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FEDERAL METEOROLOGICAL HANDBOOK NO. 2

SURFACE SYNOPTIC CODES

Page Changes

Pages   Change

vii to viii	Replace with attached vii to viii
xi	" " " xi
2-1 to 2-6	" " " 2-1 to 2-6
6-1 to 6-6	" " " 6-1 to 6-6
6-21 to 6-22	" " " 6-21 to 6-22
7-1 to 7-2	" " " 7-1 to 7-2
7-5 to 7-6	" " " 7-5 to 7-6
back cover	" " " back cover

Enter this change in the publication. Record the change on the Record of Changes. File this change notice with the publication.

FEDERAL METEOROLOGICAL HANDBOOK NO. 2

SURFACE SYNOPTIC CODES

Pen and Ink Changes

Page	Subsection	Change
viii	7.2.4	Revise page number to "7-6"
	7.2.5	Revise page number to "7-6"
6-22	6.3.6	Revise line 11 of subsection by inserting "0600," between "0000," and "1200"

Enter this change in the publication. Record the change on the Record of Changes. File this change notice with the publication.

CHAPTER 2

FORMAT OF SYNOPTIC REPORTS

2.1 General

The WMO has adopted symbolic code forms for reporting surface observations from land stations (FM 12 SYNOP) and from sea stations (FM 13 SHIP). These code forms, which have many common elements called groups, are described in the WMO Manual on Codes (WMO Pub. No. 306). This publication also defines the symbolic figures and letters, provides code tables, and presents the related technical regulations. Pertinent portions of that manual are excerpted or adapted to correspond to national observing practices and appear in appropriate portions of Chapters 2 through 7. The complete symbolic code forms are modified for use in each WMO region and further adapted for use at different reporting times.

Paragraph 2.2 is devoted to the full symbolic code form used by land stations for main and intermediate synoptic reports in Region IV (northern portion), Region IV (southern portion) and Region V. Discussions in Chapters 3 through 7 will indicate applicability of these codes to automated land stations. Paragraph 2.3 presents the full symbolic code forms used by various categories of sea stations: (a) U.S. Navy ships and select ships in the U.S. Voluntary Observing Ship (VOS) fleet, (b) supplementary ships in the VOS fleet, (c) auxiliary ships in the VOS fleet, and (d) automated sea stations.

The full code consists of six sections made up of code groups. Note that certain groups may be repeated. This is discussed where it is applicable. Inclusion of certain groups is mandatory. If inclusion is mandatory, it will be noted when that group is discussed. Note that most groups begin with a numerical indicator. This provides flexibility. Code groups can be deleted without affecting the meaning of the remaining groups. Reports from a land station will always include at least Sections 0 and 1 of FM 12 SYNOP and sea stations will include at least Section 0 and the first two groups of Section 1 in FM 13 SHIP.

- ♦ Section 0 provides sufficient information to locate a station, and may also indicate the date and time of the observation, and whether it is a land or sea station.

- ♦ Section 1 contains general meteorological information: visibility, wind velocity, atmospheric temperature and dewpoint, atmospheric pressure information, weather phenomena and cloud data.

- ♦ Section 2, used by selected staffed coastal stations and by ships, contains data pertaining to wind waves and swell, and when reported by ships may contain information on sea water temperature and ice.

- ♦ Section 3 includes information for regional exchange: maximum and minimum temperature, snow or ice depth, 24-hour precipitation amount, additional cloud information and special phenomena. This section is not used by staffed ships.

- ♦ Section 4 is not used by U.S. stations.

♦ Section 5, reported by selected land stations and by automated sea stations, includes data for National use only. At land stations, these data include information such as meteorological records established, data for city locations reported by airport locations, tide data from some coastal locations, and water temperature at selected stations. The code format used is appropriate to all U.S. stations in Regions IV and V that report this section, but it is unlikely that any station would report all groups at any reporting time. For that reason the symbolic code forms for Section 5 will not be exhibited in paragraph 2.2, though they will be discussed in Chapter 7. Automated sea stations use Section 5 to report additional wind data.

2.2 Land Stations

The following code forms include the maximum number of groups that may be reported in each regional category at main reporting times or at intermediate reporting times.

2.2.1 WMO Region IV (Northern Portion).

2.2.1.1 Main Synoptic Reporting Times.

Section 0 $IIiii$

Section 1 $i_R i_x hVV$ $Nddff$ (00fff) $1s_n TTT$ $2s_n T_d T_d T_d$

$3P_o P_o P_o P_o$ $4PPPP$ $5appp$ $6RRRt_R$ $7wwW_1W_2$

$8N_h C_L C_M C_H$

Section 2 $222//$ $2P_w P_w H_w H_w$ $3d_{w1}d_{w1}d_{w2}d_{w2}$ $4P_{w1}P_{w1}H_{w1}H_{w1}$

$5P_{w2}P_{w2}H_{w2}H_{w2}$

Section 3   333 $1s_n T_x T_x T_x$ $2s_n T_n T_n T_n$ $4E'sss$ $7R_{24}R_{24}R_{24}R_{24}$

$8N_s Ch_s h_s$ $9S_P S_P s_p s_p$

Section 5   National groups

2.2.1.2 Intermediate Synoptic Reporting Times.

Section 0   IIiii

Section 1 i_Ri_xhVV Nddff (00fff) $1s_nTTT$ $2s_nT_dT_dT_d$

   $3P_oP_oP_oP_o$ 4PPPP   5appp $7wwW_1W_2$ $8N_hC_LC_MC_H$

Section 2   222// $2P_wP_wH_wH_w$ $3d_{w1}d_{w1}d_{w2}d_{w2}$ $4P_{w1}P_{w1}H_{w1}H_{w1}$

   $5P_{w2}P_{w2}H_{w2}H_{w2}$

Section 3   333 $8N_sCh_sh_s$ $9S_PS_Ps_ps_p$

2.2.2 WMO Region IV (Southern Portion).

This generally includes stations in the Caribbean, the Bahamas, Mexico and Central America, but the region may include selected more northerly stations in the warmer season.

2.2.2.1 Main Synoptic Reporting Times.

Section 0   IIiii

Section 1 i_Ri_xhVV Nddff (00fff) $1s_nTTT$ $2s_nT_dT_dT_d$

   $3P_oP_oP_oP_o$ 4PPPP $7wwW_1W_2$ $8N_hC_LC_MC_H$

Section 2   222// $2P_wP_wH_wH_w$ $3d_{w1}d_{w1}d_{w2}d_{w2}$ $4P_{w1}P_{w1}H_{w1}H_{w1}$

   $5P_{w2}P_{w2}H_{w2}H_{w2}$

Section 3   333 $0C_sD_LD_MD_H$ $1s_nT_xT_xT_x$ $2s_nT_nT_nT_n$

   $5j_1j_2j_3j_4$ $7R_{24}R_{24}R_{24}R_{24}$ $8N_sCh_sh_s$ $9S_PS_Ps_ps_p$

Section 5   **National groups**

2.2.2.2 Intermediate Synoptic Reporting Times.

Section 0 II_iii

Section 1 i_Ri_xhVV Nddff   (00fff) $1s_nTTT$ $2s_nT_dT_dT_d$

$3P_oP_oP_oP_o$ 4PPPP $7wwW_1W_2$ $8N_nC_LC_MC_H$

Section 2   222// $2P_wP_wH_wH_w$ $3d_{w1}d_{w1}d_{w2}d_{w2}$ $4P_{w1}P_{w1}H_{w1}H_{w1}$

$5P_{w2}P_{w2}H_{w2}H_{w2}$

Section 3   333 $0C_sD_LD_MD_H$ $8N_sCh_sh_s$ $9S_PS_Ps_ps_p$

2.2.3 WMO Region V.

2.2.3.1 Main Synoptic Reporting Times.

Section 0 $(M_iM_iM_jM_j$ $YYGGi_w)$ II_iii

Note: Some selected stations in Region V include the above parenthetical groups in their report.

Section 1 i_Ri_xhVV Nddff   (00fff) $1s_nTTT$ $2s_nT_dT_dT_d$

$3P_oP_oP_oP_o$ 4PPPP   5appp $6RRRt_R$ $7wwW_1W_2$

$8N_hC_LC_MC_H$

Section 2   222// $2P_wP_wH_wH_w$ $3d_{w1}d_{w1}d_{w2}d_{w2}$ $4P_{w1}P_{w1}H_{w1}H_{w1}$

$5P_{w2}P_{w2}H_{w2}H_{w2}$

Section 3   333// $1s_nT_xT_xT_x$ $2s_nT_nT_nT_n$ $5j_1j_2j_3j_4$

$7R_{24}R_{24}R_{24}R_{24}$ $8N_sCh_sh_s$ $9S_PS_Ps_ps_p$

Section 5   **National groups**

2.2.3.2 Intermediate Synoptic Reporting Times.

Section 0	$(M_iM_iM_jM_j$ YYGGi$_w)$	IIiii		
Section 1	i_Ri_xhVV	Nddff (00fff)	1s$_n$TTT	2s$_n$T$_d$T$_d$T$_d$
3P$_o$P$_o$P$_o$P$_o$	4PPPP	5appp	6RRRt$_R$ 7wwW$_1$W$_2$	8N$_h$C$_L$C$_M$C$_H$
Section 2	222//	2P$_w$P$_w$H$_w$H$_w$	3d$_{w1}$d$_{w1}$d$_{w2}$d$_{w2}$ 4P$_{w1}$P$_{w1}$H$_{w1}$H$_{w1}$	
5P$_{w2}$P$_{w2}$H$_{w2}$H$_{w2}$				
Section 3	333	8N$_s$Ch$_s$h$_s$	9S$_P$S$_P$s$_P$s$_P$	

2.3 Sea Stations

There are about 1300 ships in the U.S. VOS fleet. These U.S. supervised ships are classified by the WMO as select, supplementary or auxiliary ships. Select ships are mobile stations with sufficient meteorological instruments certified for accuracy; they report in the full SHIP synoptic code. U.S. Coast Guard and Navy ships also report in the full SHIP synoptic code. Supplementary ships are mobile stations with a limited complement of certified meteorological instruments; they report in an abbreviated form. Auxiliary ships are mobile stations that normally do not have certified meteorological instruments; they report in a reduced form.

In addition to the Coast Guard ships, Navy ships and the U.S. supervised ships in the VOS program, synoptic observations are obtained from automated environmental observing systems on data buoys. Data buoy reports are normally made at main and intermediate times. Ship reports shall be made at main reporting times, but may be made at intermediate times, too. The code format does not vary with the reporting time, but with the capabilities of the observation station.

2.3.1 U.S. Coast Guard and Navy Ships and Civil Select Ships (Full SHIP Report).

Section 0	D. . . .D	YYGGi$_w$	99L$_a$L$_a$L$_a$	Q$_c$L$_o$L$_o$L$_o$L$_o$
Section 1	i_Ri_xhVV	Nddff (00fff)	1s$_n$TTT	2s$_n$T$_d$T$_d$T$_d$
4PPPP	5appp	7wwW$_1$W$_2$	8N$_h$C$_L$C$_M$C$_H$	
Section 2	222D$_s$v$_s$	0s$_n$T$_w$T$_w$T$_w$	2P$_w$P$_w$H$_w$H$_w$	3d$_{w1}$d$_{w1}$d$_{w2}$d$_{w2}$
4P$_{w1}$P$_{w1}$H$_{w1}$H$_{w1}$	5P$_{w2}$P$_{w2}$H$_{w2}$H$_{w2}$	6I$_s$E$_s$E$_s$R$_s$	ICE + plain language	
			or	
			ICE c$_i$S$_i$b$_i$D$_i$z$_i$	

2.3.2 Civil Supplementary Ships (Abbreviated SHIP Report). Supplementary ships that do not have a full set of certified instruments report in the following symbolic code form. Although sea (wind waves) and swell are not shown in Section 2, those groups can be added (see paragraph 2.3.1).

Section 0	$D...D$	$YYGGi_w$	$99L_aL_aL_a$	$Q_cL_oL_oL_oL_o$
Section 1	i_Ri_xhVV	$Nddff$ $(00fff)$	$1s_nTTT$	$4PPPP$
	$7wwW_1W_2$	$8N_hC_LC_MC_H$		
Section 2	$222//$	$6I_sE_sE_sR_s$	ICE + plain language	
			or	
			ICE $c_iS_ib_iD_iz_i$	

2.3.3 Civil Auxiliary Ships (Reduced SHIP Report). Auxiliary ships that do not have certified instruments may report in the following reduced code form or in plain language. They, too, can add sea and swell data in Section 2 (see paragraph 2.3.1).

Section 0	$D...D$	$YYGGi_w$	$99L_aL_aL_aL_a$	$Q_cL_oL_oL_oL_o$
Section 1	i_Ri_xhVV	$Nddff$ $(00fff)$	$1s_nTT/$ $4PPP/$	
	$7wwW_1W_2$			
Section 2	$222//$	$6I_sE_sE_sR_s$	ICE + plain language	
			or	
			ICE $c_iS_ib_iD_iz_i$	

2.3.4 Automated Sea Stations. Automated synoptic observations are available from NOAA moored buoys and U.S. Coast Guard navigational buoys. The messages from these automated observations are in the following code form:

Section 0	$A_1b_wn_bn_bn_b$	$YYGGi_w$	$99L_aL_aL_a$	$Q_cL_oL_oL_oL_o$		
Section 1	$i_Ri_x///$	$/ddff$	$1s_nTTT$	$2s_nT_dT_dTd$	$4PPPP$	$5appp$
Section 2	22200	$0s_nT_wT_wT_w$	$1P_{wa}P_{wa}H_{wa}H_{wa}$	$70H_{wa}H_{wa}H_{wa}$		
Section 3	333	$912ff$				
Section 5	555	$11fff$	$22fff$	$3GGgg$	$4ddf_mf_m$	$(9GGgg)$

CHAPTER 6

SECTION 3 – REGIONAL DATA

6.1 General

Section 3 of the report is used to send information that is needed within a particular WMO region, but not outside of the region. The groups in Section 3 that begin with identifiers 1, 2, 3, 4, 5, 8, and 9 are standard in format in all the regions. However, not all of these groups are used in all the regions, and the regulations and even the code table for each of these groups may vary between regions. The groups in Section 3 that begin with identifiers 0 and 7 are not standard in all the regions. Each of the WMO regions decides whether there is a need for two more groups in Section 3, and what the groups will be used for. The precipitation group in Section 3 that begins with the identifier 6 is reported by U.S. stations in Section 1 instead of Section 3.

U.S. stations in WMO Region IV use a slightly different format than U.S. stations in WMO Region V for the maximum number of groups that may be included in Section 3.

♦ This is the format for U.S. stations in WMO Region IV:

$$333 \quad 0C_sD_LD_MD_H \quad 1s_nT_xT_xT_x \quad 2s_nT_nT_nT_n \quad 4E'sss$$

$$5j_1j_2j_3j_4 \quad 7R_{24}R_{24}R_{24}R_{24} \quad 8N_sCh_sh_s \quad 9S_pS_ps_ps_p$$

♦ This is the format for U.S. stations in WMO Region V:

$$333 \quad 1s_nT_xT_xT_x \quad 2s_nT_nT_nT_n \quad 5j_1j_2j_3j_4 \quad 7R_{24}R_{24}R_{24}R_{24}$$

$$8N_sCh_sh_s \quad 9S_pS_ps_ps_p$$

♦ The format for U.S. automated sea stations is limited to the special phenomenon group used to send the speed of the maximum wind.

$$333 \quad 9S_pS_ps_ps_p$$

6.2 Common Groups

The only groups common to both land and sea stations are the identifier for Section 3 and the special phenomenon group, though the special phenomena reported by land and sea stations differ.

6.2.1 Identification Group, 333. One of the few commonalities among messages from the different regions and the automated stations is the use of the identification group, **333**, to indicate the beginning of Section 3 in the synoptic report.

6.2.2 Special Phenomena Group, 9S$_P$S$_P$s$_P$s$_P$.

| 6.2.2.1 **General.** Special phenomena groups are reported by U.S. land stations and one group is reported by U.S. automated sea stations. The first character in the group, **9**, is the identifier for a special phenomenon group in Section 3 of the report. The next two characters, **S$_P$S$_P$**, are a two digit code figure to indicate the particular phenomenon. Though there are 100 possible phenomena, only 40 are reported in Region IV, and this is reduced to 4 when the ones reported by U.S. land stations are considered. There is an additional one that is reported by automated sea stations. Descriptions follow in Table 6-1.

Table 6–1. Special Phenomena, S$_P$ S$_P$ reported by U.S. Stations*

Code
figure

09	time precipitation began or ended; duration and character of precipitation
12	highest mean wind speed
31	depth of new snow past 6 hours
38	average rate of accrual of glaze

*Code figures 09, 31, and 38 are used by U.S. land stations; code figure 12 by U.S. automated sea stations.

The last 2 characters, **s$_p$s$_p$**, are used to encode the value(s) of the phenomenon given by S$_P$S$_P$.

| 6.2.2.2 **Depth of New Snow, 931nn.** The code letters **nn** represent the depth (in centimeters) of new snow in the past 6 hours (using a leading zero if less than 10 centimeters). The amount reported for **nn** is the actual amount that has fallen, even if some (or all) of it has melted. Two examples follow.

(1) During the 6-hour period it snows two times. After the first snow there are 5 centimeters of new snow. Before the second snow, 2 centimeters of the new snow melts. The second snow adds another 3 centimeters of new snow. The group **931nn** is encoded as 93108.

(2)   During the 6-hour period it snows only one time, but it is of long duration and adds 15 centimeters of new snow. Between melting and drifting, there are only 8 centimeters left by the time of the observation. The group **93lnn** is encoded as 93115. If snow depth is measured in centimeters, the measurement is directly encoded. If measured in inches or tenths of inches, the measurement is converted to centimeters by multiplying the measurement by 2.54.

6.2.2.3 Additional Precipitation Information, 909R$_t$d$_c$. This group is used within Region IV every time the group **6RRRt$_R$** is reported. The fourth character in the group, **R$_t$**, is used to encode the time precipitation began and ended. If there was more than one period of precipitation covered by the precipitation group **6RRRt$_R$**, the last period is used to encode **R$_t$** (see Table 6-2).

Table 6-2. Time at which Precipitation Given by RRR Began or Ended, R$_t$ (WMO Code Table 3552)

Code figure	
1	Less than 1 hour before time of observation
2	1 to 2 hours before time of observation
3	2 to 3 hours before time of observation
4	3 to 4 hours before time of observation
5	4 to 5 hours before time of observation
6	5 to 6 hours before time of observation
7	6 to 12 hours before time of observation
8	More than 12 hours before time of observation
9	Unknown

If there is precipitation at the time of the observation or during the hour before the observation, use **R$_t$** to indicate when the precipitation began. If there is no precipitation at the time of the observation and none occurred during the past hour, but group **6RRRt$_R$** was used in Section 1, use **R$_t$** to show the time when the precipitation ended.

The last character in the group, **d$_c$**, is used to show the duration and character of the precipitation (see Table 6-3).

Table 6–3. Duration and Character of Precipitation Given by RRR, d_c
(Modification of WMO Code Table 0833)

Code
figure

Note: Code figures 0 through 3 are used if only one period of precipitation has occurred during the period covered by W_1W_2 or $W_{a1}W_{a2}$

0	Lasted less than 1 hour
1	Lasted 1 to 3 hours
2	Lasted 3 to 6 hours
3	Lasted more than 6 hours

Note: Code figures 4 through 7 are used if two or more periods of precipitation have occurred during the period covered by W_1W_2 or $W_{a1}W_{a2}$

4	Lasted less than 1 hour
5	Lasted 1 to 3 hours
6	Lasted 3 to 6 hours
7	Lasted more than 6 hours
8	Not used
9	Unknown

The number of periods of precipitation is the number of times that precipitation began and ended. If there was steady precipitation and the intensity changed several times during the period, then there was still only one period. On the other hand, if the precipitation stopped, even for a minute or two, and then started again, then there was more than one period of precipitation.

6.2.2.4 Accrual of Glaze, 938nn. This special phenomenon group **938nn** is used to report the average accrual of glaze during the 6 hours before the observation. Glaze is the smooth ice that forms when freezing rain or freezing drizzle hits a cold surface. The last two characters in the group, **nn**, are the average rate of accrual, in millimeters. To find the average rate, measure the accumulated depth of the glaze to the nearest whole millimeter, and divide it by the actual time the glaze was accumulating, rounded to the nearest whole hour. If the time is less than 30 minutes, round it up to 1 hour. Finally, round the average rate to the nearest whole millimeter per hour.

If there was glaze forming, and the average rate rounds off to zero millimeters per hour, then encode the group **938nn** as 93800. If, for any reason, an accurate measurement cannot be made, use a reasonable estimate. If a reasonable estimate cannot be made, then encode the group **938nn** as 938//. If the depth of the glaze is measured in millimeters, use that value to calculate the average. If the depth is measured with inches as the basic unit, multiply the value by 25.4 (e.g. the depth of glaze is 0.10 in; 25.4(0.10) = 2.54 mm); encode **nn** = 03 if the glaze accrued during a one hour period.

6.2.2.5 Speed of Highest Mean Wind, 912ff. This special phenomenon group, **912ff**, is used to report the highest mean wind speed observed at automated sea stations. The group **912ff** will be included in all observations that have an average wind. If there is no average wind (**/ddff** encoded as /////), then the group **912ff** will not be included in the observation.

The highest mean wind is the highest "instantaneous" wind speed measured during any of the 4 to 8 second increments included in the calculation of the average vector wind that is reported in the **/ddff** group in Section 1. The highest mean wind speed, just like the average wind speed, is in meters per second and is always encoded as a two-digit number. If the wind is calm during the observation period, **ff** will be encoded as 00; if the highest mean wind speed is less than 10 meters per second, the first digit will be encoded as 0 (e.g., if the speed is 7 meters per second, **ff** is encoded 07); if the highest mean wind speed is 10 meters per second or more, **ff** is encoded as that value.

6.3 Land Groups

6.3.1 General. The groups in Section 3 that are unique to land station synoptic reports are summarized below with references to the stations that include these groups in their reports.

State of the Sky in the Tropics, $0C_sD_LD_MD_H$

Reported by staffed stations in the southern part of WMO Region IV that are at elevations less than 3,280 feet above sea level and within 310 miles of the shore. This group is only reported during that time of the year that tropical weather is normally observed.

Maximum and Minimum Temperatures, $1s_nT_xT_xT_x$, $2s_nT_nT_nT_n$

Reported by all stations in all regions at the main synoptic reporting time.

Snow (or Ice) Depth on the Ground, $4E'sss$

Reported by stations in the northern part of Region IV when there is at least a trace of snow or ice on the ground at observing times that correspond with issuance of main synoptic reports.

Supplemental Information, $5j_1j_2j_3j_4$

Used by stations in the southern part of Region IV and in Region V to report 24-hour pressure changes at selected main synoptic reporting times. In addition, used by stations in Region V to report cloud movement.

Precipitation Past 24 Hours, $7R_{24}R_{24}R_{24}R_{24}$

Reported by stations in Region IV and U.S. stations in Region V at main synoptic reporting times.

Cloud Data, $8N_sCH_sh_s$

Reported by a few staffed stations in Region IV and V.

6.3.2 State of the Sky in the Tropics Group, $0C_sD_LD_MD_H$. This group is omitted if there are no clouds. The first character, **0**, is the identifier for the state of the sky in the tropics group in Section 3 of the report. The character, C_s, is the state of the sky in the tropics. Table 6-4 contains code figures for encoding C_s, to describe the clouds that are observed. Supplemental pictures (Figure 6-1) are provided that match each code figure.

The first character, **4**, is the indicator for the group used to report snow (or ice) depth in Section 3. The second character **E'**, state of the ground with snow or ice, is not reported in the United States (always encode with a **/**). The last three characters, **sss**, represent the depth of snow or ice on the ground at the time of observation reported in whole centimeters from 001 to 996). WMO code figures 000, 997, 998 and 999 are not used in the United States. If the depth is not uniform, the average depth over a representative area is reported (see FMH No. 1).

6.3.5 Supplemental Information Group, $5j_1j_2j_3j_4$. The following symbolic expressions have been adopted in Regions IV and V.

$56D_LD_MD_H$	cloud movement group	Region V
$58p_{24}p_{24}p_{24}$	pressure change group (higher or the same)	Region V and southern part of Region IV
$59p_{24}p_{24}p_{24}$	pressure change group (lower)	Region V and southern part of Region IV

a. **Cloud Movement Group, $56D_LD_MD_H$.** The first two characters, **56**, identify the cloud movement group in Section 3 of the report. The last three characters in the group, $D_LD_MD_H$, represent the true directions from which the C_L clouds are moving (D_L), from which the C_M clouds are moving (D_M) and from which the C_H clouds are moving (D_H). This group is included in the report if the group $8N_hC_LC_MC_H$ was included in Section 1. Use Table 6-5 to encode D_L, D_M and D_H. If there are no clouds at a particular level, encode a solidus (**/**). For example, a report from Region V includes the notation 56/46 in Section 3. The **56** indicates that this is the cloud movement group; there are no low clouds; middle clouds are moving from south to north; and high clouds are moving from west to east.

b. **Pressure Change Groups, $58p_{24}p_{24}p_{24}$ or $59p_{24}p_{24}p_{24}$.** These two groups are used to report the pressure change. The first two digits in each group indicate whether the pressure is higher, the same as, or lower than the pressure 24 hours ago. If the pressure is either unchanged or higher than 24 hours ago, the group is introduced by **58**; if the pressure is lower than 24 hours ago, the group is introduced by **59**. The symbolic elements $p_{24}p_{24}p_{24}$ represent the absolute value of the pressure change in tenths of a hectopascal (filling 3 digits). If the pressure is read in inches, convert to hectopascals.

$$33.864 \ (P_{inches}) = P_{hPa}$$

For example, the pressure is 0.39 inches higher than 24 hours ago, which is the equivalent of 13.2 hectopascals higher. This is encoded 58132.

As another example, the pressure is 1.9 hectopascals lower than 24 hours ago. This is encoded 59019.

♦ Stations in the southern part of Region IV report the 24-hour pressure change in each main synoptic report. (These stations do not report the 3-hour pressure change, **5appp**, in Section 1.)

♦ Stations in Region V report the 24-hour pressure change at 0000 **UTC** and 1200 **UTC**, only. These stations also report the 3-hour pressure tendency in Section 1.

6.3.6   Precipitation Past 24-Hours Group, 7R$_{24}$R$_{24}$R$_{24}$R$_{24}$. The first character, **7**, is the identifier for the 24-hour precipitation group in Section 3 of the report. The 24-hour period is the 24 hours before actual time of the 0000, 0600, 1200, or 1800 UTC observation. The precipitation amount reported in R$_{24}$R$_{24}$R$_{24}$R$_{24}$ is the actual amount of liquid precipitation or the water equivalent for solid precipitation (reported in tenths of millimeters). If instruments are read in tenths or hundredths of an inch, readings must be converted to millimeters for the report.

25.4 x precipitation in inches = precipitation in millimeters

For example, total precipitation during the past 24 hours is 1.71 inches, which is equivalent to 43.43 millimeters. The group is encoded 70434.

Stations report this group in their 0000, 1200 and 1800 UTC report if there is more than a trace of precipitation during the preceding 24 hours. The minimum amount that a station can report depends on the calibration of the rain gauge.

There are a select number of stations in the U.S. CLIMAT network. These stations must include this group in their 0600 UTC report, whether or not there was precipitation during the period. If there was a minimum reportable amount, the above reporting rules are applicable. If there was only a trace of precipitation during the 24 hours before the actual time of observation, the group is encoded as 79999. (If precipitation is normally read in hundredths of an inch, a trace is less than .005 inch; if precipitation is read in tenths of a millimeter, a trace is less than .05 millimeters.) If there was no precipitation during the 24-hour period before the actual time of observation, R$_{24}$R$_{24}$R$_{24}$R$_{24}$ is encoded as 70000 in the 0600 UTC report.

6.3.7   Cloud Layers Data, 8N$_s$Ch$_s$h$_s$.

a. **General.** This group is reported by very few U.S. staffed stations and by no automated stations. It is restricted to those stations that do not transmit hourly observations and is used to provide information about height, amount and type of cloud in individual cloud layers. This group can be repeated (up to four **8N$_s$Ch$_s$h$_s$** groups can be reported). The rules governing reporting a layer and the number of times this group is used in Section 3 will follow a discussion on encoding/decoding the group.

CHAPTER 7

SECTION 5 – NATIONAL CODE GROUPS

7.1 General

This part of the code is reserved for national use. Each country is free to use Section 5 for transmission of groups that are of interest within that particular country. For example, the format for Section 5 in a Canadian surface synoptic report will be completely different from the format for Section 5 in a U.S. report. Section 5 is included only in U.S. reports from National Weather Service stations (land stations or automated sea stations).

The format for Section 5 at land stations is:

$$555 \qquad RECORD \qquad 0i_t t_D t_D t_D \qquad 1s_n TT \qquad s_n T_x T_x s_n T_n T_n \qquad RECORD$$

$$2R_{24}R_{24}R_{24}R_{24} \qquad 44s_n T_w T_w \qquad 9YYGG$$

Land stations use this section to report items concerning record temperatures, tide information, reports on city data from selected airport stations, and a redundant date-time group. It is unlikely that any one station would report all groups.

The full format for automated sea stations is:

$$555 \qquad 11fff \qquad 22fff \qquad 3GGgg \qquad 4ddf_m f_m \qquad (9GGgg)$$

This section is used by these stations to provide additional information about winds; and the exact time of the report.

The first group, **555**, is an identifier that this is Section 5 of the report. The other codes will be discussed in paragraph 7.2 (Land Stations) and paragraph 7.3 (Sea Stations).

7.2 Land Stations

Land stations may report several types of information in Section 5:

♦ indication that an old record temperature has been equalled or exceeded;

♦ tide information from selected coastal stations;

♦ reports of city information from selected airport stations; or

♦ water temperature data from selected stations

♦ redundant date-time group required by selected stations.

7.2.1 RECORD (Record Temperature) Group.

7.2.1.1 General. A record temperature may be reported from a station for several reasons. These include keeping records up-to-date at the National Climatic Data Center and, on the other end of the spectrum, satisfying the curiosity of the general public when a record temperature has been set or equalled. In order to report a record temperature, a station must first have collected data over a number of years from the same location. There must also be a need for the information. A number of stations have been instructed to include this group.

7.2.1.2 Code Procedures. The word **RECORD** is not used when reporting this group. Instead, Table 7-1, below, is used to select appropriate contractions to indicate that monthly or yearly temperatures have been equalled or exceeded. For example, a new low temperature is measured in January. It is encoded LOXFM in Section 5 of the report.

Table 7-1. Set of Contractions for Encoding/Decoding Annual and Monthly Record Temperatures

RECORD PERIOD	High Equalled	High Exceeded	Low Equalled	Low Exceeded
Annual (all time, AT)	**HIEAT**	**HIXAT**	**LOEAT**	**LOXAT**
Monthly Summer (Jun, Jul, Aug) or Winter (Dec, Jan, Feb)	**HIEFM**	**HIXFM**	**LOEFM**	**LOXFM**
Spring (Mar, Apr, May) high so early (SE)	**HIESE**	**HIXSE**		
low so late (SL)			**LOESL**	**LOXSL**
Fall (Sept, Oct, Nov) low so early (SE)			**LOESE**	**LOXSE**
high so late (SL)	**HIESL**	**HIXSL**		

Note: Send only the contraction(s). Do not send the word **RECORD**.

In addition to the contractions in Table 7-1, a select group of stations report record temperatures for the day based on the following set of contractions (Table 7-2).

Maximum/Minimum Temperature in the City Group, $s_nT_xT_xs_nT_nT_n$.

The second city data group is a six character group. The first and the fourth characters, s_n, represent the sign of the data with the coding convention discussed above. The second and third digits in the group, T_xT_x, are the maximum temperature in whole degrees Fahrenheit, using two digits to code T_xT_x (the same way as **TT**.) The maximum temperature reported in the 0000 UTC observation is the maximum during the past 12 hours. The maximum temperature reported in the 1200 UTC observation is the maximum during the past calendar day. The last two digits in the group, T_nT_n, are the minimum temperature in whole degrees Fahrenheit using two digits to code T_nT_n (the same way as **TT** and T_xT_x; however, it is very unlikely that a minimum temperature will be 100°F or higher). The minimum temperature in the 0000 UTC observation is the minimum during the past 18 hours. The minimum reported temperature in the 1200 UTC observation is the minimum during the past 12 hours.

RECORD City Temperature Group

This third city data group treats record temperatures in the city in the same manner as **RECORD** in the station report (paragraph 7.2.1).

Precipitation Past 24-Hours Group, $2R_{24}R_{24}R_{24}R_{24}$

This is the last group containing city data. The first character, **2**, is the indicator for the 24-hour precipitation group for the city location. The symbols $R_{24}R_{24}R_{24}R_{24}$ represent the amount of precipitation (in hundredths of an inch) at the city location during the 24 hours ending at the time of the observation. The amount of precipitation is the actual amount of liquid precipitaiton and the water equivalent of solid precipitation. This group is only included if the total amount is .01 inch or more. For example, if the precipitation amount was 0.37 inch, $R_{24}R_{24}R_{24}R_{24}$ would be encoded 20037.

7.2.3.3 Examples of City Data Groups.

◆ 1086 093074   Present temperature is 86°F.
                                    Maximum temperature was 93°F.
                                    Minimum temperature was 74°F.
                                    No precipitation (group not reported).

◆ 1077 082067 20098   Present temperature is 77°F.
                                    Maximum temperature was 82°F.
                                    Minimum temperature was 67°F.
                                    24-hour precipitation amount is 0.98 inch.

7.2.4 Water Temperature, 44s$_n$T$_w$T$_w$. Some National Weather Service stations are required to report temperature (mostly lake temperatures). The first two characters, **44**, are an indicator for the water temperature. The characters **T$_w$T$_w$** represent the absolute temperature of the water in whole degrees Celsius. The code letter **s$_n$** provides the sign of the data, 0 if the temperature is zero or greater and 1 if the temperature is below zero. For example, if the water temperature is $-2°$C, group would be encoded 44102.

7.2.5 Additional Date-Time Group, 9YYGG. Selected stations are required to include a date-time group within the body of the observation, in addition to the date-time group included at the beginning of a bulletin of observations. If included in the group, it will be the last group in section 5, and therefore the last in the observation. The first digit in the group, **9**, is the identifier for the redundant date-time group in the observation. The next two digits, **YY**, and the last two digits, **GG**, are the UTC day and time of the observation (paragraph 3.2.2).

7.3 Sea Stations

7.3.1 General. Section 5 is used in surface synoptic reports from automated sea stations, but not from staffed ships. It is used by automated sea stations to provide supplemental wind data.

7.3.2 Coding Procedures. The first group, **555**, indicates that this is section 5 of the report.

The next two groups, **11fff 22fff**, are used to report equivalent wind speed data. The height of the anemometer on a U.S. data buoy, at this time, may vary from 3.4 meters to 13.8 meters. The WMO standard anemometer height is 10 meters. The average height for a ship anemometer, and the height used for most oceanographic wave models, is 20 meters. In the group **11fff**, the symbolic letters **fff** represent the equivalent wind speed at 10 meters (in meters per second); and in the group **22fff**, the symbolic letters **fff** represent the equivalent wind at 20 meters. Both groups will be included, regardless of the actual anemometer height.

The next two groups, **3GGgg 4ddf$_m$f$_m$**, are used to provide data concerning the maximum wind speed since the time of the last observation. In the group **4ddf$_m$f$_m$**, **f$_m$f$_m$** is the maximum wind speed in meters per second; **dd** is the true direction in tens of degrees; and **4** is the identifier for the wind speed group. The preceding group, **3GGgg**, indicates the UTC time at which the maximum wind occurred. (**3** is the identifier for this time group, **GG** is the UTC hour and **gg** the minutes after the hour.)

The last group, **9GGgg**, is included by only a few automated sea stations which take more than one observation each hour. This group tells the user whether the observation is a "normal" hourly, or one taken at some other time during the hour. (**9** is the identifier for this time group, **GG** is the UTC hour and **gg** the minutes after the hour.)

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