U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE
NATIONAL METEOROLOGICAL CENTER

OFFICE NOTE 28

LABELS FOR NMC DATA FIELDS

Automation Division

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Replacement for NMC Office Note No. 28
(February 1969, Revised March 1971)

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OFFICE NOTE 28

AUTOMATION DIVISION

Each NMC data field is prefixed with a 300-bit label. The first 180 bits contain values which indicate the quantity, the surface(S) or layer, and the time of the data being labeled. The next 60 bits contain the initial time, the number of data points, and generating code information. The last 60 bits hold scale factors pertinent to packed data. Appendix C shows each entry and its location within the label.

All data fields can be thought of as some quantity Q on a horizontal or quasi-horizontal surface S at some level of value L. If the quantity Q is by its nature a layer-defined quantity, the limits of the layer are given by S_1 at L_1 and S_2 at L_2. Code figures for Q and S are both given in Table 1.

The numerical value of the level L for the corresponding surface S is composed of two numbers: an integer C and a power of ten with the exponent E such that

$$L = C \times 10^{E}.$$

L, C, and E are signed integers (sign and magnitude). The space allocated for the coefficient C in the identifier is 18 bits which is large enough to accomodate the binary equivalent of 5-digit decimal integers. The convention which must be followed in order to provide a unique bit configuration for any given level is as follows:

(a) The coefficient C must be a 5-digit decimal integer, and
(b) The leading digit (the highest order digit) of the C must be nonzero, unless L is zero.

Once the coefficient C is determined, the value of the exponent E naturally follows such that the resulting L will have its true value in the standard units given in Table 1. For example, if L is 500 mb

$$C = 50000$$
$$E = -2$$
$$50000 \times 10^{-2} = 500;$$

or if L is 0.7 mb

$$C = 70000$$
$$E = -5$$
$$70000 \times 10^{-5} = 0.7$$

Appendix B contains the octal equivalents of commonly used values of C.

Table 1A gives the values for the marker N which is used for identifying different spectral quantities.

Table 2 gives the values for the marker t which is used for identifying fields involving time and explains how f_1 and f_2 are to be used for each value of t.

Table 3 gives the values for the marker m which is used for identifying fields involving layers.

Table 4 gives values to be used for the marker X. In general, this marker will be non-zero only for fields in a guess file.

Table 4a gives the values for the markers CM and CD which identify climatological data.

Table 5 gives the values for the marker K which identifies the grid to which these data apply.

Table 5a gives the values for the marker KS which indicates if the grid was derived from spectral or other special methods.

The fourth group of 60 bits in the label contain time I and date Y, M, D information, run marker R, number of data points J, and the generating code number g.

The initial hour I of the forecast (or the observation time on which the analysis is based) is entered in accordance with the 24-hour clock GMT to the nearest hour. For example: I = 00 for midnight GMT and I = 12 for noon GMT. Y is the year within the century. For example, for the year 1969, Y = 69. M is the month of they year, and D is the day of the month.

Table 6 gives the values for the marker R which identifies the run within the cycle.

Table 7 gives the values for the marker g assigned to the program which generated the field.

Each datum point value Q on a surface S (Q_S) is scaled and then packed into 12 bits (sign and magnitude). Q_S must be in the standard units given in Table 1. The scaled datum point value $\hat{Q}_S$ is defined by the following equation:

$$\hat{Q}_S = (Q_S - A)/2^{-n}.$$

The procedure followed for scaling is to scan the data to find the maximum and minimum values of Q_S. The value of A is set equal to $[(Q_S)\max + (Q_S)\min]/2$. This procedure allows maximum accuracy to be maintained in packing the data. The exponent n is chosen such that 2^n is the smallest value which satisfies the condition $([(Q_S)\max - A]/2^n) < 1$.

The scaling terms A and n are placed in the last 60 bits of the label. A consists of two signed binary integers a and b ($A = a \times 2^b$). The integer a occupies 45 bits (sign and magnitude) and the high order bit of the magnitude is nonzero (unless A is zero). The integer b occupies 9 bits (sign and magnitude). The integer n occupies 6 bits (sign and magnitude).

Appendix D is an example of the first 360 bits of a packed data field.

TABLE 1 - Q and S

Parameters and Surfaces

Number Octal	Number Decimal	Abbreviation*	Parameter Name	Standard Unit
			Height w/r to mean sea level	
1	1	-HGT--	geopotential	geopotential meter
2	2	-P-ALT	pressure altitude	geopotential meter
			Distance w/r to earth's surface	
6	6	-DIST-	geometric distance	meter
			Pressure	
10	8	-PRES-	atmospheric pressure	mb
			Temperature	
20	16	-TMP--	atmospheric temperature	degree K
21	17	-DPT--	dewpoint temperature	degree K
22	18	-DEPR-	dewpoint depression	degree K
23	19	-POT--	potential temperature	degree K
24	20	-T-MAX	maximum temperature	degree K
25	21	-T-MIN	minimum temperature	degree K
			Vertical Motion	
50	40	-V-VEL	vertical velocity $(\frac{dp}{dt})$	mb/sec
51	41	-NETVD	net vertical displacement	mb
52	42	-DZDT-	vertical velocity $(\frac{dz}{dt})$	meter/sec
53	43	-OROW-	orographical component $(\frac{dz}{dt})$	meter/sec
54	44	-FRCVV	frictional component $(\frac{dz}{dt})$	meter/sec
			Wind	
60	48	-U-GRD	u component of wind (with respect to grid)	meter/sec
61	49	-V-GRD	v component of wind (with respect to grid)	meter/sec
62	50	-WIND-	wind speed	meter/sec
63	51	-T-WND	thermal wind speed	meter/sec
64	52	-VW-SH	vertical speed shear	sec^{-1}
65	53	-U-DIV	divergent u component (with respect to grid)	meter/sec
66	54	-V-DIV	divergent v component (with respect to grid)	meter/sec
67	55	-WDIR-	direction from which wind is blowing w/r to north	degree
70	56	-WWND-	westerly component of wind	meter/sec
71	57	-SWND-	southerly component of wind	meter/sec
72	58	-RATS-	ratio of speeds	dimensionless
73	59	-VECW-	vector wind (spectral)	not applicable

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Number Octal	Number Decimal	Abbreviation*	Parameter Name	Standard Unit
			Fluid Flow Functions	
110	72	-ABS-V	absolute vorticity	sec^{-1}
111	73	-REL-V	relative vorticity	sec^{-1}
112	74	-DIV--	divergence	sec^{-1}
120	80	-STRM-	stream function	$meter^2/sec$
121	81	-V-POT	velocity potential	$meter^2/sec$
			Moisture	
130	88	-R-H--	relative humidity	percent
131	89	-P-WAT	precipitable water	$kg/meter^2$
132	90	-A-PCP	accumulated total precipitation	meter
133	91	-P-O-P	probability of precipitation	percent
134	92	-P-O-Z	probability of frozen precipitation	percent
135	93	-SNO-D	snow depth	meter
136	94	-ACPCP	accumulated convective precipitation	meter
137	95	-SPF-H	specific humidity	dimensionless
140	96	-L-H2O	liquid water	dimensionless
			Stability	
160	112	-LFT-X	lifted index	degree K
161	113	-TOTOS	total totals	degree K
162	114	-K-X--	k-index	degree K
163	115	-C-INS	convective instability	degree K
			Wave Components	
170	120	-L-WAV	long wave component of geopotential	geopotential meter
171	121	-S-WAV	short wave component of geopotential	geopotential meter
			Miscellaneous Surfaces	
200	128	------	Mean Sea Level	dimensionless
201	129	------	Earth's Surface	dimensionless
202	130	------	Tropopause	dimensionless
			Sigma Domain	
220	144	------	boundary	dimensionless
221	145	------	troposphere	dimensionless
222	146	------	stratosphere	dimensionless
223	147	------	quiet cap	dimensionless

Number Octal	Number Decimal	Abbreviation*	Parameter Name	Standard Unit
			Miscellaneous Parameters	
240	160	-DRAG-	drag coefficients	dimensionless
241	161	-LAND-	land/sea	dimensionless
242	162	-KFACT	k factors (700mb to 500mb normal ratio)	dimensionless
243	163	-1OTSL	conversion constants (1000mb to sea level pressure)	dimensionless
244	164	-7TSL-	sea level pressure specification from 700mb heights	mb/meter
245	165	-RCPOP	regression coefficients for probability of precipitation	percent/meter
246	166	-RCMT-	regression coefficients for mean temperature	degree K/meter
247	167	-RCMP-	regression coefficients for mean precipitation	dimensionless
250	168	-ORTHP	orthogonal pressure function	mb
260	176			
261	177			
262	178			
263	179			
264	180			
265	181			
266	182			
267	183			
			Oceanographic Variables	
600	384	-WTMP-	water temperature	degree K
601	385	-WVHGT	height of wind driven waves	meter
602	386	-SWELL	height of sea swells	meter
603	387	-WVSWL	combined height of waves and swells	meter
604	388	-WVPER	period of wind driven waves	second
605	389	-WVDIR	direction from which waves are moving (w/r to north)	degree
606	390	-SWPER	period of sea swells	second
607	391	-SWDIR	direction from which sea swells are moving (w/r to north)	degree

* Abbreviations are 6 characters. A dash (-) is used to indicate a blank.

TABLE 1a

N

Spectral Quantity Marker
(3 bits)

N	MEANING
0	Not to be assigned
1	Spectral specification
2	Zonal coefficient
3	Spectral amplitude
4	Spectral phase angle

TABLE 2

Time Marker t (6 bits)

t	MEANING	f_1	f_2
0	Indicates the field is instantaneous; e.g., a 500 mb height forecast: Q_S	Forecast hour (tau)	0
1	Indicates the field is formed from two fields of the same type whose valid times are equal but whose forecast hours (taus) may or may not be equal; e.g., difference between two analyses (taus equal) of the same parameter; difference between a forecast and the verifying analysis of the same parameter (taus unequal): $(Q_S)_2 - (Q_S)_1$	Forecast hour (tau) of $(Q_S)_2$	Tau of $(Q_S)_2$ minus tau of $(Q_S)_1$
2	Indicates the field is formed from two fields of the same parameter whose forecast hours (taus) are equal and whose valid times are unequal; e.g., a tendency field formed by differencing two analyses of the same parameter which are 12 hours apart: $(Q_S)_2 - (Q_S)_1$	Forecast hour (tau) of $(Q_S)_2$ and $(Q_S)_1$	Valid time of $(Q_S)_2$ minus valid time of $(Q_S)_1$
3	Indicates the field is formed from two fields of the same parameter whose forecast hours (taus) are unequal and whose initial times are equal; e.g., a forecast tendency field: $(Q_S)_2 - (Q_S)_1$	Forecast hour (tau) of $(Q_S)_2$	Forecast hour (tau) of $(Q_S)_2$ minus forecast hour (tau) of $(Q_S)_1$
4	Indicates the field is formed from a number of fields of the same parameter to obtain average or normal values. If the average applies to a number of <u>days</u>, f_1 is used to indicate this number; and if the average applies to a number of years, f_2 is used to indicate that number	Days used in average or 0	0 or years used in average

TABLE 2 - continued

5	Indicates the field is non-instantaneous and applies during some time period; e.g., a field of forecast probability of precipitation during some time period. $\overline{Q}_S$	Forecast hour (tau) at end of period.	Tau at ending of period minus tau at beginning of period.

TABLE 3

m

LEVEL DIFFERENCE MARKER

(6 Bits)

m	MEANING
0	Indicates $\underline{S}_2$ and $\underline{L}_2$ are not applicable.
1	Indicates a field is formed by taking the value of Q at S_1 minus the value of Q at S_2 .
2	Indicates a field of Q for the layer bounded by S_1 and S_2 not covered by category m = 1.

TABLE 4

X
EXCEPTION MARKER
(6 Bits)

X	MEANING
0	Indicates the initial time of the field is the same as the current date of the observation cycle.
1	Indicates the initial time of the field is six hours prior to the current date of the observation cycle.
2	Indicates the initial time of the field is twelve hours prior to the current date of the observation cycle.
3	Indicates the initial time of the field is eighteen hours prior to the current date of the observation cycle.
4	Indicates the initial time of the field is twenty-four hours prior to the current date of the observation cycle.
5	Indicates the initial time of the field is thirty hours prior to the current date of the observation cycle.
6	Indicates the initial time of the field is thirty-six hours prior to the current date of the observation cycle.
. . . .	
62	Indicates the initial time of the field is three hundred seventy-two hours prior to the current date of the observation cycle.
63	Not applicable. The exception marker (X) does not apply for this data or the value of X is greater than 62.

TABLE 4a

CM and CD

CLIMATOLOGY MARKERS

(6 bits each)

(MONTH-HOUR)

CM	MEANING
00	Not applicable.
01	JAN 0000 GMT
02	FEB 0000 GMT
.	.
.	.
.	.
12	DEC 0000 GMT
13	JAN 1200 GMT
14	FEB 1200 GMT
.	.
.	.
24	DEC 1200 GMT

(DAY OF MONTH)

CD	MEANING
00	Not applicable.
01	First
02	Second
.	.
.	.
.	.
31	Thirty-first

TABLE 5

K

GRID TYPE MARKER
(9 bits)

K	MEANING
0	1977 - point octagonal grid (Northern Hemisphere) (Grid increment = 381 km)
1	1679 - point grid (73 x 23) Tropical) (Grid increment = 5° longitude)
2	1752 - point grid (73 x 24) Tropical (Grid increment = 5° longitude)
3	3021 - point grid (53 x 57) Northern Hemisphere (Grid increment = 381 km)
4	510 - point FD (U,V,T) grid
5	3021 - point (53 x 57) fine mesh grid (N. America) (Grid increment = 190.5 km)
6	1977 - point fine mesh octagon (N. America) (Grid increment = 190.5 km)
7	2329 - point (53 x 53) octagon (N. America)
8	5104 - point facsimile grid (116 x 44)
9	143 - U. S. cities for Max/Min Temp.
10	216 - U. S. cities for Probability of Precipitation
11	286 - U. S. cities for Precipitation Amount
12	1702 - point tropical grid (74 x 23) (Grid increment = 5° longitude)
13	576 - point latitude/longitude grid (Grid increment = 10°)
14	108 - U. S. station array
15	40 - U. S. station array
16	1560 - point grid (39 x 40) eastern half of U. S. (Grid increment = 95.2 km)
17	221 - point grid (13 x 17) centered over U. S. (Grid increment = 381 km)
18	Reserved
19	1977 - point octagon (Southern Hemisphere) (Grid increment = 381 km)
20	2655 - point Mercator grid (45 x 59) (Grid increment = 1½° longitude)
21	1387 - point latitude/longitude grid (Grid increment = 5°)
22	Not assigned
23	783 - point subset of grid 5 (fine mesh) (29 x 27) PBL grid
24	651 - point (31 x 21) facsimile grid covering U. S. (Grid increment = 190.5 km)
25	3021 - point grid (53 x 57) Southern Hemisphere (Grid increment = 381 km)
26	2385 - point (53 x 45) fine mesh grid (N. America) (Grid increment = 190.5 km)
27	Not applicable

TABLE 5a

KS

Spectral Method Marker
(3 bits)

KS	MEANING
0	Not to be assigned
1	Hough spectral method

TABLE 6

R

RUN MARKER
(6 Bits)

R	MEANING
0	New operational run (LFM)
1	First operational run with an observation cycle (RADAT)
2	Second operational run (RAOB)
3	Third operational run (OPNL)
4	Fourth operational run
5	Fifth operational run (10 + 0 FINAL)

TABLE 7

g
CODE NUMBER OF PROGRAM GENERATING DATA
(9 Bits)

OCTAL	DEC	NAME OF GENERATING PROGRAM
(00)	00	Objective analysis
(01)	01	Barotropic Forecast model described in NMC Office Note 15
(02)	02	Mesh model 1958 described in NMC Office Note 15
(03)	03	Mesh model 1964 (with improved terrain) described in Office Note 24
(04)	04	Reed 1000 mb forecast model described in NMC Tech. Memo 26
(05)	05	3-level baroclinic forecast model described in NMC Tech. Memo 22
(06)	06	4-level baroclinic forecast model
(07)	07	4-layer Primitive Equation (PE) model
(10)	08	6-layer PE model
(11)	09	Maximum and minimum temperature forecast
(12)	10	Sea height and swell forecast
(13)	11	Tropical Analysis
(14)	12	Tropical Forecast
(15)	13	Bat Analysis
(16)	14	Tropical Forecast
(17)	15	Tropical Forecast with Satellite Modification
(20)	16	Sub-synoptic Advection Model
(21)	17	Compute long wave components
(22)	18	Trajectory Forecast
(23)	19	Limited-area Fine Mesh Analysis

TABLE 7 CONTINUED

(24)	20	Limited-area Fine Mesh Forecast
(25)	21	Perfect Prog Precipitation Forecast
(26)	22	Hough Analysis
(27)	23	MCTA - Eddy Analysis & Sanbar Forecast
(30)	24	NWRC/NCAR Climatology data
(31)	25	Snow cover
(32)	26	Planetary boundary layer analysis and forecast
(33)	27	Extended Forecast data processor
(34)	28	PE and Trajectory Model Output Statistics
(35)	29	8-layer spheral ("global") PE model (5° mesh)
(36)	30	8-layer northern hemispheral ("hemiglobal") PE model (2.5° mesh)

APPENDIX A

Examples of Data Identifiers (first 120 bits). Numbers for Q and S are octal.

1. Analysis of geopotential of a 500 mb surface

Word 1	Word 2
Q = 1 (Geopotential)	m = 0
S_1 = 10_8 (Atmospheric pressure)	t = 0
L_1 = 50000 x 10^{-2} (500 mb)	S_2 = 0
f_1 = 0	L_2 = 0
	f_2 = 0
00010010141520420000	00000000000000000000

2. Analysis of geopotential of a 150 mb surface

Word 1	Word 2
Q = 1 (Geopotential)	m = 0
S_1 = 10_8 (Atmospheric pressure)	t = 0
L_1 = 15000 x 10^{-2} (150 mb)	S_2 = 0
f_1 = 0	L_2 = 0
	f_2 = 0
00010010035230420000	00000000000000000000

3. Twelve-hour forecast of 500 mb to 1000 mb thickness

Word 1	Word 2
Q = 1 (Geopotential)	m = 1
	t = 0
S_1 = 10_8 (Atmospheric pressure)	S_2 = 10_8 (Atmospheric pressure)
L_1 = 50000 x 10^{-2} (500 mb)	L_2 = 10000 x 10^{-1} (1000 mb)
f_1 = 12	f_2 = 0
00010010141520420014	01000010023420410000

4. Thirty-six hour error in 500 mb geopotential

Word 1	Word 2
Q = 1 (Geopotential)	m = 0
$S_1 = 10_8$ (Atmospheric pressure)	t = 1
$L_1 = 50000 \times 10^{-2}$ (500 mb)	$S_2 = 0$
$f_1 = 36$	$L_2 = 0$
	$f_2 = 36$
00010010141520420044	00010000000000000044

5. Sea level pressure analysis

Word 1	Word 2
$Q = 10_8$ (Atmospheric pressure)	m = 0
$S_1 = 200_8$ (Mean Sea Level)	t = 0
$L_1 = 0$	$S_2 = 0$
$f_1 = 0$	$L_2 = 0$
	$f_2 = 0$
00100200000000000000	00000000000000000000

6. Eighteen-hour forecast of pressure at the tropopause

Word 1	Word 2
$Q = 10_8$ (Atmospheric pressure)	m = 0
$S_1 = 202_8$ (Tropopause)	t = 0
$L_1 = 0$	$S_2 = 0$
$f_1 = 18$	$L_2 = 0$
	$f_2 = 0$
00100202000000000022	00000000000000000000

7. Twenty-four hour forecast of 500 mb temperature

Word 1	Word 2
$Q = 20_8$ (Atmospheric temperature)	m = 0
$S_1 = 10_8$ (Atmospheric pressure)	t = 0
$L_1 = 50000 \times 10^{-2}$ (500 mb)	$S_2 = 0$
$f_1 = 24$	$L_2 = 0$
	$f_2 = 0$
00200010141520420030	00000000000000000000

8. Twelve-hour temperature tendency formed from analyses at the earth's surface

Word 1	Word 2
$Q = 20_8$ (Atmospheric temperature)	m = 0
$S_1 = 201_8$ (Earth's surface)	t = 2
$L_1 = 0$	$S_2 = 0$
$f_1 = 0$	$L_2 = 0$
	$f_2 = 12$
00200201000000000000	00020000000000000014

9. Twelve-hour forecast of tendency of 500 mb temperature from tau 24 to tau 36

Word 1	Word 2
$Q = 20_8$ (Atmospheric temperature)	m = 0
$S_1 = 10_8$ (Atmospheric pressure)	t = 3
$L_1 = 50000 \times 10^{-2}$ (500 mb)	$S_1 = 0$
$f_1 = 36$	$L_1 = 0$
	$f_2 = 12$
00200010141520420044	00030000000000000014

10. Thirty-six hour forecast of mean temperature in boundary layer of Sigma domain

Word 1	Word 2
Q = 20 (Atmospheric temperature)	m = 2
$S_1 = 220_8$ (Boundary layer)	t = 0
$L_1 = 0$ (Top of layer)	$S_2 = 220_8$ (Boundary layer)
$f_1 = 36$	$L_2 = 10000 \times 10^{-4}$ (1 = bottom of layer)
	$f_2 = 0$
00200220000000000044	02000220023420440000

11. Twenty-four hour forecast of 650 mb vertical velocity

Word 1	Word 2
$Q = 50_8$ (Vertical velocity)	m = 0
$S_1 = 10_8$ (Atmospheric pressure)	t = 0
$L_1 = 65000 \times 10^{-2}$ (650 mb)	$S_2 = 0$
$f_1 = 24$	$L_2 = 0$
	$f_2 = 0$
00500010176750420030	00000000000000000000

12. Thirty-six hour vertical displacement of a parcel from 500 mb

Word 1	Word 2
$Q = 51_8$ (Vertical displacement)	m = 0
$S_1 = 10_8$ (Atmospheric pressure)	t = 3
$L_1 = 50000 \times 10^{-2}$ (500 mb)	$S_2 = 0$
$f_1 = 36$	$L_2 = 0$
	$f_2 = 36$
00510010141520420044	00030000000000000044

13. Twelve-hour forecast of U component of wind at 850 mb

Word 1	Word 2
$Q = 60_8$ (U component)	m = 0
$S_1 = 10_8$ (Atmospheric pressure)	t = 0
$L_1 = 85000 \times 10^{-2}$ (850 mb)	$S_2 = 0$
$f_1 = 12$	$L_2 = 0$
	$f_2 = 0$
00600010246010420014	00000000000000000000

14. Twenty-four hour 500 mb absolute vorticity

Word 1	Word 2
$Q = 110_8$ (Absolute vorticity)	m = 0
$S_1 = 10_8$ (Atmospheric pressure)	t = 0
$L_1 = 50000 \times 10^{-2}$ (500 mb)	$S_2 = 0$
$f_1 = 24$	$L_2 = 0$
	$f_2 = 0$
01100010141520420030	00000000000000000000

15. Initial 500 mb stream function

Word 1	Word 2
$Q = 120_8$ (Stream function)	m = 0
$S_1 = 10_8$ (Atmospheric pressure)	t = 0
$L_1 = 50000 \times 10^{-2}$ (500 mb)	$S_2 = 0$
$f_1 = 0$	$L_2 = 0$
	$f_2 = 0$
01200010141520420000	00000000000000000000

16. Twenty-four hour relative humidity in the layer bounded by 400 mb and 1000 mb

Word 1	Word 2
$Q = 130_8$(Relative humidity)	m = 2
$S_1 = 10_8$(Atmospheric pressure)	t = 0
$L_1 = 40000 \times 10^{-2}$ (400 mb)	$S_2 = 10_8$(Atmospheric pressure)
$f_1 = 24$	$L_2 = 10000 \times 10^{-1}$ (1000 mb)
	$f_2 = 0$
01300010116100420030	02000010023420410000

17. Forty-eight hour accumulated total precipitation during 36 to 48 hour period

Word 1	Word 2
$Q = 132_8$(accumulated precipitation)	m = 0
$S_1 = 201_8$(Earth's surface)	t = 3
$L_1 = 0$	$S_2 = 0$
$f_1 = 48$	$L_2 = 0$
	$f_2 = 12$
01320201000000000060	00030000000000000014

18. Thirty-six hour probability of precipitation (during 24 to 36 hour period)

Word 1	Word 2
$Q = 133_8$(Probability of precipitation)	m = 0
$S_1 = 201_8$(Earth's surface)	t = 5
$L_1 = 0$	$S_2 = 0$
$f_1 = 36$	$L_2 = 0$
	$f_2 = 12$
01330201000000000044	00050000000000000014

19. Initial snow depth

Word 1	Word 2
$Q = 135_8$(Snow depth)	m = 0
$S_1 = 201_8$(Earth's surface)	t = 0
$L_1 = 0$	$S_2 = 0$
$f_1 = 0$	$L_2 = 0$
	$f_2 = 0$
01350201000000000000	00000000000000000000

20. Twenty-four lifted index for layer bounded by 500 mb and the "middle" of the boundary layer

Word 1	Word 2
$Q = 160_8$(Lifted index)	m = 2
$S_1 = 10_8$(Atmospheric pressure)	t = 0
$L_1 = 50000 \times 10^{-2}$ (500 mb)	$S_2 = 220_8$(Sigma boundary)
$f_1 = 24$	$L_2 = 50000 \times 10^{-5}$ (.5 is mean of layer)
	$f_2 = 0$
01600010141520420030	02000220141520450000

21. Thirty-six hour long wave component of 500 mb geopotential

Word 1	Word 2
$Q = 170_8$(Long wave component)	m = 0
$S_1 = 10_8$(Atmospheric pressure)	t = 0
$L_1 = 50000 \times 10^{-2}$ (500 mb)	$S_2 = 0$
$f_1 = 36$	$L_2 = 0$
	$f_2 = 0$
01700010141520420044	00000000000000000000

22. Analysis of sea surface temperature

Word 1	Word 2
$Q = 600_8$(Water temperature)	m = 0
$S_1 = 201_8$(Earth's surface)	t = 0
$L_1 = 0$	$S_2 = 0$
$f_1 = 0$	$L_2 = 0$
	$f_2 = 0$
06000201000000000000	00000000000000000000

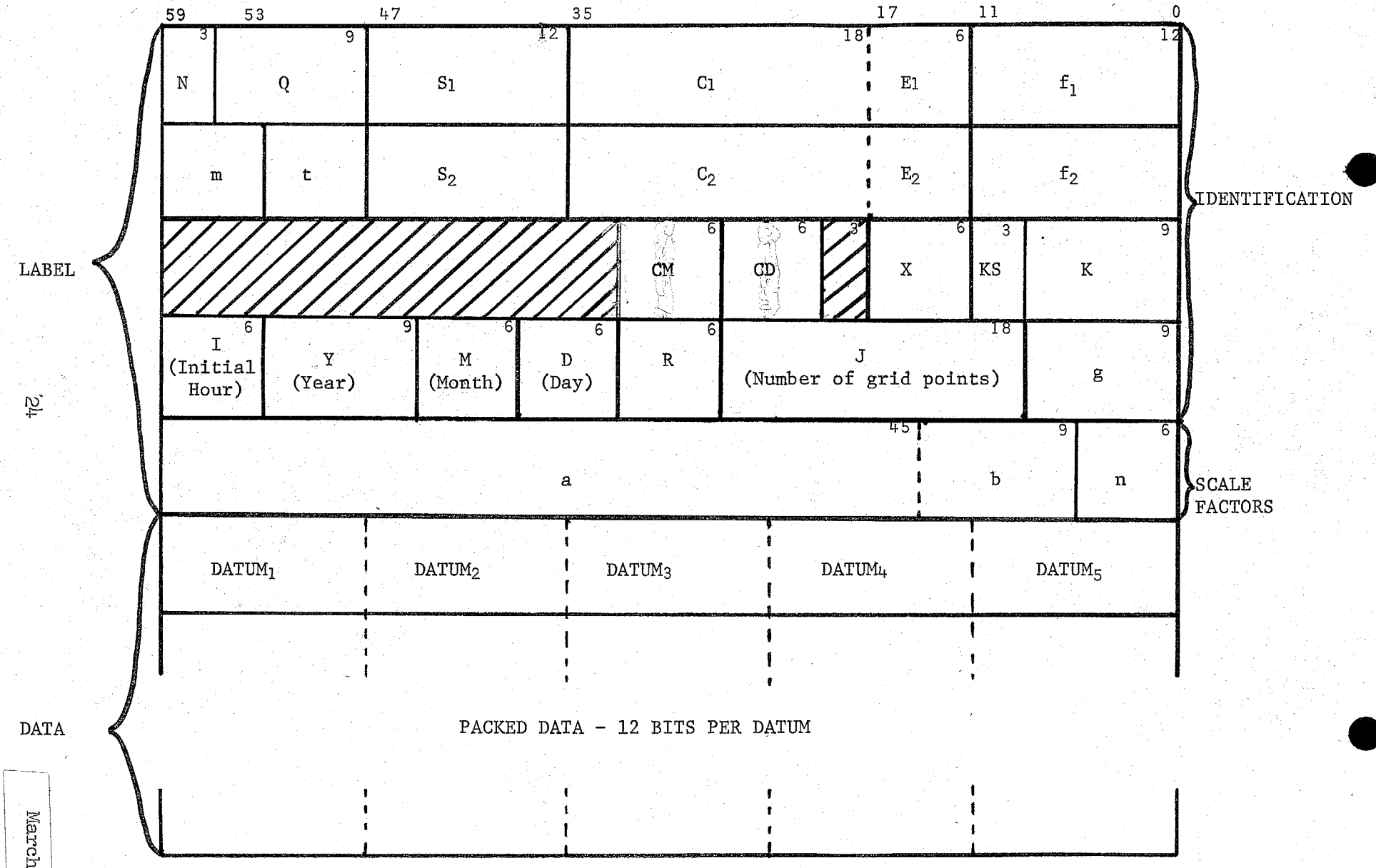
23. Thirty-six hour combined height of waves

Word 1	Word 2
$Q = 603_8$(Combined heights)	m = 0
$S_1 = 0$ (Surface not applicable)	t = 0
$L_1 = 0$	$S_2 = 0$
$f_1 = 36$	$L_2 = 0$
	$f_2 = 0$
06030000000000000044	00000000000000000000

APPENDIX B

Octal equivalents for commonly used values of C

Decimal	Octal
10000	23420
15000	35230
15240	35610
18290	43562
20000	47040
21340	51534
25000	60650
27315	65263
27430	65446
30000	72460
30480	73420
33333	101065
35000	104270
36580	107344
40000	116100
42670	123256
45000	127710
50000	141520
55000	153330
60000	165140
65000	176750
66667	202153
70000	210560
75000	222370
80000	234200
85000	246010
90000	257620
91400	262410
95000	271430


59
53
47
35
17
11
0
3
9
12
18
6
12
N
Q
S1
C1
E1
f1
m
t
S2
C2
E2
f2
IDENTIFICATION
LABEL
CM
6
CD
6
3
X
6
3
KS
9
K
I (Initial Hour)
6
Y (Year)
9
M (Month)
6
D (Day)
6
R
6
J (Number of grid points)
18
g
9
45
a
b
9
n
6
SCALE FACTORS
DATUM1
DATUM2
DATUM3
DATUM4
DATUM5
DATA
PACKED DATA - 12 BITS PER DATUM

APPENDIX D

The First 360 Bits of a 12-Hour Forecast of 1000mb Height

Octal print of identification and scaling information:

0001001002342041001 4
0000000000000000000
0000000000000000000
0011102270300367101 0
2605605075341214451 0

Octal print of five datum points:

0246023402340170013 2

Decimal values of the five datum points:

109.11
107.86
107.86
103.36
99.61