SURFACE AIRWAYS HOURLY
TD-3280

AND

AIRWAYS SOLAR RADIATION
TD-3281

Prepared by

Pete Steurer and Matt Bodosky

National Climatic Data Center

Federal Building

Asheville, North Carolina

August 19, 1999

This document was prepared by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Environmental Satellite Data and Information Service, National Climatic Data Center, Asheville, North Carolina.

This document is designed to provide general information on the current, origin, format, integrity and the availability of this data file.

Errors found in this document should be brought to the attention of the Data Base Administrator, NCDC. See topic 58 for a summary of this data set.

Table of Contents

1. Data Set ID:

TD-3280 and TD-3281

2. Data Set Name:

Surface Airways Hourly and Airways Solar Radiation

3. Data Set Aliases:

Surface Weather Observations
Airways Weather Reports

4. Access Method and Sort for Archived Data:

MANUAL AND TAPE NOTATIONS

1. FILE (NCDC Variable Length Storage Structure)

A. Physical Characteristics

Data in this file are retained in chronological order by station. Although library tapes are normally maintained as described below, different characteristics including fixed length records can be furnished on request. Additional charges may be accrued for special processing.

B. COBOL or FORTRAN Data Description

(1) Typical ANSI COBOL

```
 IDENTIFICATION DIVISION.
 PROGRAM-ID. CRDWT3280.
*  THIS PROGRAM READS TD3280 DATA AND LISTS IT ON
*  A PRINTER.
 ENVIRONMENT DIVISION.
 CONFIGURATION SECTION.
 SOURCE-COMPUTER. UNIVAC-1100.
 OBJECT-COMPUTER. UNIVAC-1100.
 INPUT-OUTPUT SECTION.
 FILE-CONTROL.
     SELECT INDATA ASSIGN TO INTERCHANGE.
 DATA DIVISION.
 FILE SECTION.
 FD  INDATA
     LABEL RECORDS ARE STANDARD
     RECORDING MODE IS D
     BLOCK CONTAINS 12000 CHARACTERS
```

```
           DATA RECORD IS DATA-RECORD.
        01  DATA-RECORD.
           02 RECORD-ID.
             03 RECORD-TYPE PIC X(3).
             03 STATION-ID PIC X(8).
             03 ELEMENT-TYPE PIC X(4).
             03 ELEMENT-UNITS PIC XX.
             03 YEAR PIC 9(4).
             03 MONTH PIC 99.
             03 SOURCE-CODE-1 PIC X.
             03 SOURCE-CODE-2 PIC X.
             03 DAYX PIC 9(2).
             03 NUM-VALUES PIC 9(3).
           02  DAILY-ENTRY OCCURS 1 TO 100 TIMES DEPENDING ON NUM-
                VALUES.
               04 TIME-OF-VALUE PIC 9(4).
               04 DATA-VALUE PIC S9(5) SIGN LEADING SEPARATE.
               04 FLAG-1 PIC X.
               04 FLAG-2 PIC X.
      *
        WORKING-STORAGE SECTION.
      *
        01  ELEM-CT PIC 9(5) COMP.
        01  PRCT PIC 9(5) COMP.
      *
      *
        PROCEDURE DIVISION.
        OPENING.
            OPEN INPUT INDATA.
        READ-REC.
            READ INDATA AT END GO TO ENDALL.
######*    ADD 1 TO ELEM-CT.
######*    IF ELEM-CT > 5 GO TO ENDALL.
*************************************************
********* THE TWO STATEMENTS IMMEDIATELY ABOVE CONTROL
********* THE NUMBER OF ELEMENTS PRINTED.
*************************************************
           DISPLAY  '   ' UPON PRINTER.
           DISPLAY  '+++++++++++++++++++++++++++++++++++++++++'
             UPON PRINTER.
           DISPLAY RECORD-ID UPON PRINTER.
           MOVE O TO PRCT.
           PERFORM PRINT-A-RECORD NUM-VALUES TIMES.
           GO TO READ-REC.
      PRINT-A-RECORD.
           ADD 1 TO PRCT.
           DISPLAY DAILY-ENTRY(PRCT) UPON PRINTER.
      ENDALL.
```

```
          DISPLAY '::::::::::::::::::::::::::::::::::'
            UPON PRINTER.
          DISPLAY '::::::::::::::::::::::::::::::::::'
            UPON PRINTER.
          DISPLAY 'E N D  OF  R U N' UPON PRINTER.
          CLOSE INDATA.
          STOP RUN.
```

(2) TYPICAL FORTRAN 77

```
C*******************************************************
 C*****PROGRAM. FRDWT3280
C*****THIS PROGRAM READS TD3280 AND LISTS IT ON A PRINTER.
C*******************************************************
      CHARACTER*3  RECTYP
      CHARACTER*8  STNID
      CHARACTER*4  ELMTYP
      CHARACTER*2  EUNITS
      CHARACTER*1  SRC1, SRC2, FLAG1, FLAG2
      DIMENSION ITIME(100), IVALUE(100), FLAG1(100), FLAG2(100)
      OPEN(10,FILE='INDATA',ACCESS='SEQUENTIAL',
     +     STATUS='OLD',RFORM='VB',MRECL=1230,
     +     TYPE='ANSI',BLOCK=12000)
C*************************************************
C*****THE LAST FOUR ARGUMENTS OF THE OPEN STATEMENT ARE
C*****EXTENSIONS ON THE UNISYS SYSTEM.
C*************************************************
 5    READ(10,100,END=999)RECTYP,STNID,ELMTYP,EUNITS,IYEAR,
     +IMON,SRC1,SRC2,IDAY,NUM,(ITIME(J),IVALUE(J),FLAG1(J),
       +FLAG2(J),J=1,NUM)
 100  FORMAT(A3,A8,A4,A2,I4,I2,A1,A1,I2,I3,100(I4,I6,2A1))
C     IELMCT=IELMCT+1
C     IF(IELMCT.GT.5)GO TO 999
C*****************************************************
C*****THE TWO STATEMENTS IMMEDIATELY ABOVE CONTROL
C*****THE NUMBER OF ELEMENTS TO PRINT.
C*****************************************************
      WRITE(6,200)RECTYP,STNID,ELMTYP,EUNITS,IYEAR,IMON,SRC1,
     +SRC2,IDAY,NUM
 200  FORMAT(1X,A3,A8,A4,A2,I4,I2,A1,A1,I2,I3)
 15   DO 25 I=1,NUM
      WRITE(6,300)ITIME(I),IVALUE(I),FLAG1(I),FLAG2(I)
 300  FORMAT(1X,I4,I6,2A1)
 25   CONTINUE
      GO TO 5
 999  CLOSE(UNIT=10)
      WRITE(6,*)' E N D  OF  R U N'
      STOP
```

```
      END
```

NOTE: If you do not have FORTRAN 77 you can read the character data described above into integer variables.

C. IBM JCL NOTES.

1. For ASCII Variable specify:

```
LRECL     =    1234
RECFM     =    DB
OPTCODE   =    Q
```

2. For EBCDIC Variable specify:

```
LRECL     =    1234
RECFM     =    VB
```

2. RECORD

A. Physical Characteristics

Each logical record contains one station's hourly data values for a specific meteorological element for a period of one day. The record consists of a control word, and identification portion, and a data portion. The control word is used by the computer operating system for record length determination. The identification portion identifies the record type, observing station, element type, element units, year/month, source codes, day and number of values. The data portion contains the meteorological observations for the hourly data values and flags. The data portion is repeated for as many hourly values as occur in a day.

NOTE: Present Weather Code (PWTH) is an exception. See Code Definitions and Remarks on 'PWTH'.

NCDC Library Tapes are structured as follows:

```
Record Length  :    Variable with maximum of 1230 characters
Blocked        :    12000 characters maximum
Media          :    ASCII 18-Track IBM-Type 3480 Cartridge
Density        :    36,000 BPI
Parity    :    Odd
Label          :    ANSI Standard Labeled
File           :    1 File per tape
```

B. FORMAT (VARIABLE RECORD)

The first ten tape fields, the ID PORTION of the record, describe the characteristics of the entire record. The DATA PORTION of the record contains information about each element value reported. This portion is repeated for as many hourly values as occur in a day.

Each logical record is of variable length with a maximum of 1230 characters. Each logical record contains a station's hourly data for a specific meteorological element for a one day interval.

C. List of Variables

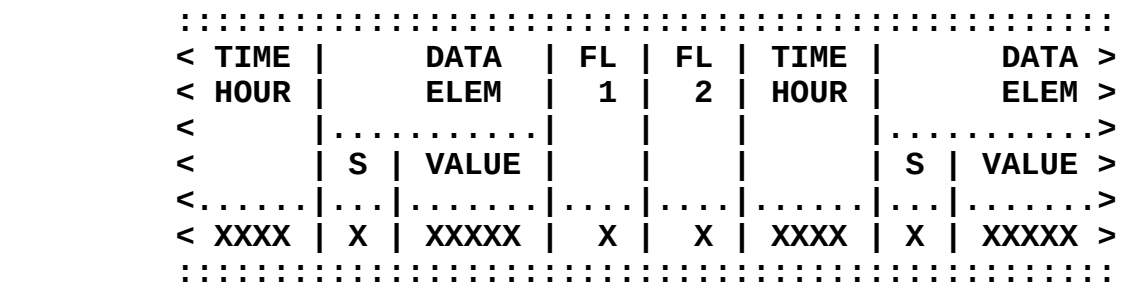
	ELEMENT	WIDTH	POSITION	
001	RECORD TYPE	3	001-003	I
002	STATION I.D.	8	004-011	D
003	METEOROLOGICAL ELEMENT TYPE	4	012-015	
004	MET. ELEMENT MEASUREMENT UNIT CODE	2	016-017	P
005	YEAR	4	018-021	O
006	MONTH	2	022-023	R
007	SOURCE CODE 1	1	024	T
008	SOURCE CODE 2	1	025	I
009	DAY OF MONTH	2	026-027	O
010	NUMBER OF DATA PORTION GROUPS THAT FOLLOW	3	028-030	N
011	TIME OF OBSERVATION (HOUR)	4	031-034	
012	SIGN OF METEOROLOGICAL VALUE	1	035	D
013	VALUE OF METEOROLOGICAL ELEMENT	5	036-040	A
014	QUALITY CONTROL FLAG 1	1	041	T
015	QUALITY CONTROL FLAG 2	1	042	A
(016-020)	DATA GROUPS IN THE SAME FORM AS TAPE	12	(043-054)	
(021-025)	FIELDS O11-015. REPEATED AS MANY TIMES	12	(055-066)	P
(026-030)	AS NEEDED TO CONTAIN ONE DAY OF RECORD.	5	(067-078)	O
(196-201)		6	(1219-1230)	R T I O N

ID PORTION (30 Characters) Variable Length

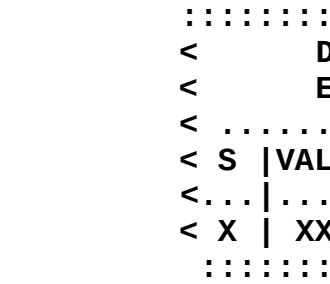
REC TYP	STATION ID	ELEM TYPE	UNT	YEAR	MO	SRC 1	SRC 2	DAY	NO. VAL. >
...	.....	....	...	....	...	...	...	...	....>
XXX	XXXXXXXX	XXXX	XX	XXXX	XX	X	X	XX	XXX >

TAPE FIELD	001	002	003	004	005	006	007	008	009	010

DATA PORTION (12 Characters Number-Values Times)



TAPE FIELD 011 012 013 014 015 016 017 018



TAPE FIELD 198 199 200 201

5. Access Method and Sort for Supplied Data:

Definitions and general information about the Surface Airways Hourly Observations are contained in the basic documentation used to describe the format of Variable length records. Variable length and fixed length records can be supplied to users. The variable length attributes are described under Topic 4 of this document.

MANUAL AND TAPE NOTATIONS

1. FILE (NCDC FIXED LENGTH (USER SERVICES))

A. Physical Characteristics

Data in this file are retained in chronological order by station. The fixed length records described below can be furnished upon request. Additional charges may be accrued for this special processing.

B. COBOL or FORTRAN Data Description

(1) Typical ANSI COBOL (Fixed Length)

```
          FD   INDATA

               LABEL RECORDS ARE STANDARD
                 RECORDING MODE F
               BLOCK CONTAINS 20 RECORDS
               DATA RECORD IS DATA-RECORD.
           01   DATA-RECORD.
               02   RECORD-TYPE              PIC X(3).
               02   STATION-ID               PIC X(8).
               02   ELEMENT-TYPE             PIC X(4).
               02   ELEMENT-UNITS            PIC XX.
               02   YEAR                     PIC 9(4).
               02   MONTH                    PIC 99.
               02   SOURCE-CODE-1            PIC X.
               02   SOURCE-CODE-2            PIC X.
               02   DAY                      PIC 9(2).
               02   NUM-VALUES               PIC 9(3).
               02   DAILY-ENTRY
                    OCCURS 24 TIMES.
                04       TIME-OF-VALUE       PIC 9(4).
            04       DATA-VALUE          PIC S9(5) SIGN
                                           LEADING SEPARATE.
                04       FLAG-1              PIC X.
                04       FLAG-2              PIC X.
```

(2) Typical FORTRAN 77 (Fixed Length)

```
C=======================================================
C=====PROGRAM "FB3280"
C===== THIS PROGRAM READS FIXED-LENGTH TD3280 AND LISTS
C===== IT ON A PRINTER.
C=======================================================

      CHARACTER*3 RECTYP
      CHARACTER*8 STNID
      CHARACTER*4 ELMTYP
      CHARACTER*2 EUNITS
      CHARACTER*1 SRC1, SRC2, FLAG1, FLAG2
      DIMENSION ITIME(24), IVALUE(24), FLAG1(24), FLAG2(24)
      OPEN(10,FILE='INDAT',ACCESS='SEQUENTIAL',
     +STATUS='OLD',RFORM='FB',MRECL=318,
     +TYPE='ANSI',BLOCK=6360)
C=====================================================
C====THE LAST FOUR ARGUMENTS OF THE OPEN STATEMENT ARE
C====EXTENSIONS ON THE UNISYS SYSTEM.
C=====================================================
 5    READ(10,100,END=999)RECTYP,STNID,ELMTYP,EUNITS,IYEAR,
     +IMON,SRC1,SRC2,IDAY,NUM,(ITIME(J),IVALUE(J),FLAG1(J),
     +FLAG2(J),J=1,24)
```

```
 100  FORMAT(A3,A8,A4,A2,I4,I2,A1,A1,I2,I3,24(I4,I6,2A1))
C     IELMCT=IELMCT+1
C     IF(IELMCT.GT.5)GO TO 999
C=====================================================
C=====THE TWO STATEMENTS IMMEDIATELY ABOVE CONTROL
C=====THE NUMBER OF ELEMENTS TO PRINT
C=====================================================
      WRITE(6,200)RECTYP,STNID,ELMTYP,EUNITS,IYEAR,IMON,SRC1,
     +SRC2,IDAY,NUM
 200  FORMAT(1X,A3,A8,A4,A2,I4,I2,A1,A1,I2,I3)
 15   DO 25 I=1,NUM
      WRITE(6,300)ITIME(I),IVALUE(I),FLAG1(I),FLAG2(I)
 300  FORMAT(1X,I4,I6,2A1)
 25   CONTINUE
      GO TO 5
 999  CLOSE(UNIT=10)
      WRITE(6,*)'E N D  O F  R U N'
      STOP
      END
```

NOTE: If you do not have FORTRAN 77 you can read the character data described above into integer variables.

1. RECORD

A. Physical Characteristics

Each logical record contains one station's hourly data values for a specific meteorological element for a period of one day. The record consists of an identification portion, and a data portion. The identification portion identifies the record type, observing station, element type, element units, year/month, source codes, day, and number of values. The data portion contains the meteorological observation for the hourly data values and quality flags. The data portion is repeated 24 times.

NOTE: Present Weather Code (PWTH) is an exception. See Code Definitions and Remarks on 'PWTH' in documentation on variable format.

TD3280/TD3281 data can be provided on magnetic tape structured as follows:

Record Length	:	FIXED 318 characters
Blocked	:	6360 characters
Media	:	ASCII or EBCDIC Magnetic Tape - 9 Track/ 18 Track, 1.44Mb Diskette

Density : 1600 or 6250 BPI (36,000 BPI on IBM-Type 3480 cartridge)
Parity : Odd
Label : ANSI standard labeled (ASCII only) or unlabeled
File : 1 File per tape

These fixed length records may be selected in either of the following two forms:

1. The data values as originally reported.

2. The data values as originally reported with edited replacement values substituted for the values which did not pass the quality checks. If no choice is made by the user, NCDC will supply form #2.

B. FORMAT (FIXED RECORD)

1. The first ten tape fields, the ID PORTION of the record, describe the characteristics of the entire record. The DATA PORTION of the record contains information about each element value reported. This portion is repeated for 24 hourly values representing 1 full day of observations. Each logical record is of fixed length with 318 characters. Each logical record contains a station's data for a specific meteorological element for a one day interval.

	ELEMENT	WIDTH	POSITION	
001	RECORD TYPE	3	001-003	
002	STATION I.D.	8	004-011	I
003	METEOROLOGICAL ELEMENT TYPE	4	012-015	D
004	MET. ELEMENT MEASUREMENT UNITS	2	016-017	
005	YEAR	4	018-021	P
006	MONTH	2	022-023	O
007	SOURCE CODE 1		024	R
008	SOURCE CODE 2	1	025	T
009	DAY OF MONTH	2	026-027	I
010	NUMBER OF DATA PORTION GROUPS THAT FOLLOW (24)	3	028-030	O N
011	TIME OF OBSERVATION (HOUR - LEFT JUSTIFIED	4	031-034	
012	SIGN OF METEOROLOGICAL VALUE	1	035	D
013	VALUE OF METEOROLOGICAL ELEMENT	5	036-040	A
014	QUALITY CONTROL FLAG 1		041	T
015	QUALITY CONTROL FLAG 2	1	042	A
(016-020)	DATA GROUPS IN THE SAME FORM AS TAPE	12	(043-054)	P
(021-025)	FIELDS 011-015.	12	(055-066)	O

(026-030) REPEATED 24 TIMES 12 (067-078) RATION

(126-130) 12 (307-318)

ID PORTION (30 characters) Fixed Length

REC TYP	STATION ID	ELEM TYPE	UNT	YEAR	MO	SRC 1	SRC 2	DAY	NO VAL
XXX	XXXXXXXX	XXXX	XX	XXXX	XX	X	X	XX	XXX

TAPE FIELD	001	002	003	004	005	006	007	008	009	010

DATA PORTION (12 Character Data Portion repeats the number of times indicated by the data value stored in Tape Field 010, Fixed are 12 characters repeated 24 times.)

TIME HOUR	DATA ELEM		FL 1	FL 2	TIME HOUR	DATA ELEM	
		S	VALUE				S	VALUE
XXXX	X	XXXXX	X	X	XXX	X	XXXXX	

TAPE FIELD	011	012	013	014	015	016	017	018

	DATA ELEM	FL 1	FL 2
S	VALUE		
X	XXXX	X	X

TAPE FIELD	127	128	129	130

6. Element Names and Definitions:

SPECIAL NOTES

CEILING HEIGHTS

Ceiling was recorded in hundreds of feet above the ground to nearest 100 feet up to 5,000 feet, to nearest 500 feet from 5,000 to 10,000 feet, to nearest 1,000 feet above that. The recording increments changed for Automated Surface Observing System(ASOS) stations beginning in 1992. ASOS stations report ceiling up to only 12,000 feet with a precision to nearest 100 feet up to 5,000 feet, to nearest 200 feet between 5,000 feet and 10,000 feet, and to nearest 500 feet above 10,000 feet. Before 1949 Air Force stations recorded ceilings up to and including 20,000 feet, above which point the ceiling was classified as unlimited; Weather Bureau and Navy stations recorded ceiling only up to and including 9,500 feet, above which point the ceiling was considered unlimited. Beginning in 1949, ceiling was redefined to include the vertical visibility into obscuring phenomena not classified as thin, that, in a summation with all lower layers, covers 6/10 or more of the sky. Also at that time, all limits to height of ceiling were removed, so that an unlimited ceiling became simply less than 6/10 sky cover, not including thin obscuration. Then, beginning June 1, 1951, ceiling heights were no longer established solely on the basis of coverage. The ascribing of ceilings to thin broken or thin overcast layers was eliminated. A layer became classified as "thin" if the ratio of transparency to total coverage at that level is **2** or more.

SKY CONDITIONS AND CLOUD LAYERS

Many different coding practices on sky conditions and cloud layers occurred throughout the years. The mid 1980 element format conversion took into account all the different practices and converted all the procedures into a common format. If one is interested in all the changes in coding, please refer to WBAN Surface Observations Card Deck 144 documentation.

DATSAV SOURCE DATA

Because of differences in Airways and METAR codes and the limited information available on the telecommunicated source compared with manuscript forms, DATSAV derived data contains less complete information than otherwise available. Element conversions unique to METAR stations are as follows:

1. Visibility - METAR codes are converted to Airways codes or the NCDC data base. This conversion will cause 6-mile visibilities from METAR stations to be recorded as 7-mile

visibilities. METAR code permits the transmission of a visibility of 9,000 meters without obstruction, while Airways requires a visibility of at least 7 miles without obstruction. The 9,000 meters is converted to 6 miles in the program and flagged because it is less than the 7-mile requirement. These 6-mile visibilities are changed to 7 miles so that these data will conform with the rest of the data in the data base. When 'CAVOK' is found in the transmitted data, 7 miles with no obstructions is entered in the data base.

2. Weather - Only the highest numbered weather code is transmitted. This causes all accompanying weather to be lost from the data base. For example, the manuscript form might indicate moderate or heavy rain and snow showers mixed (code 84) with fog (code 45). Only code 84 will be transmitted and fog will be eliminated.

3. Clouds - Total sky and sky condition are not reported on telecommunicated data. Layer amounts are reported in eighths and converted to tenths. This conversion results in the loss of any entries of 2 or 7 tenths.

4. Ceiling - When 'CAVOK' is found in the transmitted data, an unlimited ceiling is entered in the data base.

5. Temperature and Dew Point Temperature - These temperatures are given in Celsius on the forms, Kelvin on DATSAV, Celsius on intermediate output, and are stored in Fahrenheit in whole degrees in the data base. Rounding during conversions can cause a loss of accuracy of one degree.

RECORD TYPE
The type of data stored in this record. (Value is "HLY"). Each record contains one day of hourly values.

STATION-ID
Contains the WBAN Station Number. (Assigned by NCDC.) ID Range of values = 00000000-00099999. Five digit station numbers are always right justified and zero filled.

METEOROLOGICAL ELEMENT-TYPE
The type of meteorological element stored in this record consisting of a four character alpha. Range of values is listed below.

ALC"x"

DESCRIPTION: Sky condition in tenths and height per layer.
VALID TIMES: Used from 9/1992 thru current
STATION TYPES: ASOS and ASOS Augmented only
COMMENTS: This element began with the implementation of ASOS in September 1992. The ASOS ceilometer provides data for a maximum of three layers at or below 12,000 feet and does not distinguish between thin and opaque cloud layers. ASOS sites augmented by a human observer can report up to six layers of clouds and are not limited to 12,000 feet. Beginning July 1, 1996 with the implementation of the Metar code, the element ALC@x@ (tenths) was derived from the element ALM@x@ (eights).

The "x" indicates the layer where:

1 = The lowest layer
2 = The second layer
3 = The third layer
4 = The fourth layer (ASOS Augmented stations only)
5 = The fifth layer (ASOS Augmented stations only)
6 = The sixth layer (ASOS Augmented station only)

The DATA-VALUE portion of the record will appear as XXYYY where:

XX = The code for sky condition
YYY = The layer height in hundreds of feet.

XX Code - Sky Condition (tenths)

00 = clear or less than .1 coverage
02 = scattered .1 to .5 coverage
04 = broken .6 to .9 coverage
06 = overcast 1.0 coverage
07 = obstruction 1.0 coverage
09 = unknown

NOTE: The XX code is the same used for element CLC"x" except that thin layers and partial obscurations are not currently measured by ASOS.

YYY Code - Layer Height (hundreds of feet)

000 = Clear conditions (with ›00' code for XX)
999 = Unknown value (with ›09' code for XX)

The NWS Automated Surface Observing System (ASOS) began gradual implementation at weather stations in September 1992. Sky and ceiling information are automatically derived from ceilometer data

in the ASOS. Except in the case of augmentation, sky and ceiling are no longer an estimate of conditions from a human observer. The ASOS cloud height is an estimate based on the heights of clouds detected every 30 seconds during the previous 30 minutes (with the last 10 minutes of data double weighted). The cloud amount (CLR, SCT, BKN, OVC) is derived from the ratio of the number of possible hits. The ceilometer measures clouds at or below 12,000 feet.

ALM"x"

DESCRIPTION: Sky condition in eights and height per layer.
VALID TIMES: Used from July 1, 1996 thru current
STATION TYPES: ASOS and ASOS Augmented only
COMMENTS: This element is only used for stations using the ASOS system and begins in July 1996. The ASOS ceilometer provides data for a maximum of three layers at or below 12,000 feet and does not distinguish between thin and opaque cloud layers. ASOS sites augmented by a human observer can report up to six layers of clouds and are not limited to 12,000 feet. The element ALC@x@ (tenths) was derived from the element ALM@x@ (eights).

The "x" indicates the layer where:

1 = The lowest layer
2 = The second layer
3 = The third layer
4 = The fourth layer (ASOS Augmented stations only)
5 = The fifth layer (ASOS Augmented stations only)
6 = The sixth layer (ASOS Augmented station only)

The DATA-VALUE portion of the record will appear as XXYYY where:

XX = The code for sky condition
YYY = The layer height in hundreds of feet.
XX Code - Sky Condition (eights)

00 = Clear
01 = few scattered 1/8 to 2/8 coverage
02 = scattered 3/8 to 4/8 coverage
04 = broken 5/8 to 7/8 coverage
06 = overcast 8/8 coverage
07 = obscuration 8/8 coverage
09 = unknown

NOTE: This XX code is the same used for the element CLM"x", the MAPSO station version of ALM@x@.

YYY Code - Layer Height (hundreds of feet)

000 = Clear conditions (with ›00' code for XX)
999 = Unknown value (with ›09' code for XX)

The NWS Automated Surface Observing System (ASOS) began gradual implementation at weather stations in September 1992. Sky and ceiling information are automatically derived from ceilometer data in the ASOS. Except in the case of augmentation, sky and ceiling are no longer an estimate of conditions from a human observer. The ASOS cloud height is an estimate based on the heights of clouds detected every 30 seconds during the previous 30 minutes (with the last 10 minutes of data double weighted). The cloud amount (CLR, SCT, BKN, OVC) is derived from the ratio of the number of possible hits. The ceilometer measures clouds at or below 12,000 feet.

ALTP

DESCRIPTION: Altimeter setting.
VALID TIMES: All stations begin on July 1, 1996; Navy stations begin in September 1984
STATION TYPES: All stations (ASOS, ASOS Augmented, and human observer)

Range of values: 02700 to 03200

CC51

DESCRIPTION: The sky condition.
VALID TIMES: Prior to June 1951
STATION TYPES: Human observer stations only
COMMENTS: Old code not used since June 1951

DATA-VALUE will appear as 0XYYZ where:

X = Amount of higher layer
YY = Height of lowest scattered layer in hundreds of feet
Z = Amount of lowest layer

NOTE: This element is only recorded for data prior to June 1,1951. Check Flags 1 and 2 for further definition of CC51. C-A-U-T-I-O-N must be taken when using this element.

Sky condition is a descriptive symbolic coding of the state of the sky, referring in general to the amount of the celestial dome covered by clouds or obscuring phenomena.

X and Z Code Amounts
0 = clear or less than .1 coverage
1 = thin scattered
2 = scattered

3 = dark scattered
4 = thin broken
5 = broken
6 = dark broken
7 = thin overcast
8 = overcast
9 = dark overcast
- = obscuration 10/10ths obscuration
b = (blank) partial obscuration

YY Code

00 - 95 = Height in hundreds of feet
96 = Value unknown. Manuscript entry was ›bb'(blanks).
97 = No low scattered clouds. Manuscript entry was '___'(line).
98 = Invalid original value. Manuscript entry was '**'.
99 = 10,000 feet or higher.

CLC"x"

DESCRIPTION: Sky condition in tenths and cloud coverage by layer.
VALID TIMES: through current
STATION TYPES: Human observer stations only
COMMENTS: Beginning July 1, 1996 with the implementation of the Metar code, 1) the element CLC@x@ (tenths) was derived from CLM@x@ (eights) and 2) a maximum of 6 cloud layers may be reported. Prior to July 1, 1996, the element CLC@x@ was directly observed in tenths and an Ainfinite number@ of cloud layers could be reported.

The sky condition. The "x" indicates the layer where:

1 = Lowest cloud layer
2 = 2nd cloud layer
3 = 3rd cloud layer
4 = 4th cloud layer
5 = 5th cloud layer
6 = 6th cloud layer
N = N'th cloud layer if necessary (prior to July 1, 1996 only)

Cloud information pertaining to sky condition and cloud coverage are contained within one element per level. Check data Flags 1 and 2 for further definition.

The DATA-VALUE portion of the record will appear as: Example 0XXYY constitutes the five character field where:

XX = code for sky condition
YY = cloud coverage (tenths)

XX Code - Sky Condition

00 = Clear or less than .1 coverage
01 = thin scattered .1 to .5 coverage (used before July 1996)
02 = scattered .1 to .5 coverage
03 = thin broken .6 to .9 coverage (used before July 1996)
04 = broken .6 to .9 coverage
05 = thin overcast 1.0 coverage (used before July 1996)
06 = overcast 1.0 coverage
07 = obscuration 1.0 coverage
08 = partial obscuration <1.0 coverage (used before July 1996)
09 = unknown

YY Code - Cloud Coverage

Cloud coverage is expressed in tenths.

00 = Clear conditions (with ›00' code for XX)
99 = Unknown value (with ›09' code for XX)

NOTE: Prior to 1984, if the sky was totally clear of clouds then CLC"x" is not reported and the TSKC(Total Sky Cover) element appears as "00000". It indicates that some cloud type less than .1 coverage was observed and not a clear sky condition.

CLM"x"

DESCRIPTION: Sky condition in eights and cloud coverage by layer.
VALID TIMES: July 1, 1996 through current
STATION TYPES: Human observer stations only
COMMENTS: Beginning July 1, 1996 with the implementation of the Metar code, 1) the element CLC@x@ (tenths) was derived from CLM@x@ (eights)and 2) a maximum of 6 cloud layers may be reported.

Sky condition and height contained within one element per layer. The "x" indicates the layer where:

1 = The lowest layer
2 = The second layer
3 = The third layer
4 = The fourth layer
5 = The fifth layer
6 = The sixth layer

The DATA-VALUE portion of the record will appear as 0XXYY where:

XX = The code for sky condition.
YY = The cloud coverage expressed in eighths.

XX Code - Sky Condition

00 = Clear
01 = few scattered 1/8 to 2/8 coverage
02 = scattered 3/8 to 4/8 coverage
04 = broken 5/8 to 7/8 coverage
06 = overcast 8/8 coverage
07 = obscuration 8/8 coverage
09 = unknown

Note: This XX code is the same used for the element ALM"x", the ASOS station version of CLM@x@.

YY Code - Cloud Coverage

Cloud coverage is expressed in eighths.

00 = Clear conditions (with ›00' code for XX)
99 = Unknown value (with ›09' code for XX)

CLHT

DESCRIPTION: Ceiling height
VALID TIMES: through current
STATION TYPES: ASOS, ASOS augmented and Human observer stations
COMMENTS: Since July 1, 1996, the Metar code does not distinguish between thin and opaque clouds. In addition, beginning 9/1992, the implementation of ASOS celiometers does not distinguish between thin and opaque clouds. These two changes result in all clouds being considered opaque after either of these two changes became effective. Prior to these two changes, thin clouds were not included in ceiling height.

Ceiling height is defined as the height of the lowest sky cover layer that is more than 1/2 opaque. Heights are defined in hundreds of feet. The DATA-VALUE will appear as 00XXX. Range of values = 00000 to 99999. A value of 99999 indicates an unlimited ceiling. The unknown or missing value is 00999.

The NWS Automated Surface Observing System (ASOS) began implementation at stations in September 1992. Sky and ceiling information are automatically derived from ceilometer data in the ASOS. The ASOS cloud height is an estimate based on the heights of clouds detected every 30 seconds during the previous 30 minutes (with the last 10 minutes of data double weighted). The ASOS ceilometer measures clouds at or below 12,000 feet. ASOS Augmented sites and human observer sites can also report ceiling heights greater than 12,000 feet.

CLT"x"

DESCRIPTION: The cloud type and height by layer.
VALID TIMES: through current
STATION TYPES: ASOS Augmented and Human observer stations only
COMMENTS: Since July 1, 1996, the Metar code only allows the reporting of CB (Cumulonimbus) and TC (Towering Cumulus) cloud types. However, human observer stations using the MAPSO system can report other cloud types and obscuring phenomena listed below.

The "x@ indicates the layer where:

1 = lowest cloud layer or obscuring phenomena
2 = 2nd cloud layer
3 = 3rd cloud layer
4 = 4th cloud layer
5 = 5th cloud layer
6 = 6th cloud layer
N = Nth cloud layer if necessary (before July 1996 only)

Cloud information pertaining to cloud type and cloud height is contained within one element per level. The DATA-VALUE portion of the record will appear as: XXYYY.

XXYYY constitutes the five character field where:

XX =Code for cloud type (or obstruction to vision code at lowest cloud layer) code listed below.

YYY =Cloud height (hundreds of feet)

9's for any unknown value.

NOTE: (1) Cloud type/obscuring phenomena code check Flags 1 and 2 for further definition.

(2) Prior to 1984, if any of the four layers (maximum number of layers reported) were obscured the remaining layers appear as "00999" indicating "no clouds". If the sky was totally clear of clouds then CLT'x" was not reported. After 1984 only those cloud layers observed are indicated.

Generic cloud type or obscuring phenomena codes are:

	CLOUD TYPE	ABBREVIATION
00 =	None	

11 = Cumulus	CU
12 = Towering Cumulus	TCU
13 = Stratus Fractus	STFRA
14 = Stratus Cumulus Lenticular	SCSL
15 = Stratus Cumulus	SC
16 = Stratus	ST
17 – Cumulus Fractus	CUFRA
18 = Cumulonimbus	CB
19 = Cumulonimbus Mammatus	CBMAM
21 = Altostratus	AS
22 = Nimbostratus	NS
23 = Altocumulus	AC
24 = Altocumulus Lenticular	ACSL
28 = Altocumulus Castellanus	ACCAS
29 = Altocumulus Mammatus	ACMAM
32 = Cirrus	CI
35 = Cirrocumulus Lenticular	CCSL
37 = Cirrostratus	CS
39 = Cirrocumulus	CC

OBSCURING PHENOMENA
(Began Jan. 1984)

01 = Blowing spray	BY
03 = Smoke and haze	KH or HK
04 = Smoke	K
05 = Haze	H
06 = Dust	D
07 = Blowing dust	BD
08 = Volcanic ash (begin Aug. 92)	VA
30 = Blowing sand	N or BN
36 = Blowing snow	BS
44 = Ground fog	GF
45 = Fog	F
48 = Ice fog	IF
50 = Drizzle	L or ZL
60 = Rain	R or RW or ZR
70 = Snow	S or SP or SW or SG
76 = Ice crystals	IC

98 = Obscuring phenomena other than fog (prior to 1984)

C2C3

DESCRIPTION: The total amount of sky cover by the first two cloud layers and the first three cloud layers.
VALID TIMES: through current
STATION TYPES: Human Observer sites only

COMMENTS: Since July 1, 1996, the Metar code requires the reporting

of sky cover in eighths. Prior to July 1, 1996, sky cover is in tenths. This element is not used for ASOS or ASOS augmented observations.

DATA-VALUE will appear as 0XXYY where:

Prior to JULY 1996:
XX = Summation of first two cloud layers (10ths)
YY = Summation of first three cloud layers (10ths)

Range = 00 through 10 and 99.

00 = Clear or < .1
01 = 0.1
02 = 0.2
03 = 0.3
04 = 0.4
05 = 0.5
06 = 0.6
07 = 0.7
08 = 0.8
09 = 0.9
10 = 1.0
99 = Unknown or missing

Beginning JULY 1996:
XX = Summation of first two cloud layers (8ths)
YY = Summation of first three cloud layers (8ths)

Range = 00 through 08 and 99.

00 = Clear or < 1/8
01 = 1/8
02 = 2/8
03 = 3/8
04 = 4/8
05 = 5/8
06 = 6/8
07 = 7/8
08 = 8/8
99 = Unknown or missing

DPTC

DESCRIPTION: Dew Point Temperature in tenths degree Celsius.
VALID TIMES: Beginning July 1, 1996 through current
STATION TYPES: All stations (ASOS, ASOS, Augmented and Human Observer stations)
COMMENTS: Since July 1, 1996, the element DPTP (degrees Fahrenheit)

was derived from the element DPTC (tenths degree Celsius).
The DATA-VALUE will appear as 00XXX.

Range of values: 00000 to 00600 (positive and negative)
Unknown or Missing: 00999
Measured to tenths degrees Celsius

DPTP

DESCRIPTION: Dew Point Temperature in degrees Fahrenheit.
VALID TIMES: Through current
STATION TYPES: All stations (ASOS, ASOS Augmented and Human Observer stations)
COMMENTS: Since July 1, 1996, the element DPTP (degrees Fahrenheit) was derived from the element DPTC (tenths degree Celsius).

The DATA-VALUE will appear as 00XXX.
Range of values: 00000 to 00140 (positive and negative)
Measured or derived to whole degrees F.

DRAD

DESCRIPTION: Direct radiation.
Hourly values are one-minute samples summed over the hour and divided by 60 to obtain the mean hourly value ending on the hour indicated in Local Standard Time (LST). Zeros are inserted during nighttime hours. (Nearest tenth watt per meter squared.)

GRAD

DESCRIPTION: Global radiation

See description for element DRAD

HZVS

DESCRIPTION: The prevailing Horizontal Visibility
VALID TIMES: Through current
STATION TYPES: All stations (ASOS, ASOS Augmented, and Human Observer stations)

The DATA-VALUE will appear as XXXXX. Range of value = 00000 to 99999. A value of 99999 indicates unknown or unlimited visibility (> 100 miles). Horizontal visibility is usually reported at an elevation of 6 feet above the ground.

The following code is used:

HZVS CODE

Reported by ASOS	Reported by Manned	Archive Code	Actual visibility (in miles)
	Yes	00000	Zero visibility
	Yes	00006	1/16 miles
	Yes	00012	1/8 miles
Yes	Yes	00019	3/16 (ASOS <1/4 miles)
Yes	Yes	00025	1/4 miles
	Yes	00031	5/16 miles
	Yes	00038	3/8 miles
Yes	Yes	00050	1/2 miles
	Yes	00062	5/8 miles
Yes	Yes	00075	3/4 miles
	Yes	00081	3/4 or 7/8-see note below
	Yes	00087	7/8 miles
Yes	Yes	00100	1 mile
	Yes	00112	1 1/8 miles
Yes	Yes	00125	1 1/4 miles
	Yes	00138	1 3/8 miles
Yes	Yes	00150	1 1/2 miles
	Yes	00162	1 5/8 miles
Yes	Yes	00175	1 3/4 miles
Yes	Yes	00200	2 miles
	Yes	00225	2 1/4 miles
Yes	Yes	00250	2 1/2 miles
	Yes	00275	2 3/4 miles
Yes	Yes	00300	3 miles
Yes		00350	3 1/2 mi.(ASOS only)
Yes	Yes	00400	4 miles
Yes	Yes	00500	5 miles
Yes	Yes	00600	6 miles
Yes	Yes	00700	7 miles
Yes	Yes	00800	8 miles
Yes	Yes	00900	9 miles
Yes	Yes	01000	10 miles(ASOS 10+ miles)
	Yes	10000	100 Miles
	Yes	99999	Unknown or Unlimited(See Flag 1)

NOTE: 1) Historical data archived prior to Jan. 1984 did not differentiate between 3/4 and 7/8 visibilities. This historical data was converted from TD1440 to TD3280 coded as ›00081'. 2) In September 1992 Automated Surface Observing Systems began to be commissioned at NWS, FAA and DOD sites. The automated visibility sensors report values in the range of < 1/4 to 10+ miles. These reportable ASOS values are indicated in the table above along with those values reportable by human observers.

PRES

DESCRIPTION: The station pressure
VALID TIMES: Through current
STATION TYPES: All stations (ASOS, ASOS Augmented and Human Observer stations)

The station pressure at station level in inches and thousandths of mercury. The DATA-VALUE will appear as XXXXX.

Range of values: 19000 to 39990

NOTE: For ASOS stations, station pressure is not reported after June 1996 with the implementation of the Metar code. See element ALTP (Altimeter setting)

PWTH

DESCRIPTION: The present (or prevailing) weather occurring at the time of the observation.
VALID TIMES: Through current
STATION TYPES: All stations (ASOS, ASOS Augmented and Human Observer stations)

Present weather codes are two characters in length. The leftmost character indicates the general class of present weather while the rightmost character is a qualifier.

The two digit codes are stored into the five digits of the DATA-VALUE portion. ***If there is no occurrence of present weather the valid DATA-Value will always be 00000. Within the five digits used, the leftmost digit is always set to zero. Through June 1996, the two-digit weather codes are entered left justified for the remaining four digits. From July 1996 through present, the two-digit weather codes are right justified. For example, moderate snow would be coded as 04100 through June 1996. From July 1996 through present, moderate snow is coded as 00041. If two types of weather occur for the same hour, the value field would appear as 0XXYY. For example, light rain and fog occurring on the same hour would be coded as 02070.

If more than two types occur for the same hour, they will be stored into additional PWTH records as necessary.

Consider the following examples:

On day 11 Feb 1981 at 1200 (noon) and 1300 hours no present weather occurred.

0054HLY00005264PWTHNA198102111100212 00b00000b11300b00000b1

On day 11 Feb 1981 at 1200 (noon) light snow, light freezing rain, ice fog, and blowing snow all occur. The records will appear as:

0042HLY000005264PWTHNA19810211110011200<u>4026</u>b1
0042HLY000052664PWTHNA19810211110011200<u>07184</u>b1

PRESENT WEATHER CODES descriptions follow:

<u>CODE FOR PWTH RANGE 00.</u>

00 ********** No Occurrence
where:

00 = No present weather occurred

<u>CODE FOR PWTH RANGE 10 TO 19.</u>
1X ********** Thunderstorm, Tornado, Squall
where:

X = 0 thunderstorm - lightning and thunder. Wind gust < 50 knots - hail < .75 inches. Beginning July 1996 a thunderstorm is defined as a local storm produced by a cumulonimbus cloud that is accompanied by lighting and/or thunder. Intensity attributed to frequency of lighting, speed of wind gust, and size of hail ended June 1996.

= 1 heavy or severe thunderstorm frequent intense lightning and thunder. Wind gust 50 knots or greater - hail .75 inches or greater (ends June 1996).

= 2 report of tornado or water spout

= 3 light squall (through May 1951 only)

= 4 moderate squall - Beginning in June 1951, only this code (14) is recorded.

Code 13 and 15 are recorded beginning in January 1949 and ending in May 1951. Prior to 1949 rain squalls are distinguished from snow squalls and recorded in separate general classes of present weather. A squall is a sudden increase of wind speed by at least 16 knots, reaching 22 knots or more and lasting for at least one minute.

= 5 heavy squall (through May 1951 only)

= 6 water spout (began Jan 1984 and ends June 1996)

= 7 funnel cloud (began Jan 1984)
= 8 tornado (began Jan 1984 and ends June 1996)
= 9 unknown

CODE FOR PWTH RANGE 20 TO 29

2X ********* Rain, Rain Showers, Freezing Rain
where:

X = 0 light rain
= 1 moderate rain
= 2 heavy rain
= 3 light rain showers
= 4 moderate rain showers
= 5 heavy rain showers
= 6 light freezing rain
= 7 moderate freezing rain
= 8 heavy freezing rain
= 9 unknown

CODE FOR PWTH RANGE 30 TO 39

3X ********* Rain Squalls, Drizzle, Freezing Drizzle
where:

X = 0 light rain squalls (through 1948 only)
= 1 moderate rain squalls (through 1948 only)
= 2 heavy rain squalls (through 1948 only)
= 3 light drizzle
= 4 moderate drizzle
= 5 heavy drizzle
= 6 light freezing drizzle
= 7 moderate freezing drizzle
= 8 heavy freezing drizzle
= 9 unknown. Beginning Sept 1992 the Automated Surface Observing System (ASOS) can report unknown precipitation. This is an indication of light precipitation and is reported when the precipitation discriminator detects, but cannot recognize the type of precipitation.

CODE FOR PWTH RANGE 40 TO 49

4X ********* Snow, Snow Pellets, Ice Crystals
where:

X = 0 light snow
= 1 moderate snow

= 2 heavy snow
= 3 light snow pellets (ends June 1996)
= 4 moderate snow pellets (ends June 1996
= 5 heavy snow pellets (ends June 1996)
= 6 light ice crystals (ends March 1963)
= 7 moderate ice crystals
= 8 heavy ice crystals (ends March 1963)
= 9 unknown

Beginning April 1963 any occurrence of ice crystals is recorded as a 47. Prior to this date intensities were reported. Code 43, 44, 45 ended June 1996 and were reported in code 67.

CODE FOR PWTH 50 TO 59

5X ********* Snow Showers, Snow Squalls, Snow Grains
where:

X = 0 light snow showers
= 1 moderate snow showers
= 2 heavy snow showers
= 3 light snow squall (through 1948 only)
= 4 moderate snow squall (through 1948 only)
= 5 heavy snow squall (through 1948 only)
= 6 light snow grains
= 7 moderate snow grains
= 8 heavy snow grains
= 9 unknown

CODE FOR PWTH RANGE 60 TO 69

6X ********* Sleet, Sleet Showers, Hail
where:

X = 0 light ice pellet showers
= 1 moderate ice pellet showers
= 2 heavy ice pellet showers
= 3 light hail (see note below)
= 4 moderate hail (see note below)
= 5 heavy hail (see note below)
= 6 light small hail (see note below)
= 7 moderate small hail (see note below)
= 8 heavy small hail (see note below)
= 9 unknown

Prior to April 1970 ice pellets were coded as sleet. Beginning April 1970 sleet and small hail were redefined as ice pellets

and are coded as 60, 61 or 62. Beginning September 1956 intensities of hail were no longer reported and all occurrences were recorded as a 64. Beginning July 1996 hail was defined as hailstones 1/4 inch or larger in diameter; small hail and snow pellets are reported when less than 1/4 inch in diameter and are coded as 64 and 67, respectively.

CODE FOR PWTH RANGE 70 TO 79

7X ********* Fog, Blowing dust, Blowing Sand
where:

X = 0 fog/mist. Beginning July 1996 fog was redefined as a visible aggregate of minute water particles (droplets) which are based at the earth's surface and reduces the horizontal visibility to less than 5/8 statute miles. Mist is defined as a visible aggregate of minute water particles suspended in the atmosphere that reduces visibility to less than 7 statute miles but greater than or equal to 5/8 statute miles.
= 1 ice fog / freezing fog
= 2 ground fog
= 3 blowing dust
= 4 blowing sand
= 5 heavy fog
= 6 glaze (begin 1984)
= 7 heavy ice fog (begin 1984)
= 8 heavy ground fog (begin 1984)
= 9 unknown

All of the above values are recorded only when visibility is less than 7 miles. Beginning July 1996 ice fog is called freezing fog and is coded as 71.

CODE FOR PWTH RANGE 80 TO 89

8X ******** Smoke, Haze, Smoke and Haze, Blowing Snow, Blowing Spray, Dust
where:

X = 0 smoke
= 1 haze
= 2 smoke and haze
= 3 dust
= 4 blowing snow
= 5 blowing spray
= 6 dust storm (begin 1984)

= 7 volcanic ash (begin Aug.1992)
= 8 not used
= 9 unknown

These values are recorded only when visibility is less than 7 miles.

CODE FOR PWTH RANGE 90 TO 97 AND 99

CODE FOR PWTH RANGE 90 TO 97

9X ****** Ice Pellets, Hail Showers, Small Hail/Snow Pellet Showers, Fog (partial, patches), snow (low drifting)

where:

X = 0 light ice pellets
= 1 moderate ice pellets
= 2 heavy ice pellets
= 3 hail showers (begins July 1996)
= 4 small hail/snow pellet showers(begins July 1996)
= 5 partial fog (begins July 1996)
= 6 patches fog (begins July 1996)
= 7 low drifting snow (begins July 1996)
= 9 unknown

PWVC

DESCRIPTION: The present (or prevailing) weather occurring between 5 and 10 statute miles at the time of the observation in the vicinity of the observation.

VALID TIMES: From July 1, 1996 through current.
STATION TYPES: All stations (ASOS, ASOS Augmented and Human Observer stations)

COMMENTS: The element PWVC began with the implementation of the Metar code on July 1, 1996.

PWVC weather codes are two characters in length. The two digit codes are stored into the five digits of the DATA-VALUE portion. ***If there is no occurrence of PWVC, the DATA-Value is not archived.

Within the five digits used, the leftmost digit is always set to zero. The two-digit weather codes are always right justified. For example, showers in the vicinity would be coded as 00002. If two types of weather in the vicinity occur for the same hour, the value field would appear as 0XXYY. For example, a thunderstorm in the vicinity and shower in the vicinity would be coded as 00102.

If more than two types of weather in the vicinity occur for the same hour, they will be stored into additional PWVC records as necessary. See element PWTH for examples.

PWVC DATA-VALUE code descriptions follow:

Code	Description
00	no occurrence
01	Thunderstorm in vicinity
02	Showers in vicinity
03	Sandstorm in vicinity
04	Sand / Dust whirls in vicinity
05	Dustorm in vicinity
06	Blowing snow in vicinity
07	Blowing sand in vicinity
08	Blowing dust in vicinity
09	Fog in vicinity

RHUM

DESCRIPTION: Relative Humidity
VALID TIMES: Through current.
STATION TYPES: All stations (ASOS, ASOS Augmented and Human Observer stations)

Relative Humidity expressed in whole percent. The DATA-VALUE will appear as 00XXX.

Range of values: 00000 to 00100

SLVP

DESCRIPTION: Sea level pressure
VALID TIMES: Through current.
STATION TYPES: All stations (ASOS, ASOS Augmented and Human Observer stations)

Pressure, reduced to sea level, expressed in millibars and tenths. The DATA-VALUE will appear as XXXXX.

Range of values: 09200 to 10900

TMCD

DESCRIPTION: Dry Bulb Air Temperature in tenths degree Celsius.
VALID TIMES: Beginning July 1, 1996 through current
STATION TYPES: All stations (ASOS, ASOS Augmented and Human Observer stations)
COMMENTS: Since July 1, 1996, the element TMPD (whole degrees Fahrenheit) was derived from the element TMCD (tenths of degree

Celsius).

The DATA-VALUE will appear as 00XXX.
Range of values: 00000 to 00600 (positive or negative)
Measured to tenths degree Celsius

TMPD

DESCRIPTION: Dry Bulb Air Temperature in whole degrees Fahrenheit.
VALID TIMES: Through current
STATION TYPES: All stations (ASOS, ASOS Augmented and Human Observer stations)
COMMENTS: Since July 1, 1996, the element TMPD (whole degrees Fahrenheit) was derived from the element TMCD (tenths of degree Celsius).

The DATA-VALUE will appear as 00XXX.
Range of values: 00000 to 00140 (positive or negative)
Measured or derived to whole degrees F.

TMPW

DESCRIPTION: Wet bulb Temperature in degrees Fahrenheit to tenths.
VALID TIMES: Through current
STATION TYPES: All stations (ASOS, ASOS Augmented and Human Observer stations)
COMMENTS: The element TMPW is derived from the dry bulb and dew point temperature. Prior to July 1, 1996, dry bulb and dew point temperatures were observed in degrees Fahrenheit. Since July 1, 1996, dry bulb and dew point temperatures are observed in tenths of degree Celsius with the implementation of the Metar code.

The DATA-VALUE will appear as 0XXXX.

Range of values: 00000 to 01400 (positive or negative)

TSCE

DESCRIPTION: Total sky cover, measured in eighths.
VALID TIMES: July 1, 1996 through current
STATION TYPES: Human observer sites only
COMMENTS: The Metar code does not distinguish between thin and opaque clouds.

TSCE describes the amount of the celestial dome covered by clouds or obscuring phenomena.

The DATA-VALUE will appear as 0XXYY where XX is the total sky cover. YY which is the total opaque sky cover, is not reportable by the Metar code and is always assigned as missing and coded 99.

00 = clear
01 = scattered clouds 1/8 coverage
02 = scattered clouds 2/8 coverage
03 = scattered clouds 3/8 coverage
04 = scattered clouds 4/8 coverage
05 = broken clouds 5/8 coverage
06 = broken clouds 6/8 coverage
07 = broken clouds 7/8 coverage
08 = overcast 8/8 coverage
99 = missing or unknown

TSKC

DESCRIPTION: Total sky cover and total opaque sky cover measured in tenths
VALID TIMES: Through current
STATION TYPES: Human observer sites only
COMMENTS: Since July 1, 1996, 1) the Metar code does not distinguish between thin and opaque clouds and 2) the element TSKC (tenths) was derived from the element TSCE (eights).

The amount of the celestial dome covered by clouds or obscuring phenomena. Opaque means clouds or obscuration through which the sky or higher cloud layers cannot be seen. Range of value 00 to 10 (tenths) and 99.

The DATA-VALUE will appear as 0XXYY where XX is the total sky cover. YY is the total opaque sky cover. Since July 1, 1996, opaque sky cover is not reportable by the Metar code and is always assigned as missing and coded 99.

00 = clear or less than .1 coverage
01 = scattered clouds .1 coverage
02 = scattered clouds .2 coverage
03 = scattered clouds .3 coverage
04 = scattered clouds .4 coverage
05 = scattered clouds .5 coverage
06 = broken clouds .6 coverage
07 = broken clouds .7 coverage
08 = broken clouds .8 coverage
09 = broken clouds .9 coverage
10 = overcast 1.0 coverage
99 = missing or unknown

WD16

DESCRIPTION: Wind direction and speed to 16 point WBAN code
VALID TIMES: Through December 31, 1963
STATION TYPES: Human observer sites only
COMMENTS: Old code not used since December 31, 1963. Beginning 1

Jan 1964 wind directions were observed and coded to tens of degrees (see elements WIND and WND2).

Direction is the direction from which the wind is blowing. Speed in knots.

WIND DIRECTION CODES
(through Dec. 1963 only)

WBAN Code	16 Pt	Degrees
00	Calm	Calm
11	N	349-011
12	NNE	012-033
22	NE	034-056
32	ENE	057-078
33	E	079-101
34	ESE	102-123
44	SE	124-146
54	SSE	147-168
55	S	169-191
56	SSW	192-213
66	SW	214-236
76	WSW	237-258
77	W	259-281
78	WNW	282-303
88	NW	304-326
18	NNW	327-348
99	Unknown	

Example of DATA-VALUE XXYYY for wind direction (XX) and speed (YYY): 12037 wind is from the NNE at 37 knots. 12 = wind from NNE. 037 = wind speed is 37 knots.

WIND

DESCRIPTION: Wind Direction and Speed
VALID TIMES: January 1, 1964 through current
STATION TYPES: Human observer sites only
COMMENTS: WIND (10's of Degrees Code) element begins January 1964. Prior to 1964 winds observed in the WD16 (16 point code). In September 1992 with the implementation of ASOS, the element WND2 is used when a station converted to ASOS. With the implementation of the Metar code on July 1, 1996, the definitions for calm and variable wind changed as described below.

Direction is the direction from which the wind is blowing. Speed is in knots. Range of values (direction) = 00 to 36 and 99. Range

of value (speed) = 000 to 250.

Example of DATA-VALUE XXYYY for wind direction (XX) and speed (YYY): 02037 wind is from 020 degrees at 37 knots. 02 = wind 020 degrees. 037 = wind speed is 37 knots.

WIND DIRECTION CODES
(begin 1964)

Degrees Code		10's of Degrees
00	=	Calm (see note below)
01	=	010
02	=	020
.	=	.
. through		.
.		.
36	=	360
99	=	Unknown

Since July 1, 1996 calm and variable winds are defined as follows:

Calm winds include wind speeds of 0 to 2 knots and are coded as 00000
Variable winds include wind speeds of 3-6 knots and are coded as 00003 through 00006

Example 00004 is a variable wind at 4 knots.

WND2

DESCRIPTION: Wind Direction and Speed from ASOS
VALID TIMES: September 1992 through current
STATION TYPES: ASOS and ASOS Augmented sites only
COMMENTS: In September 1992 with the implementation of ASOS, the element WND2 is used when a station converted to ASOS. With the implementation of the Metar code on July 1, 1996, the definitions for calm and variable wind changed as described below.

ASOS wind speeds are two-minute averages in knots. Direction is the direction (in tens of degrees) from which the wind is blowing.

The DATA VALUE portion of the record will appear as XXYYY where:

XX = The direction in tens of degrees. 00 = calm, 36 = 360 degrees.
YYY = The speed of the wind in knots.

Example: 28014 is a wind from 280 degrees at 14 knots. 28 = wind 280 degrees. 014 = wind speed is 14 knots.

Since July 1, 1996 calm and variable winds are defined as follows:

Calm winds include wind speeds of 0 to 2 knots and are coded as 00000
Variable winds include wind speeds of 3-6 knots and are coded as 00003 through 00006

Example 00004 is a variable wind at 4 knots.

ELEMENT - UNITS
The unit and decimal position of the DATA-VALUE of this record.

ELEMENT-UNITS TABLE

DT	Wind direction in tens of degrees
F	Whole degrees Fahrenheit
HF	Hundreds of feet
HM	Miles and hundredths
IH	Inches and hundredths of mercury
IT	Inches and thousandths of mercury
KD	knots and direction in tens of degrees
KS	Knots and direction in 16 point WBAN Code
MT	Millibars and tenths
NA	No units applicable (non-dimensional)
N1	No units applicable - element to tenths
N2	No units applicable - element to hundredths
P	Whole percent
TC	Degrees Celsius in tenths
TF	Degrees Fahrenheit in tenths
WH	Watt hour per meter squared

NOTE: All entries are left justified and blank filled.

YEAR
This is the year of the record. Range of value is 1900 to the current year processed.

MONTH
This is the month of record. Range of value is 01-12.

SOURCE CODE-1
Contains a code indicating the primary source of the original record this element was taken from. Range is 1-9.

SOURCE CODE TABLE

1	Original Manuscript
2	SRRS
3	AFOS
4	DATSAV
5	NMC
6	Foreign Keyed
7	MAPSO
8	SRRS plus
9	Other/unknown
A	ASOS

Source codes reflect normally expected data sources and do not necessarily indicate the actual source of a specific item. Pre-1984 data will be coded as a 1.

SOURCE CODE-2
Contains a code indicating the back-up source of the original record this element was taken from. Range is 1-9.

SOURCE CODE TABLE

1	Original Manuscript
2	SRRS
3	AFOS
4	DATSAV
5	NMC
6	Foreign Keyed
7	MAPSO
8	SRRS plus
9	Other/unknown
A	ASOS

Pre-1984 data will be coded as a 1.

DAY
Contains the day of the record. Range 01-31.

NUM-VALUES
This notates the actual number of values reported. Range of values is 001-048.

NOTE: A record may contain fewer or more data values than you might expect. A daily record or hourly value may contain as few as one data value or as many as 48. This is primarily due to missing or edited data. If a particular data value was not

taken or is unavailable there is no entry for it. Also, when erroneous data are encountered during quality control the original value is flagged and could be followed by a replacement value (see FLAG-2 TABLE for details).

TIME-OF VALUE

Contains the hour and minute of the hourly element value. Range is 0000-2300. The hour is in the leftmost two digits and the minute is in the rightmost two digits. Minutes are always 00. Hour is reported using the 24 hour clock. The time entered is that of the record observation, taken within 10 minutes prior to the hour (e.g., 1353 punched 14 and now archived as 1400). Prior to June 1957, observations were taken within 10 minutes prior to the half hour with minutes disregarded in keying (e.g., 1224 punched 12 and now archived as 1200).

SIGN OF METEOROLOGICAL VALUE

This is the 'SIGN' of the meteorological data value (Tape Field 013). This field contains either 1) a blank indicating a positive value or 2) a minus sign indicating a negative value. A plus is not used to indicate a positive value.

DATA-VALUE

Actual data value. This field is a five-digit integer. Unit and decimal position of the data value are indicated in the ELEMENT-UNITS field described in Tape Field 004.

FLAG-1

The data measurement FLAG.

FLAG-1 TABLE (Measurement Value)
(Valid for all elements except GRAD and DRAD.)

C	Ceiling of cirroform clouds at unknown height (Sep 56 - Mar 70)
D	Derived value
E	Estimated value
G	Visibility > or = 100 miles (data value = 10000)
M	Visibility missing (data value = 99999)
N	Unlimited visibility (data value = 99999)
R	Dew Point and/or Relative Humidity, originally calculated with respect to ice have been recomputed

with respect to water. (DPTP,RHUM)

U Unlimited ceiling height (DATA-VALUE = 99999). (CLHT)

b (blank) Flag not needed. (All elements except CC51)

The following 4 flags apply only to the 'CC51' element type produced for cloud coverage prior to July 1951.

B The 0 found in byte 2 of CC51 should be a 'b' = thin obscuration.

* The 0 found in byte 2 of CC51 should be a '*' = original value invalid.

- The 0 found in byte 2 of CC51 should be a '-' = total obscuration.

9 The digit found in byte 2 of CC51 (high cloud amount) is a valid code. See Pre-June 1951 Cloud Cover Table.

The following flags apply only to the 'DRAD' and 'GRAD' elements. These flags appear as a pair in flag positions one and two.

At NOAA's Atmospheric Research Labortory in Oak Ridge, Tennessee, the data processes through a quality control procedure and daily plotting of time series. The passed 15-minute mean values are also tested against the Solar Energy Research Institute (SERI, but now National Renewable Energy Laboratory) Quality Control (SERI QC) software. The SERI QC generates flags for global, normal incident, and diffuse global radiation. This quality control primarily flags data that departs from expected limits and boundaries. Flagging convention follows:

00 Untested (raw data)

01 Passed one-component test; data fall within max-min limits of Kt, Kn, or Kd

02 Passed two-component test; data fall within 0.03 of the Gompertz boundaries

03 Passed three-component test; data come within $\pm$ 0.03 of satisfying Kt = Kn + Kd

04 Passed visual inspection: not used by SERI_QC1

05 Failed visual inspection: not used by SERI_QC1

06 Value estimated; passes all pertinent SERI_QC tests

07 Failed one-component test; lower than allowed minimum

08 Failed one-component test; higher than allowed maximum

09 Passed three-component test but failed two-component test by 0.05

10-93 Failed two- or three- component tests in one of four ways. To determine the test failed and the manner of failure (high or low), examine the remainder of the calculation (flag+2)/4.

Rem	Failure
0	Parameter too low by three-component test (Kt = Kn + Kd)
1	Parameter too high by three component test (Kt = Kn + Kd)
2	Parameter too low by two-component test (Gompertz boundary)
3	Parameter too high by two-component test (Gompertz boundary)

The magnitude of the test failure (distance in K-units) us determined from: d = (INT(flag + 2)/4)100.

94-97 Data fails into physically impossible region where Kn > Kt by K-space distances of 0.05 to 0.10 (94), 0.10 to 0.15 (95), 0.15 to 0.20 (96), and $\geq$ 0.20 (97).

98 Not used

99 Missing data

FLAG-2

The data quality FLAG.

FLAG-2 (Quality Flag)
(Valid for all elements except CC51, GRAD and DRAD. For GRAD and DRAD, see information under **FLAG-1** above.)

0 Observed data has passed all internal consistency checks.

1 Validity indeterminable (primarily for pre-1984 data).

2 Observed data has failed an internal consistency check - subsequent edited value follows observed value.

3 Data beginning January 1,1984 - observed data has failed a consistency check - No edited value follows.

Data prior to 1 Jan 84 - observed data exceeded preselected climatological limits during conversion from historic TD-1440 files. No edited value

follows.

4 Observed data value invalid - no edited value follows.

5 Data converted from historic TD-1440 exceeded known climatological extremes - no edited value follows.

E Edited data value passes all system checks - no observed value present.

M Manually edited data value added to data set after original archival. Automated edit not performed on this item.

S Manually edited data passes all system checks.

The following 4 flags apply only to the 'CC51' element type produced for cloud coverage prior to June 1951.

B The 0 found in byte 5 of CC51 should be a 'b' = thin obscuration.
- The 0 found in byte 5 of CC51 should be a '-' = total obscuration.
* The 0 found in byte 5 of CC51 should be a '*' = original value invalid.
9 The digit found in byte 5 of CC51 (low clout amount)is a valid code. See Pre-6/51 Cloud Cover Table for Element 'CC51".

7. Start Date:

Military stations provided most of the early observations for archiving from 1941 through June 1948. Major changes in observing and recording practices during 1948 represent the primary basis of digital information for all the principle reporting stations residing in this data set. ASOS stations began in September 1992.

8. Stop Date:

Present

9. Coverage:

Southernmost Latitude: 90S
Northernmost Latitude: 90N
Westernmost Longitude: 180W
Easternmost Longitude: 180E

10. Location:

Areal Coverage

U.S.A., Caribbean Islands, Pacific Islands, and other overseas stations of the National Weather Service, U.S. Navy, and U.S. Air Force.

11. Keyword:

Meteorology
Climatology
TD-3280
3280
Dew Point Temperature
Direct Radiation
Global Radiation
Horizontal Visibility
Visibility
Temperature
Dry Bulb Temperature
Wet Bulb Temperature
Station Pressure
Sea Level Pressure
Pressure
Weather
Present Weather
Relative Humidity
Humidity
Sky Cover
Total Sky Cover
Cloud Heights
Cloud Type
Wind
Wind Direction
Wind Speed

12. How to Acquire the Data:

The data are available for purchase from the National Climatic Data Center, Climate Service Branch, Federal Building, 151 Patton Avenue, Room 120, Asheville, NC 28801-5001, phone number (828)-271-4800.

13. Data Center, Archiving:

National Climatic Data Center

NOAA/NESDIS/NCDC
Federal Building
151 Patton Avenue, Room 120
Asheville, NC 28801-5001

14. Technical Contact:

Climate Services Division
Federal Building
151 Patton Avenue, Room 120
Asheville, NC 28801-5001

15. Known Uncorrected Problems:

Major Changes to TD3280

Major changes have occurred to the TD3280 data set which may have caused significant biases when used in conjunction with the historical record. In September 1992, the Automated Surface Observing System (ASOS) was gradually implemented for stations in this data set replacing the human observer. ASOS was designed specifically to support aviation operations and forecast activities. As a result, significant changes have occurred in this data set for many previously observed weather parameters. For example clouds, are not observed by the ASOS celiometer above 12,000 feet The user is advised to carefully read the documentation for each desired weather element in order to ascertain any possible data biases that may have been introduced in the historical record as a result of ASOS.

On July 1, 1996, another significant change occurred, which involved the operational transmission of hourly surface observations. On this date, the United States implemented the International METAR transmission format code, replacing the long standing Surface Airways Observation (SAO) code. The METAR code requires different format procedures for transmitting basic weather observations. For example, cloud amounts are transmitted in eights as opposed to tenths and temperature is transmitted in Celsius as opposed to Fahrenheit. There are many other differences, both major and minor. Again, the user is advised to carefully read the documentation for each desired weather element in order to ascertain any possible data biases that may have been introduced in the historical record as a result of the METAR code change.

16. Quality Statement:

Quality of the Surface Airways Hourly data is considered quite

good. All observations have received some form of quality control measures depending on the agency and the years of collection. During the early years this was almost entirely a manual effort. As more sophisticated techniques of processing were introduced, the quality control procedures were also improved. Generally, quality has improved throughout the period of record. Beginning with the data for January 1984, the surface airways hourly observations were processed through a completely revised system. Relying heavily on new computer editing procedures, data are subjected to internal consistency checks, compared against climatological limits.
See EIS C-2.

The automated recording of surface observations began in September 1992 with the implementation of ASOS. The ASOS data receive various types of quality control at the station. For example, pressure is quality controlled by use of redundant sensors. If one or more of the six samples read each minute from one pressure sensor is missing, only the remaining sensors are used to determine the pressure. Sensor values for the same minute may not differ by more than 0.04 inches. The lowest pressure reading that does not differ from the other sensor readings by more than 0.04 inches mercury is considered the observed pressure. Discussion of quality control procedures for other sensors may be found in the ASOS USER'S GUIDE.

17. Revision Dates:

May 1994
August 1994
November 1995
February 1997
June 1998
August 1999

18. Source Data Sets:

Surface Airways Hourly Manuscript records
TD-1440 (tape deck format used from the 1970s through 1980s)
Daily Observations (Original Manuscripts)
Mapso Diskettes
AFOS
DATSAV
SRRS Manuscripts
Card Deck 144 (punch cards used through the 1970s)
ASOS

19. Essential Companion Data Set:

The use of NCDC=s Station History file (TD9767) is required in order to determine metadata on each station (name, location, elevation, etc.). This can be accomplished by comparing the station number in bytes 4 through 11 of this data set with the corresponding station number in the Station History data set.

Station History Locations are known to the nearest minute of latitude and longitude. ASOS provides location to the nearest second.

20. Derived Data Set:

Daily Summary Data, processed into TD3210 and published in the Local Climatological Data (LCD) publication.
Monthly Summary Data, TD3220.
Hourly precipitation data, TD3240.
Weather Duration, TD3292.

21. References:

National Weather Service, August 1991: ASOS USER'S GUIDE, NOAA-NWS, Silver Spring, MD.

Environmental Information Summary C-2, Local Climatological Data, National Climatological Data Center (NCDC).

22. Summary:

This data set contains hourly or 3-hourly surface weather observations that are measured primarily at major airports and military bases. Observations are made by trained personnel or automated equipment that has been tested by the controlling agency. The stations are usually fully instrumented and therefore record a complete range of meteorological parameters. The observations are generally recorded for the 24-hour period midnight to midnight.

The major data variables and parameters are as follows: Record Type (HLY), WBAN Identification Station number, Units of measurement indicators, source codes, data quality flags, and element types: cloud data, visibility data, wind data, temperature data, sky cover data, relative humidity data, pressure data, solar radiation data, and present weather data. Hourly precipitation data are stored in the Hourly Precipitation Data file TD3240.

The stations are located worldwide and are operated by the National Weather Service (NWS), U.S. Air Force (Air Weather Service), U.S. Navy (Navy Weather Detachment) and the Federal Aviation

Administration (FAA). The NWS and FAA sites are located in the contiguous U.S., Alaska, Puerto Rico, Hawaii and other Pacific Islands. The Navy and Air Force operate stations worldwide.

Major Changes to TD3280

In September 1992, the Automated Surface Observing System (ASOS) was gradually implemented for stations in this data set replacing the human observer. ASOS was designed specifically to support aviation operations and forecast activities. The automated system provides continuous minute-by-minute observations which are then averaged into an hourly observation. The capability does exists for a human observer to augment parts of an ASOS observation. For example, a human observer may augment an ASOS observation to include cloud conditions above 12,000 feet.

There are three main components to ASOS: 1) the Individual Weather Sensors, 2) the Data Collection Package(s), and 3) the Acquisition Control Unit. ASOS was designed primarily for aviation use. NWS recognized that other users have become accustomed to data no longer provided by ASOS or are provided in a different way. As a result, significant changes have occurred in this data set for many previously observed weather parameters. The user is advised to carefully read the documentation for each desired weather element in order to ascertain any possible data biases that may have been introduced in the historical record as a result of ASOS.

On July 1, 1996, another significant change occurred, which involved the operational transmission of hourly surface observations. On this date, the United States implemented the International METAR transmission format code, replacing the long standing Surface Airways Observation (SAO) code. The METAR code requires different format procedures for transmitting basic weather observations. For example, cloud amounts are transmitted in eights as opposed to tenths and temperature is transmitted in Celsius as opposed to Fahrenheit. There are many other differences, both major and minor. Again, the user is advised to carefully read the documentation for each desired weather element in order to ascertain any possible data biases that may have been introduced in the historical record as a result of the METAR code change.

Historical Practices

This digital data file primarily begins in the late 1940's. Much data for earlier years are available in manuscript form. Beginning January 1, 1965, for most NWS stations and March 1, 1972, for most Naval Weather Service stations, the digitizing of the airways observations was reduced from 24 observations per day to 8

observations per day. These observations, at 3-hourly intervals, coincided with the normal GMT schedule of 00Z, 03Z, 06Z, etc. This means that the observations, keyed in local standard time (LST) differ according to time zone. Beginning with August 1981 data, 24 observations per day were again digitized for most active stations.

Through the years approximately 1,500 principal stations have recorded observations in this program. In 1984 there were just more than 370 active stations being processed for inclusion in the digital data base. In 1998, there were just more than 320 active stations being processed. Surface airways hourly data were initially transferred to punch cards beginning in the late 1940's to facilitate summarizing climatological data. The late 1960s saw the transfer of punched cards to magnetic tape. These TD-14 formats represented the digital file through 1983. During 1983, an element file structure was developed and processing of airways hourly data was revised. This processing system became operational January 1984. Data are currently processed utilizing the element file structure. The conversions of historical data included gross data checks on the TD-1440 data file. No edited values were derived during the historical conversion but undecodable data were flagged.

Due to many special projects performed at NCDC and other Centers, 24 hourly observations may have been keyed for varying periods of time for selected stations. Inventories must be consulted to determine the exact period of record for each station. Beginning with the data for January 1984, the surface airways hourly observations were processed through a completely revised system. Relying heavily on new computer editing procedures, data are subjected to internal consistency checks, compared against climatological limits.

Station Data Time Averaging

Prior to the implementation of ASOS, conventional observations were generally instantaneous and collected by a human observer during the ten minutes prior to the hour. Cloud data, visibility, present weather, and freezing rain were estimated and noted at the time of observation. Temperature and dew points were read from a dial or analog chart record. Pressure was read from a dial or scale on the mercurial barometer and precipitation was manually measured at the gauge each hour. Wind data were estimated by viewing a dial for one minute and estimating the average speed and direction during that time.

ASOS is designed to collect data continuously. Hourly observations

are computed from data accumulations over the following time periods prior to the report:

Cloud Height	30 minutes
Cloud Amount	60 minutes
Visibility	10 minutes
Present Weather	10 minutes
Freezing Rain	15 minutes
Temperature/Dew Point	5 minutes
Wind	2 minutes
Pressure	1 minute
Precipitation Accumulation	60 minutes

Station Observation Schedule

Historically the time of observation (hour) archived is that of the record observation, taken within 10 minutes prior to the hour (e.g., 1355 keyed 1400). Prior to June 1957, observations were taken within 10 minutes prior to the half hour; minutes are disregarded in punching (e.g., 0222 punched 02 and now archived 0200; 1428 punched 14 and now archived 1400). All "War Times" and "Standard Meridian Times" were converted to Local Standard Time before punching. For Air Force stations in the United States, the times were punched in accordance with the established time zones. Time entries for Air Force stations outside the United States were edited prior to punching and, where necessary, converted to the Local Standard Time of the nearest meridian evenly divisible by 15 degrees.