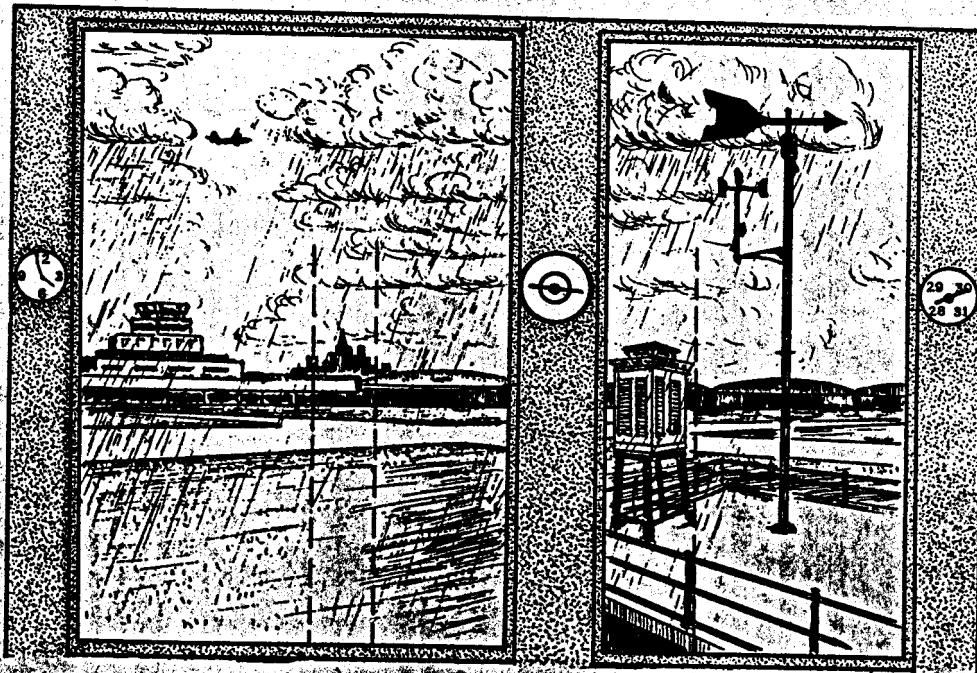


TDF - 14



Surface Observations

TAPE DECK		PAGE NO.
1440	AIRWAYS SURFACE OBSERVATIONS	1

INTRODUCTION

SOURCE

Weather observations, in support of aircraft operations, have been taken at airports since the earliest days of aviation. The rapid growth of the industry during the 1940's made it evident that some mechanical means of summarizing the data must be developed. How was a site to be selected or an airport designed without adequate statistical information on which to base decisions? The first efforts toward this end caused the WBAN No. 1 card to come into being. For archiving purposes these observations, mostly from military stations, were designated as Card Deck-141. The period of record is generally 1941-1944. A change of format necessitated a new card deck designation (Card Deck-142) to be instituted in 1945. This deck remained in force into 1948. During 1948 additional major changes were made in observing and recording practises. These led to the development of Card Deck-144. Although the usual beginning data of digital information in this form is June 1948 the changeover was made station by station on varying dates. Then too, some stations have had observations back-punched in this format to much earlier dates.

In the early 1960's the FAA undertook a major airport study. To facilitate the handling of large masses of data necessary for this effort the Climatological Services of the Weather Bureau, Air Force and Navy along with the FAA devised the tape format described in this manual. This format was called Tape Data Family-14 (TDF-14) to retain some continuity with the card decks. Within this family of similar observations there are several Tape Decks - each one uniquely identified at the beginning of each physical record on tape.

Beginning January 1, 1965, for most National Weather Service stations and March 1, 1972, for most Naval Weather Service stations the digitizing of the Airways Observations was reduced from 24 obs/day to 8 obs/day. These observations, at 3-hourly intervals, coincide with the normal GMT schedule of 00Z, 03Z, 06Z etc. This means, of course, that the observations, keyed in Local Standard Time (LST) differ according to time zone.

TAPE DECK		PAGE NO.
1440	AIRWAYS SURFACE OBSERVATIONS	11

QUALITY CONTROL AND CONVERSIONS

All observations have been subjected to some form of quality control. During the earlier years this was almost entirely a manual effort. As more sophisticated techniques of processing were introduced the quality control procedures were also improved. Today, the quality control effort is a blend of several computer programs and manual review. Observations are checked for conformance to established observing and coding practises, for internal consistency, for serial, or time oriented consistency, and against defined limits for various meteorological parameters.

The archiving of long term climatological information presents an almost constant dilemma to the archivist, systems analyst and programmer. Refinements of observational instruments, new techniques, changes in user needs and other factors combine to keep the incoming data in an almost perpetual state of change. In some instances the changes are of such significance that individual fields in the tape format must be redefined and the ultimate user must adapt this new information to his needs.

At other times the changes may be of such a nature that they can be incorporated into the existing format by converting units or other measurements. For example, wind speeds were recorded and punched in miles per hour through 1955 and in knots thereafter. All wind speeds on the tape file are in knots, the earlier period having been converted from mph.

USE OF THE MANUAL

This manual was designed so that recourse to additional reference material should be unnecessary. Occasionally, however, the researcher may wish to obtain a copy of the original Card Deck reference manual. This may be done by writing to the Director, National Climatic Center, Federal Building, Asheville, NC 28801.

Care should be taken to read carefully the general tape notations and coding practises.

TAPE DECK		PAGE NO.
1440	AIRWAYS SURFACE OBSERVATIONS	111

MANUAL AND TAPE NOTATIONS

FORMAT

Each physical tape record contains six observations and is 495 bytes long.* These records consist of 15 bytes of identification followed by six logical records of 80 bytes each. Records always begin with the Local Standard Time hour of 00LST, 06LST, 12LST or 18LST. Thus, four physical records are needed to contain each day's observations.

Space is always retained on tape for 24 obs/day. When no observation is available the hour is indicated (2 bytes) and all other fields are coded blank. Care in programming should be taken to allow for this condition, particularly with most tapes from 1965 onward.

The manual presents a graphical representation of the standard format indicating Tape Fields, Tape Positions and Element Definition followed by detailed information for each field.

Also included as part of the manual is a simple FORTRAN program that may be used to overcome the problems of alphanumeric characters.

MANUAL AND TAPE

The following notations are used throughout the manual:

- x = any numeric or alphanumeric character
- i = same as x but used to show that the character is an indicator rather than part of the recorded element
- = an "11" or zone punch
- + = a "12" punch
- both the - and the + may appear by themselves or in combination with a numeric digit to indicate an overpunch or signed field
- Δ = blank
- * = an 11,8,4 punch

* Currently, archive tapes are 9 track, 1600 bpi, blocked four (495x4=1980 bytes) and can be furnished with this blocking factor if requested. The advantage is that the entire period of record for one station can be provided on one reel of tape.

TAPE DECK		PAGE NO.
1440	AIRWAYS SURFACE OBSERVATIONS	iv

SPECIAL NOTE

The observations described in this manual are those from Card Deck-144. The Tape Deck number is 1440. Elements for certain fields may differ in other Decks within this Tape Data Family. Requesters of data other than TD-1440 will be furnished appropriate reference material.

TAPE DECK		PAGE NO.
1440	AIRWAYS SURFACE OBSERVATIONS	v

CHARACTER SET TDF-14

	<u>HEXADECIMAL</u>	<u>OCTAL</u>	<u>EQUIVILANT CARD PUNCH COMBINATION</u>
1	F1	01	1
2	F2	02	2
3	F3	03	3
4	F4	04	4
5	F5	05	5
6	F6	06	6
7	F7	07	7
8	F8	10	8
9	F9	11	9
0	F0	12	0
Δ(blank)	40	20	blank
-	60	40	11
*	5C	54	11,8,4
&	50	60	12
A	C1	61	12,1
B	C2	62	12,2
C	C3	63	12,3
D	C4	64	12,4
E	C5	65	12,5
F	C6	66	12,6
G	C7	67	12,7
H	C8	70	12,8
I	C9	71	12,9
J	D1	41	11,1
K	D2	42	11,2
L	D3	43	11,3
M	D4	44	11,4
N	D5	45	11,5
O	D6	46	11,6
P	D7	47	11,7
Q	D8	50	11,8
R	D9	51	11,9
	C0	72	12,0
	D0	52	11,0
	E0	32	0,2,8 (record mark)

TAPE DECK		PAGE NO.
1440	AIRWAYS SURFACE OBSERVATIONS	vi

FORTRAN SUBROUTINE FOR SIGNED FIELDS

SUBROUTINE SIGNCK (IFLD,ISGN)

C THIS SUBROUTINE WILL TEST ANY WIND SPEED OR PSYCHROMETRIC WITH A SIGN OVER UNITS POSITION
C READ AS A1, AND THE HIGH ORDER POSITIONS READ AS AN I SPEC OF PROPER WIDTH.
C THE SIGN SHOULD ENTER THE PARAMETER LIST AS ISGN, THE REMAINING PORTION AS
C IFLD. UPON RETURN FROM THIS ROUTINE, THE VALUE OF THE FIELD WILL BE AN INTEGER
C WITH PROPER SIGN. IT WILL BE THE USER RESPONSIBILITY TO CONVERT THIS TO REAL
C FORM WITH PROPER DECIMAL ALIGNMENT. INVALID CONDITION CAUSES IFLD TO BE
C SET TO 9999.

```
DIMENSION IP(10),MIN(10),NUM(10)
DATA IP/'A','B','C','D','E','F','G','H','I','O'/
DATA MIN/'J','K','L','M','N','O','P','Q','R','O'/
DATA NUM/1,2,3,4,5,6,7,8,9,0/,IAST/'*'/
```

```
IF (ISGN.EQ.IAST) GO TO 16
DO 14 K=1,10
IF (ISGN.EQ.IP(K)) GO TO 20
IF (ISGN.EQ.MIN(K)) GO TO 22
14 CONTINUE
16 IFLD= 9999
RETURN
20 IFLD= IFLD*10 + NUM(K)
RETURN
22 IFLD= -(IFLD*10 + NUM(K))
RETURN
END
```

TAPE DECK		PAGE NO.
1440	AIRWAYS SURFACE OBSERVATIONS	vii

TAPE DECKS WITHIN TDF-14

<u>TAPE DECK</u>	<u>NAME OF CARD DECK</u>
1400	USWB Form 1130-Aero Hourly Surface Observations
1410	USAF Form 94-A Hourly Surface Observations
1411	Hourly Ceiling-Visibility Observations (Card 1)
1412	Canadian Hourly Surface Observations (Type 141)
1420	WBAN Hourly Surface Observations, 1945-1948
1422	Canadian Hourly Surface Observations (Type 142)
1440	WBAN Hourly Surface Observations, 1945-
1441	Hourly Ceiling-Visibility Observations (Card 2)
1442	Canadian Hourly Surface Observations (Type 144)
1443	Canadian Hourly Surface Observations, 1950-
1445	Metar Observations
1480	Turkish Hourly Observations
1481	British Hourly Observations
1482	Azores Hourly Observations
1483	Korean Hourly Observations (ROK)
1484	Taichung Hourly Observations
1485	German Hourly Observations (GZMO)
1486	Chinese & Formosan Hourly Observations

TAPE DECK	AIRWAYS SURFACE OBSERVATIONS	PAGE NO.
1440		1

TAPE DECK	STN NUMB	YR	MO	DY	HR	CEIL	VIS	WIND		DRY BLB	WET BLB	DEW PT	REL HUM	S.L. PRESS	STA PRES	SKY COND
								DR	SPD							
14XX	XXXXX	XX	XX	XX	XX	1XXX	1XXX	XX	XXX	XXX	XXX	XXX	1XXX	XXXXX	XXXX	1XXXX

FIELD NUMBER	001	002	003	004	005	010	012	013	014	015	016	017	018	019	010	011	012
--------------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

T O P T Q	CLOUDS												WEATHER												WEATHER																
	LAYER 1			LAYER 2			LAYER 3			LAYER 4																															
	A	T	HGT	A	T	HGT	A	T	HGT	A	T	HGT	T	L	Q	F	R	Z	O	B	W	D	BLK	R	HR	CEIL	T	L	Q	F	R	Z	O	B	W	D	BLK	R	HR	CEIL	
	M	Y		M	Y		M	Y		M	Y		D	P	P	C	P	V	S								H	D	P	P	C	P	V	S							
X	X	X	X	XXX	X	X	XXX	X	X	X	XXX	X	X	X	X	X	X	X	X	X	X	X	ΔΔΔ	+	XX	1XXX	X	X	X	X	X	X	X	X	XX	ΔΔΔ	+				

FIELD NUMBER	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	201	202	629	630	631	632	633	634	635	636	637	638	639
--------------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

TAPE FIELD NUMBER	TAPE POSITIONS	ELEMENT
001	001 - 004	TAPE DECK NUMBER
002	005 - 009	STATION NUMBER
003	010 - 011	YEAR
004	012 - 013	MONTH
005	014 - 015	DAY
101	016 - 017	HOURL
102	018 - 021	CEILING HEIGHT AND INDICATOR
103	022 - 025	HORIZONTAL VISIBILITY AND INDICATOR
104	026 - 027	WIND DIRECTION - 16 POINTS
105	028 - 030	WIND SPEED
106	031 - 033	DRY BULB (AIR) TEMPERATURE
107	034 - 036	WET BULB TEMPERATURE
108	037 - 039	DEW POINT TEMPERATURE
109	040 - 043	RELATIVE HUMIDITY AND INDICATOR
110	044 - 048	SEA LEVEL PRESSURE
111	049 - 052	STATION PRESSURE
112	053 - 057	SKY CONDITION AND INDICATOR
113	058	TOTAL SKY COVER
114	059	TOTAL OPAQUE SKY COVER
115	060	AMOUNT OF LOWEST CLOUD LAYER
116	061	TYPE OF LOWEST CLOUD OR OBSCURING PHENOMENA
117	062 - 064	HEIGHT OF BASE OF LOWEST CLOUD LAYER OR OBSCURING PHENOMENA
118	065	AMOUNT OF SECOND CLOUD LAYER
119	066	TYPE OF CLOUD - SECOND LAYER
120	067 - 069	HEIGHT OF BASE OF SECOND CLOUD LAYER
121	070	SUMMATION AMOUNT OF FIRST TWO CLOUD LAYERS
122	071	AMOUNT OF THIRD CLOUD LAYER
123	072	TYPE OF CLOUD - THIRD LAYER
124	073 - 075	HEIGHT OF BASE OF THIRD CLOUD LAYER
125	076	SUMMATION AMOUNT OF FIRST THREE CLOUD LAYERS
126	077	AMOUNT OF FOURTH CLOUD LAYER
127	078	TYPE OF CLOUD - FOURTH LAYER
128	079 - 081	HEIGHT OF BASE OF FOURTH CLOUD LAYER
129	082	OCCURRENCE OF THUNDERSTORM, TORNADO OR SQUALL
130	083	OCCURRENCE OF RAIN, RAIN SHOWERS OR FREEZING RAIN
131	084	OCCURRENCE OF RAIN SQUALLS, DRIZZLE OR FREEZING DRIZZLE
132	085	OCCURRENCE OF SNOW, SNOW PELLETS OR ICE CRYSTALS
133	086	OCCURRENCE OF SNOW SHOWERS, SNOW SQUALLS OR SNOW GRAINS
134	087	OCCURRENCE OF SLEET, SLEET SHOWERS OR HAIL
135	088	OCCURRENCE OF FOG, BLOWING DUST, OR BLOWING SAND

TAPE DECK	AIRWAYS SURFACE OBSERVATIONS	PAGE NO.
1440		2

<u>TAPE FIELD NUMBER</u>	<u>TAPE POSITIONS</u>	<u>ELEMENT</u>
136	089	OCCURRENCE OF SMOKE, HAZE, SMOKE AND HAZE, DUST, BLOWING SNOW, BLOWING SPRAY
137	090 - 091	WIND DIRECTION - 36 POINTS
138	092 - 094	BLANK
139	095	RECORD MARK
201 - 239	096 - 175	SECOND OBSERVATION)
301 - 339	176 - 255	THIRD OBSERVATION)
401 - 439	256 - 335	FOURTH OBSERVATION)
501 - 539	336 - 415	FIFTH OBSERVATION)
601 - 639	416 - 495	SIXTH OBSERVATION)

THESE OBSERVATIONS FOLLOW
THE SAME FORMAT AS FIELDS
101-139 (TAPE POSITIONS
016-095).

TAPE DECK		AIRWAYS SURFACE OBSERVATIONS		PAGE NO.
1440				3
<u>TAPE FIELD NUMBER</u>	<u>TAPE POSITIONS</u>	<u>ELEMENT</u>	<u>TAPE CONFIGURATION</u>	<u>CODE DEFINITIONS AND REMARKS</u>
001	001 - 004	TAPE DECK NUMBER	1400 - 1499	Used to distinguish different data sources. See current list at beginning of manual.
002	005 - 009	STATION NUMBER	01001 - 98999	Unique number used to identify each station. Usually a WBAN number but occasionally a WMO number.
003	010 - 011	YEAR	00 - 99	Year of observation. 00-99 = 1900-1999
004	012 - 013	MONTH	01 - 12	Month of observation. 01-12 = Jan. - Dec.
005	014 - 015	DAY	01 - 31	Day of month.
101	016 - 017	HOURL	00 - 23	Hour of observation in local standard time. 00-23 = 0000-2300 LST
1021	018	CEILING HEIGHT INDICATOR	1,2,3,- &,Δ,A	These codes indicate various schemes used to convert ceiling heights to hundreds of feet or to indicate special conditions of little or no meaning to the general user.
102	019 - 021	CEILING HEIGHT	000 - 800 888, 999 ΔΔΔ, ΔΔ*	Ceiling in hundreds of feet. Ceiling is defined as sky cover of .6 or greater. 000-800 = 00000-80,000 feet 888 = Ceiling of cirroform clouds at unknown height. Used for the period Sep. 1956-March 1970. 999 = Unlimited ceiling ΔΔΔ = Unknown ΔΔ* = Original value invalid
1031	022	VISIBILITY INDICATOR	0 - 5 M, Δ	These codes indicate various schemes used to convert visibilities into statute miles and have little or no meaning to the general user.

Oct 1975

TAPE DECK		AIRWAYS SURFACE OBSERVATIONS		PAGE NO.
1440				4
TAPE FIELD NUMBER	TAPE POSITIONS	ELEMENT	TAPE CONFIGURATION	CODE DEFINITIONS AND REMARKS
103	023 - 025	HORIZONTAL VISIBILITY	000-990 999 (Not all values used) ΔΔΔ ΔΔ*	Prevailing horizontal visibility (usually at an elevation of 6 feet above the ground) in statute miles. 000 = Zero visibility 001 = 1/16 Statute miles 002 = 1/8 " 003 = 3/16 " 004 = 1/4 " 005 = 5/16 " 006 = 3/8 " 007 = 1/2 " 008 = 5/8 " 009 = 3/4-7/8 " 010 = 1 " 012 = 1 1/8 " 014 = 1 1/4 " 016 = 1 3/8 " 017 = 1 1/2 " 018 = 1 5/8 " 019 = 1 3/4 " 020 = 2 " 024 = 2 1/4 " 027 = 2 1/2 " 030-150 = 3-15 miles in increments of one mile 200-950 = 20-95 miles in increments of five miles 990 = 100 miles or greater 999 = Unlimited ΔΔΔ = Unknown ΔΔ* = Original value invalid
104	026 - 027	WIND DIRECTION - 16 POINTS	00-88 ΔΔ, Δ*	Direction from which the wind is blowing in special 16 point WBAN code. 11 = North 349°-011° 12 = North-Northeast 012°-033° 22 = Northeast 034°-056° 32 = East-Northeast 057°-078° 33 = East 079°-101° 34 = East-Southeast 102°-123° 44 = Southeast 124°-146° 54 = South-Southeast 147°-168° 55 = South 169°-191° 56 = South-Southwest 192°-213° 66 = Southwest 214°-236° 76 = West-Southwest 237°-258° 77 = West 259°-281° 78 = West-Northwest 282°-303° 88 = Northwest 304°-326° 18 = North-Northwest 327°-348° 00 = Calm ΔΔ = Unknown Δ* = Original value invalid Note: Beginning Jan 1, 1964 wind directions were observed and coded to tens of degrees (see field 137). These values were converted to the 16 point code.

TAPE DECK		AIRWAYS SURFACE OBSERVATIONS			PAGE NO.
1440					5
TAPE FIELD NUMBER	TAPE POSITIONS	ELEMENT	TAPE CONFIGURATION	CODE DEFINITIONS AND REMARKS	
105	028 - 030	WIND SPEED	000 - 199 ΔΔΔ, ΔΔ*	Wind speed in whole knots. ΔΔΔ = Unknown ΔΔ* = Original value invalid Note: When this field is numeric it is <u>always</u> signed positive (12 over punch).	
106	031 - 033	DRY BULB (AIR) TEMPERATURE	001̄ - 130̄	Specified temperature in whole degrees fahrenheit. 001̄ - 130̄ = -1° - -130°F 000̄ - 140̄ = 0° - +140°F ΔΔΔ = Unknown ΔΔ* = Original value invalid Note: When these fields are numeric they are always signed to indicate negative (11 overpunch) or positive (12 overpunch) temperatures	
107	034 - 036	WET BULB TEMPERATURE	000̄ - 140̄		
108	037 - 039	DEW POINT TEMPERATURE	ΔΔΔ - ΔΔ*		
1091	040	RELATIVE HUMIDITY INDICATOR	&, Δ	& = Used to denote that dew point temperatures and relative humidities were originally coded with respect to ice when temperature was below 32°F but were recomputed with respect to water. Δ = No special conversions made.	
109	041 - 043	RELATIVE HUMIDITY	001 - 100 ΔΔΔ, ΔΔ*	Relative humidity in whole percent. ΔΔΔ = Unknown ΔΔ* = Original value invalid.	
110	044 - 048	SEA LEVEL PRESSURE	09000 - 10999 ΔΔΔΔΔ, ΔΔΔΔ*	Pressure, reduced to sea level, in millibars and tenths. 09000-10999 = 900.0 - 1099.9 mb ΔΔΔΔΔ = Unknown ΔΔΔΔ* = Original value invalid.	
111	049 - 052	STATION PRESSURE	1900 - 3999 ΔΔΔΔ, ΔΔΔ*	Pressure at station level in inches and hundredths of Hg. 1900-3999 = 19.00 - 39.99 in Hg. ΔΔΔΔ = Unknown ΔΔΔ* = Original value invalid.	

TAPE DECK		AIRWAYS SURFACE OBSERVATIONS			PAGE NO.
1440					6
TAPE FIELD NUMBER	TAPE POSITIONS	ELEMENT	TAPE CONFIGURATION	CODE DEFINITIONS AND REMARKS	
1121	053	SKY CONDITION INDICATOR	-, Δ	<p>Indicator of method of recording sky condition or other phenomena.</p> <p>- = Sky condition - U.S. stations prior to June 1951.</p> <p>Δ = Sky conditions - U.S. stations June 1951 and later.</p> <p>Note: Some other decks have various configurations in this position denoting deviation from standard coding. Detailed information will be supplied when applicable.</p>	
112	054 - 057	SKY CONDITION		<p>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. There was a major change in the method of recording this field in June 1951.</p> <p>When used to describe the amount of sky cover alphanumeric characters in this field have the following meaning:</p> <p>0 = Clear or less than .1 cover 1 = Thin scattered clouds .1 - .5 2 = Scattered clouds .1 - .5 3 = Dark scattered clouds .1 - .5 4 = Thin broken clouds .6 - .9 5 = Broken clouds .6 - .9 6 = Dark broken clouds .6 - .9 7 = Thin overcast clouds 1.0 8 = Overcast clouds 1.0 9 = Dark overcast clouds 1.0 - = Obscuration Δ = Partial obscuration</p> <p><u>PRIOR TO JUNE 1951</u></p> <p>During this period when scattered clouds were reported the two middle figures of the field represent the height, in hundreds of feet, of the lowest layer of scattered clouds.</p> <p>During this period only two layers were recorded in this field. The first digit always represents the higher layer and the last digit the lowest layer.</p> <p>The codes on page 7 describe the Sky Condition configurations that appear on tape prior to June 1951. Tape configurations for the period July 1951 onward are explained on page 8.</p>	

TAPE DECK		AIRWAYS SURFACE OBSERVATIONS		PAGE NO.
1440				7
TAPE FIELD NUMBER	TAPE POSITIONS	ELEMENT	TAPE CONFIGURATION	CODE DEFINITIONS AND REMARKS
112	054 - 057	SKY CONDITION		<p> 0--- = Obscuration occurring alone 0--0 = Clear or less than .1 cover 0--Δ = Thin obscuration reported alone 0--4 to 0--9 = One layer of broken or overcast clouds reported 4--- to 9--- = Obscuration with higher layer of broken or overcast clouds 4--Δ to 9--Δ = Thin obscuration with higher layer of broken or overcast clouds Δ--4 to Δ--9 = Layer of broken or overcast clouds with thin obscuration above 4--4 to 9--9 = Two layers of broken or overcast clouds ---- = Two layers of obscuration phenomena ---Δ = Thin obscuration with obscuration above Δ--- = Obscuration with thin obscuration above Δ--Δ = Thin obscuration with thin obscuration above ---4 to ---9 = Layer of broken or overcast clouds with obscuration above 0001 to 0993 = Layer of scattered clouds 1001 to 9993 = Layer of scattered clouds with scattered, broken or overcast layer above -001 to -993 = Layer of scattered clouds with obscuration above Δ001 to Δ993 = Layer of scattered clouds with thin obscuration above **** = Original value invalid ΔΔΔΔ = Unknown </p> <p>For the two middle digits:</p> <p> 00 - 98 = Height of the lowest scattered layer in hundreds of feet 99 = 10,000 feet or greater -- = No low scattered clouds ΔΔ = Unknown *Δ, Δ*, ** = Original value invalid </p>

TAPE DECK		AIRWAYS SURFACE OBSERVATIONS		PAGE NO.
1440				8
TAPE FIELD NUMBER	TAPE POSITIONS	ELEMENT	TAPE CONFIGURATION	CODE DEFINITIONS AND REMARKS
112	054 - 057	SKY CONDITION	0000 - 9999 **** ΔΔΔΔ	Beginning June 1951 sky condition was reported and coded by layer in ascending order. This allows four layers to be described because heights of scattered clouds are no longer entered. Individual sky condition characters have the same meaning (0-9, Δ, -) as those described on page 6. If less than four layers are present the remaining positions are coded 0. Example: 2580 = Three layers of clouds - lower scattered, broken layer and higher overcast ΔΔΔΔ = Unknown **** = Original value invalid
113	058	TOTAL SKY COVER	0 - 9	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. 0 = Clear or less than .1 1-5 = .1 to .5 covered (scattered) 6-9 = .6 to .9 covered (broken) - = > .9 covered (overcast) Δ = Unknown Note: When cloud amount for individual layers is less than one tenth, the height field may appear as the actual height of the fragment or as an invalid (ΔΔ*) configuration.
114	059	TOTAL OPAQUE SKY COVER	-, Δ	
115	060	AMOUNT OF LOWEST CLOUD LAYER		
118	065	AMOUNT OF SECOND CLOUD LAYER		
122	071	AMOUNT OF THIRD CLOUD LAYER		
126	077	AMOUNT OF FOURTH CLOUD LAYER		
116	061	TYPE OF LOWEST CLOUD OR OBSCURING PHENOMENA	0-9, - K,M,N,O P,R,Δ	Generic cloud type or obscuring phenomena. 0 = None 1 = Fog 2 = Stratus 3 = Stratocumulus 4 = Cumulus 5 = Cumulonimbus 6 = Altostratus 7 = Altocumulus 8 = Cirrus 9 = Cirrostratus K = Stratus Fractus M = Cumulus Fractus N = Cumulonimbus Mamma O = Nimbostratus P = Altocumulus Castellanus R = Cirrocumulus - = Obscuring phenomena other than fog Δ = Unknown
119	066	TYPE OF CLOUD-SECOND LAYER		
123	072	TYPE OF CLOUD-THIRD LAYER		
127	078	TYPE OF CLOUD-FOURTH LAYER		

TAPE DECK		AIRWAYS SURFACE OBSERVATIONS		PAGE NO.
1440				9
TAPE FIELD NUMBER	TAPE POSITIONS	ELEMENT	TAPE CONFIGURATION	CODE DEFINITIONS AND REMARKS
117	062 - 064	HEIGHT OF BASE OF LOWEST CLOUD LAYER OR OBSCURING PHENOMENA	000 - 800 --- ΔΔΔ	Height of base of clouds or obscuring phenomena in hundreds of feet.
120	067 - 069	HEIGHT OF BASE OF SECOND CLOUD LAYER	ΔΔ*	
124	073 - 075	HEIGHT OF BASE OF THIRD CLOUD LAYER	888	000-800 = 0 - 80,000 feet 888 = Cirroform clouds of unknown height
128	079 - 081	HEIGHT OF BASE OF FOURTH CLOUD LAYER		--- = Partial obscuration when field 116 coded - or 1. Otherwise indicates none or no clouds for which height could be reported. ΔΔΔ = Unknown ΔΔ* = Original value invalid
121	070	SUMMATION AMOUNT OF FIRST TWO CLOUD LAYERS	0 - 9 -, Δ	Total amount of sky covered by the indicated layers.
125	076	SUMMATION AMOUNT OF FIRST THREE CLOUD LAYERS		0 = Clear or less than .1 1-9 = .1 to .9 covered - = > .9 covered Δ = Unknown
129	082	OCCURRENCE OF THUNDERSTORM, TORNADO OR SQUALL	0 - 6 Δ *	0 = None 1 = Thunderstorm - lightning and thunder. Wind gusts less than 50 knots, and hail, if any, less than 3/4 inch diameter. 2 = Heavy or severe thunderstorm - frequent intense lightning and thunder. Wind gusts 50 knots or greater and hail, if any, 3/4 inch or greater diameter. 3 = Report of tornado or waterspout. 4 = Light squall (through 5/51 only) 5 = Moderate squall 6 = Heavy squall (through 5/51 only) Note: Beginning June 1951 only moderate squall is recorded Squall is sudden increase of wind speed by at least 16 knots, reaching 22 knots or more and lasting for at least one minute. Δ = Unknown * = Original value invalid
130	083	OCCURRENCE OF RAIN, RAIN SHOWERS OR FREEZING RAIN	0 - 9 Δ *	0 = None 1 = Light rain 2 = Moderate rain 3 = Heavy rain 4 = Light rain showers 5 = Moderate rain showers 6 = Heavy rain showers 7 = Light freezing rain 8 = Moderate freezing rain 9 = Heavy freezing rain Δ = Unknown * = original value invalid

TAPE DECK		AIRWAYS SURFACE OBSERVATIONS		PAGE NO.
1440				10
TAPE FIELD NUMBER	TAPE POSITIONS	ELEMENT	TAPE CONFIGURATION	CODE DEFINITIONS AND REMARKS
130	083	OCCURRENCE OF RAIN, RAIN SHOWERS OR FREEZING RAIN		Light = Trace (< .005in.) to .10 inches per hour Moderate = .11 to .30 inches per hour Heavy = > .30 inches per hour
131	084	OCCURRENCE OF RAIN SQUALLS, DRIZZLE OR FREEZING DRIZZLE	0-9 Δ *	<p>0 = None 1 = Light rain squalls 2 = Moderate rain squalls 3 = Heavy rain squalls See note under field 129. Beginning Jan 1949 squalls were reported separately and these figures should not appear thereafter. 4 = Light drizzle 5 = Moderate drizzle 6 = Heavy drizzle 7 = Light freezing drizzle 8 = Moderate freezing drizzle 9 = Heavy freezing drizzle Δ = Unknown * = Original value invalid</p> <p>When drizzle or freezing drizzle occurs with other weather phenomena: Light = Trace (< .005 in) to .01 inches per hour Moderate = > .01 to .02 inches per hour Heavy = > .02 inches per hour</p> <p>When drizzle or freezing drizzle occurs alone: Light = Visibility 5/8 mile or greater Moderate = Visibility 5/16 - 1/2 mile Heavy = Visibility 1/4 mile or less</p>
132	085	OCCURRENCE OF SNOW, SNOW PELLETS OR ICE CRYSTALS	0-9 Δ *	<p>0 = None 1 = Light snow 2 = Moderate snow 3 = Heavy snow 4 = Light snow pellets 5 = Moderate snow pellets 6 = Heavy snow pellets 7 = Light ice crystals 8 = Moderate ice crystals 9 = Heavy ice crystals Δ = Unknown * = Original value invalid</p> <p>Beginning April 1963 any occurrence of ice crystals is recorded as an 8. Prior to this date intensities were reported.</p>

TAPE DECK		AIRWAYS SURFACE OBSERVATIONS		PAGE NO.
1440				11
TAPE FIELD NUMBER	TAPE POSITIONS	ELEMENT	TAPE CONFIGURATION	CODE DEFINITIONS AND REMARKS
133	086	OCCURRENCE OF SNOW SHOWERS, SNOW SQUALLS OR SNOW GRAINS	0-9 Δ *	0 = None 1 = Light snow showers 2 = Moderate snow showers 3 = Heavy snow showers 4 = Light snow squall 5 = Moderate snow squall 6 = Heavy snow squall Beginning Jan 1949 squalls were reported separately and these figures should not appear thereafter. 7 = Light snow grains 8 = Moderate snow grains 9 = Heavy snow grains Δ = Unknown * = Original value invalid
134	087	OCCURRENCE OF SLEET, SLEET SHOWERS OR HAIL	0-9 Δ *	0 = None 1 = Light sleet or sleet showers (ice pellets) 2 = Moderate sleet or sleet showers (ice pellets) 3 = Heavy sleet or sleet showers (ice pellets) 4 = Light hail 5 = Moderate hail 6 = Heavy hail 7 = Light small hail 8 = Moderate small hail 9 = Heavy small hail Δ = Unknown * = Original value invalid 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 a 1, 2 or 3 in this position. Beginning Sep 1956 intensities of hail were no longer reported and all occurrences were recorded as a 5.
135	088	OCCURRENCE OF FOG, BLOWING DUST OR BLOWING SAND	0-5 Δ *	0 = None 1 = Fog 2 = Ice fog 3 = Ground fog 4 = Blowing dust 5 = Blowing sand Δ = Unknown * = Original value invalid These values recorded only when visibility less than 7 miles.

Oct 1975

TAPE DECK		AIRWAYS SURFACE OBSERVATIONS		PAGE NO.																																		
1440				12																																		
TAPE FIELD NUMBER	TAPE POSITIONS	ELEMENT	TAPE CONFIGURATION	CODE DEFINITIONS AND REMARKS																																		
136	089	OCCURRENCE OF SMOKE, HAZE SMOKE AND HAZE, DUST, BLOWING SNOW, BLOWING SPRAY	0 - 6 Δ *	0 = None 1 = Smoke 2 = Haze 3 = Smoke and haze 4 = Dust 5 = Blowing snow 6 = Blowing spray Δ = Unknown * = Original value invalid These values recorded only when visibility less than 7 miles.																																		
137	090 - 091	WIND DIRECTION - 36 POINTS	00 - 36 ΔΔ	Direction from which the wind is blowing, in tens of degrees. Stations began using this system on 01 Jan 1964. To achieve continuity with earlier records these values are converted to the 16 point scale and placed in field 104. 00 = Calm ΔΔ = Unknown <div style="text-align: center;">CONVERSION CODE</div> <table> <thead> <tr> <th>tens of degrees</th> <th>16 pt.</th> </tr> </thead> <tbody> <tr><td>35-01</td><td>= 11</td></tr> <tr><td>02-03</td><td>= 12</td></tr> <tr><td>04-05</td><td>= 22</td></tr> <tr><td>06-07</td><td>= 32</td></tr> <tr><td>08-10</td><td>= 33</td></tr> <tr><td>11-12</td><td>= 34</td></tr> <tr><td>13-14</td><td>= 44</td></tr> <tr><td>15-16</td><td>= 54</td></tr> <tr><td>17-19</td><td>= 55</td></tr> <tr><td>20-21</td><td>= 56</td></tr> <tr><td>22-23</td><td>= 66</td></tr> <tr><td>24-25</td><td>= 76</td></tr> <tr><td>26-28</td><td>= 77</td></tr> <tr><td>29-30</td><td>= 78</td></tr> <tr><td>31-32</td><td>= 88</td></tr> <tr><td>33-34</td><td>= 18</td></tr> </tbody> </table>	tens of degrees	16 pt.	35-01	= 11	02-03	= 12	04-05	= 22	06-07	= 32	08-10	= 33	11-12	= 34	13-14	= 44	15-16	= 54	17-19	= 55	20-21	= 56	22-23	= 66	24-25	= 76	26-28	= 77	29-30	= 78	31-32	= 88	33-34	= 18
tens of degrees	16 pt.																																					
35-01	= 11																																					
02-03	= 12																																					
04-05	= 22																																					
06-07	= 32																																					
08-10	= 33																																					
11-12	= 34																																					
13-14	= 44																																					
15-16	= 54																																					
17-19	= 55																																					
20-21	= 56																																					
22-23	= 66																																					
24-25	= 76																																					
26-28	= 77																																					
29-30	= 78																																					
31-32	= 88																																					
33-34	= 18																																					
138	092 - 094	BLANK	ΔΔΔ																																			
139	095	RECORD MARK	†, Δ	This position may contain a blank or record mark. Record mark = 0,2,8, card punch																																		

Oct 1975