PART C

SYNOPTIC OBSERVATIONS

CHAPTER 11

THE SYNOPTIC CODE – GENERAL DESCRIPTION

11.1 GENERAL. Weather recognizes no international boundaries. A precise synoptic picture of weather conditions over a vast area of the earth's surface is required in order to provide national and international forecasts and climatological data to satisfy the needs of aviation, agriculture, industry and the public. As a first step in meeting these requirements, surface weather reports are prepared and exchanged throughout the world in an international code developed and agreed upon by member states of the World Meteorological Organization. Such reports are made at least four times daily and a complete report may contain over 20 pieces of information which include measurements of atmospheric pressure, calculated from barometer readings taken at precisely the same time throughout the world, i.e., 0000 UTC, 0600 UTC, 1200 UTC and 1800 UTC. These observations are referred to as Synoptic Observations.

11.2 THE SYNOPTIC CODE. The international meteorological code FM 12–IX SYNOP is used for reporting synoptic surface observations from a land station, either manned or automatic. This code is called FM 13–IX SHIP when used for reporting similar observations from a manned or automatic sea station. The common synoptic code comprises six sections numbered 0 to 5, each of which is primarily composed of five–figure code groups. Most groups in sections 1 to 5 begin with a numerical indicator and these indicators are numbered consecutively within each section. The numerical indicators identify a specific group which always contains the same weather elements. Thus the omission, whether accidental or deliberate, of any one group will not affect the identification of other groups. Indeed, provision is made within the code for omission of groups when their weather elements are either not present or cannot be observed. This also assures a code flexible enough for both manned and automatic stations.

11.2.1 Section 0 contains, in the case of land stations (SYNOP report), the station identifier; in the case of sea stations (SHIP report), the ship's position and call sign (or buoy identifier number). It also contains a message type identifier group and a date–time–wind indicator group which is transmitted once at the beginning of an SM bulletin.

11.2.2 Section 1 contains data for international as well as regional and national exchange. This section is included in both the SYNOP and the SHIP code form.

11.2.3 Section 2 contains maritime data pertaining to a sea station. Land stations do not use this section, except in the case of a coastal station that transmits maritime data.

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11.2.4 Section 3 contains data for regional and national exchange only. It is always included in reports from Canadian land stations.

11.2.5 Section 4 is for use of designated mountain stations only, for reporting of clouds below station level and is not normally used in Canada.

11.2.6 Section 5 is used by land stations to transmit data for national exchange only.

11.2.7 Within a given five–figure code group, the relative position of each code figure, denoting a specific weather element, is constant, thus the Synoptic Code can be represented symbolically,as follows:

11.3 SYMBOLIC FORM OF THE SYNOPTIC CODE

Section 0

(SYNOP) $M_iM_iM_jM_j$ YYGGi_w IIiii

(SHIP) $M_iM_iM_jM_j$ D....D or $A_1b_wn_bn_bn_b$ YYGGi_w 99$L_aL_aL_a$ $Q_cL_oL_oL_oL_o$

Section 1

i_Ri_xhVV Nddff (00fff) $1s_nTTT$ $2s_nT_dT_dT_d$ $3P_oP_oP_oP_o$ 4PPPP 5appp $6RRRt_R$ $7wwW_1W_2$ $8N_hC_LC_MC_H$ 9GGgg

Section 2

$222D_sv_s$ $0s_nT_wT_wT_w$ $1P_{wa}P_{wa}P_{wa}P_{wa}$ $2P_wP_wH_wH_w$ $3d_{w1}d_{w1}d_{w2}d_{w2}$ $4P_{w1}P_{w1}H_{w1}H_{w1}$ $5P_{w2}P_{w2}H_{w2}H_{w2}$ $6I_sE_sE_sR_s$ ICE $c_iS_ib_iD_iz_i$

Section 3

333 [$0C_sD_LD_MD_H$] $1s_nT_xT_xT_x$ $2s_nT_nT_nT_n$ [3Ejjj] 4E'sss 5EEEi_e 55SSS $j_5F_{24}F_{24}F_{24}F_{24}$ $6RRRt_R$ $7R_{24}R_{24}R_{24}R_{24}$ $8N_sCh_sh_s$ $9S_pS_{ps}s_{ps}s_p$

Section 4

[444] [N'C'H'H'C_t]

Section 5

555 1ssss $2s_ws_ws_ws_w$ $3d_md_mf_mf_m$ $4f_hf_tf_tf_t$

A detailed explanation of these symbols and complete coding instructions for each group are given in Chapter 12.

NOTE: GROUPS ENCLOSED BY SQUARE BRACKETS, [ ], ARE NOT REPORTED IN CANADA.

11.4 INTERPRETATION OF THE SYMBOLS

11.4.1 SECTION 0 – LAND STATIONS

11.4.1.1	$M_iM_iM_jM_j$	Message type identifier in second line of SYNOP bulletins; coded by computer.
11.4.1.2	$YYGGi_w$	(In second line of SYNOP bulletins; coded by computer.)
	YY	Day of the month (UTC)
	GG	Hour of observation (UTC)
	i_w	Indicates units of wind speed, and whether measured or estimated. In Canada always coded as '4'
11.4.1.3	IIiii	International index number
	II	Block number
	iii	Station number

11.4.2 SECTION 0 – SEA STATIONS

11.4.2.1	$M_iM_iM_jM_j$	Message type identifier in second line of SHIP bulletins
11.4.2.2	D....D	Ship's call sign
	or	or
	$A_1b_wn_bn_bn_b$	buoy identifier number
11.4.2.3	$YYGGi_w$	Same as for land stations, but included with every individual report, and i_w may be coded '3' or '4'
11.4.2.4	$99L_aL_aL_a$	
	99	Group identifier
	$L_aL_aL_a$	Latitude of station in tenths of a degree
11.4.2.5	$Q_cL_oL_oL_oL_o$	
	Q_c	Quadrant of globe
	$L_oL_oL_oL_o$	Longitude of station in tenths of a degree

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11.4.3 SECTION 1

11.4.3.1 $i_R i_x hVV$

i_R	Identifier for inclusion or omission of precipitation data (group $6RRRt_R$)
i_x	Identifier for type of station operation and for present and past weather data (group $7wwW_1W_2$)
h	Height, above ground, of the base of the lowest cloud
VV	Horizontal visibility

11.4.3.2 Nddff

N	Fraction of the celestial dome covered by cloud
dd	True direction, in tens of degrees, from which the wind is blowing
ff	Wind speed in knots

11.4.3.3 (00fff) Supplementary wind group

00	Group identifier
fff	Wind speed when 99 kts or more

11.4.3.4 $1s_nTTT$

1	Group identifier
S_n	Sign of temperature
TTT	Air temperature in tenths of a degree Celsius

11.4.3.5 $2s_nT_dT_dT_d$

2	Group identifier
s_n	Sign of dew point temperature
$T_dT_dT_d$	Dew point temperature in tenths of a degree Celsius

11.4.3.6 $3P_oP_oP_oP_o$

3	Group identifier
$P_oP_oP_oP_o$	Station pressure in tenths of a hectopascal

11.4.3.7 4PPPP

4	Group identifier
PPPP	MSL pressure in tenths of a hectopascal

11.4.3.8 5appp

5	Group identifier
a	Characteristic of the pressure tendency during the three hours preceding the time of observation
ppp	Amount of pressure tendency during the three hours preceding the time of observation, in tenths of a hectopascal

11.4.3.9 $6RRRt_R$

6	Group identifier
RRR	Amount of precipitation which has fallen during the period indicated by t_R
t_R	The coding for the period of reference ending at the time of the report, for RRR. (See WMO Code 4019, para. 12.3.9.3)

11.4.3.10 7 wwW_1W_2

7	Group Identifier
ww	Present weather
W_1W_2	Past weather

11.4.3.11 $8N_hC_LC_MC_H$

8	Group identifier
N_h	Total amount of all C_L clouds, or if no C_L clouds, total amount of all C_M clouds
C_L	Clouds of SC, ST, CU and CB types
C_M	Clouds of AS, NS, and AC types
C_H	Clouds of CI, CS, and CC types

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11.4.3.12 9GGgg

9	Group identifier
GGgg	Actual time of observation at a data platform when it differs by more than 10 minutes from the standard time reported by GG in section 0.

11.4.4 SECTION 2 (The groups of this section are for the use of sea stations, or of land stations which are required to transmit marine data.)

11.4.4.1 $222D_sv_s$

222	Section 2 identifier
D_s	Ship's course (true) made good during the three hours preceding the time of observation
v_s	Ship's average speed made good during the three hours preceding the time of observation

11.4.4.2 $0s_nT_wT_wT_w$

0	Group identifier
s_n	Sign of sea–surface temperature
$T_wT_wT_w$	Sea surface temperature in tenths of a degree Celsius

11.4.4.3 $1P_{wa}P_{wa}H_{wa}H_{wa}$

1	Group identifier
$P_{wa}P_{wa}$	Period, in seconds, of sea waves, obtained by instrumental methods
$H_{wa}H_{wa}$	Height of sea waves, obtained by instrumental methods

11.4.4.4. $2P_wP_wH_wH_w$

2	Group identifier
P_wP_w	Period, in seconds, of sea waves (non–instrumental)
H_wH_w	Height of sea waves (non–instrumental)

11.4.4.5 $3d_{w1}d_{w1}d_{w2}d_{w2}$

3	Group identifier
$d_{w1}d_{w1}$	True direction, in tens of degrees, from which swell waves (first system) are coming
$d_{w2}d_{w2}$	True direction, in tens of degrees, from which swell waves (second system) are coming

11.4.4.6 $4P_{w1}P_{w1}H_{w1}H_{w1}$

4	Group identifier
$P_{w1}P_{w1}$	Period, in seconds, of swell waves (first system)
$H_{w1}H_{w1}$	Height of swell waves (first system)

11.4.4.7 $5P_{w2}P_{w2}H_{w2}H_{w2}$

5	Group identifier
$P_{w2}P_{w2}$	Period, in seconds, of swell waves (second system)
$H_{w2}H_{w2}$	Height of swell waves (second system)

11.4.4.8 $6I_sE_sE_sR_s$

6	Group identifier
I_s	Type of ice accretion on ships
E_sE_s	Thickness of ice accretion on ships in centimetres
R_s	Rate of ice accretion on ships

11.4.4.9 $ICE + c_iS_ib_iD_iz_i$

ICE	Symbolic word identifies ice group
c_i	Concentration or arrangement of sea ice
S_i	Stage of development of sea ice
b_i	Ice of land origin
D_i	Bearing of principal ice edge
z_i	Present ice situation and trend of conditions over preceding 3 hours

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11.4.5 SECTION 3

11.4.5.1	333	Section 3 identifier
11.4.5.2	$\lfloor 0C_sD_LD_MD_H \rfloor$	This group is not used in Canada
	0	Group identifier
	C_s	State of sky in tropics
	D_L	Direction from which C_L clouds are moving
	D_M	Direction from which C_M clouds are moving
	D_H	Direction from which C_H clouds are moving
11.4.5.3	$1s_nT_xT_xT_x$	
	1	Group identifier
	s_n	Sign of maximum temperature
	$T_xT_xT_x$	Maximum temperature in tenths of a degree Celsius
11.4.5.4	$2s_nT_nT_nT_n$	
	2	Group identifier
	s_n	Sign of minimum temperature
	$T_nT_nT_n$	Minimum temperature in tenths of a degree Celsius
11.4.5.5	$\lfloor 3Ejjj \rfloor$	This group is not used in Canada
	3	Group identifier
	E	State of ground without snow or measurable ice cover
	jjj	Supplementary data on state of ground
11.4.5.6	4E'sss	
	4	Group identifier
	E'	State of ground with snow or measurable ice cover
	sss	Total depth of snow in centimetres

11.4.5.7 $5EEEi_E$

5	Group identifier
EEE	Amount of evaporation or evapotranspiration, in tenths of a millimetre, for a 24 hr. period
i_E	Type of instrumentation or crop (See WMO code 1806, para. 12.4.5.3)

11.4.5.8 $55SSS\ j_5F_{24}F_{24}F_{24}F_{24}$

55	Group identifier
SSS	Duration of bright sunshine in tenths of an hour for 24 hours ending at midnight LAT
j_5	Radiation field identifier
$F_{24}F_{24}F_{24}F_{24}$	Amount of radiation, in joules per square centimetre, for the 24 hour period ending at 1200 UTC. (j_5 indicates whether radiation is global solar, or net; group may be repeated)

11.4.5.9 $6RRRt_R$ See para. 11.3.3.9. In Canada, the 6–group is always transmitted in section 1 of main synoptic reports when applicable. The 6–group, when applicable, is also included in section 3 by stations which transmit intermediate synoptic reports.

11.4.5.10 $7R_{24}R_{24}R_{24}R_{24}$

7	Group identifier
$R_{24}R_{24}R_{24}R_{24}$	Total amount of precipitation during the 24–hour period ending at the time of observation, in tenths of a millimetre

11.4.5.11 $8N_sCh_sh_s$

8	Group identifier
N_s	Summation amount of significant layer
C	Type of significant cloud
h_sh_s	Height above ground of the layer to which N_s refers

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11.4.5.12 $9S_pS_ps_ps_p$

9	Group identifier
S_pS_P	Special phenomena, general description
s_ps_p	Special phenomena, detailed description

11.4.5.13 [80000] Identifier to indicate additional regional groups to follow (not currently used inRegion IV)

11.4.6 SECTION 4 This section is for use of designated mountain stations only.

11.4.6.1 [444] Section 4 identifier.

11.4.6.2 [N'C'H'H'C_t]

N'	Amount of cloud the base of which is below the level of the station
C'	Type of cloud whose base is below the level of the station
H'H'	Altitude of the upper surface of clouds reported by C', in hundreds of metres
C_t	Description of the top of cloud whose base is below the level of the station

11.4.7 SECTION 5

11.4.7.1 555 Section 5 identifier

11.4.7.2 1ssss

1	Group identifier
ssss	Amount of snowfall in tenths of a centimetre, 24 hour period ending at 0600 UTC

11.4.7.3 $2s_ws_ws_ws_w$

2	Group identifier
$s_ws_ws_ws_w$	Water equivalent, in tenths of a millimetre, of 24 hour snowfall ending at 0600 UTC

11.4.7.4 $3d_md_mf_mf_m$

3	Group identifier
d_md_m	Direction, in tens of degrees, of maximum wind speed if in excess of 16 knots, for 24 hour period ending at 0600 UTC
f_mf_m	Maximum wind speed, in knots, if wind in excess of 16 knots, for 24 hour period ending at 0600 UTC

11.4.7.5 $4f_hf_tf_tf_i$

4	Group identifier
f_h	Hundreds digit of maximum wind speed reported in 3–group.
f_tf_t	Time of occurrence of maximum wind speed reported in 3–group.
f_i	Index identifies range of maximum two minute mean wind speed in 24 hour period ending at 0600 UTC

11.5 CONTENT OF THE CODED SYNOPTIC MESSAGE

Main synoptic messages from land stations will normally consist of Sections 0, 1, and 3. While some groups are mandatory and must be reported in each synoptic message, other groups may be omitted, depending on specified conditions. At land stations, the communications computer will normally insert the first two groups of Section 0; the observer will code and transmit the remainder of the message. Mandatory and optional groups are briefly described below. Detailed coding instructions follow in chapter 12.

Section 0:	This section is mandatory for all synoptic reports. For land stations, $M_iM_iM_jM_j$ and $YYGGi_w$ will normally be coded and inserted by the communications computer, whereas IIiii will always be coded by the observer. Other groups in section 0 are for the identification and location of sea stations, and are not used by land stations.

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Section 1:

Groups $i_R i_x$hVV, Nddff, $1s_nTTT$, $2s_nTdTdTd$, $3P_oP_oP_oP_o$, 4PPPP, and 5appp shall always be included.

Group 00fff shall be included ONLY if wind speed equals or exceeds 99 knots.

Group $6RRRt_R$ shall be included ONLY if precipitation has occurred.

Group $7wwW_1W_2$ shall be included ONLY if present or past weather of significance is observed.

Group $8N_hC_LC_MC_H$ shall be included ONLY if clouds are observed.

Section 2:

This section shall not be used by land stations except by those specifically instructed to do so by the ADMA.

Section 3:

In main synoptics, the indicator group, 333, and groups $1s_nT_xT_xT_x$, $2s_nT_nT_nT_n$ and $7R_{24}R_{24}R_{24}R_{24}$ are always included.

Groups with identifiers 0 and 3 are not used in Canada.

Group 4E'sss is included at certain times when there is snow or ice on the ground.

Groups $5EEEi_E$, 55SSS, and $j_5F_{24}F_{24}F_{24}F_{24}$ are included once daily by those stations capable of doing so.

Group $8N_sCh_sh_s$ is included if there is no Hourly Observation transmitted for the same hour, and there are significant cloud data to report. The group is repeated when necessary.

Group $9S_PS_Ps_ps_p$ is included only if there are special phenomena to report. It is included if precipitation has occurred.

Section 4:

This section shall not be used, except by mountain stations specifically so instructed by the ADMA.

Section 5:

The groups in this section pertain to summarized daily climatological data, thus each group is included no more than once daily and distribution is within Canada only.

11.5.1 Intermediate synoptic reports shall include sections 0 and 1, omitting groups $3P_oP_oP_oP_o$ and $6RRRt_R$. Group $7wwW_1W_2$ is included only if present or past weather of significance is observed. In section 3, group $6RRRt_R$ is included if precipitation has occurred in the preceding three hours and if so, group $9S_PS_PS_pS_p$ is also included; group $8N_sCh_sh_s$ is included only by stations which do not transmit an hourly observation for the same hour and have significant cloud data to report.

Note: If a tornado is at or within sight of a station at the time of observation or within the past hour, the plain language word TORNADO shall be recorded and transmitted as the last group of Section 3. A tornado may also be reported in the 7–group simultaneously if ww = 19 is the highest present weather code applicable at the time. This coding shall apply to both main and intermediate synoptic reports, if applicable.

11.5.2 = Message Separation Signal – The message separation signal, = , shall be included as the last character of the last group of each transmitted synoptic message. The separation signal is always added to the last data group without a space intervening, thus the last group of the transmitted synoptic message will consist of 6 characters.

11.5.3 Missing Data – Elements of missing data are recorded in section III of the Surface Weather Record by means of an "X". When entering a synoptic report on a computer or communications system for transmission, replace any "Xs" by a solidus, that is, a "/".

11.6 OBSERVING SCHEDULE. The times of the main synoptic reports are 0000, 0600, 1200 and 1800 UTC. The times of the intermediate synoptic reports are 0300, 0900, 1500 and 2100 UTC. In all cases the barometer shall be read at the hour. The observing, recording and coding of all elements, except the pressure and tendency, should be done in the 10 minutes preceding the hour. In difficult weather it may be necessary to begin 15 minutes before the hour in order to be ready to read the barometer at the hour. All stations shall conform to this schedule of observing, unless special permission to deviate is obtained from the ADMA.