	APPLING	APPLING 2NW	AUGUSTA DANIEL FIELD	AUGUSTA BUSH FIELD
Maximum Temperature (degF)	104	106	104	108
	6/30/1959	7/14/1980	6/27/1950	8/21/1983
Minimum Temperature (degF)	6	-4	11	-1
	12/3/1960	1/21/1985	11/25/1950	1/21/1985
Maximum 24-hr Rainfall (in.)	4	**9.5**	3.63	**7.3**
	3/30/1960	10/12/1990	7/6/1950	9/3/1998
Maximum Monthly Rainfall (in.)	8.64	**14.92**	12.16	**14.82**
	Sep-59	Oct, 1990	Jul-50	Oct-90
Minimum Monthly Rainfall (in.)	****	0.05	****	0.02
		Sep-84		Oct-98
Maximum 24-hr Snowfall (in.)	****	****	****	8
				2/9/1973
Maximum Monthly Snowfall (in.)	3	10	0	14
	Mar-60	Feb-73	Jan-50	Feb-73
Maximum Daily Snow Depth (in.)	2	10	0	13
	2/11/1960	2/11/1973	1/1/1950	2/11/1973

The staff reproduced the applicant's Table 2.3-3 using NCDC data and Southeast Regional Climate Center (SERCC) data

*** Note - Rainfall extremes due to tropical systems are shaded**

AUGUSTA(WSO)	LOUISVILLE 1 E	MIDVILLE	MIDVILLE EXP STA	MILLEN 4 N	NEWINGTON
108	112	103	105	109	110
8/21/1983	7/24/1952	6/28/1998	7/21/1986	7/24/1952	7/13/1980
-1	-2	22	-1	0	-1
1/21/1985	1/21/1985	11/18/1997	1/21/1985	1/21/1985	1/21/1985
7.3	**8.6**	**7.59**	**8.19**	**8.02**	5.5
9/3/1998	10/12/1990	10/12/1990	10/12/1990	8/29/1964	10/10/1990
14.82	**22.16**	15.2	**14.22**	**13.45**	15.29
Oct-90	Oct-90	Aug-70	Oct-90	Aug-64	Jul-89
0	0.09	0	0.04	0	0
Oct-53	Oct-87	Oct-61	10/10/1974	Oct-61	Nov-91
8	14.8	****	15.97	14	5
2/9/1973	2/10/1973		8/1/1970	2/10/1973	2/10/1973
14	14.8	10	14	15	8
Feb-73	Feb-73	Feb-73	Feb-73	Feb-68	Feb-73
13	3	3	0	0	8
2/11/1973	1/4/2004	2/24/1968	1/1/2006	1/1/1998	2/11/1973

ROCKY FORD 4 SE	SYLVANIA 2 SSE	WAYNESBORO 2 S	ALLENDALE 2 NW	BAMBERG
103	103	108	106	109
7/20/2000	7/21/2000	7/14/1980	7/12/2000	7/24/1952
14	14	-1	-2	2
1/24/2003	1/25/2005	1/21/1985	1/21/1985	1/21/1985
4.02	5.1	7.4	8	**8.02**
8/6/2003	10/7/2005	10/3/1994	6/27/1993	9/23/2000
12.22	15.13	16.99	12.58	**15.26**
Jun-04	Aug-95	Oct-94	Aug-91	Aug-95
****	****	0	****	0
		Nov-91		Oct-00
****	****	16	****	19
		2/10/1973		2/10/1973
0	0	16	3	22
Jan-06	Jan-06	Feb-73	Feb-89	Feb-73
0	0	2	0	19
1/1/2006	1/1/2006	2/10/1967	1/1/2006	2/10/1973

BLACKVILLE 3 W	HAMPTON 1S	AIKEN 5SE	CLARKS HILL 1 W	TRENTON 1 NNE	Springfield, SC
108	107	109	109	107	NA
8/1/1999	7/13/1980	8/22/1983	7/29/1987	7/12/1930	
-1	1	-4	-2	8	NA
1/21/1985	1/21/1985	1/21/1985	1/21/1985	1/26/1940	
7.53	6.75	9.68	**9.4**	**3.65**	**7.1**
9/30/1959	9/1/1969	4/16/1969	10/12/1990	10/8/1946	9/30/1959
14.67	13.8	14.45	**15.09**	9.65	17.32
Oct-90	Jun-73	Mar-80	Oct-90	Jul-41	Jun-73
0.02	0.02	0	0.04	0	****
Oct-78	Oct-00	Jul-80	Oct-53	Oct-53	
17	8	15	****	****	8
2/10/1973	2/10/1973	2/10/1973			2/11/1973
17	11	15	8	2.5	15
Feb-73	Feb-73	Feb-73	Feb-89	Sep-32	Feb-73
4	3	4	8	0	****
2/24/1968	12/24/1989	2/19/1979	2/24/1989	1/1/1957	

SITE EXTREMES	Station
112	LOUISVILLE 1 E
-4	AIKEN 5SE
9.68	AIKEN 5SE
22.16	LOUISVILLE 1 E
0	MULTIPLE
19	BAMBERG
22	BAMBERG
19	BAMBERG

National Climatic Data Center

DATA DOCUMENTATION

FOR

DATA SET 3200 (DSI-3200)

SURFACE LAND DAILY COOPERATIVE SUMMARY OF THE DAY

June 2, 2006

National Climatic Data Center
151 Patton Ave.
Asheville, NC 28801-5001 USA

Table of Contents

1. **Abstract**: This data set has been used in countless climatological studies, legal litigations, insurance claims, and various other research applications. It contains various parameters consisting of the previous days maximum and minimum temperatures, snowfall, and 24-hour precipitation totals that are initially obtained from state universities, state cooperatives, and the National Weather Service. Currently, there are approximately 8,000 active stations, known as cooperative observing stations with cooperative observers, but data are in these files for approximately 23,000 stations for various years. Selected Summary of the Day data from related file DSI-3210 for National Weather Service "first order" or principal climatological stations and "second order" stations have been merged into this file. Therefore, users must be aware that if an element in DSI-3210 was flagged as suspicious or in error and an estimated value is included, the estimated value is entered into DSI-3200 as an "original" value. If a user needs the true original value, it must be retrieved from DSI-3210.

The period of record and number of stations varies among the states. Most states began collecting data during 1948, but some began in 1946. Prior to 1948, most of these data were collected through cooperative agreements with state universities and other state organizations. Many years of records were digitized with some going as far back as the 1850s. It must be noted that NCDC has the observations from the time the station opened, but the NWS has the current data. Official surface weather observation standards can be found in the Federal Meteorological Handbook.

Stations

The DSI-3200 database is comprised primarily of stations in the National Weather Service (NWS) cooperative station network. The vast majority of the observers are volunteers (non-paid, private individuals). However, the cooperative network also includes the NWS principal climatological stations, which are operated by highly trained observers. The NWS cooperative station network also includes stations that are supported by other federal agencies (e.g., the Department of Interior and Department of Transportation). Commonly the observers at these stations are employees of the Federal Aviation Administration (FAA), National Park Service (NPS), Bureau of Land Management (BLM), U.S. Forest Service (USFC), U.S. Geological Survey (USGS), and Tennessee Valley Authority (TVA). A handful of stations in the DSI-3200 database are stations of the U.S. Department of Defense (DoD) (e.g., Air Force and Navy bases).

The observing equipment used at all of the stations, whether at volunteer sites or federal installations, are calibrated and maintained by NWS field representatives, Cooperative Program Managers (CPMs) and Hydro-Meteorological Technicians (HMTs).

Years ago, stations were selected according to a grid plan. Today stations are selected if another station closes or a different requirement exists for a specific area. When a previously established station closes, a new station compatible to it is established within 5 miles when possible. There are no specifics for distribution of stations, other than an attempt to give a reasonable sampling of the entire region. Currently there are approximately 8,000 active stations in the data set. Historically, approximately 23,000 stations are included for various years.

Elevations for fixed surface locations for the data set are mostly below 1,000 meters above sea level. The minimum elevation is -30 meters and the maximum is 3,000 meters.

The accuracy of the maximum-minimum temperature system (MMTS) is +/- 0.5 degrees C, and the temperature is displayed to the nearest 0.1 degree F. The observer records the values to the nearest whole degree F. A Cooperative Program Manager calibrates the MMTS sensor annually against a specially-maintained reference instrument.

Observations

The primary intent of the cooperative observing program today is the recording of 24-hour precipitation amounts, but about 55% of the stations also record maximum and minimum temperatures. These observations are for the 24-hour period ending at the time of observation and might be called Summary of the Day observations.

The vast majority of observation times are near either 7:00 a.m. or 7:00 p.m. local time. Principal climatological stations are usually fully instrumented, and therefore record a more complete range of meteorological parameters than other stations. These observations are usually for the 24-hour period midnight to midnight. Observation times do vary however, because of special program needs, and because many of the observers are unpaid volunteers with their own scheduling needs. Ideally, all observations should be taken at the same time, but it not possible to establish and enforce such requirements. The next best thing is to have adequate and accurate information about the observing practices at each station. Even this is an elusive target. Volunteer observers occasionally change their observing schedule without notifying either the NWS or NCDC. In some instances precipitation observations are taken in the morning and temperature observations in the evening, or vice versa. It must be noted that all observations for precipitation amount and temperature max and min are from the previous 24 hour period. Users should also be aware of a potential for a time lapse between a change of observation times at the observing site and the first appearance of the time change in NCDC records (that is, several months may be archived under an "old" observation time before NCDC received notification).

The DSI-3200 data itself contains certain observation-time aberrations: Observations through June 1967 originally carried only the designation "AM" or "PM"; these were later set to 06 or 18 respectively. (The actual hour is shown in the Climatological Data bulletin.) From July 1967 through December 1981, all observation times are shown as 18 (and in fact the majority are p.m. observations. Users must take these facts into consideration. From January 1982 onward, the official time of observation is carried with the data.

2. Element Names and Definitions: DSI-3200 data are archived in a variable length element file structure. The element file structure is designed to allow maximum flexibility in requesting data. Only those elements or groups of elements of particular interest need be ordered.

A DSI-3200 record contains one month of daily data of one data type for one weather station. The record consists of two distinct portions:

The first portion, consisting of the first 30 characters of the record, is the ID section. The second portion, consisting of the rest of the record, is the data. These portions are discussed in more detail below.

In general, there is only one record with a particular station, data type, year and month. Exceptions are the soil temperature data types and the "days with weather" data type, in which there may be multiple records.

The record format lends itself to variable-length records, and that is one way the user may receive it. Data may also be received in a fixed length record structure. Data may also be received in a fixed length record structure described below.

a. COBOL Data Description (1 example)
b. FORTRAN Data Descriptions (2 examples)
c. Control Language Notes
d. List of Variables ("Elements") (Described below)
e. Schematic Variable Length Record Format Layout (Described below)

List of Variables

ELEMENT		WIDTH	POSITION	
001	RECORD TYPE (= DLY)	3	001-003	--
002	STATION ID	8	004-011	|
003	METEOROLOGICAL ELEMENT TYPE	4	012-015	|
004	MET. ELEMENT MEASUREMENT UNITS CODE	2	016-017	-- ID
005	YEAR	4	018-021	| PORTION
006	MONTH	2	022-023	|
007	FILLER (= 9999)	4	024-027	|
008	NUMBER OF DATA PORTIONS THAT FOLLOW	3	028-030	--
009	DAY OF MONTH	2	031-032	--
010	HOUR OF OBSERVATION	2	033-034	|
011	SIGN OF METEOROLOGICAL ELEMENT VALUE	1	035	-- DATA
	VALUE OF METEOROLOGICAL ELEMENT	5	036-040	| PORTION
	QUALITY CONTROL FLAG 1	1	041	|
	QUALITY CONTROL FLAG 2	1	042	--
	DATA GROUPS IN THE SAME FORM AS ELEMENT	12	043-054	DATA PORT.
	POSITIONS 31-42 REPEATED AS MANY	12	055-066	DATA PORT.
	TIMES AS NEEDED TO CONTAIN ONE MONTH	12	067-078	DATA PORT.
	OF RECORDS.	.....	.....	
608		12	1219-1230	DATA PORT.

Format (Variable Length Record Layout)

1. The first eight elements (positions 001-030) constitute the ID PORTION of the record and describe the characteristics of the entire record. The next six elements, the DATA PORTION of the record contains information about each meteorological element value reported. This portion is repeated for as many values as occur in the monthly record.

2. Each logical record is of variable length with a maximum of 774 characters. (In the FORTRAN and COBOL examples, a larger number of characters may be allowed for.) Each logical record contains a station's data for a

specific meteorological element over a one month interval. The form of a record is:

ID PORTION (30 Characters) Fixed length

REC TYP	STATION ID	ELEM TYPE	UNT	YEAR	MO	FILL	NUM VAL >
XXX	XXXXXXXX	XXXX	XX	XXXX	XX	XXXX	XXX >

ELEMENTS 001 002 003 004 005 006 007 008

DATA PORTION (12 Characters, repeated "NUM-VAL" times--up to 100)

DY	HR	MET. ELEM	FL 1	FL 2	DY	HR	MET. ELEM	FL 1	FL 2 >
			DATA					DATA	
		S	VALUE				S	VALUE	
XX	XX	X	XXXXX	X	X	XX	XX	X	XXXXX	X	X >

ELEMENTS 009 010 011 012 013 014 015 016 017 018 019 020

DY	HR	MET. ELEM	FL 1	FL 2 *
			DATA	
		S	VALUE	
XX	XX	X	XXXXX	X	X *

ELEMENTS 603 604 605 606 607 608

3. The Number of Data Portions (position 008) for the logical record of type "DLY" ranges from 1 to 62.

In addition to a variable length record structure, users may also receive data in a fixed length record structure. However, the user must specify whether to extract either the original or edited data values. Supplied data are in the same sort as archived data.

Provided within this section are information and examples of how to access the fixed length data records, specifically:

a. COBOL Data Description
b. FORTRAN Data Description
c. List of Variables ("Elements")
d. Schematic Fixed Length Record Format Layout

The type of meteorological elements stored in this record and range of values are listed below.

DYSW - The different types of weather occurring that day (reference Table "C"; See topic 46 "Data Quality: Confidence Factors").

EVAP - Daily evaporation (not reported when temperature below freezing). Unit Measurement, Inches & Hundredths of Inches.

MNPN - Daily minimum temperature of water in an evaporation pan (effective September 1963). Unit Measurement, Whole Degrees Fahrenheit.

MXPN - Daily maximum temperature of water in an evaporation pan (effective September 1963). Unit Measurement, Whole Degrees Fahrenheit.

PRCP - Daily precipitation. (Precipitation reading for 24 hours ending at time of observation. Trace is less than 0.005 inch. Unit Measurement, Inches to Hundredths.

SNOW - Daily Snowfall (Snowfall includes sleet). Amount is for 24-hour period ending at observation time. Hail was included with snowfall from July 1948 through December 1955. Hail occurring alone was not included with either snowfall or snow depth before and after that period. Trace is less than 0.05 inch. Unit Measurement, Inches to Tenths.

SNWD - Snow depth at observation time. (Snow depth is depth of snow on the ground at time of observation. Trace is depth less than 0.5 inch.) Unit Measurement, Whole Inches.

TMAX - Daily maximum temperature. (Maximum temperature reading for 24 hours ending at time of observation.) Unit Measurement, Whole Degrees Fahrenheit.

TMIN - Daily minimum temperature. (Minimum temperature reading for 24 hours ending at time of observation.) Unit Measurement, Whole Degrees Fahrenheit.

TOBS - Temperature at observation time. Unit Measurement, Whole Degrees Fahrenheit.

WDMV - 24-hour wind movement. Unit Measurement, Whole Miles.

WTEQ - Water equivalent of snow depth. (For principal stations only. Effective October 1963 for snow depth equal or greater than 2 inches). Unit Measurement, Inches to Tenths.

SNyz - Daily minimum soil temperature (see note below). Unit Measurement, whole degrees Fahrenheit.

SOyz - Soil temperature at observation time (see note below). Unit Measurement, whole degrees Fahrenheit.

SXyz - Daily maximum soil temperature (see note below). Unit Measurement, whole degrees Fahrenheit.

Soils Note 1: Even though TD-3200 is daily data, many cases of two or more soil temperature measurements per day, at different times, can be found.

Soils Note 2: Positions "y" and "z" of the soil temperatures are encoded using reference Table "D", e.g., SN12 indicates that the daily minimum soil temperatures that follow are measured in an area covered with grass and at a depth of four inches or 10 centimeters.

METEOROLOGICAL ELEMENT MEASUREMENT UNITS CODE - The units and decimal position (precision) of the data value for this record (reference Table "E"). See topic "Known Uncorrected Problems" for additional details.

YEAR - This is the year of the record. Range of values is 1850-current year processed.

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

FILLER - Filler value is 9999.

NUMBER OF DATA PORTIONS THAT FOLLOW
The number of data values in this record. Range of values is 01-62.

NOTE: A record may contain fewer or more data values than you might expect.

A maximum of two DATA PORTIONS are used for each day of the month so as to allow one original data value and one edited data value. At most, 62 data values may be contained in any given record (e.g., 30 + (62 x 12) = 774 characters). Thus, while a maximum of 1,230 characters has been assigned in some of the program examples, no more than 774 characters will be used for the daily data record types.

If a particular data value was not taken or is unavailable, there is no entry for it. For meteorological elements observed once a day, if all the daily observations of a given month are received and pass QC checks, there will be one DATA PORTION for each day. And, if every value failed the quality control, there may be two DATA PORTIONS for every day of that month. When two DATA PORTIONS for a daily record are encountered (with the exception of DYSW), one finds that the original data values are flagged and the second DATA PORTION is the best available replacement. (See code definitions for the Flag 2 element).

DAY OF MONTH - Contains the day of the month on which an observation was made. Range of values is 01-31.

HOUR OF OBSERVATION - Contains the hour of the daily observation. Hour of observation is reported using the 24-hour clock with values ranging from 00-23 LST, except in the cases of soil temperatures element-type (where the hour is 99 to indicate missing) and "days with weather" (where the hour is 24). Through June 1967 observations were designated as "AM" or "PM"; these values were set to 06 or 18 respectively during a conversion of earlier data to DSI-3200. From July 1967 through 1981, all observations were set to hour 18 (because the majority are p.m. observations). Beginning January 1982, the actual hour of the observation is available and is indicated.

SIGN OF METEOROLOGICAL VALUE - The algebraic sign of the meteorological data value is given as either a blank or a minus sign (-). Blank indicates a positive value and a minus sign represents a negative value.

VALUE OF METEOROLOGICAL ELEMENT - The actual data value is given as a five-digit integer. One major exception does exist however, for the DYSW (days with weather code) element-type values as explained in Table "C".

NOTE: For fixed length records only - when a data value is missing, the sign of the data value is set to "-", the data value is set to "99999", flag position 1 is set to "M" and flag position 2 is blank. For variable-length records, the minus sign is omitted for any such values.

A special case of missing data occurs in the precipitation data types when, for one or more days, the observer made no measurements. On a later day, the observer resumed measurements. The first new measurement showed the accumulated total of precipitation during all of the missing days. This case is represented in TD-3200 data by observations for two days: The first day is the first on which no measurement was made. It has a data value of "99999" (missing) and has "S" in flag 1. The second day is the day of the first new measurement. The data value of the second day is the accumulated total and has "A" or "B" in flag 1.

FLAG1 - The Data Measurement FLAG (reference Table "F").

FLAG2 - The Data Quality FLAG (reference Table "G").

TABLE "A"

State-Code Table

01 Alabama	28 New Jersey
02 Arizona	29 New Mexico
03 Arkansas	30 New York
04 California	31 North Carolina
05 Colorado	32 North Dakota
06 Connecticut	33 Ohio
07 Delaware	34 Oklahoma
08 Florida	35 Oregon
09 Georgia	36 Pennsylvania
10 Idaho	37 Rhode Island
11 Illinois	38 South Carolina
12 Indiana	39 South Dakota
13 Iowa	40 Tennessee
14 Kansas	41 Texas
15 Kentucky	42 Utah
16 Louisiana	43 Vermont
17 Maine	44 Virginia
18 Maryland	45 Washington
19 Massachusetts	46 West Virginia
20 Michigan	47 Wisconsin
21 Minnesota	48 Wyoming
22 Mississippi	49 Not Used
23 Missouri	50 Alaska
24 Montana	51 Hawaii
25 Nebraska	66 Puerto Rico
26 Nevada	67 Virgin Islands
27 New Hampshire	91 Pacific Islands

TABLE "B"

Cooperative Network Division Table

NOTE: The division number for a station may change over time.

HAWAII (STATE 51)

ISLAND NAME	DIVISION
Kauai	01
Oahu	02
Molokai	03
Lanai	04
Maui	05
Hawaii	06

PACIFIC ISLANDS (STATE 91)

Division:

02 - East of 180th Meridian - Phoenix Islands, Line Islands, American Samoa
03 - Western Pacific Islands, North of 12N

TABLE "C"

DYSW - Daily Occurrence of Weather Tables

POR = Period of Record.
00 - Day of no occurrence
01 - Day with smoke or haze (POR through 1963 and 1982 to Present
02 - Day with fog (POR through 1963 and 1982 to Present)
04 - Day with drizzle (POR through 1963 and 1982 to Present)
05 - Day with ice pellets (sleet)
06 - Day with glaze
07 - Day with thunder
08 - Day with hail
09 - Day with dust or sand storm (POR through 1963 and 1982 to Present)
10 - Day with blowing snow
11 - Day with high wind (POR through 1963 and 1982 to Present)
12 - Day with tornado (POR through 1963 and 1982 to Present)
13 - Day with rain (1982 to Present)
14 - Day with snow (1982 to Present)

Note: These two-character DYSW element-type codes are stored into the rightmost four characters of the data value portion of the meteorological element. The leftmost character is always zero (0). Within the four characters used, the weather codes are entered left justified. Thus, if one type of weather occurs during a day, the data values would appear as OXXOO, where XX is the appropriate weather code. If two types of weather occur, the data value will contain OXXYY, where XX is the first code and YY is the second. If more than two types of weather occur on the same day, they will be stored into additional records of the element-type code "DYSW" as needed.

TABLE "D"

Soil Temperature Table

(y = Code for soil cover) (z = Code for soil depth)

Code	Cover	Code	Depth (inches)	Depth (cm)
y=1	Grass			
2	Fallow	z = 1	2	5
3	Bare ground	2	4	10
4	Brome grass	3	8	20
5	Sod			
6	Straw mulch	4	20	50
7	Grass muck	5	40	100
8	Bare muck	6	60	150

			7	72	180
0	Unknown		0	Unknown	Unknown

NOTE: Soil records are kept since 1982. Some stations may report soil temperatures at observation time twice a day. Separate records will occur for both observation times. The 60 and 72 inch soil depths are effective with the January 2006 data month.

TABLE "E"

Units of Measurement Table

Range of values where b = Blank:

bF	Whole degrees Fahrenheit (right justified
HI	Hundredths of inches
bI	Whole inches (right justified)
bM	Whole miles (right justified)
NA	No units applicable (nondimensional)
TI	Tenths of inches

TABLE "F"

Data Measurement Flag 1

A -	Accumulated amount since last measurement.
B -	Accumulated amount includes estimated values (since last measurement).
E -	Estimated (see Table "G" for estimating method).
J -	Value has been manually validated.
M -	For fixed length records only. Flag1 is "M" if the data value is missing. In this case, the sign of the meteorological value is assigned "-" and the value of the meteorological element is assigned "99999".
S -	Included in a subsequent value. (data value = "00000" OR "99999").
T -	Trace (data value = 00000 for a trace).
(-	Expert system edited value, not validated.
) -	Expert system approved edited value.
Blank -	Flag not needed.

Notes:

An original observation that is followed by an edited observation is indicated by "2" in Flag 2.

Flag 1 values of "S" and "A" occur in pairs (i.e. a daily value will have "S" in Flag 1 and the next daily value will have "A" or "B" in Flag 1). These flags have traditionally been associated with PRCP and SNOW data, but can ccur in any of the data types in which the data may be cumulative from day to day

TABLE "G"

Data Quality Flag 2

0 - Valid data element.
1 - Valid data element (from "unknown" source, pre-1982).
2 - Invalid data element (subsequent value replaces original value).
3 - Invalid data element (no replacement value follows).
4 - Validity unknown (not checked).
5 - Original non-numeric data value has been replaced by its deciphered numeric value.
A - Substituted TOBS for TMAX or TMIN.
B^- Time shifted value.^
C - Precipitation estimated from snowfall.
D - Transposed digits.
E - Changed units.
F - Adjusted TMAX or TMIN by a multiple of + or -10 degrees.
G - Changed algebraic sign.
H - Moved decimal point.
I - Rescaling other than F, G, or H.
J - Subjectively derived value.
K - Extracted from an accumulated value.
L - Switched TMAX and/or TMIN.
M - Switched TOBS with TMAX or TMIN.
N+- Substitution of "3 nearest station mean".+
O - Switched snow and precipitation data value.
P - Added snowfall to snow depth.
Q - Switched snowfall and snow depth.
R - Precipitation not reported; estimated as "O".
S*- Manually edited value.
T - Failed internal consistency check.
U - Failed areal consistency check (beginning Oct. 1992).
V - Replacement value based on TempVal QC process (beginning Feb. 2006).

* Manually edited value could be derived by any procedure - Procedure unspecified.

+ Starting with the January 2002 data month, the "3 nearest station mean" value is derived by NCDC's spatial quality control algorithm named TempVal. This value is based on ASOS/AWOS/CRN grids summarized for each reader group, AM (at 0800), PM (at 1600), and Midnight (at 2400). Starting with the August 2004 data month, the ASOS/AWOS/CRN grids are based on hourly temperature values. The use of the hourly grids allows the quality control algorithm to compare COOP grids properly with the ASOS/AWOS/CRN grids based upon the observer's reported observation time. Starting with the Feb 2006 data month, TempVal edits will use the 'V' flag.

^ Beginning with the January 2003 data month, the TempVal algorithm began to detect shifters. Some shifters may be manually detected.

3. **Start Date**: Data from 1948 onward comprise the bulk of the data set. This is when punch cards were used to help summarize climatological data. Data from earlier periods were placed upon punch cards as a result of various agreements with state universities.

Meteorological Element-Type

Daily Temperature	1850
Daily Precipitation	1862
Daily Evaporation	1951
Soil Data	1982

4. **Stop Date**: Ongoing.

5. **Coverage**: the USA, Alaska, Hawaii, US Pacific Islands, Puerto Rico and the US Virgin Islands

a. Southernmost Latitude	15S
b. Northernmost Latitude	75N
c. Westernmost Longitude	130E
d. Easternmost Longitude	60W

6. **How to Order Data**:

Ask NCDC•s Climate Services about the cost of obtaining this data set.
Phone: 828-271-4800
FAX: 828-271-4876
e-mail: **NCDC.Orders@noaa.gov**

7. **Archiving Data Center**:

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001
Phone: (828) 271-4800.

8. **Technical Contact**:

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001
Phone: (828) 271-4800.

9. **Known Uncorrected Problems**: Users should also be aware of a potential for a "lag" in the change of observation times used in the logical record and what is actually in practice at the site (that is, several months may be archived digitally under an "old" observation time before NCDC received notification).

10. **Quality Statement**: These data have received a high measure of quality control through computer and manual edits. These data are subjected to internal consistency checks, compared against climatological limits, checked serially, and evaluated against surrounding stations. Quality control "flags" are appended to each element value to show how they fared during the edit procedures and to indicate what, if any, action was taken. The historical data prior to 1982 were converted from existing files then placed in the element file structure format after being processed only through a gross value check. In November 1993 the entire historical period of record was processed through a stringent quality control. Another round of quality control in November 2000 increased the data set's quality still more.

The DYSW ▪days with weather• element data, which is fair to poor, depending on the station, cannot be used with any measure of confidence. Principal climatological stations operating 24 hours a day are expected to be the most reliable source of "days with weather". Reporting of this element by cooperative observers is not a requirement and criteria for reporting is not definitive. Most stations do not record this information.

11. Essential Companion Datasets: DSI-3200 requires use of NCDC's in-house Station History file.

12. References:

National Weather Service, 1987: Cooperative Program Management, Weather Service Operations Manual B-17 (revised), NOAA-NWS, Silver Springs, MD.

Reek T., S. R. Doty, and T. Owen, 1991: ValHiDD Documentation and Users Guide, Internal NCDC document, 20 pp.

APPENDIX A:

Program 3200fix_1.c

```
/*

WHAT THIS PROGRAM DOES:

This program is the first of two that make corrections to NCDC DSI-3200 data.
The program itself is generic "C".

COMPILE AND RUN INSTRUCTIONS:

The source code file is "3200fix_1.c".

A suggested compile command for the SUN Solaris UNIX environment is

cc -O -o 3200fix_1 3200fix_1 -lm

(-O and -o are upper- and lower-case letters.)  This command creates an
optimized program named "3200fix_1".

To run the program:  Place all input files in one directory.  Make that
directory the current directory.  Then type in

<path>3200fix_1

where <path> is the location of the program.  <Path> can be omitted if the
program is located in the current (input files) directory.

DETAILS:

Five types of files are involved in running this program.  All but (1) are
ASCII text.

(1) The program itself, "3200fix_1".
(2) DSI-3200 input files (in NCDC's standard element format for DSI-3200).
```

:
:

(3) One output data file per input file.
(4) One output file that is a summary log of changes.
(5) One output file that is a detailed log of changes.

Referring to (2): "3200fix_1" will attempt to open, as input files, all ASCII files in the current directory whose names do NOT contain any periods (.). Files that are directories or programs will be ignored, regardless of name. Records may be fixed or variable length; it makes no difference.

Referring to (3): One output file is created for each input file. Each output file name is the same as the input file name, except that the extension ".nd" is appended. Output files are variable length ASCII.

Referring to (4): One summary log file named "3200log.summary1" is created. The file shows the number of records read, deleted, modified, swapped and output for each input file and station.

Referring to (5): One detailed log file named "3200log.details1" is created. It shows each modified record before and after the changes. For deleted records, it shows the record before deletion. Because it contains record images, it is variable length ASCII like (3).

OTHER PROGRAM INFORMATION:

Functions appear in alphanumeric order in the "Function Prototypes" section.

Variable names try to suggest what the variable represents. But names longer than a dozen characters are rare and local work variable names are usually quite short, often 1 or 2 characters. (The author's prejudice is that overly long variable names are more clumsy than helpful.)

Variable names are composed of some combination of letters, underscores, and numbers. Underscores and numbers may occur in any name. Letters occur in all names. Letter case is used to indicate the type of variable.

a. All letters are upper case in global definition names and macro names.

b. An upper case 'G' is always the first character of a global variable name. Other letters are always lower case.

c. All letters in function names and in names of local variables are lower case.

A few words about pointers and copy-overwrites, methods heavily used in this program, can be found at the end of this file.

APPENDIX B:

Program 3200fix_2.c
/*

WHAT THIS PROGRAM DOES:

:
:
:

This program is the second of two that make corrections to NCDC TD-3200 data. The program itself is generic "C".

COMPILE AND RUN INSTRUCTIONS:

The source code file is "3200fix_2.c".

A suggested compile command for the SUN Solaris UNIX environment is

cc -O -o 3200fix_2 3200fix_2 -lm

(-O and -o are upper- and lower-case letters.) This command creates an optimized program named "3200fix_2".

To run the program: Place all input files in one directory. Make that directory the current directory. Then type in

<path>3200fix_2

where <path> is the location of the program. <Path> can be omitted if the program is located in the current (input files) directory.

DETAILS:

Five types of files are involved in running this program. All but (1) are ASCII text.

(1) The program itself, "3200fix_2".
(2) DSI-3200 input files (in NCDC's standard element format for DSI-3200).
(3) One output data file per input file.
(4) One output file that is a summary log of changes.
(5) One output file that is a detailed log of changes.

Referring to (2), input file names must be of the form "*.nd" where "*" is any group of characters that make a legal file name in your computer's operating system. The extension ".nd" is required.

Referring to (3), an output file is created for each input file. Each output file name is the same as the input file name, except the extension is ".nd2". Output files contain variable-length records.

Referring to (4), one summary log file named "3200log.summary2" is created. It shows the number of records read, deleted, modified, and output for each input file and station.

Referring to (5), one detailed log file named "3200log.details2" is created. It shows each modified record before and after the changes. For deleted records, the original record is shown. Records with no changes do not appear in this log file.

OTHER USEFUL INFORMATION:

Function prototypes appear in alphanumeric order in the "Function Prototypes" section.

Functions appear in the following order in the code itself:
(1) "Main()".
(2) Specialized functions in alphanumeric order.
(3) General-purpose functions in alphanumeric order.

The phrase "significant obs" or "significant observation" is often seen in the comments. The basic meaning of this is "an edited obs, or an original obs without an edited obs following". Conversely, a "non-significant obs" is "an original obs with an edited obs following". Sometimes, a "significant obs" must also not be error-flagged.

Variable names usually suggest what the variable represents. Names longer than a dozen characters are rare. Work/scratch variable names are usually quite short, often 1 letter.

Names are composed of letters, underscores, and numbers. Letter case is significant:

a. Global variable names always begin with an upper case letter, often a 'G'. Any other letters in the names are lower case.

b. Global definition names and macro names never contain lower case letters.

c. Ordinary variable names and function names never have upper case letters.

More about pointer arithmetic and character string copying:

One form of character string copying that is much used in this program is the copy-overwrite, in which pointer arithmetic is rampant. Typical are lines of code like

```
(1)  mystrcpy(a, a+12) ;
(2)  mystrcpy(a+12, a) ;
```

where "mystrcpy()" is a general-purpose function in this program. "a" and "a+12" are character addresses inside the same long character string, whose starting address is typically stored in some other variable that is not mentioned; "a+12" is 12 bytes to the right (toward higher addresses) of "a". "a-12" is 12 bytes to the left (toward lower addresses) of "a".

Code line (1) copies, to "a", the character substring that begins at "a+12" and ends after the long string's NULL character. In effect, the 12 bytes between "a" and "a+11" are lifted out of the long string and discarded; and the right end of the long string is slid to the left to fill the gap. The long string is 12 bytes shorter. This trick removes a 12-byte observation in a DSI-3200 record.

:
:

Code line (2) copies, to "a+12", the character substring that begins at "a" and ends after the long string's NULL character. In effect, the right end of the long string, starting at "a+12", is slid to the right, leaving a 12-byte gap; and the 12 bytes between "a" and "a+11" are duplicated in the gap. The long string is 12 bytes longer. A new 12-byte observation in a DSI-3200 record can be copied into the gap.

National Climatic Data Center

DATA DOCUMENTATION

FOR

DATA SET 3210 (DSI-3210)

Summary of the Day - First Order

May 4, 2005

National Climatic Data Center
151 Patton Ave.
Asheville, NC 28801-5001 USA

Table of Contents

1. **Abstract**: This Summary of the Day First Order data file contains daily selected elements of observations taken by certified observers. The stations are located worldwide and are operated by the National Weather Service (NWS), U.S. Air Force (Air Force Weather), U.S. Navy (Navy Weather Service), and the Federal Aviation Administration (FAA). A very small portion of this data dates back to 1890. Data from the late 1940's and onward comprise the bulk of this data set. These First Order Stations are usually fully instrumented and therefore record a complete range of meteorological parameters. The observations are generally recorded for the 24-HR period midnight to midnight.

Through the years, approximately 1,380 principle stations have recorded observations in the program. Stations have varying periods of record and varying types of data elements. In the early years of aviation most stations were located in major cities. As aviation became more sophisticated, stations shifted to airports. Areal coverage includes the contiguous United States, Caribbean Islands, Pacific Islands, and other overseas stations of the NWS, FAA, U.S. Navy, and U.S. Air Force.

Field elevations of fixed surface locations for the data set are mostly below 1,000 meters above sea level. The minimum elevation is 1 meter and the maximum is 2,300 meters.

The primary source of surface observational data in the United States is the Automated Surface Observing System (DS-3211). Users must be aware that this data set contains flagged data that have been quality controlled by personnel at the NCDC. DS-3211 contains only automated quality controlled data. The ASOS users guide covers all essential aspects of system operation, including data acquisition, processing, and report formatting and dissemination. Elements, such as soil data, not found in DS-3210 can be found in DS-3200.

It must be noted that NCDC has the observations from the time the station opened, but the NWS has the current data. Official surface weather observation standards can be found in the Federal Meteorological Handbook.

2. **Element Names and Definitions**:

The first ten tape fields, the ID PORTION of the record, describe the characteristics of the entire record, i.e., the record type, observing station, element type, element units, year/hour, and the meteorological daily data and flags. The DATA PORTION of the record contains information about each element value reported. This portion is repeated for as many values as occur in the monthly record.

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

List of Variables

Element	Width	Position
001 Record Type	3	001-003
002 Station ID	8	004-011
003 Meteorological Element Type	4	012-015
004 Met. Element Measurement Units Code	2	016-017
005 Year	4	018-021

006 Month	2	022-023
007 Source Code 1		024
008 Source Code 2	1	025
009 Reserved for Future Use	2	026-027
010 Number of Data Portion Groups That Follow	3	028-030
011 Day of Month	2	031-032
012 Hour of Observation	2	033-034
013 Sign of Meteorological Value	1	035
014 Value of Meteorological Element	5	036-040
015 Quality Control Flag 1		041
016 Quality Control Flag 2	1	042
(017-022) Data Groups in the Same	12	043-054
(023-028) Form as Tape Fields 011-	12	055-066
as Needed to Contain One Month of Record	12	067-078
(197-202)	12	1219-1230

RECORD TYPE
The type of data stored in this record. (Value is "DLY"). Each record contains one month of daily values.

STATION-ID
This eight-digit numeric identifier (WBAN STATION NUMBER) is assigned by the National Climatic Data Center. The first 3 digits are zero's. WBAN NUMBER is a 5 digit number formulated to designate the station. A list of stations with their coordinates, elevation and period of record is available upon request. Values range from 00000001 through 00099999.

METEOROLOGICAL ELEMENT-TYPE
The type of meteorological element stored in this record is given as a 4-Character alphanumeric acronym. The following list denotes the specific elements contained in TD-3210. To determine which units are used for each element-type you must read Tape Field 004 "Element-Units" (Reference Table "A").

ASMM
Average Cloudiness Midnight to Midnight (begin September 1992 for ASOS sites). This is the average of all available 30-second ceilometer data for the 24-hour period expressed in tenths of cloud cover at or below 12,000 feet. The DATA-VALUES are defined in Reference Table AD@.

ASSS
Average Cloudiness Sunrise to Sunset (begin September 1992 for ASOS sites). This is the average of all available 30-second ceilometer data for the period from sunrise to sunset expressed in tenths of cloud cover at or below 12,000 feet. The DATA-VALUES are defined in Reference Table AD@.

AWND
Average Daily Wind Speed (begin 1984). Units expressed in miles per hour to tenths. From January 1984 through June 1987 the Element Unit is incorrectly listed as TK (Tenths of Knots), it should be MH (Miles per Hour to tenths).

CLDG
Cooling Degree Day (begin 1984). Base 65 degrees Fahrenheit.

DPNT
Departure from Normal Temperature. DATA-VALUE = -00099 to b00099 degrees Fahrenheit.

DPTP
Average Daily Dew-Point Temperature (begin 1984). Units expressed in tenths of degrees Fahrenheit.

DYSW
Daily Occurrence of WEATHER. These two digit DYSW element codes are stored in the rightmost four digits of the VALUE portion of the DATA-VALUE field. Within the four digits used, the weather codes are entered left justified. Thus, if one type of weather occurs during a day the VALUE field would appear as OXXOO where XX is the appropriate weather code. If two types of weather occur the VALUE field will contain OXXYY where XX is value 1 and YY is value 2. If more than 2 types of weather occur on the same day, they will be stored in additional DYSW records as needed. (Reference Table "A1")

DYVC
Day with Weather in the Vicinity (begin July 1996). The present (or prevailing) weather occurring at the time of the observation in the vicinity of the station, between 5 and 10 statute miles of the point of observation.

NOTE: This element is used beginning July 1996 and is coded in the same manner as the element DYSW. See the description for DYSW for details. (Reference Table "A1")

F2MN
Fastest 2-minute Wind Direction and Speed (begin September 1992 for ASOS sites). Direction is expressed in tens of degree from true north. Speed is expressed in miles per hour. When two or more equal speeds have occurred, the most recent speed and direction are entered. Example of DATA-VALUE field XXYYY for wind direction and speed: 22048. Wind is from 220 degrees at 48 miles per hour.

F5SC
Fastest 5-second Wind Direction and Speed (begin September 1992 for ASOS sites). Direction is expressed in tens of degrees from true north. Speed is expressed in miles per hour. When two or more equal speeds have occurred, the most recent speed and direction are entered.

FMTM
Time of Fastest Mile or Fastest 1-minute Wind (begin 1984), or Fastest 2-minute Wind (begin September 1992). Units are expressed in hours and minutes.

FRGB
Base of Frozen Ground Layer. The depth below the surface of the ground at which frozen ground is last struck. Data available through 1964 only for designated stations. DATA-VALUE = b00000 to b00099 expressed in whole inches.

FRGT
Top of frozen ground layer - The depth below the surface of the ground at which frozen ground is first struck. Data available through 1964 only for designated stations. DATA-VALUE = b00000 to b00099 expressed in whole inches.

FRTH
Thickness of Frozen Ground Layer. Base value minus top value. Data available

through 1964 only for designated stations. DATA-VALUE = b00000 to b00099

FSIN
Highest Instantaneous Wind Direction and Speed. This is the highest gust or peak reached by the pen of the gust recorder during the 24 hour period. Direction is expressed in 16 Point WBAN Code (Reference Table "B1"). Speed generally expressed in miles per hour. When two or more equal wind speeds occur the most recent is archived.

FSMI
Fastest Mile Wind Direction and Speed. Recorded by stations having triple or multiple register type recording instruments. The speed of a mile of wind occurring in the shortest time is used. This is determined by measuring the jogs on the chart made by the one mile contacts of the anemometer. Direction is expressed in 16 Point WBAN Code. Speed expressed in miles per hour. Example of value field XXYYY for wind direction and speed: 18045; 18 = wind direction from 169 degrees to 191 degrees. 045 = wind speed 45 miles per hour. FSMI is not digitized for Air Weather Service stations. (Reference Table "B1")

FSMN
Fastest Observed One-minute Wind Direction and Speed. This is used at stations not equipped with recording instruments. It is obtained by observation of an indicator for one minute and using an average value. Direction is expressed in Tens of Degrees Code. Speed expressed in miles per hour. Example of value field XXYYY for wind direction and speed: 18045; 18 = wind direction from 169 degrees to 191 degrees. 045 = wind speed 45 miles per hour. FSMN is not digitized for Air Weather Service Stations. (Reference table "C")

GAHT
River Gauge Height - Below zero gauge readings. DATA-VALUE = negative values of b00000 to b00999, expressed to the nearest tenth of a foot.

HTDG
Heating Degree Days (begin 1984; however, several stations reported this element as early as 1961). Base 65 whole degrees Fahrenheit.

MNRH
Minimum Relative Humidity (through 1955). DATA-VALUE = b00000 to b00100, expressed in whole percent. (USAF stations through January 1958, NWS, FAA, and Navy stations through December 1964. Most stations restarted in 1984; some stations reported this element as early as 1961).

MNTP
Average Temperature (begin 1984). The value is the (Max Temp. + Min Temp.)/2, expressed in whole degrees Fahrenheit.

MXRH
Maximum Relative Humidity. DATA-VALUE = b00000 to b00100, expressed in whole percent. (USAF stations through June 1958, NWS, FAA, and Navy stations through December 1964. Most stations restarted in 1986.)

PGTM
Peak Gust Time or Maximum 5-second Wind Speed Time. Value = b00000 to b02359, expressed in hours and minutes. Example: 2359 = 23 hours and 59 minutes.

PKGS
Peak Gust Direction and Speed. If two or more equal peak gust speeds occurred

on the same day, the first was digitized for the period July 1968 through December 1972. Beginning in January 1973, the last was digitized. The direction is generally expressed in 16 Point WBAN Code, with the following exceptions:

(1) Air Force stations used 36 Point code from January 1964 through February 1967, 16 Point WBAN Code from March 1967 through June 1968, and 36 Point code again from July 1968 through December 1970. Air Force data was generally discontinued by December 1970.

(2) Navy stations used 16 Point WBAN Code from the beginning of record through January 1971, and 36 Point Code from February 1971 through the present.

Wind speeds are generally expressed in miles per hour through December 1954, and in knots from January 1955 to the present. A consistent exception is Navy stations, which used knots for the entire period of record. Example of value field XXYYY after 1954 for wind direction and speed: 44032; 44 = Wind direction from the SE. 032 = Wind speed 032 knots.

Beginning July 1996, wind direction is expressed in 32 Point WBAN Code (Reference Table "B2").

PRCP
Daily Precipitation. Rainfall and melted frozen precipitation are included. Trace is less than .005 inch. DATA-VALUE = b00000 to b99999 expressed in hundredths of inches.

PRES
Average Daily Station Pressure (begin 1984). Based on eight 3-hourly observations per day. Units expressed in thousandths of inches of Mercury.

PSUN
Daily Percent of Possible Sunshine (begin January 1965). Data Value = b00000 to b00100, expressed in percent.

RDIR
Resultant Wind Direction (begin 1984). DATA-VALUE expressed to the nearest whole degree code. From January 1984 through late 1994 the Meteorological Element Measurement units code is incorrectly recorded as DT (wind direction in tens of degrees). It should be DW (wind direction in whole degrees).

RWND
Resultant Wind Speed (begin 1984). DATA-VALUE is expressed in miles per hour to tenths. From January 1984 through June 1987, the Meteorological Element Measurement Units Code is incorrectly recorded as TK (tenths of knots) and incorrectly recorded as MH (miles per hour) from July 1987 through late 1994. It should be TL tenths of miles per hour.

SAMM
Average Cloudiness Midnight to Midnight - (begin September 1992 for ASOS sites). This is the average of all available 30-second ceilometer data for the 24-hour period expressed in oktas of cloud cover at or below 12,000 feet. The DATA-VALUES are defined in Reference Table AD1".

SASS
Average Cloudiness Sunrise to Sunset (begin September 1992 for ASOS sites).

This is the average of all available 30-second ceilometer data for the period from sunrise to sunset expressed in oktas of cloud cover at or below 12,000 feet. The DATA-VALUES are defined in Reference Table AD1".

SCMM
Average Sky Cover Midnight to Midnight (begin January 1965). Element not recorded at stations where personnel were not on duty 24 hours a day. See Elements ASMM and STMM for ASOS sites. DATA-VALUES are expressed in tenths and are defined in Reference Table "D".

SCSS
Average Sky Cover Sunrise to Sunset - (begin January 1965). DATA-VALUES are expressed in tenths and are defined in Reference Table "D". See Elements ASSS and STSS for ASOS sites.

SGMM
Average Cloudiness Midnight to Midnight (begin September 1992; end June 1996; derived from GOES satellite data). The areal coverage is approximately 50km by 50km centered on the ASOS site. DATA-VALUE is the average of all satellite scans of the site during the 24-hour period, expressed in oktas of cloud cover occurring above 12,000 feet. The DATA-VALUES are defined in Reference Table AD1".

SGSS
Average Cloudiness Sunrise to Sunset (begin September 1992; end June 1996; derived from GOES satellite data). The areal coverage is approximately 50km by 50km centered on the ASOS site. DATA-VALUE is the average of all satellite scans of the site during period from sunrise to sunset, expressed in oktas of cloud cover occurring above 12,000 feet. The DATA-VALUES are defined in Reference Table AD1".

SLVP
Average Daily Sea Level Pressure (begin 1984). DATA-VALUE expressed in tenths of millibars.

SMMM
Average Sky Cover Midnight to Midnight (begin January 1965). Element not recorded at stations where personnel were not on duty 24 hours a day. See Elements SAMM and SGMM for ASOS sites. DATA-VALUES are expressed in oktas and are defined in Reference Table "D1".

SMSS
Average Sky Cover Sunrise to Sunset - (begin January 1965) DATA-VALUES are expressed in oktas and are defined in Reference Table "D1". See Elements SASS and SGSS for ASOS sites.

SNOW
Daily Snowfall. Hail is included with snowfall from July 1948 to December 1955 and from May 1989 to the present. Effective April 1970, amount includes sleet/ice pellets. DATA-VALUE = b00000 to b99999 expressed in tenths of inches. Trace of snow is less than .05 inch.

SNWD
Snowdepth at Observation Time. Hail is included with snowfall from July 1948 to December 1955 and from May 1989 to the present. (Reference Table "E")

STMM

Average Cloudiness Midnight to Midnight (begin September 1992; end June 1996; derived from GOES satellite data). The areal coverage is approximately 50km by 50km centered on the ASOS site. DATA- VALUE is the average of all satellite scans of the site during the 24-hour period, expressed in tenths of cloud cover occurring above 12,000 feet.

STSS
Average Cloudiness Sunrise to Sunset (begin September 1992; end June 1996; derived from GOES satellite data). The areal coverage is approximately 50km by 50km centered on the ASOS site. DATA-VALUE is the average of all satellite scans of the site during period from sunrise to sunset, expressed in tenths of cloud cover occurring above 12,000 feet.

THIC
Thickness of Ice on Water. Measured each Monday at noon LST, or more frequently if ice conditions are changing rapidly. Data available through December 1964 only for designated stations. DATA-VALUE = b00000 to b00999, expressed in tenths of inches.

TMAX
Daily Maximum Temperature. DATA-VALUE = -00199 to b00199, expressed in whole degrees Fahrenheit.

TMIN
Daily Minimum Temperature. DATA-VALUE = -00199 to b00199, expressed in whole degrees Fahrenheit.

TMPW
Average Daily Wet-Bulb Temperature (begin 1984). DATA-VALUE = -00199 to b00199, expressed in whole degrees Fahrenheit.

TSUN
Daily Total Sunshine. DATA-VALUE = b00000 to b01440, expressed in minutes. (Reference Table "F")

WTEQ
Water Equivalent of Snow on the Ground (begin July 1952). Reported only when there are 2 inches or more of snow on the ground. Readings taken generally at 1800 GMT. DATA-VALUE expressed in hundredths of inches from 1952 through April 10, 1970 and in tenths of inches from April 11, 1970 until the present.

METEOROLOGICAL ELEMENT MEASUREMENT UNITS CODE.
(Reference Table "A")

YEAR
This is the year of record. Range of values from 1881 (few stations) to current year processed.

MONTH
This is the month of the record. Range of values is 01 to 12.

SOURCE CODE-1
Contains a code indicating the primary source of the original record for this element. Range is 1-9 and A -Z. (Reference Table "G")

SOURCE CODE-2
Contains a code indicating the backup source of the original record for this

element. Range is 1-9 and A - Z. (Reference Table "H")

NUM-VALUES
This notates the actual number of values reported. Range = 001 to 062.

NOTE: A record may contain fewer or more data values than you might expect. A monthly record of daily values may contain as few as 1 data value or as many as 62 data values.

If a particular data value was not taken or is unavailable there is no entry for it. (If all observations are received and pass QC checks there will be one data group for each day. If each value fails QC there may be 2 data groups for each day). When two groups for a day are encountered the original values are flagged and the 2nd data group is the best possible replacement.

DAY
Contains the day of the daily element value. Range = 01 to 31. Data are for the 24-hour period midnight to midnight LST.

HOUR
Contains the hour of the daily observation. Hour is reported as 24 representing a 24-hour period midnight to midnight.

SIGN of
This is the "SIGN" of the meteorological Data Element Value. This field contains either a blank or a minus sign (never a plus sign).

DATA-VALUE
Actual data value. The DATA-VALUE (DATA ELEM VALUE) portion of the tape field is a five digit integer. One major exception does exist however. DYSW (days with weather code and days with weather in the vicinity) element-type values are explained under METEOROLOGICAL ELEMENT-TYPES DYSW and DYVC.

FLAG1
The Data Measurement Flag.(Reference Table "J")

FLAG2
Data Quality Flag.(Reference Table "K")

********** TABLE "A" **********

METEOROLOGICAL ELEMENT MEASUREMENT UNITS CODE

The units and decimal position of the data value for this record. Range of values is listed below.

C	Whole degrees Celsius
CM	Centimeters
D	Whole Fahrenheit degree days
DT	Wind direction in tens of degrees
DW	Wind direction in whole degrees
F	Whole degrees Fahrenheit
FN	Feet and tenths
FT	Whole feet
HF	Hundreds of feet
HI	Hundredths of inches
HM	Hundredths of miles
HR	Time in hours and minutes
HT	Hundredths of inches but observation was only made to tenths
I	Whole inches
IH	Hundredths of inches of mercury
IT	Thousandths of inches of mercury
KD	Knots and direction in tens of degrees
KS	Knots and direction in 16 pt. code
M	Whole miles
MD	MPH and direction in tens of degrees
ME	Whole meters
MH	Miles per hour
MM	Millimeters
MN	Minutes
MS	MPH and direction in 16 pt. code
MT	Tenths of millibars
NA	No units applicable (none-dimensional)
N1	No units applicable - element to tenths
N2	No units applicable - element to hundredths
OS	Oktas of sky cover
P	Whole percent
TC	Tenths of degree Celsius
TD	Tenths of Fahrenheit degree days
TF	Tenths of degrees Fahrenheit
TH	Tenths of hours
TI	Tenths of inches
TK	Tenths of knots
TL	Tenths of miles per hour
TM	Tenths of millimeters
TP	Tenths of percent
TS	Tenths of sky cover

Note: All single digit Element-Units are left justified and blank filled.

********** TABLE "A1" **********

DYSW/DYVC

00 No occurrence
01 Day with haze (smoke also included through August 1992; see code 30 in
:
:

this table)
02 Day with fog (ice fog included through 1983; see code 17 in this table)
03 Day with heavy fog (heavy ice fog included through 1964)
04 Day with drizzle (begin 1984)
05 Day with ice pellets (sleet and small hail; small hail included through June 1996; see code 31 in this table)
06 Day with glaze
07 Day with thunder
08 Day with hail (1/4 inch or larger in diameter beginning July 1996)
09 Day with volcanic ash (begin September 1992; dust or sandstorm with visibility < 5/8 mile was reported as code 09 through August 1992; see codes 27 and 29 in this table)
10 Day with blowing snow (includes drifting snow beginning July 1996)
11 Day with high wind (squall; speeds increasing to at least 16kts/18mph and sustained at 22kts/25mph or more for at least one minute; begin July 1996)
12 Day with tornado (funnel cloud, waterspout included through Aug 1992; see codes 20 and 21 in this table)
13 Day with snow (snow pellets, snow grains, and ice crystals included through Aug 1992; see codes 22, 23, 24 in this table)
14 Day with rain (drizzle, freezing drizzle, and freezing rain included through 1983)
15 Day with freezing rain (begin 1984)
16 Day with freezing drizzle (begin 1984)
17 Day with ice fog (begin 1984; includes freezing fog beginning July 1996)
18 Day with blowing spray (begin 1984; includes spray beginning July 1996))
19 Day with unknown source of precipitation (begin 1991 with automated stations)
20 Day with funnel cloud (begin September 1992)
21 Day with waterspout (begin September 1992; includes tornado beginning July 1996)
22 Day with snow pellets (begin September 1992 through June 1996; see code 31 in this table)
23 Day with snow grains (begin September 1992)
24 Day with ice crystals (begin September 1992)
25 Day with ground fog (begin September 1992)
26 Day with dust (begin September 1992)
27 Day with blowing dust (begin September 1992; includes duststorm when visibility is reduced to less than 5/8 miles beginning July 1996)
28 Day with blowing obstruction (begin September 1992 through June 1996)
29 Day with blowing sand (begin September 1992); also includes sand as well as sandstorm when visibility is reduced to less than 5/8 mile (begin July 1996)
30 Day with smoke (begin September 1992)
31 Day with small hail and/or snow pellets (begin July 1996; diameter less than 1/4 inch)
32 Day with well developed dust/sand whirls (begin July 1996)
33 Day with mist (begin July 1996)
34 Day with rain or snow shower; used in reference to weather in the vicinity only (begin July 1996)

********** TABLE "B1" **********

FSIN

WIND DIRECTION CODE
(16 Point WBAN Code)

12 = NNE	66 = SW
22 = NE	76 = WSW
32 = ENE	77 = W
33 = E	78 = WNW
34 = ESE	88 = NW
44 = SE	18 = NNW
54 = SSE	11 = N
55 = S	00 = Calm
56 = SSW	= Unknown

Example of DATA-VALUE field XXYYY for wind direction and speeds: 12037 Wind is from the NNE at 37 miles per hour.

********** TABLE "B2" **********

PKGS

WIND DIRECTION CODE
(36 Point WBAN Code)

03 = NNE	21 = SSW
05 = NE	24 = SW
07 = ENE	25 = WSW
09 = E	27 = W
12 = ESE	30 = WNW
14 = SE	32 = NW
16 = SSE	34 = NNW
18 = S	36 = N

********** TABLE "C" **********

FSMI & FSMN

WIND DIRECTION CODES

00 = Calm
01 = 010
02 = 020
" "
" through "
36 = 360
99 = Unknown

********** TABLE "D" **********

SKY COVER in TENTHS for ELEMENTS:
ASMM/ASSS/SCMM/SCSS/STMM/STSS

DATA-VALUE

CODE		SKY COVER
00000	=	Clear or less than .1 coverage
00001	=	.1 Coverage
00002	=	.2 Coverage
00003	=	.3 Coverage
00004	=	.4 Coverage
00005	=	.5 Coverage
00006	=	.6 Coverage
00007	=	.7 Coverage
00008	=	.8 Coverage
00009	=	.9 Coverage
00010	=	1.0 Coverage - Overcast

********** TABLE "D1" **********

SKY COVER in OKTAS for ELEMENTS:
SAMM/SASS/SGMM/SGSS/SMMM/SMSS

DATA-VALUE

CODE		SKY COVER
00000	=	Clear or less than .1 coverage
00001	=	.1 Coverage
00002	=	.3 Coverage
00003	=	.4 Coverage
00004	=	.5 Coverage
00005	=	.6 Coverage
00006	=	.8 Coverage
00007	=	.9 Coverage
00008	=	1.0 Coverage - Overcast

********** TABLE "E" **********

SNWD

DEPTH of SNOW OBSERVED AT:
00:30 GMT prior to July 1952
12:30 GMT 1 July 1952 to 30 May 1957
12:00 GMT 1 June 1957 to present

DATA-VALUE = b00000 to b99999 in whole inches. Trace of snow depth is less than 0.5 inches. Some Alaska and part-time stations take snow depth measurements at different hours.

********** TABLE "F" **********

TSUN

Conversion of minutes to tenths of hours is:

MIN	TENTHS		
1-2	0.0	33-38	0.6
3-8	0.1	39-44	0.7
9-14	0.2	45-50	0.8
15-20	0.3	51-56	0.9
21-26	0.4	57-60	1.0
27-32	0.5	A	ASOS

********** TABLE "G" **********

SOURCE CODE TABLE 1

1 Original Manuscript
2 SRRS
3 AFOS
4 DATSAV
5 NMC
6 Foreign Keyed
7 MAPSO
8 SRR 'A' side, manuscript 'B' side
9 Other/unknown
A ASOS

Source codes reflect normally expected sources and do not necessarily indicate actual source of a specific item.

********** TABLE "H" **********

SOURCE CODE TABLE 2

1 Original Manuscript
2 SRRS
3 AFOS
4 DATSAV
5 NMC
6 Foreign Keyed
7 MAPSO
8 SRRS 'A' side, manuscript 'B' side
9 Other/unknown
A ASOS

********** TABLE "J" **********

FLAG1 TABLE

A Accumulated amount. This value is the amount accumulated since the last measurement. (SNOW, SNWD, PRCP)

B Accumulated Amount. Value includes estimated values. (SNOW, SNWD, PRCP)

D Derived Value.

E Estimated Value.

M Data Element Missing. This is for fixed length records only.

P Multiple occurrence Peak Gust. Last occurrence is indicated. (PKGS, FSIN, FSMI)

S Included in a Subsequent Value. This precipitation amount is being accumulated. Total will be included in a subsequent value. (TPCP, SNOW, SNWD)

T Trace of Precipitation, Snowfall or Snow depth. Value would be '00000'. (TPCP, SNOW, SNWD)

b (blank) Not needed.

TABLE "K"

FLAG2 TABLE

O 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 prior to 1 January 1984 = Observed data exceeded preselected climatological limits during conversion from historic TD-9750 files. (No edited value follows)

Data beginning 1 January 1984 through 1988 and data beginning 1996 through current = Observed data has failed an internal consistency check. (No edited value follows) (Low level of confidence of observed value)

Data beginning 1989 through 1995 = Observed data has failed an internal consistency check but passed a manual inspection of the data. (No edited value follows)

4 Observed data value invalid. (No edited value follows)

5 Data converted from historic TD-9750 files exceeded all known climatological extremes. No edited value follows)

A Observed data has failed an internal consistency check but passed a manual inspection of the data. (No edited value follows) (High level of confidence of observed value)

D Wind direction code is invalid (PKGS through December 1983 only)

E Edited data value passes all systems checks - no observed value present

S Manually edited value passes all systems checks

3. Start Date: 1881

4. Stop Date: Ongoing

5. Coverage: North America, Caribbean, Pacific islands, and other overseas stations of the NWS, FAA, U.S. Navy, and Air Force

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

6. How to Order Data:

Ask NCDC's Climate Services about costs of obtaining this data set.

Phone: 828-271-4800
FAX: 828-271-4876
E-mail: **NCDC.Orders@noaa.gov**

7. **Archiving Data Center**:

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001

8. **Technical Contact**:

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001
Phone: 828-271-4800

9. **Known Uncorrected Problems**: There are known problems in this data set. Those problems are being addressed by a program VaLHiDD (Validation of Historical Daily Data).

During the period 1984-86 there are numerous entries for element PRCP of "NA" for the meteorological Element Units Code. These should be coded as "HI".

In 1988 for states 31-91 (North Carolina to Pacific Islands), the algebraic sign of positive meteorological data values may be coded as "+" symbols instead of as blanks.

The historical data were converted from existing digital files and placed in the element structure format in 1983. At that time these data were only processed through a gross value check. In January 1984, NCDC instituted greatly enhanced computer algorithms for automated validation of digital archives. The revised edit system performs internal consistency checks, climatological limits checks and serial checks. It is the goal of the NCDC that, as resources permit, these historical files will be brought up to the same level of quality as those from 1984 onward.

Quality control "flags" are appended to each element to show how they fared during the edit procedures and to indicate what, if any, action was taken. The files consist of observed values and, as necessary, edited values. Flags must be checked at all times to determine if an edited value is present.

The typical progression of temperature instruments was from liquid-in-glass thermometers, to (1960 series) Hygrothermometers, to (1980 series) Hygrothermometers. Scientists are currently investigating the effect these instrument changes (especially the 1980 series) may have on long term temperature records.

Inventories of the DSI-3210 data set are available which indicate missing data periods by station for most elements.

Maximum and Minimum Relative Humidity

For the period July 1996 through December 1998 the twenty four (24) hour

maximum and minimum relative humilities reported as 00000 and 00100 are incorrect. These values were incorrectly generated for stations that did not report relative humidity.

Maximum and Minimum Temperature

National Weather Service, and Federal Aviation Stations: These values are determined from stations equipped with maximum and minimum thermometers or recording instruments. For some sites, when instruments were inoperative, values were selected from hourly observations.

U.S. Air Force Stations: From May 15, 1955, for stations taking 24 record observations per day, the maximum and minimum temperatures are determined from hourly observations. The observations at the beginning and ending of day are considered. The values are reported as missing when more than 3 of the hourly observations pertinent to the determination of max and min temperatures for each 24-hour period are missing or erroneous.

U.S. Navy Stations: When maximum and minimum thermometer readings are not available, the data at most stations are reported as missing. Some Navy stations determine the maximum and minimum temperatures from hourly observations when readings from maximum and minimum thermometers are not available.

Hail and Snowfall Amounts

Although the inclusion of hail amounts with snowfall amounts was discontinued after December 31, 1955, some stations may have hail amounts included with snowfall after this date, as late as 1963 at a few stations. This occurred because on the original manuscript form the same column was used for the entry of snow, sleet and hail and the entry was not indicated as hail. For NWS sites, hail was again included in snowfall amounts beginning in 1989.

10. Quality Statement: This data set has been used in countless climatological studies, litigations, insurance claims, and various other research applications.

It must be understood that at the onset of punched card processing of climatological observations, the primary goal was the publication of the monthly climatological summaries. The conversion from manual to automated systems meant that more work could be done faster with fewer people and at less cost. Even though the punched cards were retained, it was never envisioned that 20 to 30 years from then a great number of users would be seeking large data files for retrospective studies using high-speed computers.

Benign neglect, state-of-the-art processing (CIRCA 1952), and limited resources (monetary and personnel) all contributed toward less than optimum conditions for maintaining the integrity of the digital files. Many of these shortcomings are now recognized and efforts are underway to upgrade the principal data sets.

It must be noted that this data set has flags that have been hand checked by personnel at the NCDC, unlike DSI-3211 where the data is only automatically quality controlled.

11. Essential Companion Datasets: DSI-3210 requires use of NCDC's in-house Station History file.

12. References:

National Weather Service, 1993: National Weather Service Observing Handbook No. 7, Surface Observations, NOAA-NWS, Silver Springs MD.

National Weather Service, June 1992: ASOS Users Guide, NOAA-NWS, Silver Springs, MD.

National Weather Service, April 1988: Surface Observations, Federal Meteorological Handbook No. 1 (FCM-H1-1988), Office of the Federal Coordinator, Dept of Commerce, Washington, D.C.

Federal Coordinator for Meteorological Services and Supporting Research, October 1992: Surface Aviation Observations, Federal Meteorological Handbook No. 1 (revised (FCM-H1-1991), Office of the Federal Coordinator, Rockville, MD.

National Climatic Data Center, March 1993: Local Climatological Data. Environmental Information summary (C-2), NOAA-NCDC, Asheville, NC.
Hughes, P.Y., E.H. Mason, T.R. Karl, and W.A. Brower, 1992: United States Historical Climatology Network Daily Temperature and Precipitation Data - ORNL/CDIAC-50, NPD-042. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee, 40 pp.