80	83	86	89	92	94	97	100
.94	0	3	7	10	14	19	23	29	33	38	44	50	55	59	64	68	72	76	80	83	86	89	92	94	97	100
.92	0	3	7	11	15	19	24	29	34	39	45	50	56	60	64	69	73	77	81	84	87	90	92	95	97	100
.90	0	3	7	11	15	19	24	30	35	40	45	51	56	61	65	70	74	78	81	84	87	90	92	95	97	100
.88	0	3	7	11	15	20	25	30	35	40	46	52	57	62	66	70	74	78	82	84	87	90	92	95	97	100
.86	0	3	7	11	16	20	25	31	36	41	47	52	58	62	67	71	75	79	82	85	88	90	93	95	97	100
.84	0	3	7	12	16	21	26	31	36	42	47	53	58	63	68	72	76	79	82	85	88	91	93	95	97	100
.82	0	3	8	12	17	21	27	32	37	42	48	54	59	64	69	73	76	80	83	86	89	91	93	95	97	100
.80	0	4	8	12	17	22	27	32	37	43	49	55	60	65	69	73	77	80	83	86	89	91	93	95	97	100
.78	0	4	8	13	18	23	28	33	38	44	50	55	61	66	70	74	78	81	84	86	89	92	93	95	97	100
.76	0	4	8	13	18	23	29	34	39	45	50	56	62	66	71	75	78	82	84	87	90	92	94	95	97	100
.74	0	4	9	13	18	24	29	34	40	45	51	57	63	67	72	76	79	82	85	87	90	92	94	96	98	100
.72	0	4	9	14	19	24	30	35	40	46	52	58	63	68	72	76	80	82	85	88	90	92	94	96	98	100
.70	0	4	9	14	19	25	30	36	41	47	53	59	64	69	73	77	80	83	86	88	91	92	94	96	98	100
.68	0	4	9	15	20	25	31	36	42	48	54	60	65	70	74	78	81	83	86	89	91	92	94	96	98	100
.66	0	4	10	15	20	26	32	37	43	49	55	60	66	71	75	78	81	84	86	89	91	92	94	96	98	100
.64	0	5	10	16	21	27	33	38	44	50	56	62	67	72	75	79	82	84	87	89	91	93	94	96	98	100
.62	0	5	10	16	22	28	34	39	45	51	57	63	68	72	76	80	82	85	87	89	91	93	94	96	98	100
.60	0	5	11	17	22	28	34	40	46	52	58	64	69	73	77	80	83	85	87	90	91	93	94	96	98	100
.58	0	5	11	17	23	29	35	41	47	54	59	65	70	74	78	81	83	85	88	90	92	93	94	96	98	100
.56	0	5	12	18	24	30	36	42	49	55	61	66	71	75	78	81	84	86	88	90	92	93	94	96	98	100
.54	0	6	12	18	24	31	37	43	50	56	62	68	72	76	79	82	84	86	88	91	92	93	95	96	98	100
.52	0	6	12	19	25	32	38	45	51	58	63	69	73	77	80	82	84	86	89	91	92	93	95	96	98	100
.50	0	6	13	20	26	33	39	46	53	59	65	70	74	78	81	83	85	87	89	91	92	93	95	96	98	100
.48	0	6	13	20	27	34	41	47	54	61	66	71	75	78	81	83	85	87	89	91	92	94	95	96	98	100
.46	0	7	14	21	28	35	42	49	56	62	68	72	76	79	82	84	86	88	90	91	92	94	95	96	98	100
.44	0	7	15	22	29	36	43	50	57	64	69	73	77	80	82	84	86	88	90	92	93	94	95	96	98	100
.42	0	8	15	23	30	38	45	52	59	65	70	74	77	81	83	84	86	88	90	92	93	94	95	96	98	100
.40	0	8	16	24	31	39	47	54	61	66	71	75	78	81	83	85	87	89	91	92	93	94	95	96	98	100
.38	0	9	17	25	33	41	48	56	63	68	72	76	79	81	83	85	87	89	91	92	93	94	95	96	98	100
.36	0	9	18	26	34	43	50	58	64	69	73	77	80	82	84	85	87	89	91	92	93	94	95	96	98	100
.34	0	10	19	28	36	45	52	60	66	70	74	77	80	82	84	86	87	89	91	92	93	94	95	96	98	100
.32	0	11	20	29	38	47	54	61	67	71	75	78	81	83	84	86	88	90	91	92	93	94	95	97	98	100
.30	0	11	22	31	40	49	56	63	68	72	76	79	81	83	85	86	88	90	92	93	94	95	96	97	98	100
.28	0	12	23	33	42	51	59	65	69	73	76	79	82	83	85	87	88	90	92	93	94	95	96	97	98	100
.26	0	13	25	35	44	53	61	66	70	74	77	80	82	84	85	87	89	90	92	93	94	95	96	97	98	100
.24	0	15	26	37	47	56	62	68	71	75	78	80	82	84	85	87	89	91	92	93	94	95	96	97	98	100
.22	0	16	28	39	49	58	64	69	72	75	78	81	83	84	86	87	89	91	92	93	94	95	96	97	98	100
.20	0	18	30	42	52	60	66	70	73	76	79	81	83	84	86	87	89	91	92	93	94	95	96	97	98	100
.18	0	19	33	45	55	62	67	71	74	77	80	81	83	85	86	88	89	91	92	93	94	95	96	97	98	100
.16	0	21	35	48	57	64	69	72	75	77	80	82	83	85	86	88	90	91	92	93	94	95	96	97	98	100
.14	0	23	38	50	59	65	70	73	75	78	80	82	83	85	87	88	90	91	92	93	94	95	96	97	98	100
.12	0	25	41	53	61	67	71	73	76	78	81	82	84	85	87	88	90	91	92	93	94	95	96	97	98	100
.10	0	28	45	56	63	68	72	74	77	79	81	82	84	85	87	88	90	91	92	93	94	95	96	97	98	100
.08	0	32	48	58	65	69	72	74	77	79	81	83	84	86	87	89	90	91	92	93	94	95	96	97	98	100
.06	0	36	51	60	66	70	73	75	77	79	81	83	84	86	87	89	90	91	92	93	94	95	96	97	98	100
.04	0	40	53	62	67	71	73	75	77	79	81	83	84	86	87	89	90	91	92	93	94	95	96	97	98	100
.02	0	44	56	63	68	71	73	75	77	79	81	83	84	86	87	89	90	91	92	93	94	95	96	97	98	100
0	0	49	59	65	69	72	74	76	78	80	82	83	85	87	88	89	91	92	93	94	95	96	97	98	99	100

Fig. 15. Sample listing of one of the Universal Graphs for Ceiling as produced by the program GRPHDATA.