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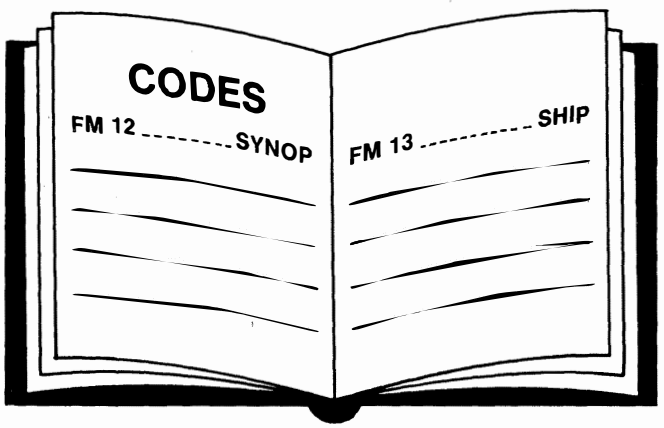
OFFICE OF THE FEDERAL COORDINATOR FOR
METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH

FEDERAL METEOROLOGICAL HANDBOOK NO. 2

SURFACE SYNOPTIC CODES

FCM—H2—1988



Washington, D.C.
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RECORD OF CHANGES

Supplement or Change No.	Effective Date	Initials	Date Entered	Remarks

WHEN CHANGES ARE ENTERED IN THIS HANDBOOK, NOTATION WILL BE MADE ON THIS PAGE. IF CHANGES ARE INCLUDED ON CHANGE SHEETS, A CHANGE BAR (▮) WILL APPEAR IN THE LEFT MARGIN ADJACENT TO THE CHANGES.

FOREWORD

The Office of the Federal Coordinator for Meteorological Services and Supporting Research, through its Working Group on Meteorological Codes, is responsible for preparing Federal Meteorological Handbook Number 2 (FMH-2), Surface Synoptic Codes, and for assuring that it remains current. This edition of FMH-2 has been updated to reflect the latest World Meteorological Organization codes and regulations, FM 12 SYNOP and FM 13 SHIP; and to bring the handbook into compliance with guidance from the Committee for Basic Services. We thank Mr. Albert L. Hernhuter, National Weather Service, for preparing the draft manuscript and acknowledge the efforts of the Federal agency reviewers.

This handbook prescribes Federal standards for the coding of U.S. synoptic weather reports by land stations and sea stations, and provides a reference for users of these data. Note that the codes for reporting manual sea stations (ship) observations have not been included in previous editions of FMH-2, but are included here so all surface synoptic code forms are standardized. The standards in FMH-2 are applicable to all U.S. Federal agencies and should be reflected in their manuals and directives. In this edition of FMH-2 we have eliminated lengthy conversion tables, such as conversions from inches of mercury to hectopascals, and have eliminated individual agency instructions, such as those related to message dissemination. Code Tables appear in this handbook where the appropriate code is first described.

Robert L. Carnahan
Federal Coordinator for
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Supporting Research

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CHAPTER 1

INTRODUCTION

1.1 Purpose

The synoptic surface weather observing program exists to provide weather data to support forecast programs. Weather data are encoded in a numeric format for international exchange. The data content of the synoptic surface weather messages, the associated codes, and the symbolic message formats have been agreed to by the World Meteorological Organization (WMO). Since the synoptic messages are entirely in code, this handbook has been prepared to provide uniform procedures for encoding and decoding synoptic weather messages from land stations in WMO Regions IV and V (Figure 1-1) and from various categories of sea stations.

The procedures in this handbook do not include instructions that relate to dissemination of messages; e.g., instructions concerning breaking groups, line feeds, carriage returns, etc. This type of information relates to the type of equipment being used and is more appropriate in agency instructions.

1.2 Synoptic Observation Program

In accordance with WMO standard practices, the United States has established a network of synoptic surface observation stations on land and recruited ships to provide surface observations in oceanic areas. The synoptic surface observation program provides for observations from these land and sea stations at the main synoptic reporting times of 0000, 0600, 1200 and 1800 Coordinated Universal Time (UTC). The WMO has recommended that synoptic observations be made by principal land stations at the intermediate times of 0300, 0900, 1500 and 2100 UTC, also. The time of an observation is the time when atmospheric pressure observations are made. Observation of other elements is made within the ten-minute period preceding the standard time for the surface synoptic observation. Synoptic surface observations normally include, at a minimum, information on amount of sky cover, wind, visibility, temperature, pressure and weather. Chapters 2 through 7 will specify which elements are reported by each category of station.

The synoptic observation at U.S. land stations may be a full observation following the synoptic observing practices. At many stations, the synoptic observation is converted from the basic weather observation (the data sent at hourly intervals) plus additional data. The observing practices for the latter type of "synoptic observation" vary in some respects from synoptic weather observing practices. These variances are indicated in appropriate portions of this handbook.

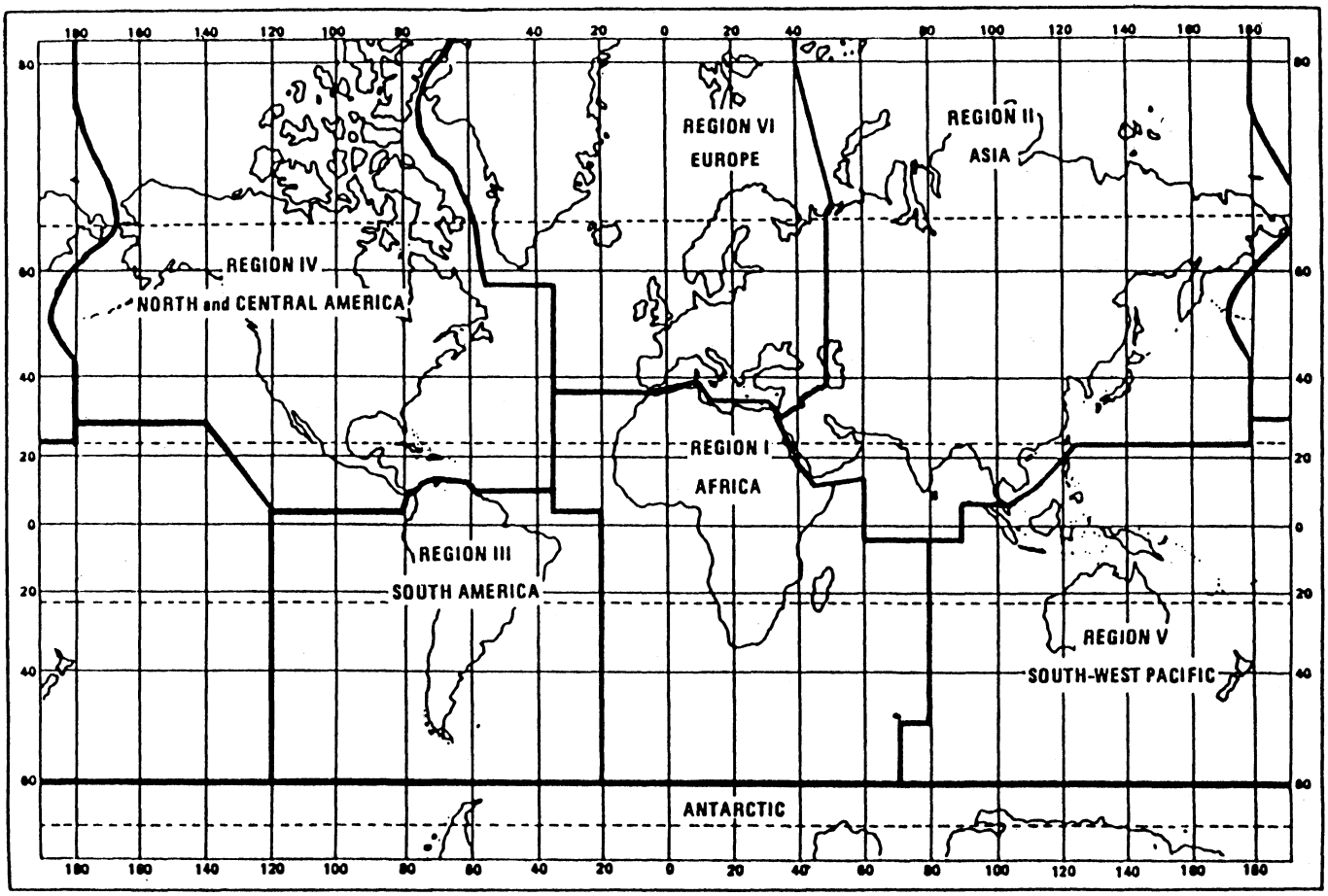


Figure 1–1 Map of WMO Regions

There are differences among land stations' reporting practices in the northern portion of WMO Region IV*, the southern portion of WMO Region IV and WMO Region V. The general differences are discussed in Chapter 2. Specific differences are indicated in appropriate portions of Chapters 3 through 7.

1.3 Relation to Other Handbooks and Manuals

Federal Meteorological Handbook (FMH) No. 2 is a handbook on standard U.S. coding of synoptic surface observation, and is not a manual on synoptic surface weather observations. In general, FMH-1 Surface Observations provides the framework within which observers at land stations can evaluate meteorological phenomena. FMH-2 briefly notes a synoptic

*There are no fixed boundaries between the northern and southern portions of Region IV. In general, the southern portion includes the Bahamas, the Caribbean, Mexico and Central America, but the region may include selected more northerly stations in the warmer season.

observation procedure if it differs from FMH-1. Maritime observing procedures are discussed in National Weather Service Observing Handbook No. 1, Marine Surface Weather Observations (which provides instructions for civil staffed ships) and in NAVOCEANCOMINST 3144.1 Manual for Ships' Surface Weather Observations (which provides instructions for U.S. Navy ships).

1.4 Format of this Handbook

Chapter 2 is separated into three principal areas:

a. a general area that provides a brief description of the content of each section of the symbolic code format;

b. a presentation of code forms that apply to land stations; and

c. a presentation of code forms that apply to sea stations.

Chapters 3 through 7 are each structured in a similar fashion and separated into appropriate segments. Chapter 3 is divided into a general discussion, followed by a section on groups common to land and sea stations, those unique to land stations and those unique to sea stations. Though this arrangement is appropriate for Chapter 3, other chapters do not require that many subsections, but follow the same general approach.

Each of the Chapters 3 through 7 is devoted to one section of the symbolic code format: Section 0 in Chapter 3; Section 1 in Chapter 4; Section 2 in Chapter 5; Section 3 in Chapter 6; and Section 5 in Chapter 7*. Where appropriate, those code groups that are common to land and sea stations will be discussed in the first segment, followed by a discussion of those groups unique to land stations and those unique to sea stations. The discussion of each group will include definitions of symbolic figures and letters, appropriate code tables, pertinent practices, WMO regulations and applicability of that group to sub-categories such as WMO region or type of station.

1.5 Changes to the Handbook

Changes, additions, deletions, and corrections will be issued as necessary. These changes will be issued only by the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) after consultation and coordination within the Working Group for Meteorological Codes (WG/MC) and the Working Group for Surface Observations (WG/SO).

*Section 4 is not applicable to synoptic reporting by United States stations; Sections 3 and 5 are not used by staffed ships.

1.6 Agency Procedural Changes

Procedural supplements may be issued by each agency for use within the issuing agency whenever necessary to meet urgent requirements. Individual agency changes will be consolidated into future supplements issued by the agency concerned.

1.7 Unforeseen Requirements

No set of instructions can cover all possibilities in weather observation. The observer must use his own judgment, adhering as closely as possible to this handbook, to describe phenomena not adequately covered by specific instructions. If the observer feels handbook procedures require change or clarification, suggested changes should be sent through normal administrative channels to the headquarters of the appropriate organization.

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 and tide data from some coastal locations. 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) $1s_nTTT$ $2s_nT_dT_dT_d$**

$3P_oP_oP_oP_o$ 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 $1s_nT_xT_xT_x$ $2s_nT_nT_nT_n$ 4E'sss $7R_{24}R_{24}R_{24}R_{24}$**

$8N_sCh_sh_s$ $9S_PS_Ps_ps_p$

Section 5 **National groups**

2.2.1.2 Intermediate Synoptic Reporting Times.

Section 0 **IIiii**

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

3$P_o P_o P_o P_o$ 4PPPP 5appp 7wwW$_1$W$_2$ 8$N_h C_L C_M C_H$

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

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

Section 3 **333 8$N_s Ch_s h_s$ 9$S_P S_P s_p s_p$**

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 **$i_R i_x$hVV Nddff (00fff) 1s_nTTT 2$s_n T_d T_d T_d$**

3$P_o P_o P_o P_o$ 4PPPP 7wwW$_1$W$_2$ 8$N_h C_L C_M C_H$

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

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

Section 3 **333 0$C_s D_L D_M D_H$ 1$s_n T_x T_x T_x$ 2$s_n T_n T_n T_n$**

5$j_1 j_2 j_3 j_4$ 7$R_{24} R_{24} R_{24} R_{24}$ 8$N_s Ch_s h_s$ 9$S_P S_P s_p s_p$

Section 5 **National groups**

2.2.2.2 Intermediate 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 $7wwW_1W_2$ $8N_n C_L C_M C_H$

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 $0C_s D_L D_M D_H$ $8N_s Ch_s h_s$ $9S_P S_P s_p s_p$**

2.2.3 WMO Region V.

2.2.3.1 Main Synoptic Reporting Times.

Section 0 **($M_i M_i M_j M_j$ YYGGi_w) IIiii**

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

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// $1s_n T_x T_x T_x$ $2s_n T_n T_n T_n$ $5j_1 j_2 j_3 j_4$**

$8N_s Ch_s h_s$

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_nTTT 2$s_n$$T_dT_dT_d$**

3$P_oP_oP_oP_o$ 4PPPP 5appp 6RRRt_R 7wwW$_1$W$_2$ 8$N_hC_LC_MC_H$

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

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

Section 3 **333 8$N_sCh_sh_s$**

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 99$L_aL_aL_a$ $Q_cL_oL_oL_oL_o$**

Section 1 **i_Ri_xhVV Nddff (00fff) 1s_nTTT 2$s_n$$T_dT_dT_d$**

4PPPP 5appp 7wwW$_1$W$_2$ 8$N_hC_LC_MC_H$

Section 2 **222D_sv_s 0$s_n$$T_wT_wT_w$ 2$P_wP_wH_wH_w$ 3$d_{w1}d_{w1}d_{w2}d_{w2}$**

4$P_{w1}P_{w1}H_{w1}H_{w1}$ 5$P_{w2}P_{w2}H_{w2}H_{w2}$ 6$I_sE_sE_sR_s$ ICE + plain language

or

ICE $c_iS_ib_iD_iz_i$

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$_a$L$_a$L$_a$**	**Q$_c$L$_o$L$_o$L$_o$L$_o$**
Section 1	**i$_R$i$_x$hVV**	**Nddff (00fff)**	**1s$_n$TTT**	**4PPPP**
	7wwW$_1$W$_2$	**8N$_h$C$_L$C$_M$C$_H$**		
Section 2	**222/**	**6I$_s$E$_s$E$_s$R$_s$**	**ICE + plain language** **or** **ICE c$_i$S$_i$b$_i$D$_i$z$_i$**	

2.3.3 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$_a$L$_a$L$_a$L$_a$**	**Q$_c$L$_o$L$_o$L$_o$L$_o$**	
Section 1	**i$_R$i$_x$hVV**	**Nddff (00fff)**	**1s$_n$TT/**	**4PPP/**	
	7wwW$_1$W$_2$				
Section 2	**222//**	**6I$_s$E$_s$E$_s$R$_s$**	**ICE + plain language** **or** **ICE c$_i$S$_i$b$_i$D$_i$z$_i$**		

2.3.4 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$_1$b$_w$n$_b$n$_b$n$_b$**		**99L$_a$L$_a$L$_a$**	**Q$_c$L$_o$L$_o$L$_o$L$_o$**		
Section 1	**i$_R$i$_x$///**		**1s$_n$TTT**	**2s$_n$T$_d$T$_d$Td**	**4PPPP**	**5appp**
Section 2	**22200**	**0s$_n$T$_w$T$_w$T$_w$**	**1P$_{wa}$P$_{wa}$H$_{wa}$H$_{wa}$**			
Section 3	**333**	**921ff**				
Section 5	**555**	**11fff**	**22fff**	**3GGgg**	**4ddf$_m$f$_m$**	**(9GGgg)**

CHAPTER 3

SECTION 0 – IDENTIFICATION

3.1 General

Section 0 is mandatory in all transmitted synoptic reports. It contains identification data, whether it is a report of surface observations from a land station (SYNOP) or from a sea station (SHIP). The code name SYNOP or SHIP is not used in the report or in a collection of reports (a bulletin).

3.2 Common Groups

The form of this section differs between land stations and sea stations. Only two of the groups are the same, $\mathbf{M_iM_iM_jM_j}$ and $\mathbf{YYGGi_w}$.

3.2.1 Station Type Identifier, $M_iM_iM_jM_j$. The identifier $\mathbf{M_iM_iM_jM_j}$ is not transmitted by sea stations or most land stations (a select group of stations in Region V include this group in their report), but is included in a bulletin to indicate whether a collection of reports is from a land station or a sea station. The identifier $\mathbf{M_iM_iM_jM_j}$ does not appear in the bulletin, but an appropriate code replaces it (Table 3-1).

Table 3–1. Indicator for Source of Report, $M_iM_iM_jM_j$

Source	Code
Land Station	**AAXX**
Sea Station	**BBXX**

3.2.2 Date/Time and Wind Indicator Group ($YYGGi_w$). The date/time and the wind indicator form a group that is generally not transmitted in a land report (except for some in Region V), but it does appear in bulletin headings. This group is transmitted by sea stations.

YY is the day of the month (UTC). It is always coded in two digits; i.e., 01, 02, ..., 30, 31. Note that this is the UTC day of the month which may vary from the local date.

GG is the actual time of the observation, the time when the barometer is read, rounded to the nearest hour UTC. For example, 2120 would be coded as 21 UTC and 2340 would be coded as 00 UTC with another day added to **YY**. There is no hour 24. At that time a new day begins, the date is advanced by 1 and the hour is 00. Of course, the addition of a day to **YY** at the end of a month would encode **YY** as 01.

i_w is a wind indicator symbolic figure. Code table 3-2 is an adaptation of WMO Table 1855. Bulletins from U.S. land stations always encode i_w as 4. U.S. staffed ships encode 3 or 4 and U.S. automated sea stations encode 1.

Table 3-2. Indicator for Source and Units of Wind Speed, i_w (Modification of WMO Code Table 1855)

Code figure	
0	Wind speed in meters per second (estimated)
1	Wind speed in meters per second (obtained from anemometer)
3	Wind speed in knots (estimated)
4	Wind speed in knots (obtained from anemometer)

3.3 Land Station

3.3.1 General.

$M_iM_iM_jM_j$ YYGGi_w IIiii

indicates the maximum number of groups that can be used in Section 0. The only group unique to land stations is the international index number, **IIiii**. In a bulletin, the groups **$M_iM_iM_jM_j$ YYGGi_w** are transmitted once as the first line of the bulletin (the line immediately following the bulletin heading). This is true whether the bulletin consists of one report or a collection of several reports. This practice assumes that all wind observations are measured. These groups were discussed in paragraph 3.2.2.

3.3.2 International Index Number, IIiii. The international index number is a five-digit identifier that applies to staffed or automated land stations. The first two digits (**II**) in the index number represent the block number. Block numbers are assigned to individual countries by the WMO. Alaska is assigned block number 70; the contiguous United States is assigned 72 and 74; block number 91 is assigned to islands in the Pacific Ocean. This means that all index numbers in Alaska begin with 70, index numbers in the contiguous U.S. may begin with a 72 or a 74 and that U.S. stations in Region V begin with a 91. The last three numbers (**iii**) are the station number. Station numbers are assigned by each country. WMO Publication No. 9, Volume A contains a list of all index numbers assigned worldwide. Another source of index numbers is National Weather Service Communications Handbook No. 4*, which is limited to the index numbers for stations in WMO Region IV and U.S. stations in WMO Region V.

*Handbook is titled Index Numbers for North and Central America, the Caribbean and U.S. Stations in the Pacific.

3.4 Sea Stations

The maximum number of groups that sea stations include in Section 0 appear below:

$\mathbf{M_iM_iM_jM_j}$ **D. . . .D or** $\mathbf{A_1b_wn_bn_bn_b}$ $\mathbf{YYGGi_w}$ $\mathbf{99L_aL_aL_a}$ $\mathbf{Q_cL_oL_oL_oL_o}$

As indicated in paragraph 3.2, ships do not transmit the group $\mathbf{M_iM_iM_jM_j}$, which is used in a bulletin of sea station reports to indicate that these reports are from sea stations. The group $\mathbf{YYGGi_w}$ was discussed in paragraph 3.2.2.

3.4.1 Ship's Call Sign, D. . . .D. A staffed ship identifies itself by transmitting its radio call sign as the first group in Section 0 of surface synoptic reports.

3.4.2 Buoy Identifier, $\mathbf{A_1b_wn_bn_bn_b}$. An automated sea station identifies itself by transmitting a buoy identifier group, $\mathbf{A_1b_wn_bn_bn_b}$. The first character, $\mathbf{A_1}$, is the WMO Region in which the buoy is located. Since the United States has stations in Regions IV and V, the character $\mathbf{A_1}$ is encoded as 4 or 5 respectively. The second character, $\mathbf{b_w}$, is the subarea within the WMO Region where the buoy is located. Figure 3-1 indicates the boundaries for each location identifier.

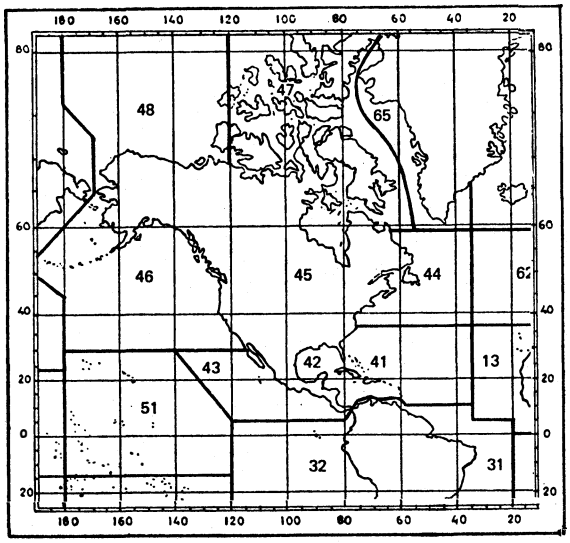


Figure 3–1 Location Identifier, $\mathbf{A_1\,b_w}$ (Excerpt from WMO Code Table 0161)

The code in each subarea incorporates the WMO Region, $\mathbf{A_1}$, and the subarea indicator, $\mathbf{b_w}$. Thus, the location identifier for U.S. operated buoys is:

$\mathbf{A_1b_w}$	=	41	(North Atlantic, from about Cape Hatteras south)
$\mathbf{A_1b_w}$	=	42	(Gulf of Mexico)
$\mathbf{A_1b_w}$	=	44	(North Atlantic, from about Cape Hatteras north)
$\mathbf{A_1b_w}$	=	45	(Great Lakes)
$\mathbf{A_1b_w}$	=	46	(Off the West Coast of the U.S. and the Gulf of Alaska)
$\mathbf{A_1b_w}$	=	51	(Pacific Ocean, in and near the Hawaiian Islands)

The last three characters in the group, $\mathbf{n_bn_bn_b}$, further identify the automated sea station. The U.S. practice is to assign the $\mathbf{n_bn_bn_b}$ code to locations rather than to buoys. That means that 41001 is the first site chosen in subarea 41, 41002 is the second site, etc. Therefore, if a buoy fails and is replaced, the new buoy assumes the old number that pertains to that site. A current list of NOAA automated sea stations (moored buoys) is published by the NOAA National Data Buoy Center each week in their Data Platform Status Report. (Copies can be obtained from the NOAA National Data Buoy Center, Stennis Space Center, MS 39529, or by telephone request to them at (601) 688-2836, FTS 494-2836 or AV 485-4411.)

3.4.3 Location of Sea Station, $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$.

3.4.3.1 Latitude, $99L_aL_aL_a$. In the group $\mathbf{99L_aL_aL_a}$, **99** is the group indicator for the latitude $\mathbf{L_aL_aL_a}$ which is the latitude in whole degrees and tenths of a degree with no decimal point. (If the latitude is less than 10 degrees a leading zero is used for the first character $\mathbf{L_a}$.)

In converting from minutes of latitude or longitude to tenths, the convention followed is to divide the number of minutes by 6 and disregard any remainder. For example, 45° 41′ is coded as 456 because 41 divided by 60 equals .683 which is rounded down to .6 (coded as 6).

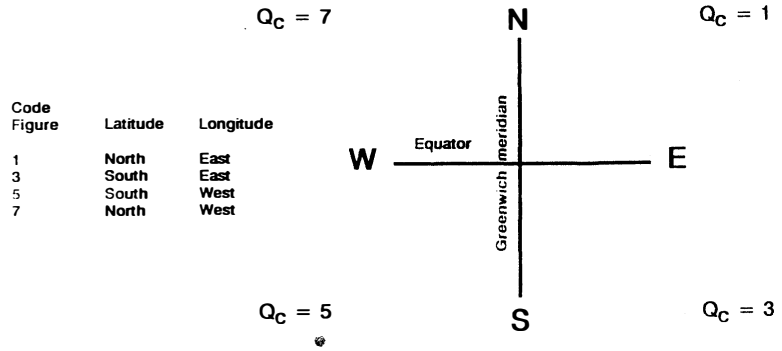
Table 3-3. Conversion of Minutes and Seconds to Tenths of a Degree

Minutes/Seconds	Tenths of a Degree	Minutes/Seconds	Tenths of a Degree
00'00"-05'59"	.0	30'00"-35'59"	.5
06'00"-11'59"	.1	36'00"-41'59"	.6
12'00"-17'59"	.2	42'00"-47'59"	.7
18'00"-23'59"	.3	48'00"-53'59"	.8
24'00"-29'59"	.4	54'00"-59'59"	.9

3.4.3.2 Longitude and Quadrant of the Globe, $Q_cL_oL_oL_oL_o$. The symbolic code figure, Q_c, is used to indicate whether a sea station location is in the north latitudes or south latitudes and, also, whether it is in the eastern or western hemisphere (see Table 3-4 below).

Table 3–4. Quadrant of the Globe, Q_c (WMO Code Table 3333)

Q_C - Quadrant of the globe



Note: The choice is left to the observer in the following cases:

When the ship is on the Greenwich meridian or the 180th meridian ($L_oL_oL_oL_o$ = 0000 or 1800 respectively):

Q_C = 1 or 7 (northern hemisphere) or
Q_C = 3 or 5 (southern hemisphere);

When the ship is on the Equator ($L_aL_aL_a$ = 000):

Q_C = 1 or 3 (eastern longitude) or
Q_C = 5 or 7 (western longitude)

All automated sea stations routinely operated by the U.S. are in Regions IV and V in northern latitudes and western longitudes and in their synoptic messages Q_c is always encoded as 7. Buoys deployed on special missions and staffed ships select an appropriate value for Q_c from Table 3-4. The longitude of the sea station, $L_oL_oL_oL_o$, is coded in whole degrees and tenths. Leading zero(es) are used, if necessary, to provide a complete entry for $L_oL_oL_oL_o$. For example, a ship at 7°39 ' W. longitude would encode $L_oL_oL_oL_o$ as 0076 using the same convention used to convert minutes to tenths of a degree latitude (paragraph 3.4.3.1 and Table 3-3). If the ship were in the Northern Hemisphere, Q_c would be 7 and the entire group $Q_cL_oL_oL_oL_o$ would be encoded 70076.

3.5 Example of Section 0 for a Sea Station

Message: 44004 07151 99385 70706

This is a report from buoy 44004 (which is located at site number 4 in the North Atlantic, north of Hatteras). The time of the observation is 1500 UTC on the seventh day of the month. The wind speed has been measured and is reported in meters per second. A more precise location of the sea station is given. It is at 38.5°N, 70.6°W.

CHAPTER 4

SECTION 1 – GENERAL METEOROLOGICAL INFORMATION

4.1 General

The maximum number of groups that is used in Section 1 of a synoptic report from a land station is presented below, followed by the maximum from a sea station.

- Land - $i_R i_X hVV$ **Nddff (00fff)** **$1s_nTTT$** **$2s_nT_dT_dT_d$** **$3P_oP_oP_oP_o$**
  4PPPP **5appp** **$6RRRt_R$** **$7wwW_1W_2$** **$8N_hC_LC_MC_H$**

- Sea - $i_R i_X hVV$ **Nddff (00fff)** **$1s_nTTT$** **$2s_nT_dT_dT_d$** **4PPPP**
  5appp **$7wwW_1W_2$** **$8N_hC_LC_MC_H$**

Section 1 contains general meteorological information: visibility, wind velocity, atmospheric temperature and dew point, atmospheric pressure information, weather phenomena and cloud data. All the groups reported in Section 1 are common to land and sea stations with the exception of the group **$3P_oP_oP_oP_o$**, the pressure at station level and the precipitation group **$6RRRt_R$**. The **$3P_oP_oP_oP_o$** group is only reported by land stations. (Barometers on U.S. civilian ships are calibrated to read in sea-level pressure.) Since the commonality is so great, this chapter will not contain separate sections for land and sea stations. Coding differences that exist because of different observing practices will be noted as each group is discussed. Some of these groups or symbolic letters within the group do not pertain to certain categories of stations. This will be noted as each group is discussed.

It was indicated in paragraph 1.2 that though many of the synoptic reports at U.S. land stations follow the synoptic observing practices, some are converted from basic weather observations (the surface hourlies) plus additive data. These latter observing practices differ in some respects from the synoptic practices which can impact the coding of certain groups and limit the coding of these groups. This, too, will be noted as each group is discussed.

Similarly, automation can impact coding procedures, and this will be indicated where it is appropriate.

4.2 Code Groups

4.2.1 Indicator Information, Cloud Height and Visibility, $i_R i_X hVV$. This group must be included in all reports. Mandatory group elements specified by symbolic letters shall be coded with solidi (/ or //) if a station is not equipped to report the relevant data.

4.2.1.1 Precipitation Indicator, i_R. The symbolic code figure i_R is an indicator that precipitation data (**6RRR**t_R) is reported in either Section 1 or in Section 3. The code table for i_R is Table 4-1.

Table 4–1. Indicator for Inclusion or Omission of Precipitation Data, i_R (WMO Code Table 1819)

Code figure	Precipitation data are reported:	Group **6RRR**t_R is:
1	In Section 1	Included
2	In Section 3	Included
3	In none of the two Sections 1 and 3	Omitted (precipitation amount = 0)
4	In none of the two Sections 1 and 3	Omitted (precipitation amount not available)

Land stations that measure precipitation can choose the appropriate code for i_R. Since U.S. stations include the group **6RRR**t_R in Section 1 rather than Section 3, any measurement of precipitation, even a trace, is coded as **6RRR**t_R and i_R is encoded as 1. If measured precipitation is zero, i_R is encoded as 3. Since ships and buoys do not measure precipitation amounts, sea stations encode i_R as 4. If an automated land station does not have the capability to measure precipitation, it encodes i_R as 4 also. If it has the capability and the instrument fails, it encodes i_R as 4.

4.2.1.2 Type of Station and Weather Group Indicator, i_x. The symbolic code figure, i_x, serves a multiple purpose (see Table 4-2). It indicates whether a station is staffed or automated. In addition, it points out whether present and past weather occurred and, if it occurred, whether it was coded in the **7wwW**$_1$**W**$_2$ or **7w**$_a$**w**$_a$**W**$_{a1}$**W**$_{a2}$ group. In addition it notes whether data are missing.

Reports from staffed stations would normally be coded 1 or 2, unless the report has been converted from a basic weather observation plus additive data. The conversion process results in assigning code values to present weather phenomena that are reported, but there is insufficient information to ascribe a code for past weather. Therefore, those stations would encode i_x as 1.

Automated sea stations and automated land stations, such as AUTOB, do not observe weather phenomena. Therefore in synoptic weather reports from buoys and AUTOB stations, i_x is always encoded as 6, a report from an automated station that does not observe present or past weather. If an automated station is deployed with a capability to observe weather phenomena, Table 4-2 provides appropriate codes.

Table 4–2. Indicator for Type of Station Operation (Staffed or Automated) and for Present and Past Weather Data, i_x (Modification of WMO Code Table 1860)

Code figure	Type of station operation	Group **7wwW$_1$W$_2$** or **7w$_a$w$_a$W$_{a1}$W$_{a2}$** is:
1	Manned	Included
2	Manned	Omitted (no significant phenomenon to report)
3	Manned	Omitted (not observed, data not available)
4	Automatic	Included using Table 4-12 and Table 4-14
5	Automatic	Omitted (no significant phenomenon to report)
6	Automatic	Omitted (not observed, data not available)
7	Automatic	Included using Table 4-13 and Table 4-15

4.2.1.3 Height of Lowest Cloud, h. The third symbolic figure in the group **i$_R$i$_x$hVV** is used to report the height of the base of the lowest cloud seen. The height reported is with respect to the surface. Table 4-3 is a variation of WMO Table 1600. In that table, **h** was based upon height in meters and a convention that coded values at the end of each range would be coded in the next higher range. In the table below, the meters were converted to feet and all reportable values (following U.S. observing practices) in each range are listed with the corresponding code value of **h**. In the U.S. convention, heights between the end of a range and beginning of the next are rounded up if midway or greater.

The lowest cloud height is coded with a solidus (/) if there is a total surface-based obscuration that prevents an observation of the clouds. Automated sea stations do not observe sky condition parameters and code **h** as a /. Automated land stations that do not have proper equipment or acceptable algorithms for evaluating **h** will report **h** as a /.

Table 4–3. Height of Cloud Base Above Ground, h (Modification of WMO Code Table 1600)

Code figure	Reportable heights(ft)
0	0 or 100
1	200 or 300
2	400 to 600*
3	700 to 900*
4	1000 to 1900*
5	2000 to 3200*
6	3300 to 4900*
7	5000 to 6500**
8	7000 to 8000**
9	8500 or higher or no clouds
/	unknown or base of clouds below surface of station

* reported in 100 foot increments Ø
** reported in 500 foot increments Ø

4.2.1.4 Visibility, VV. The U.S. practice of reporting visibility in terms of prevailing visibility is followed in reporting the visibility, **VV**. Methods for evaluating prevailing visibility at land stations are discussed in FMH-1. Visibility reported by land stations is coded using Table 4-4, which is based upon corresponding standard reporting values in the U.S. where the values are in statute miles rather than in metric units.

Table 4–4. Land Station Reports of Horizontal Visibility at the Surface (Prevailing Visibility), VV (Modification of WMO Code Table 4377)

Visibility (statute miles)	Encode VV as	Visibility (statute miles)	Encode VV as	Visibility (statute miles)	Encode VV as
<1/ 16	00	1 3/ 8	22	8	63
1/ 16	01	1 1/ 2	24	9	64
1/ 8	02	1 5/8	26	10	66
3/ 16	03	1 3/4	28	11	68
1/4	04	1 7/8	30	12	69
5/ 16	05	2	32	13	71
3/ 8	06	2 1/4	36	14	73
1/ 2	08	2 1/ 2	40	15	74
5/8	10	2 3/4	44	20	80
3/4	12	3	48	25	82
7/ 8	14	4	56	30	84
1	16	5	58	35	85
1 1/ 8	18	6	60	40	87
1 1/4	20	7	61	≥ 45	89

Methods for evaluating visibility at sea are detailed in National Weather Service Observing Handb ‹ No. 1 and NAVOCEANCOMINST 3144.1. Visibility ted by sea stations is coded using Table 4-5, which is based on U.S. ship reporting prac (reporting intervals based upon nautical miles rather than kilometers).

Table 4–5. Sea Station Reports of Horizontal Visibility at the Surface (Prevailing Visibility) VV (Modification of WMO Code Table 4377)

Code figure	Reportable visibility values (nautical miles)
90	<1/ 16
91	1/ 16
92	1/8
93	1/4
94	1/2
95	1 or 1 1/2
96	2, 2 1/ 2or 3
97	5, 6, 7, or 8
98	9 or 10
99	not reported

Sea stations do not report visibility values greater than 10 nautical miles. Due to the curvature of the earth and the relative flatness of the ocean, the distance from the ship to the horizon is limited even if there is unrestricted visibility and a maximum value for reporting visibility has been set at 10 miles (see NAVOCEANCOMINST 3144.1).

Visibility data are not available from automated sea stations, and **VV** is coded as //. Automated land stations that do not have visibility sensors and an acceptable algorithm will code **VV** as //.

4.2.1.5 Examples of Group $i_R i_x$hVV.

32866 No precipitation group in the report (amount is zero). It is a staffed station that is not reporting past or present weather because there is nothing significant to report. The base of the lowest cloud layer is a reportable value of 7000, 7500 or 8000 feet (2000 to 2500 meters). Visibility is 10 statute miles (16 kilometers). Since the code is not in the 90th decade, it indicates that the report is from a land station where the visibility units are statute miles.

46/// No precipitation group in the report (not available). Report is from an automated station with no weather group (not observed) and no cloud height or visibility reported.

11997 Precipitation group is included in section 1 of the report. It is a staffed station which is reporting the weather group, **7wwWW**. The base of the lowest cloud layer is at least 8500 feet (2500 meters) if a cloud layer is observed. (There may be no clouds.) The visibility is a reportable value of 5, 6, 7, or 8 nautical miles (10 kilometers in WMO Table 4377). A visibility code in the 90th decade indicates that it is a ship report where the visibility units reported by U.S. ships are nautical miles.

4.2.2 Total Cloud Cover and Wind Velocity, Nddff (00fff). The **Nddff** group must be included in all reports. Mandatory group elements specified by symbolic letters shall be coded with solidi (/ or //) if a station is not equipped to report the relevant data.

4.2.2.1 Total Cloud Cover, N. The symbolic letter **N** represents the total fraction of the celestial dome covered by clouds at all layers. The fraction is based on an evaluation following prescribed observing practices. Table 4-6 indicates total sky cover in both oktas (eighths) and tenths since observers in the U.S. routinely report sky cover based on tenths of sky covered.

Table 4–6. Total Cloud Cover, N (WMO Code Table 2700)

Code figure	Cloud amount in oktas (eights)	Cloud amount in tenths
0	0	0
1	1 okta or less, but not zero	1/10 or less, but not zero
2	2 oktas	2/10 - 3/10
3	3 oktas	4/10
4	4 oktas	5/10
5	5 oktas	6/10
6	6 oktas	7/10 - 8/10
7	7 oktas or more, but not 8 oktas	9/10 or more, but not 10/10
8	8 oktas	10/10
9	Sky obscured by fog and/or other meteorological phenomena	
/	Cloud cover is indiscernible for reasons other than fog or other meteorological phenomena, or observation is not made.	

Note that if there are any breaks in the sky at all, such as an overcast with a mackerel sky (altocumulus perlucidus or stratocumulus perlucidus), **N** would be encoded as 7. If there is only a wisp of cloud in the sky, **N** cannot be encoded as 0 but is encoded as 1. Synoptic observing practices related to evaluating differ from the basic observing practices. In a synoptic observation a partial obscuration does not affect the coding of **N**. In a synoptic observation, a total obscuration aloft is coded as 9, but in a basic observation it would be coded as an overcast sky. The above factors, combined with the range of values that define the terms "scattered" and "broken", make the assignment of code figures to **N** very inexact for those synoptic reports that are based on basic observations and additive data. Sky condition data are not available from automated sea stations and **N** is encoded with a /. Automated land stations that do not have appropriate sensors and an acceptable algorithm encode **N** as a /.

4.2.2.2 Wind Direction and Wind Speed, ddff 00fff. With the exception of automated sea stations the mean true direction and the speed of the wind during the ten-minute period immediately preceding the observation shall be reported for **ddff.** However, if the ten-minute period includes a discontinuity in the wind characteristics, only data obtained after the discontinuity shall be used for evaluating and reporting the mean values. The above synoptic surface weather observing practice differs from the basic weather observing ractices which average wind direction and speed over a one-minute or two-minute period. At automated sea stations, **ddff** is a vector average over the time period from 20 minutes before the hour to ten minutes before the hour.

Wind direction, **dd**, is coded from Table 4-7. (Each code figure is the wind direction in tens of degrees representing the range of wind directions in the right columns.) Note, if the wind speed is calm, **ff** and **dd** are each encoded 00.

Table 4–7. True Direction, in Tens of Degrees, from which Wind is Blowing, dd (Modification of WMO Code Table 0877)

Code figure		Code figure	
00	Calm (wind speed less than 1 unit as defined by i_w)	19	185°-194°
		20	195°-204°
01	5°- 14°	21	205°-214°
02	15°- 24°	22	215°-224°
03	25°- 34°	23	225°-234°
04	35°- 44°	24	235°-244°
05	45°- 54°	25	245°-254°
06	55°- 64°	26	255°-264°
07	65°- 74°	27	265°-274°
08	75°- 84°	28	275°-284°
09	85°- 94°	29	285°-294°
10	95°-104°	30	295°-304°
11	105°-114°	31	305°-314°
12	115°-124°	32	315°-324°
13	125°-134°	33	325°-334°
14	135°-144°	34	335°-344°
15	145°-154°	35	345°-354°
16	155°-164°	36	355°- 4°
17	165°-174°	99	Variable, or all directions, or unknown
18	175°-184°		

When the mean wind speed is calm, **ff** is encoded 00. When the wind speed is more than one unit as defined by $\mathbf{i_w}$, **ff** is a two-digit value in whole knots (using a leading zero, if appropriate), except at automated sea stations where speed is reported in whole meters per second. If the wind speed, in units indicated by $\mathbf{i_w}$, is 99 units or more, **ff** in the group **Nddff** shall be encoded 99 and the group **00fff** shall be included immediately following the group **Nddff**. The two digits **00** are an indicator for the group **00fff**. The symbolic letters **fff** are replaced by the actual value of the wind in three digits. If the speed is 99 knots, **ff** in **Nddff** is encoded 99 and **fff** in **00fff** is encoded 099. If the wind speed is 100 units or more, **ff** is encoded 99 and **fff** is encoded with the actual mean wind speed. For example if the wind speed is 112 knots the speed would be encoded as **Ndd**99 00112. If wind sensors are not operational, the wind direction and speed can be estimated at staffed stations or encoded ////. At automated stations **ddff** would be encoded //// if the sensors are not operational.

4.2.2.3 Examples of Group Nddff. The following examples assume that Section 0 of the message has indicated that the reports are not from an automated sea station (all wind speeds are in knots).

53214	The total cloud cover is 6/10 or 5 oktas; the wind is blowing from 320° (between 315° and 324°) at 14 knots.
82399 00104	Total cloud cover is 10/10 or 8 oktas; wind is blowing at 230° (between 225° and 234°) at 104 knots.
/////	Observation of total cloud cover not made or indiscernible for reasons other than fog or other meteorological phenomena (such as bright lights in the rigging of an oil platform). Wind direction and speed not observed.

4.2.3 Air Temperature and Dew Point Temperature, $1s_nTTT$ $2s_nT_dT_dT_d$.

4.2.3.1 Air Temperature, $1s_nTTT$. If air temperature cannot be measured for any reason, omit this group from the report. The first character in the group, **1**, is the identifier for the air temperature group in Section 1. The remaining data groups start with a numeric indicator. The second character in this group is the sign of the temperature (see Table 4-8).

Table 4–8. Sign of the Data, s_n (Excerpt from WMO Code Table 3845)

Code figure	
0	positive or zero
1	negative

Note: Code figures 2-8 not assigned; code figure 9 not applicable in the U.S.

The last three characters in the group, **TTT**, represent the absolute value of the air temperature in tenths of a degree Celsius expressed as a three digit number with leading zeroes, if appropriate. (Auxiliary ships without a certified instrument report air temperature in whole degrees Celsius, **TT/**.) For example, a temperature of 12.3°C is encoded 123; a temperature of 2.3°C is encoded 023; and a temperature of 0.3°C is encoded 003. The code values for **TTT** are the same for 12.3°C and for −12.3°C, but $\mathbf{s_n}$ would be encoded differently.

4.2.3.2 Dew Point Temperature, $2s_nT_dT_dT_d$. This group is omitted if the dew point temperature cannot be evaluated. It is routinely omitted by supplementary and auxiliary ships.

The character **2** in this group is the indicator for the dew point temperature group in Section 1 of the report, and the second character, $\mathbf{s_n}$, indicates the sign of the dew point temperature (see Table 4-8). The last three characters, $\mathbf{T_dT_dT_d}$, represent the absolute value of the dew point temperature in tenths of a degree Celsius, encoded in the same way as **TTT**. (Similarly to **TTT**, if the instruments are not certified, the code is reduced to the code form $\mathbf{T_dT_d/}$, whole degrees C.)

4.2.3.3 Conversion from Fahrenheit to Celsius Degrees. If instrument scales are in Fahrenheit degrees only, Fahrenheit temperature measurement ($\mathbf{T_F}$) can be converted to temperature in Celsius ($\mathbf{T_C}$) by using the equation, below:

$$\frac{5}{9}(T_F - 32) = T_C$$

4.2.3.4 Examples of Groups $1s_nTTT$ $2s_nT_dT_dT_d$.

10113 20036 Air temperature is +11.3°C; dew point temperature is +3.6°C.

10036 21036 Air temperature is +3.6°C; dew point temperature is −3.6°C.

4.2.4 Pressure Data, $3P_oP_oP_oP_o$ 4PPPP 5appp. Pressure is reported in hectopascals (hPa), the numerical equivalent of millibars. If a station's barometric instruments provide a reading in inches (of mercury) only, this reading must be converted to hectopascals before the measurement is encoded:

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

All U.S. land stations normally include the groups $\mathbf{3P_oP_oP_oP_o}$ and **4PPPP** in their reports. Sea stations do not include the $\mathbf{3P_oP_oP_oP_o}$ group, but do include the **4PPPP** group. The **5appp** group is reported by all U.S. stations except stations in the southern portion of WMO Region IV, supplementary ships and auxiliary ships.

4.2.4.1 Station Pressure, 3$P_oP_oP_oP_o$. The character **3** is the identifier for the station pressure group in Section 1 of the report. The symbolic code figures $\mathbf{P_oP_oP_oP_o}$ represent the station pressure in hectopascals with the last character the tenths digit. It is coded without the decimal. If the station pressure is 1,000 hectopascals or greater, the "1" is omitted.

Examples:

Station pressure equals	3$P_oP_oP_oP_o$ encoded
1017.3 hPa	30173
1000.0 hPa	30000
978.6 hPa	39786

If the station pressure is unavailable, this group is omitted.

4.2.4.2 Sea Level Pressure, 4PPPP. The leading character in the group, **4**, is the identifier for the sea level pressure group in section 1 of the report. The characters **PPPP** represent the sea level pressure in tenths of a hectopascal. The coding convention for **PPPP** is the same as for station pressure (see examples in paragraph 4.2.4.1). If sea level pressure is unavailable, this group is omitted. Auxiliary ships without a certified barometer report pressure in whole hectopascals and code the group **PPP/**.

4.2.4.3 Three-Hour Pressure Tendency, 5appp. Stations in the southern portion of WMO Region IV report the 24-hour pressure tendency in Section 3 instead of the 3-hour pressure tendency. Stations in Region V include the 24-hour change in addition to the 3-hour change. Use of the 24-hour tendency group is discussed in paragraph 6.3.2.4.

The leading character in this group, **5**, is the identifier for the 3-hour pressure tendency group in Section 1 of this report. The second character, **a**, is the characteristic of the tendency during the three hours preceding the observation. Use Table 4-9 to encode and decode **a**.

Table 4–9. Characteristic of Pressure Tendency During the Three Hours Preceding the Time of Observation, a (Modification of WMO Code Table 0200)

Code figure	Staffed station	Automated station
0	Increasing, then decreasing; pressure same or higher than 3 hours ago	-----
1	Increasing, then steady, or increasing then increasing more slowly	-----
2	Increasing (steadily or unsteadily)	higher than 3 hrs ago
3	Decreasing or steady, then increasing; or increasing then increasing more rapidly	-----
4	Steady; pressure same as 3 hours ago	same as 3 hrs ago
5	Decreasing then increasing; pressure same or lower than 3 hours ago	-----
6	Decreasing then steady; or decreasing then decreasing more slowly	-----
7	Decreasing (steadily or unsteadily)	lower than 3 hrs ago
8	Steady or increasing, then decreasing; or decreasing then decreasing more rapidly	-----

At a staffed station use of code figure 1, 2, or 3 indicates that pressure has increased in the past 3 hours, and use of code figure 6, 7, or 8 indicates that pressure has decreased in the past three hours. The last three characters in the group, **ppp**, represent the actual change in pressure during the 3 hours ending at the actual time of the observation. The pressure change reported is the absolute change in tenths of a hectopascal using leading zeroes, if appropriate.

Examples:

Pressure change	**ppp** encoded
10.3 hPa	103
8.3 hPa	083
0.3 hPa	003

4.2.4.4 Examples of Groups $3P_oP_oP_oP_o$ 4PPPP 5appp.

- Reports from staffed station

39548 40176 54000 Station pressure is 954.8 hPa. Sea level pressure is 1017.6 hPa. Pressure has been steady the past 3 hours. Pressure same as 3 hours ago.

4008/ No report of station pressure; sea level pressure is approximately 1008 hPa (not reporting tenths digit). No report of pressure tendency. This type of a report is typical of one from an auxiliary ship.

39658 49984 57084 Station pressure is 965.8 hPa; sea level pressure is 998.4 hPa. Pressure has been decreasing for the past 3 hours and is now 8.4 hPa lower than 3 hours ago.

- Reports from automated stations

39204 49992 52032 Station pressure is 920.4 hPa; sea level pressure is 999.2 hPa. Pressure is 3.2 hPa higher than 3 hours ago.

30002 40253 54000 Station pressure is 1000.2 hPa; sea level pressure is 1025.3 hPa. Pressure now is the same as 3 hours ago. (Note: in a report from an automatic station, whenever **a** = 4, **ppp** will always be encoded as 000.)

40076 57103 No station pressure report; sea level pressure is 1007.6 hPa. Pressure is 10.3 hPa lower than 3 hours ago. (Note: automated sea stations do not report station pressure.)

4.2.5 Precipitation Amount, $6RRRt_R$.

4.2.5.1 General. Sea stations do not report precipitation amount and omit this group. This group may be omitted by land stations, but is normally included in the main synoptic reports from land stations if there has been precipitation (even a trace) during the period covered by the **$6RRRt_R$** group for that observation.

At stations in both Region IV and Region V, the period in the 0600, 1200 and 1800 UTC reports will normally be the 6 hours before the actual time of the observation. At stations in Region IV, the period in the 0000 UTC report will normally be the 6 hours before the actual time of the observation but at stations in Region V, the period in the 0000 UTC report will normally be the 24 hours before the actual time of the observation. A station that is not open 24 hours each day may not be open during all of the main synoptic hours.

If a station has a measurable amount of precipitation during one of the 6-hour periods, but cannot send the **6RRRt_R** group because the station is closed at the time of the main synoptic report, then the group is transmitted in the next main synoptic report, with an indication that the report is for a 12- (rather than a 6-) hour period (see coding for t_R, below).

This group is directly related to two other groups in the report. Stations in both Region IV and Region V must code the proper value for i_R, in the group **$i_R i_x$hVV**, whether or not they include the **6RRRt_R** group in their reports (see paragraph 4.2.1.1). Stations in Region IV must include the group **905$R_t d_c$** in Section 3 of their report whenever they include the **6RRRt_R** group. Stations in Region V do not use the **905$R_t d_c$** group. The **905$R_t d_c$** group gives information about the time the precipitation began or ended, and the duration and character of the precipitation. The **905$R_t d_c$** group is explained in paragraph 6.2.2.3.

4.2.5.2 The 6RRRt_R Group. The character **6** is the identifier for the precipitation amount group. The three characters **RRR** represent the actual amount of liquid precipitation that accumulated during a period, t_R, or the water equivalent if the precipitation is solid. Table 4-10 is used to encode or decode **RRR**. Code figures 001 to 989 are the number of millimeters accumulated during the period. The code 000 is not used (no precipitation, no **6RRRt_R** group). The codes from 990 to 999 are used for small precipitation amounts from a trace (990) to 0.9 millimeters (999). Table 4-11 defines t_R.

Table 4–10. Amount of Precipitation, RRR, Which has Fallen during Period Indicated by t_R (WMO Code Table 3590)

Code figure		Code figure	
000	Not used	992	0.2 mm
001	1 mm	993	0.3 mm
002	2 mm	994	0.4 mm
etc.	etc.	995	0.5 mm
988	988 mm	996	0.6 mm
989	989 mm or more	997	0.7 mm
990	Trace	998	0.8 mm
991	0.1 mm	999	0.9 mm

Table 4–11. Length of Period Before Observation, t_R

Code figure	Length of period (hrs)
1	6
2	12
3	18
4	24

If a station measures precipitation in inches rather than millimeters, its measurements must be converted to millimeters before encoding **RRR**. For measurements that are less than .04 inch (1 millimeter), encode **RRR** as 993 if 0.01 inch, 995 if 0.02 inch, and 998 if 0.03 inch. For higher amounts, measurements in inches are converted to millimeters by the following:

25.4 (**RRR**) in inches = **RRR** in millimeters

Staffed stations usually encode $\mathbf{t_R}$ as 1 except for Region V stations at 0000 UTC ($\mathbf{t_R}$ = 4) and stations that are not open 24 hours per day.

4.2.5.3 Examples of Group 6RRRt_R.

69951 There has been 0.5 mm of liquid precipitation during the past 6 hours.

60232 There has been 23 mm of liquid precipitation during the past 12 hours.

4.2.6 Weather Group, 7wwW$_1$W$_2$ (7w$_a$w$_a$W$_{a1}$W$_{a2}$).

4.2.6.1 General. The **7wwW$_1$W$_2$** group may be included in any main or intermediate report from a staffed station to report the weather. The **7wwW$_1$W$_2$** or similar group (**7w$_a$w$_a$W$_{a1}$W$_{a2}$**) may be included in a report from an automatic station, if the station has proper sensor(s) and acceptable algorithms. The group includes information about the weather near the time of the observation, and the past weather since the last main synoptic observation. The **7wwW$_1$W$_2$** (or **7w$_a$w$_a$W$_{a1}$W$_{a2}$**) group is related to the character $\mathbf{i_x}$, in the group $\mathbf{i_R i_x}$hVV. (paragraph 4.2.1). If there is significant present weather or significant past weather to report, the weather group is included in the report, and an appropriate code for $\mathbf{i_x}$ is coded.

The first character, **7**, identifies the weather group in Section 1 of the report. The next two symbolic letters, **ww** or **w$_a$w$_a$** represent the present weather and **W$_1$W$_2$** or **W$_{1a}$W$_{2a}$** represents the past weather.

The coded figures related to present weather are in Table 4-12 (primarily for staffed stations) and Table 4-13 (for automated stations only). You will note that present weather codes for some weather phenomena are events that have occurred in the past hour. The code figures for past weather are in Table 4-14 (primarily for staffed stations) and Table 4-15 (for automated stations only). If there is no significant present weather and past weather, **7wwW$_1$W$_2$** (or **7w$_a$w$_a$W$_{a1}$W$_{a2}$**) is not included in the report. Code figures 00, 01, 02 and 03 of the present weather codes and code figures 0, 1 and 2 of the past weather codes are considered to represent phenomena which are not significant. Codes which are not considered to be significant are used only if there is significant weather to be reported in one of the two subgroups, **ww** or **W$_1$W$_2$**.

If, for any reason, the weather cannot be observed (this means both the present and the past weather), the weather group is omitted and $\mathbf{i_x}$ is appropriately coded. If either the present weather or the past weather can be reported (**7//W$_1$W$_2$** or **7ww//**), $\mathbf{i_x}$ is encoded to show that the weather group is included in the report ($\mathbf{i_x}$ = 1 or $\mathbf{i_x}$ = 4 or $\mathbf{i_x}$ = 7).

The code form **7ww//** is used at times, by stations that are not open 24 hours a day. The present weather may be observed, but the past weather has not been observed for those hours that the station is closed. The code form **7ww//** is used routinely in reports from stations that take basic observations that are converted into synoptic reports. Though it is not likely, it is possible to know the past weather but not know the present weather. This would be encoded **7//W_1W_2**.

4.2.6.2 Present Weather, ww or w_aw_a. The terms used in discussing the weather group are defined and observing practices discussed in FMH No. 1, in NAVOCEANCOMINST 3144.1 and in other agency manuals. It is important to realize that the U.S. observing practices relative to reporting thunderstorms, fog and squalls differ from the WMO practices. The U.S. practices (FMH No. 1) are used for synoptic observations of thunderstorms and squalls, but WMO practices are used for synoptic observations of fog. The following table (Table 4-12) is needed to encode or decode present weather from a staffed station. It is a modification of WMO Table 4677 where the codes numerically ascend from 00 to 99. In Table 4-12, the coding starts with the highest priority code and descends to 00 (the lowest priority). In addition, code figure 17 is placed out of numerical sequence to highlight its relative coding priority. Only the highest priority present weather code is reported as **ww**.

Note that when encoding and decoding of synoptic reports are based on basic weather observations, a more limited selection of possible code figures is used.

Table 4–12. Present Weather Code Specification, ww, in Order of Priority (Modification of WMO Code Table 4677)

Encode the first weather condition or restriction to visibility that applies. If more than one applies, the first described weather or restriction to visibility is the one to be reported.

---

ww = 99-50. Use code figures 99-50 for precipitation at the station at the time of observation.

---

ww = 99-80. Use code figures 99-80 for showery precipitation or precipitation with current or recent thunderstorms.

---

ww = 99-95. In order to have a thunderstorm at the time of your observation, thunder must have been heard or lightning must have been seen within 15 minutes of the observation time. In a U.S. observation there are only two intensities of thunderstorms: thunderstorm and severe thunderstorm. A thunderstorm is less than severe if within the past 15 minutes all wind gusts were less than 50 kt and all hail was less than 3/4 in (19 mm) in diameter. A thunderstorm is a severe thunderstorm if within the past 15 minutes there were any wind gusts of 50 kt or more or any hail 3/4 in (19 mm) or greater in diameter.

---

99 Thunderstorm, severe, with hail, small hail, or snow pellets at time of observation.

If there is a severe thunderstorm with hail, ice pellets, or snow pellets, use code figure 99. There may or may not also be rain or snow or a mixture of rain and snow of any intensity.

98 Thunderstorm at time of observation combined with duststorm or sandstorm at time of observation (unlikely at sea).

If there is a thunderstorm and a duststorm or sandstorm at the time of observation, use code figure 98. There must also be some sort of precipitation at the time of observation, but it may not be seen because of poor visibility. Judgment must be used.

97 Thunderstorm, severe without hail, small hail, or snow pellets but with rain and/or snow at time of observation.

If there is a severe thunderstorm at the time of observation, with rain, snow, or a mixture of rain and snow, but with no hail, ice pellets, or snow pellets, use code figure 97. The rain or snow may be of any intensity.

96 Thunderstorm with hail, small hail, or snow pellets at time of observation.

If there is a thunderstorm at the time of observation, and there is also hail, ice pellets, or snow pellets, use code figure 96. There may or may not be rain or snow or a mixture of rain and snow of any intensity.

95 Thunderstorm without hail, small hail, or snow pellets, but with rain and/or snow at time of observation.

If there is a thunderstorm at the time of observation with rain or snow or a mixture of rain and snow but with no hail, ice pellets, or snow pellets, use code figure 95. The rain or snow may be of any intensity.

---

ww = 94-91. Use code figures 94-91 if there was a thunderstorm during the past hour, and there is some sort of precipitation at the time of observation. In order to have this situation, the last lightning or thunder observed must have been more than 15 minutes before the observation, but less than 1 hour 15 minutes before the observation.

---

94 Moderate or heavy snow or rain and snow mixed or hail, small hail, or snow pellets at time of observation. Thunderstorm during previous hour but not at time of observation.

If there is moderate or heavy snow or moderate or heavy snow showers, or if there is a mixture of rain and snow or mixed rain showers and snow showers, and the intensity of either is moderate or heavy, or if there are moderate or heavy ice pellets or snow pellets, or if there is hail at the time of observation, use code figure 94.

93 Slight snow or rain and snow mixed or hail, small hail, or snow pellets at time of observation. Thunderstorm during previous hour but not at time of observation.

If there is light snow or light snow showers, or if there is a mixture of rain and snow or mixed rain showers and snow showers and the intensity of both is light, or if there are light ice pellets or light snow pellets at the time of observations, use code figure 93.

92 Moderate or heavy rain at time of observation. Thunderstorm during previous hour but not at time of observation.

If there is moderate or heavy rain, or a moderate or heavy rain shower at the time of observation (and no other forms of precipitation), use code figure 92.

91 Light rain at time of observation. Thunderstorm during previous hour but not at time of observation.

If there is light rain or a light rain shower at the time of observation (and no other precipitation), use code figure 91.

---

ww = 90-80. Use code figures 90-80 to report showery precipitation that is not associated with a thunderstorm. Showers fall from cumuliform clouds that are, by nature, isolated. Because of this, individual showers do not last very long. Between showers openings between clouds may be seen. Code figure 89 is not reported in the United States.

---

90 Moderate or heavy shower(s) of hail, with or without rain or rain and snow mixed, not associated with thunder.

If there are showers of hail at the station at the time of observation, and the hail is not associated with a thunderstorm, use code figure 90. The hail may or may not be mixed with rain or both rain and snow.

---

ww = 88-87. Use code figure 88 or 87 if showers of snow pellets or ice pellets are observed at the station at the time of the observation. The snow pellets or ice pellets may or may not be mixed with rain or both rain and snow.

---

88 Moderate or heavy shower(s) of snow pellets or small hail, with or without rain or rain and snow mixed.

If the only precipitation is snow pellets or ice pellets, and the intensity is moderate or heavy, then use code figure 88. If there is also rain, or mixed rain and snow, and any of the precipitation is moderate or heavy, also use code figure 88.

87 Light shower(s) or snow pellets or small hail, with or without rain or rain and snow mixed.

If the only precipitation is snow pellets or ice pellets, and the intensity is light, then use code figure 87. If there is also rain, or mixed rain and snow, and all of the precipitation is light, also use code figure 87.

---

ww = 86-85. Use code figure 86 or 85 if only snow showers are observed at the station at the time of observation.

---

86 Snow shower(s), moderate or heavy.

85 Snow shower(s), light.

---

ww = 84-83. Use code figure 84 or 83 if mixed rain showers and snow showers are observed at the station at the time of observation.

---

84 Moderate or heavy shower(s) of rain and snow mixed. Intensity of either may be moderate or heavy.

83 Light shower(s) of rain and snow mixed. Intensity of both must be light.

---

ww = 82-80. Use code figures 82-80 to report rain showers at the time of observation. The code figure used depends upon the intensity of the shower at time of observation.

---

82 Violent rain shower(s).

If a violent rain shower is observed at the station at the time of observation, use code figure 82. Report a rain shower as violent if the rate of fall is at least 1 in (25 mm) per hour or 0.10 in (3 mm) in 6 minutes.

81 Moderate or heavy rain shower(s).

80 Light rain shower(s).

---

ww = 79-50. Use code figures 79-50 for precipitation that is not showery.

---

ww = 79-70. Use code figures 79-70 to report solid precipitation not in showers.

---

ww = 79-76. Use code figures 79-76 to report types of solid, non-showery precipitation.

---

79 Ice pellets.

If ice pellets observed are not in the form of showers, at the time of observation, use code figure 79. Use this code figure regardless of the intensity of the ice pellets and regardless of whether the ice pellets are mixed with another type of precipitation.

78 Isolated star-like snow crystals with or without fog or ice fog.

77 Snow grains with or without fog or ice fog.

If snow grains are observed at the station at the time of observation, use code figure 77. Use this code figure regardless of intensity of the snow grains. Snow grains may or may not be accompanied by fog or ice fog.

76 Diamond dust (ice crystals) with or without fog or ice fog.

If ice crystals are observed at the station at the time of the observation, use code figure 76. Ice crystals may or may not be accompanied by fog or ice fog.

---

ww = 75-70. Use code figures 75-70 to report snow that is not in the form of showers at the station at the time of the observation. The code figure selected depends on a combination of intensity and whether the snow is intermittent or continuous.

---

75 Continuous fall of snowflakes, heavy at time of observation.

74 Intermittent fall of snowflakes, heavy at time of observation.

73 Continuous fall of snowflakes, moderate at time of observation.

72 Intermittent fall of snowflakes, moderate at time of observation.

71 Continuous fall of snowflakes, light at time of observation.

70 Intermittent fall of snowflakes, light at time of observation.

---

ww = 69-60. Code figures 69-60 are generally used to report rain.

---

ww = 69-66. Use code figures 69-66 to report liquid precipitation that is mixed with snow

---

69 Rain or drizzle and snow, moderate or heavy.

68 Rain or drizzle and snow, light.

67 Rain, freezing, moderate or heavy.

If the intensity of the freezing rain (or mixed freezing rain and freezing drizzle) is moderate or heavy use code figure 67.

66 Rain, freezing, light.

If the intensity of the freezing rain (or mixed freezing rain and freezing drizzle) is light, use code figure 66.

---

ww = 65-60. Use code figure 65-60 to report rain (but not freezing rain or rain mixed with snow) at the station at the time of observation. The code figure used depends on the combination of intensity and whether the precipitation is intermittent or

---

65 Rain, not freezing, continuous, heavy at time of observation.

64 Rain, not freezing, intermittent, heavy at time of observation.

63 Rain, not freezing, continuous, moderate at time of observation.

62 Rain, not freezing, intermittent, moderate at time of observation.

61 Rain, not freezing, continuous, light at time of observation.

60 Rain, not freezing, intermittent, light at time of observation.

---

ww = 59-50. Use 59-50 to report drizzle.

---

ww = 59-56. Drizzle mixed with rain, or freezing drizzle.

---

59 Drizzle and rain, moderate or heavy.

58 Drizzle and rain, light.

57 Drizzle, freezing, moderate or heavy.

56 Drizzle, freezing, light.

---

ww = 55-50. Use code figures 55-50 to report drizzle (but not freezing drizzle or drizzle mixed with rain) at the station at the time of observation.

---

55 Drizzle, not freezing, continuous, heavy at time of observation.

54 Drizzle, not freezing, intermittent, heavy at time of observation.

53 Drizzle, not freezing, continuous, moderate at time of observation.

52 Drizzle, not freezing, intermittent, moderate at time of observation.

51 Drizzle, not freezing, continuous, light at time of observation.

50 Drizzle, not freezing, intermittent, light at time of observation.

---

ww = 17. Thunderstorm, but no precipitation at time of observation. Code figure 17 has priority over code figures 49-20 and 16-00.

---

17 Thunderstorm, but no precipitation at time of observation.

A thunderstorm is an electrical storm that may or may not be accompanied by precipitation. If there is a thunderstorm at the station, but no precipitation, use code figure 17. Since by U.S. definition, a thunderstorm does not end until 15 minutes after the last lightning or thunder, code figure 17 would be used if the thunderstorm occurred within 15 minutes of the observation.

---

ww = 49-00. Use code figure 49-00 when no precipitation is occurring at the station at the time of observation.

---

ww = 49-40. Use code figures 49-40 only if there is fog. The fog may be made of water droplets or ice crystals (ice fog). The visibility in fog or ice fog must be less than 5/8 mi (1 km). If the visibility is 5/8 mi (1 km) or more, use code figure 10. The code figure used will depend on whether the fog has changed during the past hour and whether the sky can be seen (blue sky, stars or higher clouds).

---

49 Fog depositing rime, sky invisible.

Fog that deposits rime will be made up mostly of supercooled water droplets, not ice crystals.

48 Fog, depositing rime, sky visible.

47 Fog or ice fog, sky invisible. Fog has begun or has become thicker during the preceding hour.

46 Fog or ice fog, sky visible. Fog has begun or has become thicker during the preceding hour.

45 **Fog or ice fog, sky invisible. Fog has shown no appreciable change during the preceding hour.**

44 **Fog or ice fog, sky visible. Fog has shown no appreciable change during the preceding hour.**

43 **Fog or ice fog, sky invisible. Fog has become thinner during the preceding hour.**

42 **Fog or ice fog, sky visible. Fog has become thinner during the preceding hour.**

41 **Fog or ice fog in patches. Fog has begun or has become thicker during the preceding hour.**

40 **Fog or ice fog at a distance at the time of observation, but not at the station during the preceding hour, the fog or ice fog extending to a level above that of the observer.**

---

ww = 39-30. Use code figures 39-30 to report a duststorm, sandstorm, or drifting or blowing snow. These phenomena are rarely observed from ships except close to deserts or ice fields.

---

ww = 39-36. In deciding among code figures 39-36, the following must be considered: snow that is being moved by the wind may be generally low (below about 6 ft (2 m)) or generally high (above 6 ft (2 m)). If the snow is low, it is drifting snow; if high, it is blowing snow. Code 37 is not used in the United States.

---

39 **Heavy blowing snow, generally high (above eye level). Visibility less than 5/16 mi (1/2 km).**

38 **Slight or moderate blowing snow, generally high (above eye level). Visibility 6 mi (10 km) or less but not less than 5/16 mi (1/2 km).**

36 **Drifting snow, generally low (below eye level).**

---

ww = 35-30. In deciding among code figures 35-30 the following must be considered: if the visibility at the station at the time of observation is less than 5/16 mi (1/2 km), there is a severe duststorm or sandstorm; if the visibility is at least 5/16 mi (1/2 km) but less than 5/8 mi (1 km), there is a slight or moderate duststorm or sandstorm. The code figure used depends on the intensity of the sandstorm or duststorm and any change in its intensity during the preceding hour.

---

35 **Severe duststorm or sandstorm that has begun or has increased during the preceding hour.**

34 **Severe duststorm or sandstorm that has had no appreciable change during the preceding hour.**

33 **Severe duststorm or sandstorm that has decreased during the preceding hour.**

32 **Slight or moderate duststorm or sandstorm that has begun or has increased during the preceding hour.**

31 **Slight or moderate duststorm or sandstorm that has had no appreciable change during the preceding hour.**

30 **Slight or moderate duststorm or sandstorm that has decreased during the preceding hour.**

---

ww = 29-20. Use code figures 29-20 to report precipitation, fog, ice fog, or thunderstorm at the station during the preceding hour but not at the station at the time of observation. Code figures 29-20 are used only if there was precipitation, fog, ice fog (but not mist), or a thunderstorm at the station during the past hour, but not at the time of observation. Use code figures 29-25 if the precipitation was showery; otherwise use code figures 24-20.

---

29 **Thunderstorm (with or without precipitation).**

Since by U.S. definition, a thunderstorm ends 15 minutes after the last thunder or lightning, the last thunder or lightning must have happened at least 15 minutes before the time of the observation.

28 **Fog or ice fog.**

The visibility in the fog or ice fog must have been less than 5/8 mi (1 km).

27 Shower(s) of hail, small hail, or ice pellets, or of rain and hail, small hail, or ice pellets.

26 Shower(s) of snow, or of rain and snow.

25 Shower(s) of rain.

24 Freezing drizzle or freezing rain, not falling as shower(s).

23 Rain and snow or ice pellets, not falling as shower(s).

22 Snow not falling as shower(s).

21 Rain (not freezing), not falling as shower(s).

20 Drizzle (not freezing) or snow grains, not falling as shower(s).

---

ww = 19-00. Use code figures 19-00 to report certain hydrometeors, electrometeors, lithometeors or no precipitation at the station at the time of observation or during the preceding hour.

---

19 Funnel cloud(s), tornado, or waterspout at or within sight of the station during the preceding hour of the time of the observation.

Since the highest code figure is reported (except code figure 17), code figure 19 cannot be used if **ww** can be encoded as some higher number. If a tornado is observed at or near the station at the time of the observation or during the preceding hour, include the plain language word **TORNADO** as the last group in Section 3. This instruction shall be followed regardless of the code figure selected for **ww**. Do not include a plain language word for funnel cloud or waterspout if code figure 19 is used.

18 Squalls. By U.S. definition, a sudden increase of at least 15 knots in average wind speed and sustained at 20 knots or more for at least 1 minute. This must occur at or within sight of the station during the preceding hour or at the time of observation.

If a squall without any precipitation is observed, either at the time of observation or during the past hour, use code figure 18. If there was any precipitation, or if there was a thunderstorm with the squall, use one of the other code figures, possibly code figure 29 or one of the code figures 99-80. Select the one that best describes what happened.

16 Precipitation within sight, reaching the ground or the surface of the sea, near to, but not at the station.

The precipitation must be less than 3 mi (5 km) from the station, but not at the station to use code figure 16.

15 Precipitation within sight, reaching the ground or the surface of the sea, but distant; i.e., estimated to be more than 3 mi (5 km), from the station.

14 Precipitation within sight, not reaching the ground or the surface of the sea.

Sometimes precipitation may fall from a cloud, but into air that is dry enough to evaporate it before it can reach the ground. This is fairly common in desert areas, like some parts of the southwestern United States. This phenomena is called virga.

13 Lightning visible, no thunder heard.

There are two reasons you may see lightning but not hear thunder. The first is that the lightning may be far enough away that the thunder doesn't reach the station. The other is that local sounds may muffle the thunder. Use code figure 13 to report distant lightning.

---

ww = 12-10. Use code figure 12 or 11 to report shallow fog. Continuous refers to covering more than half of the ground or sea; patchy refers to less than one-half coverage. The apparent visibility shall be less than 5/8 mi (1 km). Code figure 10 is used to report fog that is neither shallow nor has visibility less than 5/8 mi (1 km). (Code figures 49-40 are used to report fog that is not shallow but with visibility less than 5/8 mi (1 km).)

---

12 More or less continuous shallow fog or ice fog at the station, whether on land or sea; the fog or ice fog is not deeper than about 6 ft (2 m) on land or 30 ft (10 m) at sea.

11 Patches of shallow fog or ice fog at the station, whether on land or sea; the fog or ice fog not deeper than about 6 ft (2 m) on land or 30 ft (10 m) at sea.

10 Mist.

Code figure 10 refers only to water droplets and ice crystals. The visibility restriction shall be 5/8 mi (1 km) or more but less than 6 mi (10 km). Use code figure 10 whether the mist is patchy or more or less continuous.

ww = 09-04. Use code figure 09-04 to report lithometeors.

09 **Duststorm or sandstorm within sight at the time of observation, or at the station during the preceding hour.**

Visibility in dust or sand must be (or have been) 6 mi (10 km) or less.

08 **Well-developed dust whirl(s) (devils) or sand whirl(s) seen at or near the station during the preceding hour or at the time of observation, but no duststorm or sandstorm.**

07 **Dust or sand raised by wind at or near the station at the time of observation, but no well-developed dust whirl(s) (devils) or sand whirl(s), and no duststorm or sandstorm seen; or in the case of ships, blowing spray at the station.**

Use code figure 07 if there is dust in the air, the wind is strong enough to be lifting more dust or sand at the time of observation and the visibility at the time of observation is 6 mi (10 km) or less. Do not use code figure 07 if there is a well-developed dust whirls (devils) or a duststorm or a sandstorm.

06 **Widespread dust in suspension in the air, not raised by wind at or near the station at the time of observation.**

Use code figure 06 if there is dust in the air, but the wind at the time of observation is not strong enough to be lifting more dust into the air. This code figure may be used with any visibility, as long as there is dust in the air.

05 **Haze.**

Code figure 05 is not restricted to the definition applied in FMH No. 1 for reports of haze in the basic observation, but can be used if it is simply hazy, regardless of the visibility.

04 **Visibility reduced by smoke; e.g., veldt or forest fires, industrial smoke, or volcanic ash.**

If the smoke is coming from a great distance, it will be spread through a deep layer of the atmosphere. In this case use code figure 04 regardless of how much the visibility is restricted. If the smoke is coming from somewhere fairly close, then it will be pretty much layered in the lower atmosphere. In this case, the visibility has to be 6 mi (10 km) or less before code figure 04 is used. If smoke is the only weather or restriction to visibility in the basic U.S. observation, use code figure 04.

---

ww = 03-00. Phenomena without significance.

---

03 Clouds generally forming or developing.

Use code figure 03 only if there are clouds at the time of the observation, but no other weather and both of these conditions exist: (1) The clouds must have increased or become more developed during the past hour (examples of this would be low stratus clouds forming at night, clouds moving into the area in advance of a frontal system, or cumulus clouds growing taller during the day); and (2) there is also some significant past weather to report.

02 State of sky on the whole unchanged. This is the characteristic of the sky during the past hour.

Use code figure 02 if the sky is clear at the time of observation and it was also clear during the past hour. Also use code figure 02 if there are clouds at the time of observation, but there had not been any significant change in the clouds during the past hour.

01 Clouds generally dissolving or becoming less developed. This is the characteristic of the sky during the past hour.

Use code figure 01 if the sky is clear at the time of observation, but there were clouds during the past hour. Use code figure 01 if there were clouds at the time of observation, but the clouds had dissolved or become less developed during the past hour. Some examples of this are low stratus clouds breaking up in the morning or cumulus clouds beginning to flatten in the afternoon.

00 Cloud development not observed or not observable. This is the characteristic of the sky during the past hour.

Use code figure 00 if clouds were not observed during the past hour, whether the sky is clear or not at the time of observation.

The following table (Table 4-13) is applicable for the encoding and decoding of present weather by automated stations that have appropriate sensors and acceptable algorithms.

Table 4–13. Present Weather Reported from an Automatic Station, $w_a w_a$ (Modification of WMO Code Table 4680)

Go down the list, encode the first weather condition that applies. If more than one type of weather is occurring, the first weather condition on the list is the one to be reported.

Code figure	
99	Tornado
98	reserved
97	reserved
96	Thunderstorm, severe, with hail
95	Thunderstorm, severe, with rain showers and/or snow
94	Thunderstorm, severe, with no precipitation
93	Thunderstorm, with hail
92	Thunderstorm, with rain showers and/or snow showers
91	Thunderstorm, with no precipitation
90	THUNDERSTORM
89	reserved
88	reserved
87	Snow shower(s) or intermittent rain, heavy
86	Snow shower(s) or intermittent rain, moderate
85	Snow shower(s) or intermittent rain, light
84	Rain shower(s) or intermittent rain, violent
83	Rain shower(s) or intermittent rain, heavy
82	Rain shower(s) or intermittent rain, moderate
81	Rain shower(s) or intermittent rain, light
80	SHOWER(S) OR INTERMITTENT PRECIPITATION
79	reserved
78	reserved
77	reserved
76	Ice pellets, heavy
75	Ice pellets, moderate
74	Ice pellets, light
73	Snow, heavy
72	Snow, moderate
71	Snow, light
70	SNOW
69	reserved
68	Rain or drizzle and snow, moderate or heavy
67	Rain or drizzle and snow, light
66	Rain, freezing, heavy
65	Rain, freezing, moderate

Table 4–13. (Continued)

64	Rain, freezing, light
63	Rain, not freezing, heavy
62	Rain, not freezing, moderate
61	Rain, not freezing, light
60	RAIN
59	reserved
58	Drizzle and rain, moderate or heavy
57	Drizzle and rain, light
56	Drizzle, freezing, heavy
55	Drizzle, freezing, moderate
54	Drizzle, not freezing, light
53	Drizzle, not freezing, heavy
52	Drizzle, not freezing, moderate
51	Drizzle, not freezing, light
50	DRIZZLE
49	reserved
48	FREEZING PRECIPITATION, heavy
47	FREEZING PRECIPITATION, light or moderate
46	SOLID PRECIPITATION, heavy
45	SOLID PRECIPITATION, light or moderate
44	LIQUID PRECIPITATION, heavy
43	LIQUID PRECIPITATION, light or moderate
42	PRECIPITATION, heavy
41	PRECIPITATION, light or moderate
40	PRECIPITATION
39	reserved
38	reserved
37	reserved
36	reserved
35	Fog, depositing rime
34	Fog or ice fog, has begun or become thicker during the past hour
33	Fog or ice fog, no appreciable change during the past hour
32	Fog or ice fog, has become thinner during the past hour
31	Fog or ice fog in patches
30	FOG
29	Blowing or drifting snow or sand, visibility less than 1 km
28	Blowing or drifting snow or sand, visibility equal to or greater than 1 km
27	BLOWING OR DRIFTING SNOW OR SAND

(Code figures 26-20 are used to report precipitation, fog or thunderstorm at the station during the preceding hour but not at the time of observation.)

26	Thunderstorm (with or without precipitation)
25	Freezing drizzle or freezing rain
24	Snow
23	Rain (not freezing)
22	Drizzle (not freezing) or snow grains

Table 4–13. (Continued)

21	PRECIPITATION
20	Fog
19	reserved
18	Squalls
17	reserved
16	reserved
15	reserved
14	reserved
13	reserved
12	Distant lightning
11	Diamond dust
10	Mist
09	reserved
08	reserved
07	reserved
06	reserved
05	Haze or smoke, or dust in suspension in the air, visibility less than 1 km
04	Haze or smoke, or dust in suspension in the air, visibility less than 1 km
03	Clouds generally forming or developing during the past hour
02	State of the sky generally unchanged during the past hour
01	Clouds generally dissolving or becoming less developed during the past hour
00	No significant weather observed

Notes:

(1) This code table includes terms on several levels to cover simple and increasingly complex stations.

(2) kGeneric terms for weather (e.g., FOG, DRIZZLE) are intended for use at stations capable of determining types of weather but no other information. Generic terms are included in the code table using all capital letters.

(3) lCode figures for generic precipitation (code figures 40-48) are arranged in order of decreasing complexity. For example, a very simple station that can sense only the presence or absence of precipitation would use code figure 40 (PRECIPITATION). At the next level, a station capable of sensing amount but not type would use code figure 41 or 42. A station capable of sensing gross type (liquid, solid, freezing) and amount would use code figures 43-48. A station capable of reporting actual types of precipitation (e.g., drizzle or rain) but not amount, would use the appropriate whole decadal number (e.g., 50 for DRIZZLE; 60 for RAIN).

4.2.6.3 Past Weather, W_1W_2 or $W_{a1}W_{a2}$. These codes are used to report weather during the past 6 hours at main reporting times (0000, 0600, 1200 and 1800 UTC) and during the past 3 hours at intermediate reporting times (0300, 0900, 1500 and 2100 UTC). The code figures for W_1 and W_2 (or W_{a1} and W_{a2}) shall be selected in such a way that W_1W_2 and **ww** (or $W_{a1}W_{a2}$ and w_aw_a) together give as complete a description as possible of the weather in the time interval concerned. For example, if the type of weather undergoes a complete change during the time interval concerned, the code figures selected for W_1 and W_2 (W_{a1} and W_{a2}) shall describe the weather prevailing before the type of weather indicated by **ww** (or w_aw_a) began.

The following code tables describe past weather. (Table 4-14 is primarily for staffed stations and Table 4-15 is used for automated stations, only.)

Table 4–14. Past Weather Code Specifications, W_1W_2, in Order of Priority (Modification of WMO Code Table 4561)

Use the code figure for the first applicable description for W_1; use the code figure for the second applicable description (if one exists) for W_2. If the weather has not changed through the period, W_1 and W_2 will be coded the same. Code figures 2, 1 and 0 are not reported unless the present weather reported is 04 or higher.

Code figure	
9	Thunderstorms(s) with or without precipitation
8	Shower(s)
7	Snow, or rain and snow mixed
6	Rain
5	Drizzle
4	Fog or ice fog or thick haze; visibility <5/8 mi (1 km)
3	Sandstorm, duststorm, or blowing snow; visibility <5/8 mi (1 km)
2	Cloud covering more than 1/2 of the sky throughout the appropriate period
1	Cloud covering more than 1/2 of the sky during part of the appropriate period and covering 1/2 or less during part of the period
0	Cloud covering 1/2 or less of the sky throughout the appropriate period

Table 4–15. Past Weather Code Specifications Reported from an Automatic Station ($W_{a1}W_{a2}$) in Order of Priority (Modification of WMO Code Table 4631)

Use the code figure for the first applicable description for W_{a1}; use the code figure for the second applicable description (if one exists) for W_{a2}. If the weather has been the same throughout the period, W_{a1} and W_{a2} will be coded the same. Code figure 0 is not reported unless the present weather reported is 04 or higher.

Code figure	
9	Thunderstorm
8	Showers or intermittent precipitation
7	Snow or ice pellets
6	Rain
5	Drizzle
4	PRECIPITATION
3	FOG
2	Blowing phenomena, visibility reduced
1	VISIBILITY REDUCED
0	No significant weather observed

Note: The weather descriptions in this table are designed to accommodate the different discrimination capabilities of various automatic stations. Stations having only basic sensing capability may use the basic descriptions (shown in all capital letters). Stations with progressively higher discrimination capability shall use the more detailed descriptions.

4.2.6.4 Examples of Group 7wwW$_1$W$_2$. The following discussion refers to staffed stations. The discussion would apply to an automated station if it has appropriate sensors and acceptable algorithms. The following are some hypothetical summaries of the weather and examples of how the present and past weather would be encoded at main and intermediate reporting times.

- Example Number 1

  At 0000 UTC the sky was clear. There were no restrictions to visibility. There was no change in these conditions until 0515 UTC. At that time radiation fog began to form. By the time of the 0600 UTC observation the fog thickened to the point that the sky could not be seen. The visibility was 1/2 mile (0.8 kilometer).

  For the 0300 UTC report: Since there has been no significant weather in the past 3 hours the **7wwW$_1$W$_2$** group is not included in the report. Encode **i$_x$** = 2 (see Table 4-2).

  For the 0600 UTC report: Encode **ww** = 47, fog with sky not visible; encode both **W$_1$** and **W$_2$** as 0 (**7wwW$_1$W$_2$** = 74700); encode **i$_x$** = 1.

- Example Number 2

  At 0000 UTC the sky was partly cloudy, with less than half of the sky covered by clouds. There were no restrictions to visibility. Over the next 2 hours the cloudiness increased until the sky was completely overcast. At 0210 UTC a light continuous drizzle began, changing to moderate continuous rain by the time of the 0300 UTC observation. The rain continued until 0530 UTC. There were occasional thunderstorms, beginning at 0315 UTC. At 0455 UTC lightning struck a tree about a quarter of a mile from the observation station. There was not any more lightning or thunder after that time. The only condition to report in a U.S. basic observation at 0600 UTC is an overcast sky, but no weather and no restrictions to visibility. That is not the case with the synoptic report.

  For the 0300 UTC report: Encode **ww** = 63, continuous moderate rain, not freezing; encode **W$_1$** = 5, drizzle; and **W$_2$** = 1, cloud covering more than 1/2 of the sky during part of the period and covering 1/2 or less during part of the period; (**7wwW$_1$W$_2$** = 76351); encode **i$_x$** = 1.

  For the 0600 UTC report: Encode **ww** = 29, thunderstorm in past 1 hour and 15 minutes, but not at time of observation; encode **W$_1$** = 6, rain; and **W$_2$** = 5, drizzle; (**7wwW$_1$W$_2$** = 72965); encode **i$_x$** = 1.

- Example Number 3

  At 0000 UTC there was moderate continuous rain. The rain continued, with occasional thunderstorms between 0000 and 0100 UTC. At 0200 UTC the wind changed from southeast to northwest as a strong cold front passed the station. The rain changed to light continuous snow at 0230 UTC. The snow continued until 0330 UTC. At 0400 UTC breaks appeared in the overcast sky as the clouds began to dissipate. By 0545 UTC all clouds were gone, and the sky became completely clear.

  For the 0300 UTC report: Encode **ww** = 71, light continuous snow; encode **W$_1$** = 9, thunderstorms; and **W$_2$** = 6, rain; (**7wwW$_1$W$_2$** = 77196); encode **i$_x$** = 1.

  For the 0600 UTC report: Encode **ww** = 01, sky clear, but clouds in past hour; encode **W$_1$** = 9, thunderstorm; and **W$_2$** = 7, snow, or mixed rain and snow; (**7wwW$_1$W$_2$** = 70197); encode **i$_x$** = 1.

♦ Example Number 4

At 1800 UTC the sky was clear. There was some haze, but visibility was still good (12 miles) and remained good (7 miles or more) through 0000 UTC. By the time of the 2100 UTC observation, there were scattered clouds, with some cumulus.

At 2312 UTC there were still scattered clouds with hazy skies. At that time light rainshowers began. At 2318 UTC a broken cloud layer formed, so a special basic observation was required in accordance with the rules in FMH No. 1. At the time of the 0000 UTC observation, there was an overcast sky, with light rainshowers.

For the 2100 UTC report: Since there is no significant present or past weather, the **7wwW$_1$W$_2$** group is not included in the report. Encode **i$_x$** = 2.

For the 0000 UTC report: Since there were only clear skies or scattered clouds between 1800 UTC and the time the showers began, and the haze did not reduce visibility to less than 5/8 mile, both **W$_1$** and **W$_2$** are encoded as 0. Encode **ww** = 80, light rain showers; (**7wwW$_1$W$_2$** = 78000). Encode **i$_x$** = 1.

4.2.7 Predominant Cloud Forms, 8N$_h$C$_L$C$_M$C$_H$.

4.2.7.1 General. This group, which provides information on the predominant cloud forms at the time of the observation, is included in all reports from staffed stations where cloud type is observed (excludes reports where **N** = 0; **N** = 9; **N** = 1). This group is not reported by automated stations.

The first character, **8**, identifies the cloud group in section 1 of the report. The second character, **N$_h$**, indicates the amount of low clouds. The next 3 symbolic code letters represent the predominant type of low cloud (**C$_L$**), middle cloud (**C$_M$**) and high cloud (**C$_H$**). Observers are familiar with the detailed instructions and photo-aids for identifying the various cloud forms. These instructions and aids are contained in the WMO International Cloud Atlas (Publication No. 407), Volumes I and II, and the Abridged International Cloud Atlas. The discussion and coding tables on predominant cloud forms will not be detailed, but will be sufficient to remind observers of the applicable cloud types in each category and the priority of reporting.

4.2.7.2 Amount of Cloud Represented by N$_h$. If there are any **C$_L$** clouds, whether or not there are higher clouds, **N$_h$** is the total amount of all **C$_L$** clouds (the summation of all layers containing **C$_L$** clouds). If there are no **C$_L$** clouds, but there are **C$_M$** clouds, **N$_h$** is the total amount of **C$_M$** clouds. If **C$_H$** clouds are the only clouds in the sky, **N$_h$** = 0. The associated code figures for encoding **N$_h$** are listed in Table 4-16. A few notes concerning the coding of **N$_h$** follow. If the variety of clouds associated with **N$_h$** are perlucidi (the mackerel sky associated with stratocumulus perlucidus, a **C$_L$** cloud, or altocumulus perlucidus, a **C$_M$** cloud), **N$_h$** should be coded as 7 or less. When the clouds reported by **N$_h$** are observed through fog or an analogous phenomenon, the cloud amount shall be reported as if these phenomena were not present. Lastly, if the clouds included in the report of **N$_h$** include contrails, **N$_h$** should include the amount of persistent contrails, but exclude rapidly dissipating contrails.

Table 4–16. Amount of Low Cloud, N_h* (WMO Code Table 2700)

Code figure	Cloud amount in oktas (eighths)	Cloud amount in tenths
0	0	0
1	1 okta or less, but not zero	1/10 or less, but not zero
2	2 oktas	2/10 - 3/10
3	3 oktas	4/10
4	4 oktas	5/10
5	5 oktas	6/10
6	6 oktas	7/10 - 8/10
7	7 oktas or more, but not 8 oktas	9/10 or more, but not 10/10
8	8 oktas	10/10
9	Sky obscured by fog and/or other meteorological phenomena	
/	Cloud cover is indiscernible for reasons other than fog or other meteorological phenomena, or observation not made.	

*If there are no low clouds, $\mathbf{N_h}$ will be the amount of middle clouds.

4.2.7.3 Coding Low Clouds (C_L), Middle Clouds (C_M) and High Clouds (C_H). If the group $\mathbf{8N_hC_LC_MC_H}$ is reported, a code figure shall be entered for each of the symbols $\mathbf{C_L}$, $\mathbf{C_M}$ and $\mathbf{C_H}$. Tables 4-17 ($\mathbf{C_L}$ clouds), 4-18 ($\mathbf{C_M}$ clouds) and 4-19 ($\mathbf{C_H}$ clouds) contain the same code figures as WMO Tables 0513, 0515 and 0509 respectively; but the specifications are abbreviated, and the code figures are listed in priority order.

Table 4–17. Coding Instructions for C_L Clouds (Modification of WMO Code Table 0513)

This table presents the specifications for type of low cloud, C_L, in order of priority. Go down the table and use the first applicable code figure.

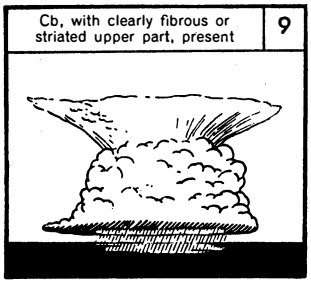
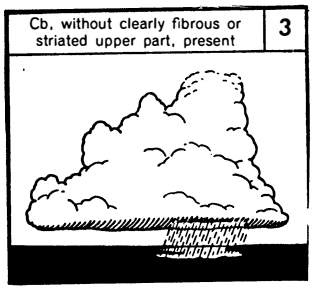
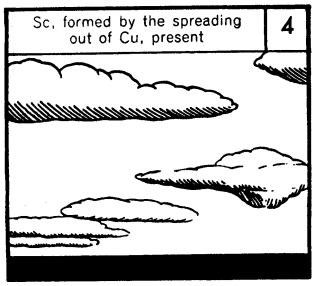
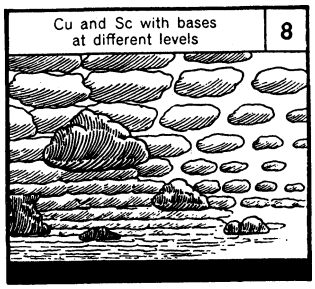
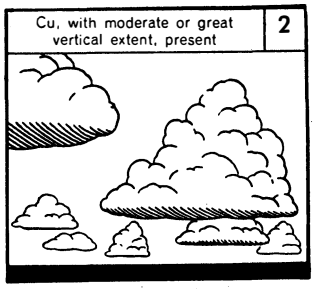
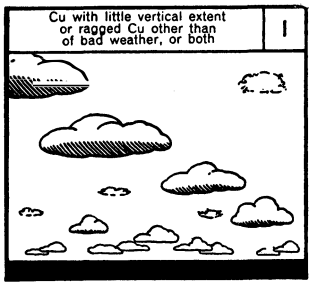
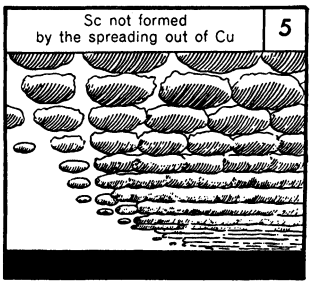
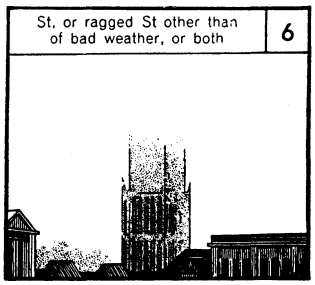
Code figure	Coding criteria	
	(a) Cumulonimbus present, with or without other C_L-clouds	
$C_L = 9$	If the upper part of at least one of the cumulonimbus clouds present is clearly fibrous or striated, use $C_L = 9$.	
$C_L = 3$	If the upper part of none of the cumulonimbus clouds present is is clearly fibrous or striated, use $C_L = 3$.	
	(b) No cumulonimbus present	
$C_L = 4$	If stratocumulus formed by the spreading out of cumulus is present, use $C_L = 4$.	
$C_L = 8$	If the C_L code figure 4 is not applicable and if cumulus and stratocumulus clouds with bases at different levels are present, use $C_L = 8$.	

Table 4–17. (Continued)

Code figure	Coding criteria	
C_L = **2**	If the C_L code figures 4 and 8 are not applicable and if cumulus clouds of moderate or strong vertical extent are present, use C_L = **2**.	
C_L = **1, 5 6, 7**	If the C_L code figures 4, 8, and 2 are not applicable: use C_L = **1**, if the C_L-clouds present are predominantly[1] cumulus with little vertical extent and seemingly flattened or ragged cumulus other than of bad weather[2], or both;	
	use C_L = **5**, if among the C_L-clouds present stratocumulus other than that formed by the spreading out of cumulus is predominant[3];	
	use C_L = **6**, if the C_L-clouds present are predominantly stratus in a more or less continuous sheet or layer, or in ragged shreds (other than ragged stratus of bad weather), or both;	

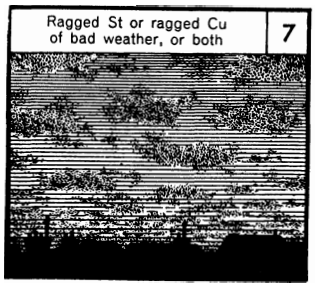
[1]In the present case, consideration of the predominance is restricted to the clouds corresponding to C_L code figures 1, 5, 6 and 7 which have the same priority. Clouds of any one of these four specifications are said to be predominant when their sky cover is greater than that of the clouds of any of the three specifications.

[2]'Bad weather' denotes the conditions which generally exist during precipitation and a short time before and after.

[3]Consult commentary on the specification C_L = **9**.

Table 4–17. (Continued)

use C_L = 7, if the C_L-clouds present are predominantly pannus (ragged shreds of stratus of bad weather or ragged cumulus of bad weather, or both).

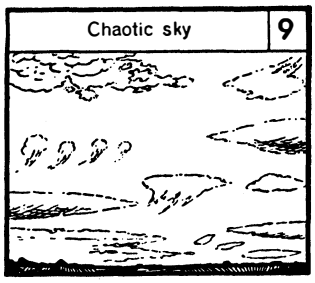
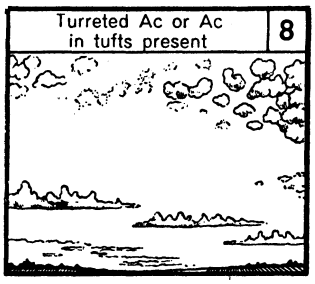
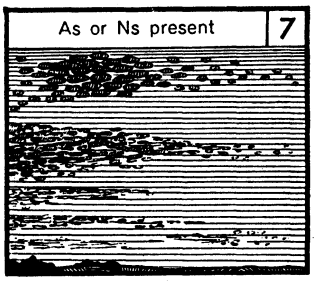
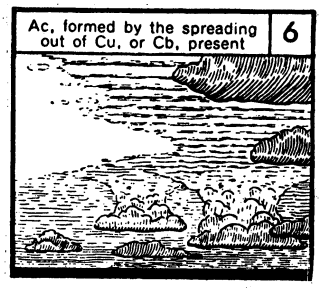
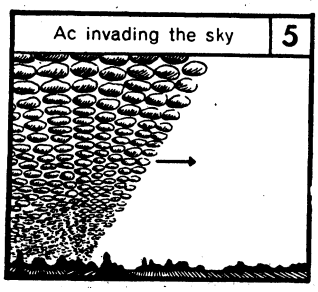


0 No C_L Clouds -- No cumulus, cumulonimbus, stratocumulus, or stratus.

/ C_L clouds not visible owing to darkness, fog, blowing dust or sand, or other similar phenomena.

Table 4–18. Coding Instructions for C_M Clouds (Modification of WMO Code Table 0515)

This table presents the specifications for type of middle cloud, C_M, in order of priority. Go down the table and use the first applicable code figure.

Code figure	Coding criteria	
	(a) Altocumulus present S	
C_M = **9**	If the sky is chaotic, use C_M = **9**.	
C_M = **8**	If the C_M code figure 9 is not applicable and if altocumulus with sprouting in the form of turrets or battlements or altocumulus having the appearance of small cumuliform tufts is present, use C_M = **8**.	
C_M = **7**	If the C_M code figures 9 and 8 are not applicable and if altostratus or nimbostratus is present together with altocumulus, use C_M = **7**.	
C_M = **6**	If the C_M code figures 9, 8, and 7 are not applicable and if altocumulus formed by the spreading out of cumulus or cumulonimbus is present, use C_M = **6**.	
C_M = **5**	If the C_M code figures 9, 8, 7, and 6 are not applicable, and if the altocumulus present is progressively invading the sky, use C_M = **5**.	

* there are several definitions of C_M = **7** and each has a different priority; therefore C_M = **7** appears several times in this code table.

Table 4–18. (Continued)

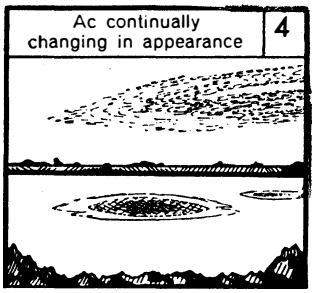
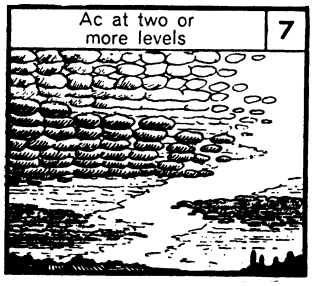
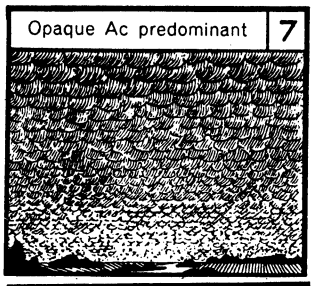
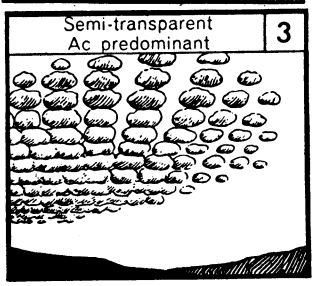
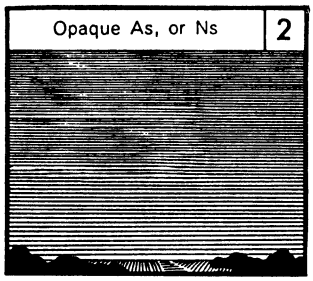
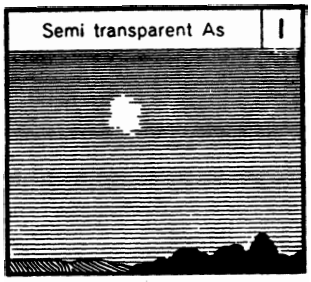
Code figure	Coding criteria	
$C_M = 4$	If the C_M code figures 9, 8, 7, 6, and 5 are not applicable and if the altocumulus present is continually changing in appearance, use $C_M = 4$.	
$C_M = 7$	If the C_M code figures 9, 8, 6, 5, and 4 are not applicable and if the altocumulus present occurs at two or more levels, use $C_M = 7$.	
$C_M = 7, 3$	If the C_M code figures 9, 8, 6, 5, and 4 are not applicable and if the altocumulus present occurs at one level, use $C_M = 7$ or 3 depending on whether the greater part of the altocumulus is respectively opaque or semi-transparent.	 
	(b) No altocumulus present	
$C_M = 2$	If nimbostratus is present or if the greater part of the altostratus present is opaque, use $C_M = 2$.	

Table 18. (Continued)

C_M = 1 — If there is no nimbostratus and if the greater part of the altostratus present is semi-transparent, use **C_M = 1.**



0 — No **C_M** Clouds -- No altocumulus, altostratus, or nimbostratus.

/ — **C_M** clouds not visible owing to darkness, fog, blowing dust or sand, or because of a continuous layer of lower clouds.

Table 4–19. Coding Instructions for C_H Clouds (Modification of WMO Code Table 0509)

This table presents the specifications for type of high cloud, C_H, in order of priority. Go down the table and use the first applicable code figure.

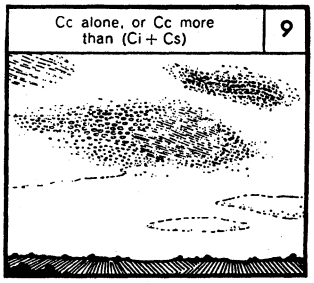
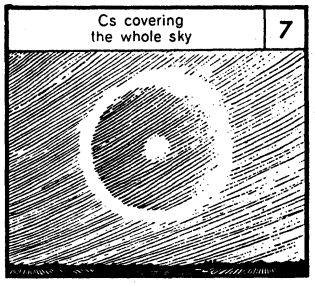
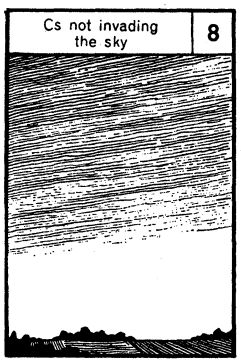
Code figure	Coding criteria	
C_H = **9**	If cirrocumulus is present alone or if more than the combined sky cover of any cirrus and cirrostratus is present, use C_H = **9**. (a) Cirrostratus present	
C_H = **7**	If the cirrostratus covers the whole sky, use C_H = **7**.	
C_H = **8**	If the cirrostratus does not cover the whole sky and is not invading the celestial dome, use C_H = **8**.	
C_H = **6**	If the cirrostratus is progressively invading the sky and if the continuous veil extends more than 45 degrees above the horizon but does not cover the whole sky, use C_H = **6**.	

Table 4–19. (Continued)

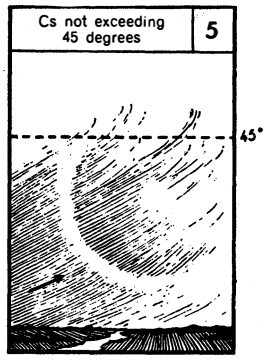
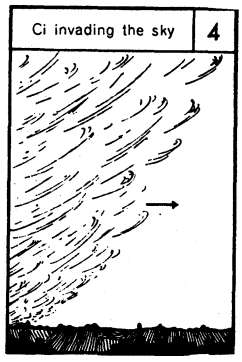
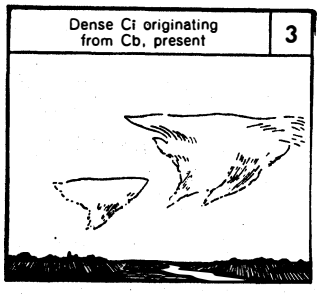
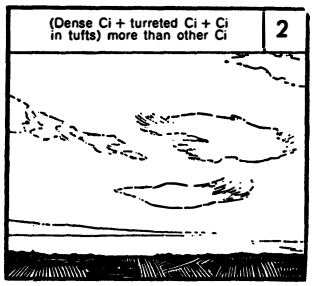
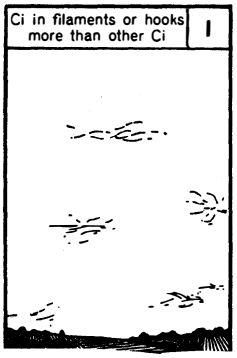
Code figure	Coding criteria	
$C_H = 5$	If the cirrostratus is progressively invading the sky but if the continuous veil does not reach 45 degrees above the horizon, use $C_H = 5$.	
	(b) $C_H = 9$ not applicable and no cirrostratus present	
$C_H = 4$	If the cirrus clouds are invading the sky, use $C_H = 4$.	
$C_H = 3$	If the C_H code figure 4 is not applicable and if dense cirrus which originated from cumulonimbus is present in the sky, use $C_H = 3$.	

Table 4–19. (Continued)

Code figure	Coding criteria
C_H = 2, 1	If the **C_H** code figures 4 and 3 are not applicable:
	use **C_H = 2**, if the combined sky cover of dense cirrus, of cirrus with sproutings in the form of small turrets or battlements and of cirrus in tufts is greater than the combined sky cover of cirrus in the form of filaments, strands or hooks;



	use **C_H = 1**, if the combined sky cover of cirrus in the form of filaments, strands or hooks is greater than the combined sky cover of dense cirrus, of cirrus with sproutings in the form of small turrets or battlements and of cirrus in tufts.



0 No **C_H** Clouds -- No cirrus, cirrostratus, or cirrocumulus.

/ **C_H** clouds not visible owing to darkness, fog, blowing dust or sand, or other similar phenomena, or because of a continuous layer of lower clouds.

4.2.7.4 Examples of Group $8N_hC_LC_MC_H$.

886// Overcast low clouds (**N_h** = 8, 10/10); low clouds are stratus, but not of bad weather (**C_L** = 6); middle and high clouds cannot be seen.

82050 Scattered middle clouds (**N_h** = 2, 2/10 to 3/10 and **C_L** = 0); no low clouds; middle clouds are altocumulus progressively invading the sky; no high clouds.

83131 Scattered low clouds (**N_h** = 3, 4/10); low clouds are fair weather cumulus (**C_L** = 1); middle clouds are altocumulus (**C_M** = 3) and the high clouds are mostly hooks of cirrus (**C_H** = 1).

CHAPTER 5

SECTION 2 – MARINE METEOROLOGICAL DATA

5.1 General

This section is included in surface synoptic reports from selected staffed coastal stations that have been instructed to provide information on wind waves and swell; reports from ships that report those elements plus sea water temperature and ice data; and reports from automated sea stations (buoys) that are limited to reporting wind wave data. The following indicates the maximum number of code groups that are reported in Section 2 at these three categories of stations.

- Land Stations –

  222// $2P_wP_wH_wH_w$ $3d_{w1}d_{w1}d_{w2}d_{w2}$ $4P_{w1}P_{w1}H_{w1}H_{w1}$ $5P_{w2}P_{w2}H_{w2}H_{w2}$

- Sea Stations (ships)

  222D_sv_s $0s_nT_wT_wT_w$ $2P_wP_wH_wH_w$ $3d_{w1}d_{w1}d_{w2}d_{w2}$ $4P_{w1}P_{w1}H_{w1}H_{w1}$

  $5P_{w2}P_{w2}H_{w2}H_{w2}$ $6I_sE_sE_sR_s$ **ICE** $c_iS_ib_iD_iz_i$ **or ICE + plain language.**

- Sea Station (automated)

  22200 $0s_nT_wT_wTw$ $1P_{wa}P_{wa}H_{wa}H_{wa}$ $70H_{wa}H_{wa}H_{wa}$

Those groups that are common to land and sea stations will be discussed in paragraph 5.2 and those unique to sea stations in paragraph 5.3.

5.2 Common Groups

The groups that are common to land and sea stations include the section identifier group, the wind wave group, and the swell groups.

5.2.1 Section Identifier Group, 222D_sv_s. The first three characters in this group, **222,** identify the beginning of Section 2 of the surface synoptic report. This group is encoded by coastal land stations as **222//**. Supplementary and auxiliary ships that do not report pressure tendency data (**5appp**) in Section 1 also encode the groups as **222//** unless otherwise directed to report D_sv_s. This group is encoded as 22200 by automated sea stations.

5.2.1.1 Direction of Ship Movement, D_s. The code figure for D_s indicates the ship's course (true) made good during the three-hour period ending at the time of the observation (in vector notation, the true direction of the resultant displacement of the ship). If the course has been constant during the period, the course at the time of observation will be the course made good. If the ship has changed course during the past three hours, the course made good will probably be different than the actual course at the time of observation.

Figure 5-1 is a graphical representation of the method for calculating the true direction of the resultant displacement (the course made good) and the speed made good.

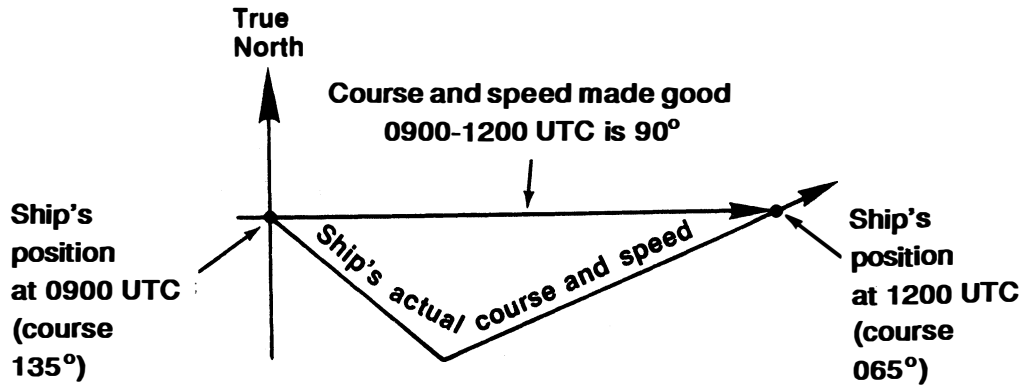


Figure 5–1 Determining Ship's Course (D_s) and Speed Made Good (v_s) during Past 3 Hours

Once the course and speed made good are determined, Table 5-1 is used to encode D_s and Table 5-2 is used to encode v_s.

Table 5–1. True Direction of Resultant Ship's Displacement (Course Made Good) during Past 3 Hours, D_s (Modification of WMO Code Table 0700)

Code figure		Code figure	
0	Stationary	5	SW
1	NE	6	W
2	E	7	NW
3	SE	8	N
4	S	9	Unknown
		/	Report from a coastal land station or ship displacement not reported.

5.2.1.2 Ship's Average Speed, v_s. The code figure for v_s, the ship's average speed made good during the 3 hours ending at the time of observation, is selected from Table 5-2.

Table 5–2. Ship's Average Speed Made Good during the Three Hours Preceding the Time of Observation, v_s (Modification of WMO Code Table 4451)

Code figure		
0	0 knots	0 km/hour
1	1-5 knots	1-10 km/hour
2	6-10 knots	11-19 km/hour
3	11-15 knots	20-28 km/hour
4	16-20 knots	29-37 km/hour
5	21-25 knots	38-47 km/hour
6	26-30 knots	48-56 km/hour
7	31-35 knots	57-65 km/hour
8	36-40 knots	66-75 km/hour
9	over 40 knots	over 75 km/hour
/	Report from a coastal land station or not reported (see paragraph 5.2.1 for ships that generally do not report).	

5.2.2 Wind Wave and Swell Wave Groups, $2P_wP_wH_wH_w$ $3d_{w1}d_{w1}d_{w2}d_{w2}$ $4P_{w1}P_{w1}H_{w1}H_{w1}$ $5P_{w2}P_{w2}H_{w2}H_{w2}$.

5.2.2.1 General. Information and instructions for observing sea condition are contained in NAVOCEANCOMINST 3144.1 and in the National Weather Service Observing Handbook No.1, Marine Surface Weather Observations. Sea condition refers to wave action. There are two types of waves: wind waves (or sea waves) and swell waves (or swell). They both have properties in common, and similar observing practices are followed. The common properties which are reported are the wave height (vertical distance from the top of the crest to the bottom of the trough) and the period (time interval for successive wave crests to pass a fixed point). One reported property that may not be common is the direction of movement of the wave train. Wind waves always move in the same direction as the wind in the local area. Therefore, the direction of wind waves is not reported. Since swell is not generated by the current winds in the local area, the direction of the swell is reported. It is possible to have more than one set of swell, each moving in a different direction. (The wind wave and swell group are not usually reported by supplementary and auxiliary ships.)

5.2.2.2 Wind Wave Group, $2P_wP_wH_wH_w$. The group **$2P_wP_wH_wH_w$** is used to report wind wave data from a staffed station based on estimation. Wave data based on instrument measurements do not discriminate between wind waves and swell (see paragraph 5.3).

Instrument measurements are the only wave data reported by automated stations. If there are no wind waves and no swell, the wind wave group is encoded 20000. If there are no wind waves but there is swell, omit the group **$2P_wP_wH_wH_w$**.

The first character, **2**, is an identifier for the wind wave group in Section 2 of the report. The last two symbolic letters $\mathbf{H_wH_w}$ represent the average height of the larger well-formed waves. (This is usually about the highest one-third of the waves, the equivalent of significant height for instrumented measurements.) U.S. staffed stations estimate wave height in whole feet but the code figures are in half-meter intervals, i.e.; code figure 4 = 2 meters, 16 = 8 meters, etc. Table 5-3 indicates the code figures associated with wave heights.

Table 5–3. Wave Height in Half–meters; $\mathbf{H_wH_w}$, $\mathbf{H_{wa}H_{wa}}$, $\mathbf{H_{w1}H_{w1}}$ or $\mathbf{H_{w2}H_{w2}}$

Code figure	Meters	Feet	Code figure	Meters	Feet
00	Calm	Calm	15	7.5	24 or 25
01	0.5	1 or 2	16	8.0	28 or 27
02	1.0	3 or 4	17	8.5	28
03	1.5	5	18	9.0	29 or 30
04	2.0	6 or 7	19	9.5	31
05	2.5	8 or 9	20	10.0	32 or 33
06	3.0	10	21	10.5	34 or 35
07	3.5	11 or 12	22	11.0	36
08	4.0	13	23	11.5	37 or 38
09	4.5	14 or 15	24	12.0	39 or 40
10	5.0	16 or 17	25	12.5	41
11	5.5	18	26	13.0	42 or 43
12	6.0	19 or 20	27	13.5	44 or 45
13	6.5	21 or 22	28	14.0	46*
14	7.0	23	//	Not determined because of confused sea	

*To obtain the code figures for heights over 46 feet, multiply the height in feet by 0.6096 and round off the result to the nearest whole number.

The symbolic letters $\mathbf{P_wP_w}$ are the period of the waves in seconds, using a leading zero if the period is less than 10 seconds. If for some reason the period can not be observed, encode $\mathbf{P_wP_w}$ as //. If the sea is confused and the height can be estimated but not the period, $\mathbf{P_wP_w}$ is encoded 99 and the code for $\mathbf{H_wH_w}$ is used. If neither the period nor the height can be estimated because of a confused sea, the group is encoded 299//.

5.2.2.3 Swell Wave Groups, $\mathbf{3d_{w1}d_{w1}d_{w2}d_{w2}}$ $\mathbf{4P_{w1}P_{w1}H_{w1}H_{w1}}$ $\mathbf{5P_{w2}P_{w2}H_{w2}H_{w2}}$. The group $\mathbf{3d_{w1}d_{w1}d_{w2}d_{w2}}$ indicates the directions of the primary and secondary swell waves. If there is no swell observed (i.e. the primary and secondary swell groups are omitted), the $\mathbf{3d_{w1}d_{w1}d_{w2}d_{w2}}$ group is left out, also. The true direction from which the primary swell is coming, $\mathbf{d_{w1}d_{w1}}$, is reported in tens of degrees using the code figures in Table 5-4. The same table is used to encode $\mathbf{d_{w2}d_{w2}}$, the true direction from which the secondary swell is coming. If there is only one swell group, encode $\mathbf{d_{w2}d_{w2}}$ as //.

The first character, **4**, in the group $\mathbf{4P_{w1}P_{w1}H_{w1}H_{w1}}$ is an identifier for the primary swell group in Section 2 of the report. The first character, **5**, in the group $\mathbf{5P_{w2}P_{w2}H_{w2}H_{w2}}$ is the identifier for the secondary swell group in the report. If no swell is observed, then $\mathbf{4P_{w1}P_{w1}H_{w1}H_{w1}}$ and $\mathbf{5P_{w2}P_{w2}H_{w2}H_{w2}}$ are not reported. If only one swell is observed, the $\mathbf{5P_{w2}P_{w2}H_{w2}H_{w2}}$ group is not reported.

The same procedures used for encoding wind waves are followed for encoding the height and period of the swell waves. (Table 5-3 is used, also, to assist in encoding the height of swell.)

Table 5–4. True Direction, $d_{w1}d_{w1}$, $d_{w2}d_{w2}$ in Tens of Degrees, from which Waves Are Coming (Modification of WMO Code Table 0877)

Code figure	Direction	Code figure	Direction
00	Calm	19	185° to 194°
01	5° to 14°	20	195° to 204°
02	15° to 24°	21	205° to 214°
03	25° to 34°	22	215° to 224°
04	35° to 44°	23	225° to 234°
05	45° to 54°	24	235° to 244°
06	55° to 64°	25	245° to 254°
07	65° to 74°	26	255° to 264°
08	75° to 84°	27	265° to 274°
09	85° to 94°	28	275° to 284°
10	95° to 104°	29	285° to 294°
11	105° to 114°	30	295° to 304°
12	115° to 124°	31	305° to 314°
13	125° to 134°	32	315° to 324°
14	135° to 144°	33	325° to 334°
15	145° to 154°	34	335° to 344°
16	155° to 164°	35	345° to 354°
17	165° to 174°	36	355° to 4°
18	175° to 184°	99	Waves confused; direction indeterminate

5.2.3 Examples of Section 2 - Land Stations. The following examples review coded reports from coastal land stations. They provide a review of the wind wave group and swell group which, together with the Section 2 identifier, constitutes the entire report. Examples of Section 2 sea station reports are shown in paragraph 5.3.6.

- Example 1

  222// 20903

This is Section 2 of a report from a station that has observed wind waves with an average period of 9 seconds and an average height of 5 feet and has observed no swell.

- Example 2

  222// 332// 41202

This is Section 2 of a report from a station that has not observed any wind waves, but has observed swell with a period of 12 seconds and an average height of 3 or 4 ft. The swell is coming from a direction of 320°. There was no secondary swell reported.

5.3 Sea Station Groups

The groups that are unique to sea stations include sea water temperature, instrument measurements of primary wave data in half-meter increments and in tenths of a meter, ice accretion on ships, plus reports of sea ice and ice of land origin.

5.3.1 Sea Surface Water Temperature Group, $0s_nT_wT_wT_w$.

5.3.1.1 General. The sea surface water temperature group shall always be reported in sea station reports when the data are available. Availability of data, though, does not assure users that the quality of the data is adequate, because there is no code group included in synoptic reports to indicate which measurement method was used. Observing practices include several that are preferable to condenser intake (induction) temperatures which have great variability. The intake temperature is dependent on status of the boilers and cooling systems in the ships, as well as on the depth of the intake. The U.S. Navy does not report sea-surface temperatures based on intake temperature unless the injection temperature can be observed or rected within 0.5°F (0.3°C) of temperatures obtained by preferred methods. The only requirement for civil ships is for the intake to be no more than 10 meters below the sea surface.

5.3.1.2 Coding Procedures. The sea-surface water temperature group in Section 2 is identified by the leading character **0**. The remaining characters, $\mathbf{s_nT_wT_wT_w}$, are coded in the same way as air temperature and dew point temperature (paragraph 4.2.3). The symbolic letters $\mathbf{T_wT_wT_w}$ represent the absolute value of the sea water temperature at the surface, expressed in tenths of degrees Celsius. For $\mathbf{T_wT_wT_w}$, all three digits shall be used (leading zeroes if appropriate). Thus, a temperature of 12.3°C is encoded 123; a temperature of 2.3°C is encoded 023; and a temperature of 0.3°C is encoded 003. (Auxiliary ships that do

not have certified thermometers report in whole degrees Celsius, using the symbolic code T_wT_w) The second character in the group, s_n, provides the sign for the absolute value $T_wT_wT_w$. The convention shown in Table 4-8 applies: if the temperature is positive or zero, encode s_n as 0; if the temperature is negative, encode s_n as 1.

5.3.2 Primary Wave Group, $1P_{wa}P_{wa}H_{wa}H_{wa}$. The primary wave group is reported by stations that derive instrumentally measured wave data. If wave data are measured, this group will be included in the report in lieu of the $2P_wP_wH_wH_w$ group sent by staffed ships.

In the group $1P_{wa}P_{wa}H_{wa}H_{wa}$, the character **1** is the identifier for the primary wave group in Section 2 of the report. $P_{wa}P_{wa}$, the period of the primary wave, is encoded in seconds, using a leading zero if the period is less than 10 seconds. The other conventions used by staffed ships are also followed for instrumentally derived reports: $P_{wa}P_{wa}$ is encoded 0 if the sea is calm, encoded 99 if the sea is confused, and encoded // if it cannot be measured. $H_{wa}H_{wa}$ is comparable to the estimated values for H_wH_w (paragraph 5.2.2.2.). $H_{wa}H_{wa}$ represents the significant wave height (average of the highest third of the waves). It is reported in a two digit code (Table 5-3) which is the height in half meters (i.e., a height of 3.1 meters would be encoded 6; a height of 5.8 meters would be encoded 12).

5.3.3 High Resolution Wave Group, $70\_H_{wa}H_{wa}H_{wa}$. The high resolution wave group is reported only if the primary group, $1P_{wa}P_{wa}H_{wa}H_{wa}$, is reported. The first two characters, **70**, are a group indicator for high resolution wave data. The last three characters, $H_{wa}H_{wa}H_{wa}$, represent the wave height in tenths of meters. (U.S. automated sea stations have sufficient instrumental accuracy to include these data.) The full report on wave data from an automated sea station reporting waves with an average height of 5.8 meters and a period of 8 seconds would be 10812 70058.

5.3.4 Ice Accretion Group, $6I_sE_sE_sR_s$.

5.3.4.1 General. Ice accretion occurs when the ship's outer surfaces are below freezing and water droplets are suspended, falling or blown in the air. It generally forms first on wires, railings, masts and fittings exposed to the air; next on flat surfaces such as catwalks, decks and bulkheads that are not affected by heating within the ship; and last on decks and bulkheads which are heated by conduction from the ship. All staffed ships provide this group in the synoptic report if ice accretion is observed. Some ships report this information in plain language preceded by the word "**ICING**", rather than in code form. Ice accretion is noted by indicating its source, its thickness and the relative rate of accretion.

5.3.4.2 Coding Procedures. The first character, **6**, identifies the ice accretion group in section 2 of the report. The symbolic letter, I_s, indicates the source or cause of the ice accretion. It is coded in accordance with Table 5-5.

Table 5–5. Causes of Ice Accretion on Ship, I_s (WMO Code Table 1751)

Code figure	
1	Icing from ocean spray
2	Icing from fog
3	Icing from spray and fog
4	Icing from rain
5	Icing from spray and rain

The next two symbolic letters, E_sE_s, indicate the thickness of the ice that has built up, expressed in centimeters (using a leading zero if less than 10 centimeters). For those who measure in inches, each inch is equivalent to 2.54 centimeters (see Table 5-6, below).

Table 5–6. Thickness of Ice Accretion, E_sE_s, in Centimeters and Inches

Code figure (cm)	Inches	Code figure (cm)	Inches	Code figure (cm)	Inches
00	Less than 1/4	10	3 3/4 or 4	20	7 3/4 or 8
01	1/4 or 1/2	11	4 1/4 or 4 1/2	21	8 1/4
02	3/4	12	4 3/4	22	8 1/2 or 8 3/4
03	1 or 1 1/4	13	5 or 5 1/4	23	9 or 9 1/4
04	1 1/2 or 1 3/4	14	5 1/2	24	9 1/2
05	2	15	5 3/4 or 6	25	9 3/4 or 10
06	2 1/4 or 2 1/2	16	6 1/4	26	10 1/4
07	2 3/4	17	6 1/2 or 6 3/4	27	10 1/2 or 10 3/4
08	3 or 3 1/4	18	7 or 7 1/4	28	11
09	3 1/2	19	7 1/2	29	11 1/4 or 11 1/2

The subjective evaluation of the observer concerning the relative rate of accretion, R_s, is coded in accordance with Table 5-7.

Table 5–7. Rate of Ice Accretion on Ships, R_s (WMO Code Table 3551)

Code figure	
0	Ice not building up
1	Ice building up slowly
2	Ice building up rapidly
3	Ice melting or breaking up slowly
4	Ice melting or breaking up rapidly

5.3.5 Sea Ice and Ice of Land Origin Group, ICE $c_i S_i b_i D_i z_i$.

5.3.5.1 General. This group is concerned with two types of ice:

- ice formed by the freezing of sea water; this ice, which is generally flat and plate-like, is called sea-ice by WMO.
- ice of land origin, broken off from a glacier.

With regards to sea ice, the observation includes information on the concentration, coverage and arrangement of the ice, the stage of development (age) of the ice, present ice situation, and the trend of the situation. For ice of land origin, it is important to classify the ice (iceberg -- size of medium sized ship or larger; bergy bit -- size of a small house; growler -- size of a truck). This part of the synoptic report can be given in plain language preceded by the word, "**ICE**", or in code preceded by the word "**ICE.**"

Note that the provision of synoptic reports of sea ice and ice of land origin shall not supersede the reporting of sea ice and icebergs in accordance with the International Convention for the Safety of Life at Sea.

The group $\mathbf{c_i S_i b_i D_i z_i}$ or the plain language equivalent, shall be reported whenever the sea ice and/or ice of land origin are observed from the ship's position at the time of observation, unless the ship is required to report ice conditions by means of a special sea-ice code.

When an ice edge is crossed or sighted between observation hours, it shall be reported as a plain-language addition in the form "ice edge, latitude, longitude" (with position in degrees and minutes).

If the ship is in the open sea reporting an ice edge, the concentration $\mathbf{c_i}$ and stage of development $\mathbf{S_i}$ shall be reported only if the ship is close to the ice (i.e., within 0.5 nautical mile).

5.3.5.2 Coding Procedures.

a. **Concentration of Sea Ice, c_i.** The possible variations in sea-ice concentration and arrangement within an area of observation are almost infinite. However, the field of reasonably accurate observation from a ship's bridge is limited. For this reason, and also because minor variations are of temporary significance, the choice of concentrations and arrangements has been restricted for reporting purposes to those representing significantly different conditions from a navigational point of view. The code figures 2 -9 are used when the ship is in ice or within 0.5 nautical mile from an ice edge. These code figures have been subdivided into two sections depending on:

- whether sea ice concentration within the area of observation is more or less uniform (code figures 2-5); or
- whether there are marked contrasts in concentration or arrangement (code figures 6-9).

Table 5-8 presents descriptions in order of navigational significance, from most to least significant.

Table 5–8. Concentration or Arrangement of Sea Ice, c_i, in Priority Order (Modification of WMO Code Table 0639)

Use the code figure for the first applicable description.

Code figure	
	Note: When reporting code figures 9 through 6: ♦ the ship is in ice or within 0.5 nautical mile of an ice edge, and ♦ the sea ice is not uniform in the observation area.
9	Fast ice with close or very close pack ice to seaward of the ice boundary
8	Fast ice with open water, very open or open pack ice to seaward of the ice
7	Strips and patches of close or very close pack ice with areas of lesser concentration between
6	Strips and patches of pack ice with open water between
	Note: When reporting code figures 5 through 2: ♦ the ship is in ice or within 0.5 nautical mile of an ice edge, and ♦ the sea ice is uniform in the observation area.
5	9/10 or more, but not 10/10 (7/8 to less than 8/8), very close pack ice
4	7/10 to 8/10 (6/8 to less than 7/8), close pack ice
3	4/10 to 6/10 (3/8 to less than 6/8), open pack ice
2	Sea ice present in concentrations less than 3/10 (3/8), open water or very open pack ice
	Note: Remaining codes follow:
1	ship in open lead more than 1.0 nautical mile, (also code $\mathbf{D_i}$ = 0, see Table 5-11), or, ship in fast ice with boundary beyond limit of visibility (also code $\mathbf{D_i}$ = 9, see Table 5-11)
0	No sea ice in sight
/	Unable to report, because of darkness, lack of visibility, or because ship is more than 0.5 nautical mile away from ice edge

b. **Stage of Development of Sea Ice, S_i.** The stage of development of the sea ice is reported when the ship is within 0.5 nautical mile of an ice edge. Table 5-9, below, lists the stage of development of the sea ice in priority order. (A higher code figure would present greater navigational difficulty than a lower code figure, if the concentrations, c_i, were equal.) If the concentration is, for example, 8/10, then new ice would hardly have any effect on navigation while predominantly old ice would provide conditions requiring reductions in speed and frequent course alterations.

Table 5–9. Stage of Development of Sea Ice, S_i, in Priority Order (Modification of WMO Code Table 3739)

Use the code figure for the first applicable stage in the list.

Code figure	
9	Predominantly old ice
8	Predominantly medium and thick first-year ice with some old ice (usually more than 2 meters thick)
7	All medium and thick first-year ice
6	Predominantly medium first-year ice (70-120 cm thick) and thick first-year ice (>120 cm thick) with some thinner (younger) first-year ice
5	All thin first-year ice (30-70 cm thick)
4	Predominantly thin first-year ice with some new and/or young ice
3	Predominantly new and/or young ice with some first-year ice
2	Young ice (grey ice, grey-white ice), 10-30 cm thick
1	Nilas or ice rind, less than 10 cm thick
0	New ice only (frazil ice, grease ice, slush, shuga)
/	Unable to report, because of darkness, lack of visibility or because only ice of land origin is visible or because ship is more than 0.5 nautical mile away from ice edge

c. **Ice of Land Origin, b_i.** Table 5-10 lists descriptions of ice of land origin in order of coding priority. Growlers and bergy bits, being much smaller and lower in the water than icebergs, are more difficult to see either by eye or radar. This is especially so if there is a heavy sea running. For this reason, code figures 4 and 5 represent more hazardous conditions than code figures 1 through 3.

Table 5–10. Ice of Land Origin, b_i, in Priority Order (Modification of WMO Code Table 0439)

Use the code figure for the first applicable description.

Code figure	
9	More than 20 icebergs with growlers and bergy bits -- a major hazard to navigation
8	11-20 icebergs with growlers and bergy bits
7	6-10 icebergs with growlers and bergy bits
6	1-5 icebergs with growlers and bergy bits
5	More than 10 growlers and bergy bits -- no icebergs
4	Up to and including 10 growlers with bergy bits -- no icebergs
3	11-20 icebergs, no growlers or bergy bits
2	6-10 icebergs, no growlers or bergy bits
1	1-5 icebergs, no growlers or bergy bits
0	No ice of land origin
/	Unable to report, because of darkness, lack of visibility or because only sea ice is visible

If no sea ice is visible, and the code group is used to report ice of land origin only, the group shall be coded as 0/$\mathbf{b_i}$/0. For example, 0/2/0 would mean 6-10 icebergs in sight, but no sea ice.

The purpose of the first code figure (0) is to establish, in relation to code $\mathbf{z_i}$ (second code figure 0) and code $\mathbf{b_i}$, whether the floating ice that is visible is only ice of land origin.

d. **Bearing of Closest Part of Principal Ice Edge, D_i.** There is no provision in the synoptic code for reporting distance from the ice edge. It will be assumed by those receiving the report that the bearing given is with respect to the closest edge. From the reported code figures for concentration and stage of development it will be clear whether the ship is in ice or within 0.5 nautical mile of the edge. If the ship is in open water and more than 0.5 nautical mile from the ice edge, the ice edge will be assumed to be aligned at right angles to the bearing which is reported. The true bearing to the closest part of the principal ice edge, $\mathbf{D_i}$, is coded in accordance with Table 5-11.

Table 5-11. True Bearing of Principal Ice Edge, D_i (WMO Code Table 0739)

Code figure	
0	Ship in shore or flaw lead
1	Principal ice edge towards NE
2	Principal ice edge towards E
3	Principal ice edge towards SE
4	Principal ice edge towards S
5	Principal ice edge towards SW
6	Principal ice edge towards W
7	Principal ice edge towards NW
8	Principal ice edge towards N
9	Not determined (ship in ice)
/	Unable to report, because of darkness, lack of visibility or because only ice of land origin is visible

e. **Present Ice Situation and Trend of Conditions, z_i.** The purpose of this element of the code is:

- b to establish whether the ship is in pack ice or is viewing floating ice (i.e., either sea ice or ice of land origin) from the open sea; and
- b to establish a qualitative estimate of the penetrability of the sea ice and the recent trend of conditions.

Table 5-12 presents descriptions of ice situations in priority order.

Table 5–12. Present Ice Situation and Trend of Conditions over Preceding 3 Hours, z_i, in Priority Order (Modification of WMO Code Table 5239)

Use the code figure for the first applicable description.

Code figure	
	Note: Code figures 9 through 6 are used when the ship is in ice that is difficult to penetrate and the conditions are worsening.
9	Ship beset
8	Ice under moderate or severe pressure
7	Ice under slight pressure
6	Ice forming and floes freezing together
	Note: Code figures 5 through 1 are used for all other situations when the ship is in ice.
5	Ship in ice difficult to penetrate; conditions not changing
4	Ship in ice difficult to penetrate; conditions improving
3	Ship in easily penetrable ice; conditions worsening
2	Ship in easily penetrable ice; conditions changing
1	Ship in easily penetrable ice; conditions improving
0	Ship in open water with floating ice in sight
/	Unable to report because of darkness or lack of visibility

5.3.6 Examples of Section 2 - Sea Stations.

- Example 1

  22263 00031 20805 30300 41204 62001

This ship is reporting that in the past three hours its course made good was westerly at an average speed of between 11 and 15 knots. The sea surface water temperature is 3.2°C. The wind waves are averaging 8 to 9 feet in height with a period of 8 seconds. There is only one swell reported - waves 6 to 7 feet in height with a period of 12 seconds. The ship is encountering ice accretion due to fog. The ice is less than 1/4 inch in thickness and is building up slowly.

- Example 2 †

  22200 01006 11010 70048 †

This report from an automated sea station indicates that the sea surface temperature is −0.6°C. The significant height of the primary wave group is 4.8 meters with a period of 10 seconds.

- Example 3

  22200 01042 20000 62011 ICE 58198

This ship has made no headway in the past 3 hours (resultant displacement and speed 0). The sea surface temperature is −4.2°C and there are no wind waves or swell reported. The ship has between 1/4 to 1/2 inch of ice due to fog, with the ice building up slowly. The ship is in very close pack ice (9/10 or more but not 10/10) with a uniform distribution of sea ice and no ice of land origin. The ice is predominantly medium and thick first year ice with some old ice (more than 2 meters in thickness). True bearing to the ice edge is not reported because the ship is in the ice under moderate to severe pressure. The ice is difficult to penetrate, and conditions are worsening.

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 $0C_sD_LD_MD_H$ $1s_nT_xT_xT_x$ $2s_nT_nT_nT_n$ 4E'sss

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

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

  333 $1s_nT_xT_xT_x$ $2s_nT_nT_nT_n$ $5j_1j_2j_3j_4$ $8N_sCh_sh_s$

- 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 $9S_PS_Ps_ps_p$

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, $9S_PS_Ps_ps_p$.

6.2.2.1 General. Regions decide on the use of this group. Region V does not report any special phenomena. Special phenomena groups are reported by Region IV 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, $\mathbf{S_PS_P}$, 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	
01	depth of new snow past 6 hours
05	time precipitation began or ended; duration and character of precipitation
07	average rate of accrual of glaze
09	water temperature
21	maximum wind speed

*Code figures 01, 05, 07, and 09 are used by Region IV land stations; code figure 21 by automated sea stations.

The last 2 characters, $\mathbf{s_ps_p}$, are used to encode the value(s) of the phenomenon given by $\mathbf{S_PS_P}$.

6.2.2.2 Depth of New Snow, 901nn. 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 **90lnn** is encoded as 90108.

(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 **90lnn** is encoded as 90115. 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, 905$R_t d_c$. 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 (Modification of WMO Regional Code Table 473)

Code figure	
1	Less than 1 hour ago
2	1 to 2 hours ago
3	2 to 3 hours ago
4	3 to 4 hours ago
5	4 to 5 hours ago
6	5 to 6 hours ago
7	6 to 12 hours ago
8	More than 12 hours ago
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 Regional Code Table 445)

Code figure	
	Note: Code figures 0 through 3 are used if only one period of precipitation has occurred during the past 6 hours
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 past 6 hours
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, 907nn. This special phenomenon group **907nn** 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 **907nn** as 90700. 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 **907nn** as 907//. 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 Water Temperature, 909T_wT_w. Some National Weather Service regional offices need to know the water temperature (mostly lake temperatures) at selected stations. Since these data are not needed globally, they are not reported in Section 2, but in Section 3.

The last two characters ($\mathbf{T_wT_w}$) represent the water temperature in whole degrees Celsius. If measured in degrees Fahrenheit ($\mathbf{T_F}$) convert to Celsius ($\mathbf{T_C}$)

$$\frac{5}{9}(\mathbf{T_F} - 32) = \mathbf{T_C}$$

If the water temperature is 0°C or higher, use that value (in two digits) for $\mathbf{T_wT_w}$. For example, if the water temperature is 5°C, the group would be encoded 90905. If the water temperature is less than 0°C, $\mathbf{T_WT_W}$ is encoded as the sum of the absolute value of the temperature plus 50. For example, if the water temperature is −5°C, the group would be encoded 90955.

6.2.2.6 Speed of Maximum Wind, 921ff. This special phenomenon group, **921ff**, is used to report the maximum wind speed observed at automated sea stations. The group **921ff** will be included in all observations that have an average wind. If there is no average wind (**/ddff** encoded as /////), then the group **921ff** will not be included in the observation.

The maximum 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 maximum 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 maximum 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 maximum 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 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.

Table 6–4. State of Sky in Tropics, C_s (Modification of WMO Regional Code Table 430)

Code figure	
0	Cumulus, if any, are quite small; generally less than 2/8 coverage, except on windward slopes of elevated terrain; average width of cloud is at least as great as its vertical thickness.
1	Cumulus of intermediate size with cloud cover less than 5/8; average cloud width is more than its vertical thickness; towers are vertical with little or no evidence of precipitation, except along slopes of elevated terrain; a general absence of middle and upper clouds.
2	Swelling cumulus with rapidly growing tall turrets which decrease in size with height and whose tops tend to separate from the lower cloud body and evaporate within minutes of the separation.
3	Swelling cumulus with towers having a pronounced tilt in a downwind direction; vertical cloud thickness is more than 1 1/2 times that of its average width.
4	Swelling cumulus with towers having a pronounced tilt in an upwind direction; vertical cloud thickness is more than 1 1/2 times that of its average width.
5	Tall cumulus congestus with vertical thickness more than twice the average width; not organized in clusters or lines; one or more layers of clouds extend out from the cloud towers, although no continuous cloud layers exist.
6	Isolated cumulonimbus or large clusters of cumulus turrets separated by wide areas in which clouds are absent; cloud bases are generally dark with showers observed in most cells; some scattered middle and upper clouds may be present; individual cumulus cells are one to two times higher than they are wide.
7	Numerous cumulus extending through the middle troposphere with broken to overcast sheets of middle clouds and/or cirrostratus; cumulus towers do not decrease, generally, in size with height; ragged dark cloud bases with some showers present.
8	Continuous dense middle clouds and/or cirrostratus cloud sheets with some large isolated cumulonimbus or cumulus congestus clouds penetrating these sheets; light rain occasionally observed from the altostratus; cumulonimbus bases ragged and dark with showers visible.
9	Continuous sheets of middle clouds and/or cirrostratus with cumulonimbus and cumulus congestus in organized lines or cloud bands; rain is generally observed from altostratus sheets and heavy showers from cumulonimbus; wind has a squally character.

Table 6-4. (Continued)

/	State of sky unknown or not described by any of above.

Note: In the event of obscuration of clouds due to heavy rain, the observer should use classification 5 or 8 (5 if the rain is localized or is brief in duration; 8 if the rain is widespread or lasts for longer periods of time).

CODE FIGURE 0

Cumulus, if any, are quite small; generally less than 2/8 coverage, except on windward slopes of elevated terrain; average width of cloud is at least as great as its vertical thickness.

Figure 6-1 Supplement to Table 6-4. State of Sky in Tropics

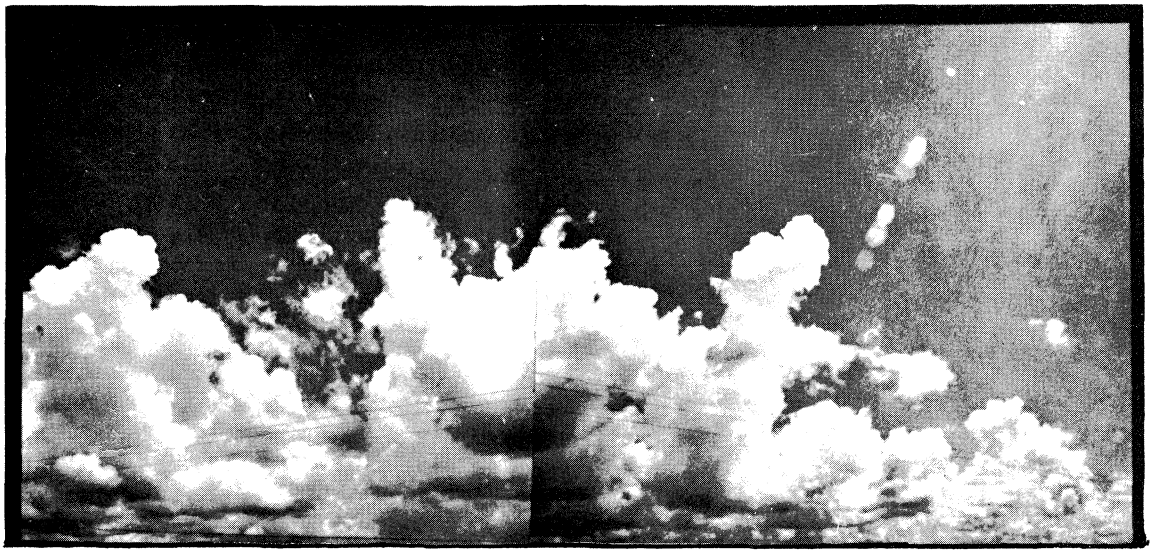
CODE FIGURE 1

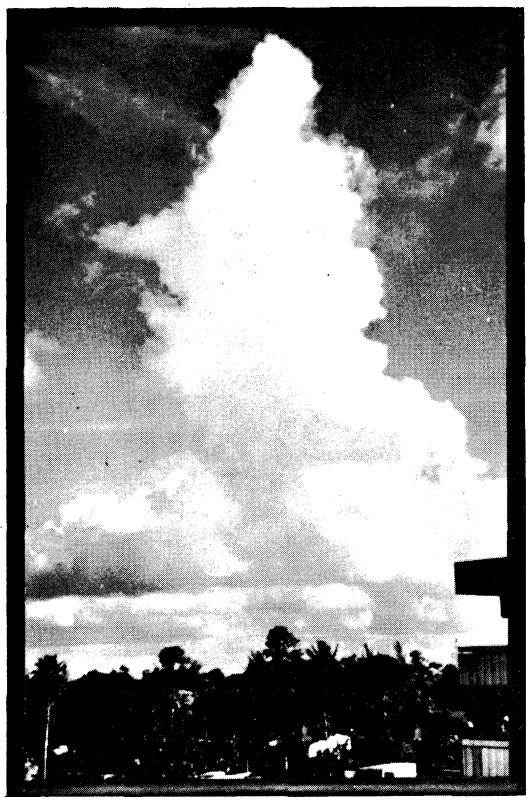
Cumulus of intermediate size with cloud cover less than 5/8; average cloud width is more than its vertical thickness; towers are vertical with little or no evidence of precipitation, except along slopes of elevated terrain; a general absence of middle and upper clouds.

Figure 6-1 (Continued)

CODE FIGURE 2

Swelling cumulus with rapidly growing tall turrets which decrease in size with height and whose tops tend to separate from the lower cloud body and evaporate within minutes of the separation.





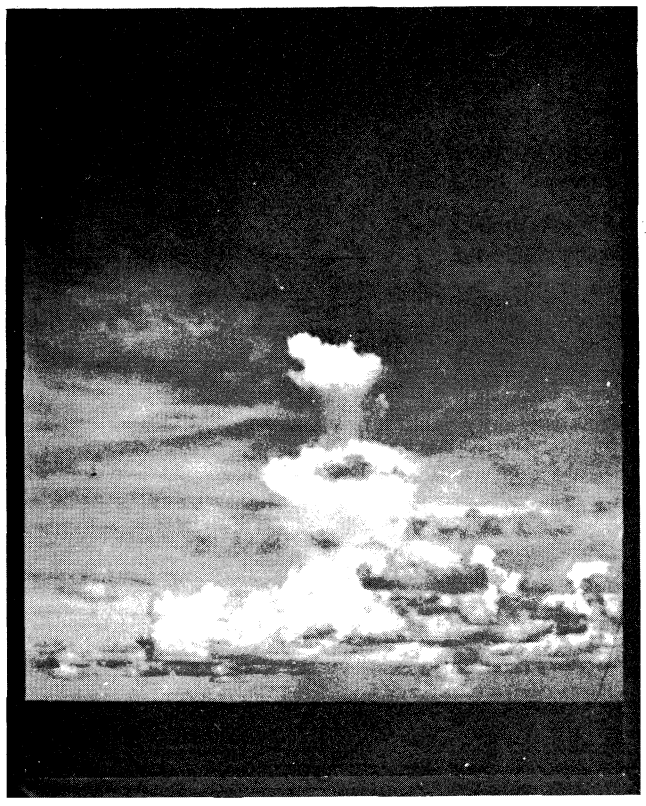


Figure 6-1 (Continued)

CODE FIGURE 3

Swelli cumulus l direction; vertic l cloud thickness is

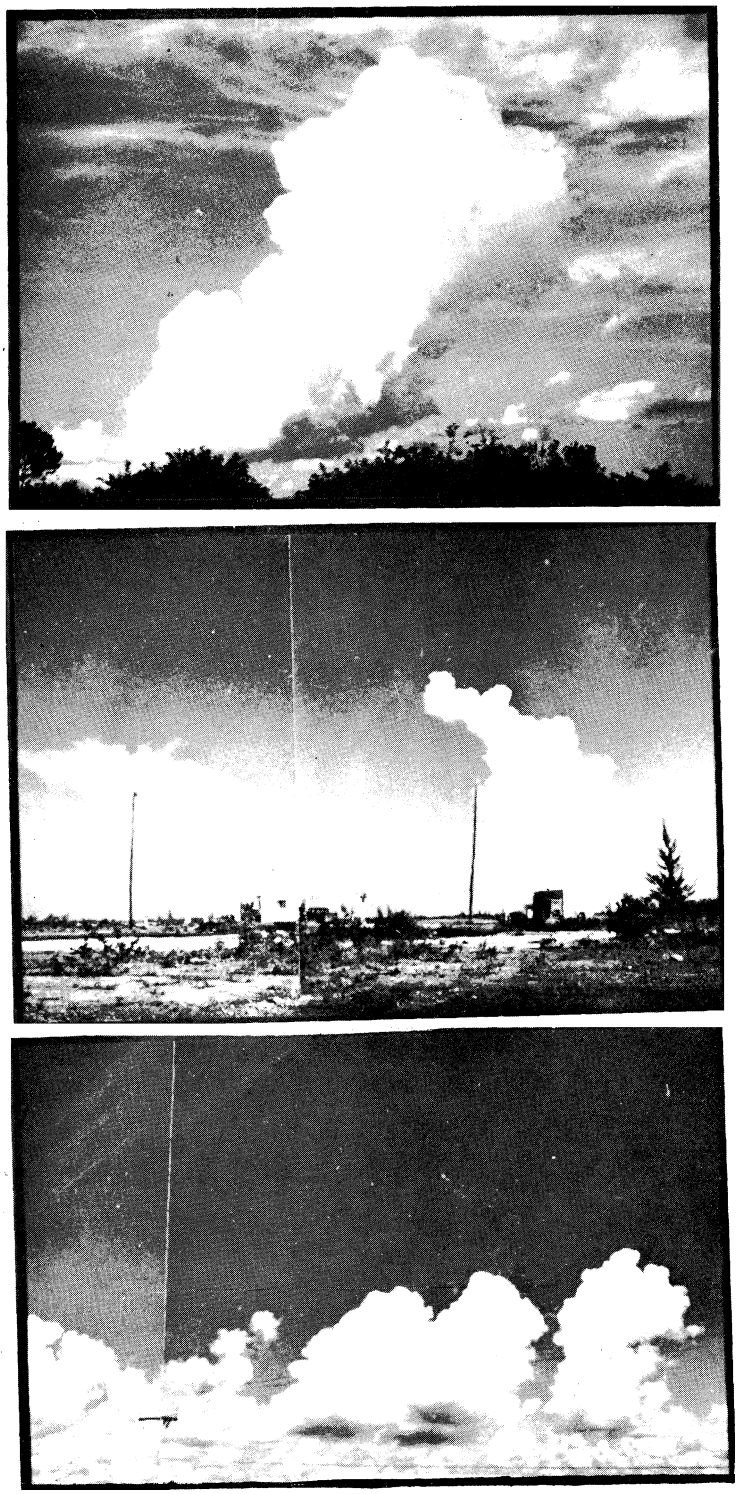


Figure 6-1 (Continued)

CODE FIGURE 4

Swelling cumulus with towers having a pronounced tilt in an upwind direction; vertical cloud thickness is more than 1 1/2 times that of its average width.

Figure 6-1 (Continued)

CODE FIGURE 5

Tall cumulus congestus with vertical thickness more than twice the average width; not organized in clusters or lines; one or more layers of clouds extend out from the cloud towers, although no continuous cloud layers exist.

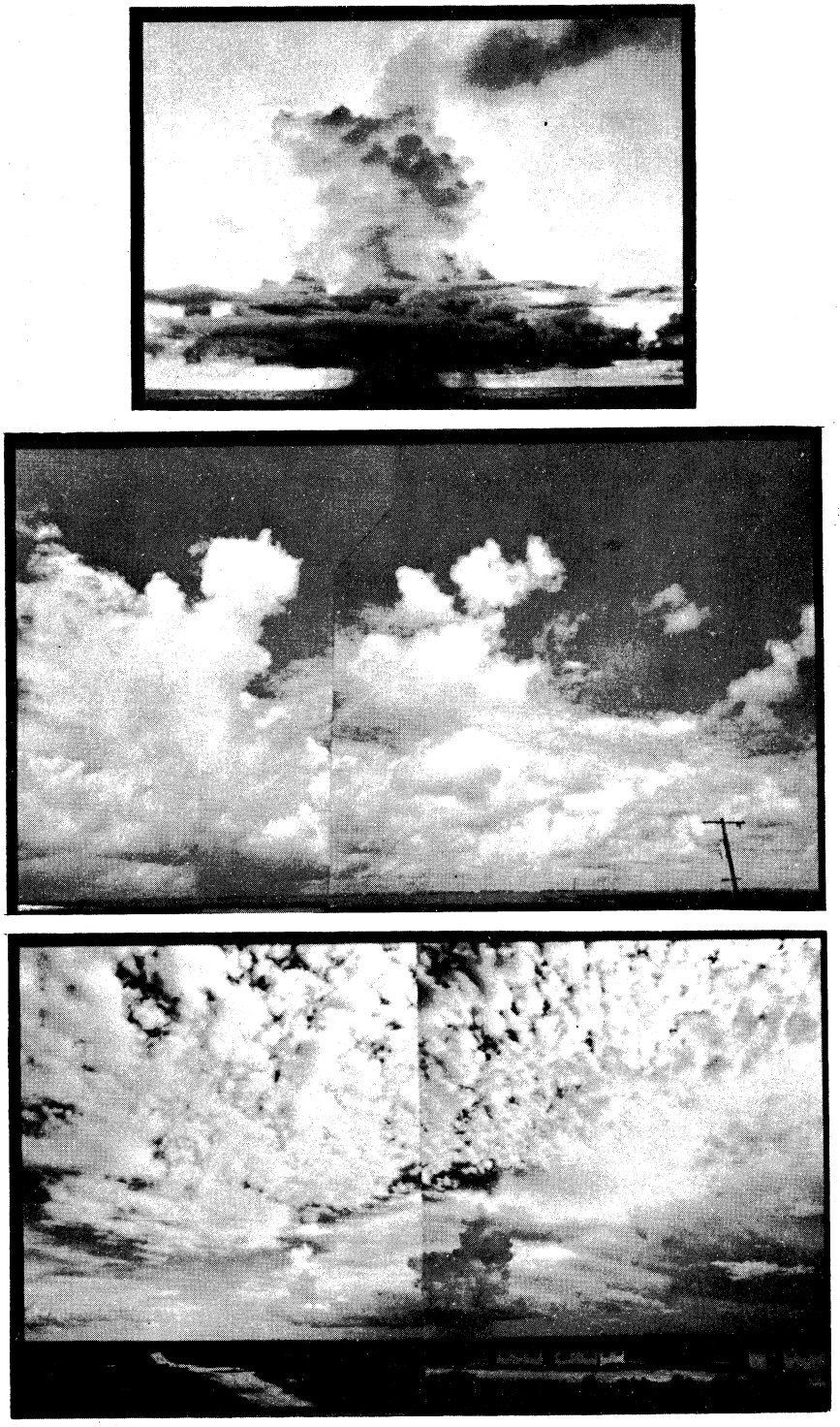


Figure 6-1 (Continued)

CODE FIGURE 6

Isolated cumulonimbus or large clusters of cumulus turrets separated by wide areas in which clouds are absent; cloud bases are generally dark with showers observed in most cells; some scattered middle and upper clouds may be present; individual cumulus cells are one to two times higher than they are wide.

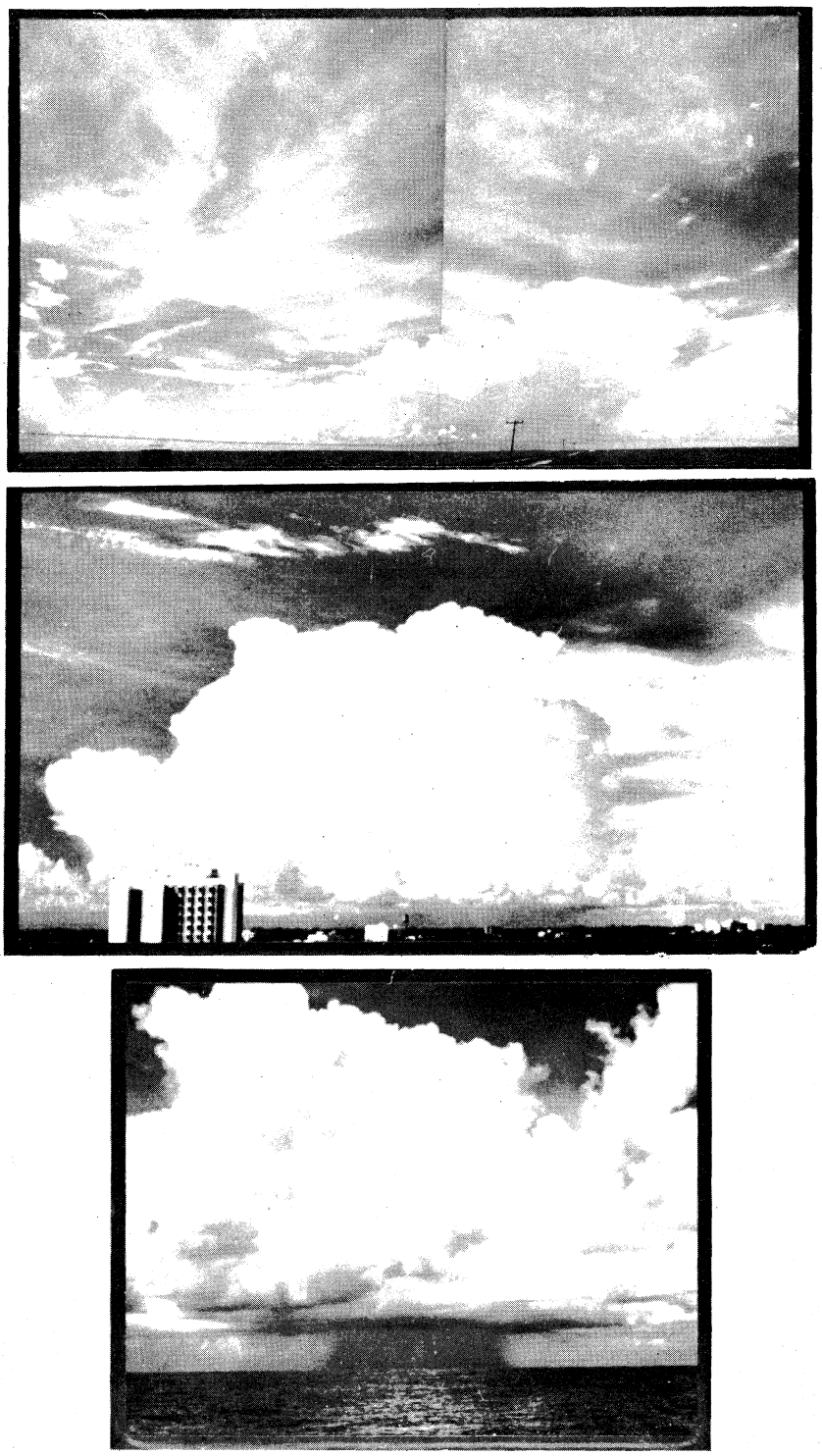


Figure 6-1 (Continued)

CODE FIGURE 7

Numerous cumulus extending through the middle troposphere with broken to overcast sheets of middle clouds and/or cirrostratus; cumulus towers do not decrease generally in size with height; ragged dark cloud bases with some showers present.

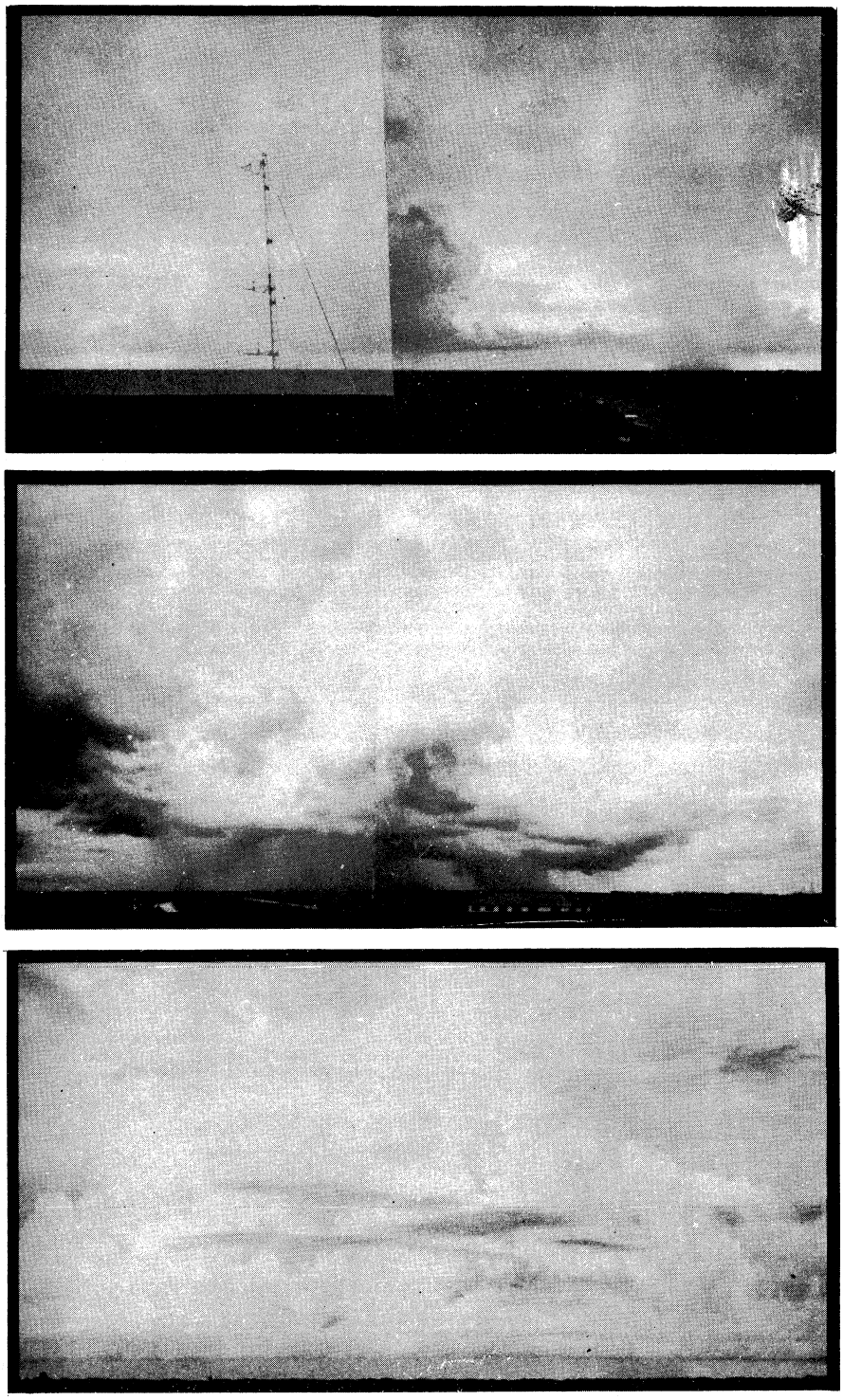


Figure 6-1 (Continued)

CODE FIGURE 8

Continuous dense middle clouds and/or cirrostratus cloud sheets with some large isolated cumulonimbus or cumulus congestus clouds penetrating these sheets: light rain occasionally observed fro visible.

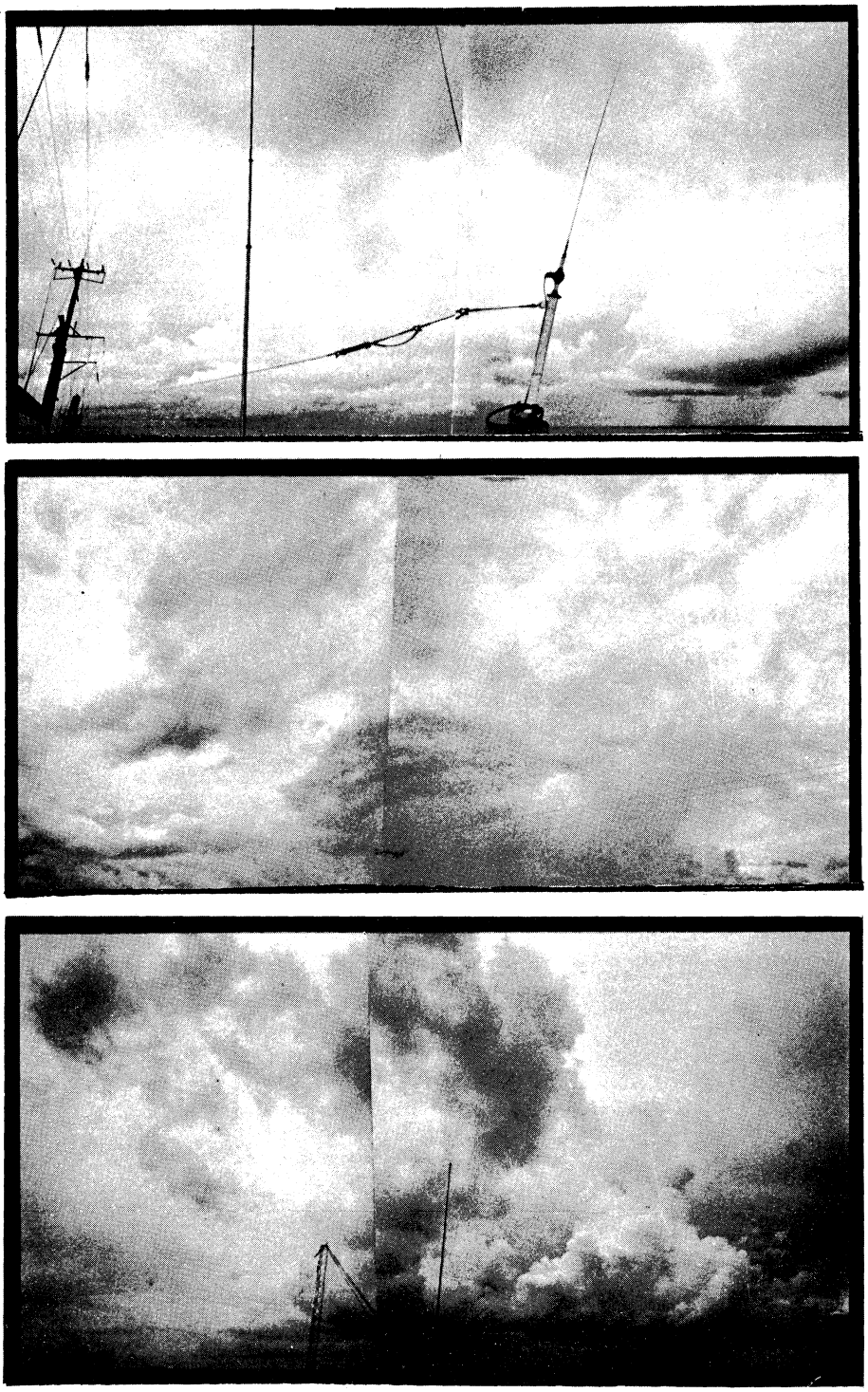


Figure 6-1 (Continued)

CODE FIGURE 9

Co[illegible]nuous s[illegible] and cum[illegible]lus congestus in[illegible] n altostr[illegible]tus sheets and he[illegible]

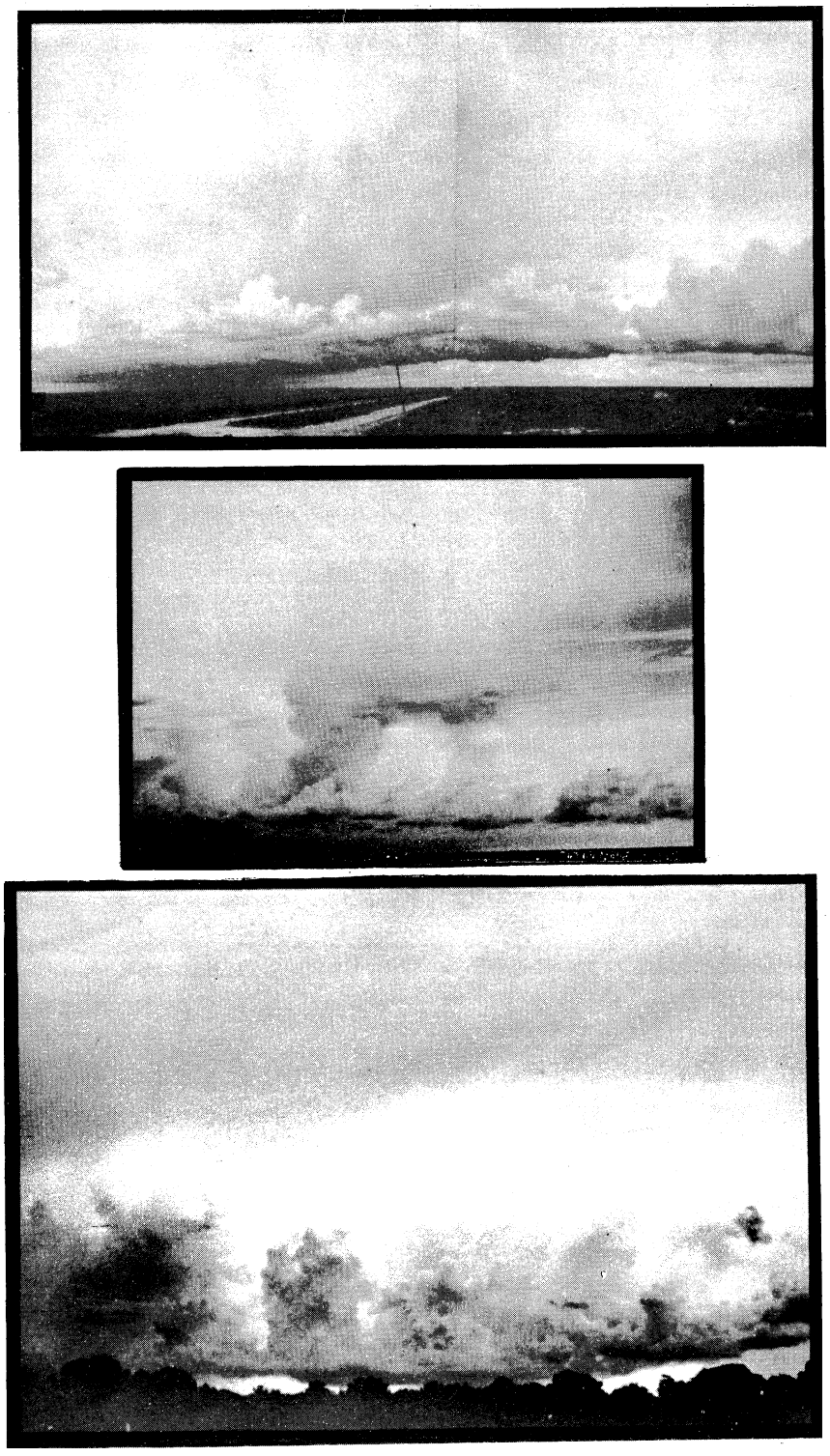


Figure 6-1 (Continued)

The last three characters, $D_L D_M D_H$, are the directions from which the low clouds (C_L), middle clouds (C_M) and high clouds (C_H) are moving. D_L, D_M, and D_H are encoded using Table 6-5. If there are no clouds at a particular level encode with a solidus (/).

Table 6–5. True Direction from which C_L Clouds are Moving (D_L); from which C_M Clouds are Moving (D_M); and from which C_H Clouds are Moving (D_H); (Modification of WMO Code Table 0700).

Code figure	
0	no movement
1	NE
2	E
3	SE
4	S
5	SW
6	W
7	NW
8	N
9	unknown

6.3.3 Maximum and Minimum Temperature Groups, $1s_nT_xT_xT_x$ $2s_nT_nT_nT_n$.

a. **Maximum Temperature.** The first character, **1**, is the identifier for the maximum temperature group in Section 3 of the report. The last three characters, $T_xT_xT_x$, are the absolute value of the maximum temperature in tenths of degrees Celsius (T_C), encoded directly if the instrument is read in degrees Celsius or else converted from degrees Fahrenheit (T_F).

$$\frac{5}{9}(T_F - 32) = T_C$$

The second character, s_n, is the sign of the temperature (encoded 1 if the temperature is below zero; encoded 0 if zero or positive).

- Stations in Region IV use the following schedule:
  - at 0000 UTC, report the maximum temperature during the past 12 hours
  - at 0600 UTC, report the maximum temperature during the past 24 hours
  - at 1200 UTC, report the maximum temperature during the previous calendar day (ending at midnight local time)
  - at 1800 UTC, report the maximum temperature during the past 12 hours
- Stations in Region V use this group at 1200 UTC to report the maximum temperature during the past 24 hours. They do not include this group in reports at any other time, nor use it to cover any other period.

Reports that are converted from basic observations may not include this group.

b. **Minimum Temperature.** The first character, **2**, is the identifier for the minimum temperature group in Section 3. The characters $\mathbf{T_nT_nT_n}$ represent the absolute value of the minimum temperature in tenths of degrees Celsius and the character $\mathbf{s_n}$ is the sign of the temperature (encoded 1 if the temperature is below zero; encoded 0 if zero or positive).

- Stations in Region IV use the following schedule:
  - at 0000 UTC, report the minimum temperature during the past 18 hours
  - at 0600 UTC, report the minimum temperature during the past 24 hours
  - at 1200 UTC, report the minimum temperature during the past 12 hours
  - at 1800 UTC, report the minimum temperature during the past 24 hours
- Stations in Region V use this group at 0000 UTC to report the minimum temperature in the past 24 hours. They do not include this group in reports at any other time, nor use it to cover any other period.

Reports that are converted from basic observations may not include this group.

6.3.4 Snow (or Ice) Depth, 4E'sss. This group is used by stations in the northern part of Region IV to report the depth of snow (or ot r solid precipitation, generically referred to as "ice") on the ground at the time of the observations that coincide with main synoptic reporting times. This group is reported whenever the reportable depth is at least 0.5 centimeters.

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 G uns. $58p_{24}p_{24}p_{24}$ o $9p_{24}p_{24}p_{24}$.** 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 $\mathbf{R_{24}R_{24}R_{24}R_{24}}$ 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(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 in Region IV 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, $\mathbf{R_{24}R_{24}R_{24}R_{24}}$ is encoded as 70000 in the 0600 UTC report.

6.3.7 Cloud Layers Data, $8N_sC_sh_s$.

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 $\mathbf{8N_sC_sh_s}$ 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.

b. **Coding.** The first character, **8**, indicates that this is the cloud layer group in section 3 of the report. The second character, $\mathbf{N_s}$, is the amount of cloud cover represented by that layer (including an estimate for those parts obscured by lower layers). Table 6-6 contains the code figures associated with $\mathbf{N_s}$. Note that there is no choice of code figure 0 because this group is not reported unless there are clouds.

Table 6–6. Amount of Individual Cloud Layer or Mass Whose Genus is Indicated by C, N_s (Modification of WMO Code Table 2700)

Code figure	Cloud amount in oktas (eighths)	Cloud amount in tenths
1	1 okta or less, but not zero	1/10 or less, but not zero
2	2 oktas	2/10 - 3/10
3	3 oktas	4/10
4	4 oktas	5/10
5	5 oktas	6/10
6	6 oktas	7/10 - 8/10
7	7 oktas or more, but not 8 oktas	9/10 or more, but not 10/10
8	8 oktas	10/10
9	Total surface based obscuration	
/	Cloud cover is indiscernible for reasons other than fog or other meteorological phenomena, or observation is not made	

The third character in the group, **C**, represents the cloud type in that layer (see Table 6-7). Encoding **C** is simple if there is only one cloud type in that layer. If there is more than one cloud type the code figure of choice depends on factors such as cloud type(s) and the amount of each type (rules discussed in 6.3.7 c.).

- If there is only one type of cloud at a particular level and the amount is great enough to report the layer, the code figure that matches **C** is reported.

- ÜIf there is more than one type of cloud at a particular level and the amount of clouds is great enough to report the layer, and there is no cumulonimbus at that level, the following rules are followed:

  - Ü If there are different amounts of the different types of clouds (for example 3/4 of clouds at that level are stratocumulus and the remaining 1/4 are cumulus) the code figure for **C** is the one that matches the predominant cloud type; i.e., **C** = 6 (stratocumulus). The associated code figure for $\mathbf{N_s}$ includes all cloud types for the entire layer.

- ÜIf there is more than one type of cloud at a particular level and one of the types is a cumulonimbus, the following rules are followed:

  - Encode one $\mathbf{8N_sCh_sh_s}$ group with **C** = 9 (cumulonimbus). The code figure for $\mathbf{N_s}$ in this group represents only the amount of cumulonimbus.

  - Ü If the amount of clouds remaining at that level is great enough to meet the requirements for a report, include a second $\mathbf{8N_sCh_sh_s}$ group at the same level. Coding of this group follows the rules for layers without cumulonimbus.

Table 6–7. Genus of Cloud Predominant in Layer, C (Modification of WMO Code Table 0500)

Code figure		Code figure	
0	cirrus (Ci)	5	nimbostratus (Ns)
1	cirrocumulus (Cc)	6	stratocumulus (Sc)
2	cirrostratus (Cs)	7	stratus (St)
3	altocumulus (Ac)	8	cumulus (Cu)
4	altostratus (As)	9	cumulonimbus (Cb)
/	Cloud not visible owing to darkness, fog, duststorm, sandstorm, or other analogous phenomena		

Note: If there is a total obscuration ($\mathbf{N_s}$ = 9), **C** is encoded with a solidus (/).

The last two characters in the group, $\mathbf{h_sh_s}$, represent the height of the base of the cloud layer above the ground, unless there is a total surface based obscuration ($\mathbf{N_s}$ = 9); then $\mathbf{h_sh_s}$ is the estimated vertical visibility into the obscuration. If the height cannot be estimated, $\mathbf{h_sh_s}$ is encoded as **//**. The code figures for $\mathbf{h_sh_s}$ are obtained from Table 6-8.

Table 6–8. Height of Base of Cloud Layer or Mass Whose Genus is Indicated by C, $h_s h_s$ (Modification of WMO Code Table 1677)

Code figure	Feet	Code figure	Feet	Code figure	Feet
00	<100	30	3000	60	10000
01	100	31	3100	61	11000
02	200	32	3200	62	12000
03	300	33	Not used	63	13000
04	400	34	3300	64	14000
05	500	35	3400	65	15000
06	600	36	3500	66	16000
07	700	37	3600	67	17000
08	800	38	3700	68	18000
09	900	39	3800	69	19000
10	1000	40	3900	70	20000
11	1100	41	4000	71	21000
12	1200	42	4100	72	22000
13	1300	43	4200	73	23000
14	1400	44	4300	74	24000
15	1500	45	4400	75	25000
16	1600	46	4500	76	26000
17	1700	47	4600	77	27000
18	1800	48	4700	78	28000
19	1900	49	4800	79	29000
20	2000	50	4900	80	30000
21	2100	51		81	35000
22	2200	52		82	39000
23	2300	53	Not used	83	44000
24	2400	54		84	49000
25	2500	55		85	54000
26	2600	56	6000	86	59000
27	2700	57	7000	87	64000
28	2800	58	8000	88	69000
29	2900	59	9000	89	>69000

Note: If the observed value is midway between two of the heights as given in the table, the code figure for the lower height shall be reported, except for code figures 50-60. In this range a value midway between the heights would be rounded up.

c. **Rules.** The following are the rules for determining whether a layer should be reported and for deciding on the number of times to use the cloud layer group in the report.

- If there are no clouds (**N** in the group **Nddff** is encoded 0) the **8N$_s$Ch$_s$h$_s$** group is not included in the report.

- If there is only one cloud layer, there may be one or two **8N$_s$Ch$_s$h$_s$** groups in the report.

  - If the layer includes only one cloud type (any type, including cumulonimbus), only one **8N$_s$Ch$_s$h$_s$** group should be included.

  - If the layer includes more than one cloud type, but no cumulonimbus, only one **8N$_s$Ch$_s$h$_s$** group should be included.

- If the layer is made up of more than one cloud type and one of them is cumulonimbus, then two **8N$_s$Ch$_s$h$_s$** groups should be included: one for the cumulonimbus and one for the other cloud type(s).

  - If there is more than one cloud layer, then a second **8N$_s$Ch$_s$h$_s$** group is included for the next highest layer that has a coverage of 3/8 (0.4) or more, and a third **8N$_s$Ch$_s$h$_s$** group for the higher layer that has a coverage of 5/8 (0.6) or more. These are the amounts for the particular layers, and not a summation up to and including the layer. It is possible that all of the higher clouds may be obscured by lower clouds. For example, if the first layer had 1/8 coverage and the second had 3/8 coverage (the minimum amount for it to be reported), then it could be difficult to see whether the third layer had 5/8 coverage. It would be impossible if there was no overlap between the first two layers. This means that all factors must be considered in determining the coverage of the higher layers. This includes the state of the sky before lower clouds developed or moved in, the way the clouds developed, and so on.

  - If there is no cumulonimbus, then a maximum of only three **8N$_s$Ch$_s$h$_s$** groups may be included. If there is cumulonimbus, regardless of the amount, a group with cumulonimbus as the cloud type must be included. If three **8N$_s$Ch$_s$h$_s$** groups have already been included in the report, and none of them show cumulonimbus for the cloud type, a fourth is included for the cumulonimbus. This is the only condition under which more than three **8N$_s$Ch$_s$h$_s$** groups can be included.

- The **$8N_sCh_sh_s$** groups in the report are always in this order:
  - The first group is the lowest layer (N_s encoded 1 or more).
  - The second group is the next higher layer (N_s encoded 3 or more).
  - The third group is the next higher layer (N_s encoded 5 or more).
  - If there is an additional cumulonimbus group, it will be in a position according to the height of its base (regardless of the value of N_s).

If there is an obscuration aloft with clouds below the obscuration, as many **$8N_sCh_sh_s$** groups as necessary are included to encode the cloud layers, but an **$8N_sCh_sh_s$** group is not used to encode the obscuration. If there are no clouds below the obscuration, an **$8N_sCh_sh_s$** group is not included in the report.

d. **Examples, Group $8N_sCh_sh_s$.**

- Example 1

  At the time of the observation there are three separate cloud layers. The lowest is 1/10 stratus at 900 feet. The next higher is 5/10 stratocumulus at 2,500 feet. The highest layer is altocumulus at 12,000 feet. From observations of the sky during the past hour, and through breaks in the lower clouds, the coverage of the highest layer is estimated to be 5/10.

  A report would include two **$8N_sCh_sh_s$** groups representing the two lower layers. A group for the third layer would not be included since the minimum coverage for a third layer is 6/10.

  The group for the lowest layer would be encoded 81709. The group for the next layer would be encoded 85625.

- Example 2

  This time there are also three cloud layers. The lowest, at 1,500 feet, is made up of 1/10 cumulonimbus and 3/10 cumulus (the whole layer covers 4/10). The next layer is 2/10 altocumulus at 14,000 feet. There is a layer of cirrocumulus at 25,000 feet. Although the layer of cirrocumulus stretches across the entire sky dome, there are some breaks in the cloud cover (overcast, but with breaks).

  This time three **$8N_sCh_sh_s$** groups would be included in the report. The first two groups would be for the same height (1,500 feet), with one for the cumulonimbus and another for the cumulus. A group for the altocumulus would not be included since the minimum coverage for a second layer (even though it would be the third group) is 4/10. A group for the highest clouds would be included. Because of the breaks in the high cloud cover, the cloud amount cannot be considered to be 8/8 (10/10), but N_s must be encoded as **7**.

The group for the cumulonimbus would be encoded 81915. The group for the rest of the lowest layer would be encoded 82815. The group for the highest layer would be encoded 87175.

- Example 3

There is thick fog at the time of the observation, totally obscuring the sky. The estimated vertical visibility into the obscuration is 400 feet.

Only one **$8N_sCh_sh_s$** group would be included in Section 3 of the report to indicate the obscuration. It would be encoded 89/04. At the same time **N** in the group **Nddff** (in Section 1) would be encoded as 9; the group **$8N_hC_LC_MC_H$** would not be included in Section 1 of the report, and **ww** (in the group **$7wwW_1W_2$** in Section 1) would be encoded to indicate the fog (possibly coded as 43, 45, or 47, depending on how the fog has changed during the hour before the observation).

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 RECORD $0i_t t_D t_D t_D$ $1s_n TT$ $s_n T_x T_x s_n T_n T_n$ RECORD

$2R_{24}R_{24}R_{24}R_{24}$ 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 11fff 22fff 3GGgg $4ddf_m f_m$ (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
- 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

	High		Low	
RECORD PERIOD	Equalled	Exceeded	Equalled	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).

Table 7–2. Set of Contractions for Encoding/Decoding Daily Record Temperatures

HIEDA the record high temperature for the day has been equalled;
HIXDA the record high temperature for the day has been exceeded;
LOEDA the record low temperature for the day has been equalled;
LOXDA the record low temperature for the day has been exceeded.

More than one **RECORD** group may appear in a report. For example, a record high temperature for a day could set a monthly record, too. The **RECORD** group(s) appear in the same synoptic report that indicates the maximum (minimum) temperatures (Section 3) for the 24 hour period of record.

7.2.2 Tide Data Group, $0i_t t_D t_D t_D$.

7.2.2.1 General. Selected stations report tide data routinely; other stations report tide data in connection with severe storms, tropical storms, tsunamis, etc. This group is used to report departures of observed tide from the predicted normal tide level. If there is a predicted high or low tide during the hour preceding the standard time for the observation, the tide observation should be made at the time coincident with the prediction. Otherwise, the tide observation is made one hour before the standard synoptic reporting time (i.e., at 2300 UTC for a 0000 UTC report).

7.2.2.2 Coding Procedures. The first character, **0**, is the indicator for the tide data group in section 5 of the report. The second character, $\mathbf{i_t}$, is the tide indicator (see Table 7-3). It tells whether or not the observation was made at the time of predicted low or high tide, and gives the sign of the departure if the observed level is not the same as the predicted level.

Table 7–3. Tide Indicator, i_t

Code figure	
0	Data not available
1	Low tide, observed tide below predicted level
2	Low tide, observed tide same as predicted level
3	Low tide, observed tide above predicted level
4	Neither low nor high tide, observed tide below predicted level
5	Neither low nor high tide, observed tide same as predicted level
6	Neither low nor high tide, observed tide above predicted level
7	High tide, observed tide below predicted level
8	High tide, observed tide same as predicted level
9	High tide, observed tide above predicted level

The last three characters, $t_Dt_Dt_D$, represent the absolute value of the actual departure from the predicted level, in tenths of feet.

7.2.2.3 Examples of Group $0i_st_Dt_Dt_D$.

00/// Data not available.
02000 Observation made at time of predicted low tide. No departure from the predicted level.
06013 There was no predicted low or high tide during the hour before the observation. The observed level was 1.3 feet higher than the predicted level.

7.2.3 City Data Groups, $1s_nTT$ $s_nT_xT_xs_nT_nT_n$ RECORD $2R_{24}R_{24}R_{24}R_{24}$.

7.2.3.1 General. In many cases there is a large difference between the meteorological conditions at the station where an observation is taken and the conditions in a nearby city. Selected stations have been instructed to add the city data to the synoptic observation. The information added to the observation will include the air temperature, maximum and minimum temperatures, an indication of a record temperature (if the old record is equalled or surpassed), and the amount of precipitation during the past 24 hours. If a station has been instructed to add these groups, they are included in the 0000 and 1200 UTC observations.

7.2.3.2 Coding Procedures.

Air Temperature at City Station Group, $1s_nTT$.

The first city data group has only four characters. The first character, **1**, identifies the air temperature at city station group in Section 5 of the report. The last two symbolic letters, **TT**, represent the absolute value of air temperature at the city station, in whole degrees Fahrenheit.

- A leading zero is used if the temperature is less than 10°F.
- If the temperature is 99°F or less, **TT** is the actual value in whole degrees.
- If the temperature is 100°F or more, the first digit is omitted; i.e., 104°F would be encoded 04. (From the airport air temperature in section 1, one can infer whether the city temperature is 4°F or 104°F.)

The second character, s_n, is the sign of the temperature (coded 1 if less than zero; coded 0 if zero or positive).

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, $\mathbf{s_n}$, represent the sign of the data with the coding convention discussed above. The second and third digits in the group, $\mathbf{T_xT_x}$, are the maximum temperature in whole degrees Fahrenheit, using two digits to code $\mathbf{T_xT_x}$ (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, $\mathbf{T_nT_n}$, are the minimum temperature in whole degrees Fahrenheit using two digits to code $\mathbf{T_nT_n}$ (the same way as **TT** and $\mathbf{T_xT_x}$; 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 $\mathbf{R_{24}R_{24}R_{24}R_{24}}$ 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, $\mathbf{R_{24}R_{24}R_{24}R_{24}}$ 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 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.)

APPENDIX A

ACRONYMS AND ABBREVIATIONS

FMH	Federal Meteorological Handbook
NAVOCEANCOMINST	Naval Oceanography Command Instruction
NOAA	National Oceanic and Atmospheric Administration
OFCM	Office of the Federal Coordinator for Meteorological Services and Supporting Research
SHIP	synoptic surface observation message from a sea station; also the associated symbolic code forms
SYNOP	synoptic surface observation message from a land station; also the associated symbolic code forms
UTC	Coordinated Universal Time
VOS	voluntary observing ship
WG/MC	Working Group for Meteorological Codes
WG/SO	Working Group for Surface Observations
WMO	World Meteorological Organization

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