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Instructions for Recording and Coding Marine Meteorological Observations in the New International Code

EFFECTIVE JANUARY 1, 1949

(Provisional Edition)

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INSTRUCTIONS FOR RECORDING AND CODING MARINE METEOROLOGICAL OBSERVATIONS IN THE NEW INTERNATIONAL CODE

Effective January 1, 1949

(Provisional Edition)

GENERAL INSTRUCTIONS

Instructions that follow are for the guidance and use of marine meteorological observers in recording and coding observations effective with the first observation, 0000 G.C.T., January 1, 1949.

Observations will be recorded on Form 1210AB in the New International Code adopted by the International Meteorological Organization in 1947.

The new code is very similar to the form of message which has been used for recording data and preparing messages for transmission by radio since 1929. Principal changes from the 1929 code involve: (1), a rearrangement of data groups in order to obtain, as far as possible, uniformity between the code form used for both land and ship station reports and (2), provision for reporting certain elements in two code figures instead of one figure as heretofore. Groups of data in coded messages prepared for radio transmission will contain five figures each as in the past. Ships of all maritime countries will use the new code; hence, rapid translation of the radio message is assured, regardless of the nationality of the ship.

For the convenience of ships' observers, the coded data as entered in the various columns headed by symbol letters on Form 1210AB can be copied directly in preparing messages for transmission provided, of course, the vessel is authorized to send radio reports to the Weather Bureau.

The new code form is as follows:

FM 21: $YQL_aL_aL_a$ $L_oL_oL_oGG$ Nddff VVwwW PPPTT $N_hC_lhC_MC_H$ D_sv_sapp
$8N_sCh_sh_s$ $0T_sT_sT_dT_d$ $1d_wd_wP_wH_w$ ICE -- followed by plain language or the group c_2KD_ire

NOTE: The code designator FM 21 is inserted for identification purposes only. It should NEVER be included in messages prepared for transmission by radio.

In preparing messages for transmission by radio to the Weather Bureau, ships' observers will be guided by instructions issued by the supervising Weather Bureau port office, which will specify the groups of the code form to be reported.

In the radio message, when the group "c_2KD_ire" is included, it must be preceded by the word "ICE". Observing officers should also note that the group "$8N_sCh_sh_s$" will not be sent in ships' radio messages except when specifically requested by the Weather Bureau although the data therefor should be recorded on Form 1210AB.

Observations taken at sea should be recorded on Forms 1210AB provided by the Weather Bureau. A sample copy of the form is included herein. Instructions for recording and coding observational data have been arranged in this booklet according to the order in which the symbol letters appear in the code form. The data columns on Form 1210AB have been arranged in a similar order.

It is desired that all ships cooperating in the U. S. Weather Bureau marine meteorological program endeavor to take and record observations at 0000, 0600, 1200 and 1800 hours G.C.T. on Form 1210AB from every part of the oceans. However, if it is impossible to do this, observers should take and record as many of the four daily observations as practicable. In addition, appropriate notes as to unusual weather con dit prevailing between observations should be recorded on the back of Form 1210AB under the headings "Gale, Fog and Precipitation Reports."

All observations sent by radio should be entered on Form 1210AB. When radio reporting ships are outside the areas from which messages are sent, the observer should continue to take and record the observations on Form 1210AB.

The forms provide for 31 observations on each sheet. However, it is requested that the observer begin a new record sheet upon crossing from one ocean to another, and on the first of a new month. The reason for this request is that the forms are filed at the Weather Bureau in separate compartments for the oceans and months; hence, special compartments must be provided for forms which contain observations for more than one ocean or more than one month. It is also highly desirable that the forms be mailed at the end of a voyage, even if a sheet is not filled; a new sheet should be started at the beginning of the next voyage.

When a new form is begun, the first step is to fill in the blank spaces at the top of the sheet. This requires the entry of the vessel's name and other information relating to the character of the instrumental equipment used.

Notes on instruments used: The kind of barometer, whether aneroid or mercurial, should be given, with the identification number furnished by the Weather Bureau.

The same barometer should be employed continuously. If for any reason, it becomes necessary to use another instrument, the fact should be stated, the reasons given, and the second instrument fully described, in order that the readings of the latter may not be confused with the readings of the barometer listed by the Weather Bureau.

The error of the barometer should be entered as determined by the last comparison with a standard instrument; also the place and date of this last comparison in the space provided.

The method of obtaining wind speed, whether estimated or by anemometer, should be shown on the completed form.

Space is provided at the top of the form for indicating how the sea surface temperature is measured. It is desirable to know this because the temperature of a sample of sea water obtained by means of a bucket is, within a very few minutes, apt to become somewhat different from the true temperature of the ocean surface, and a thermometer installed in the condenser intake may be affected by the heat of the engine room.

It is important also to state whether the temperature of the air and also the wet-bulb temperature are measured with stationary thermometers or with a psychrometer (i.e., a pair of ventilated thermometers), because stationary thermometers give much less accurate results than the psychrometer. Furthermore, the formula employed for determining the relative humidity from the readings of a psychrometer is not applicable to the readings of a stationary wet-bulb thermometer.

It will be noted, however, that it has been necessary to include in this booklet additional instructions relating to observations of ocean waves, ice, method of computing dew point temperatures, and other information which have been revised or are not contained in Circular M, 7th Edition. Such instructions will be found herein under the appropriate code symbol letters.

Instructions relating to the care, exposure and the taking of observations will be found in Circular M, entitled "Instructions to Marine Meteorological Observers," 7th Edition. However, a revised edition of Circular M, which will contain the instructions included herein, is now in the course of preparation and will be distributed to ships' weather observers shortly.

EXPLANATION OF CODE SYMBOL LETTERS

a = Characteristic of barometric tendency during the period of 3 hours preceding the time of observation

C = Significant cloud

C_H = Clouds of types Cirrus, Cirrostratus, Cirrocumulus

C_L = Clouds of types Stratocumulus, Stratus, Cumulus, Cumulonimbus

C_M = Clouds of types Altocumulus, Altostratus, Nimbostratus

c_2 = Description of kind of ice

D_i = Bearing of ice limit

D_s = Ship's course -- direction toward which ship is moving

dd = Direction (true) in 10's of degrees, FROM which wind is blowing

$d_w d_w$ = Direction from which waves are coming

e = Orientation of ice limit from reporting ship

ff = Wind speed in knots

GG = Greenwich civil time of observation (00 = midnight, 06 = 6 a.m., 12 = noon, and 18 = 6 p.m., etc.)

H_w = Mean maximum height of waves

h = Height above ground (or sea) or the lowest cloud

$h_s h_s$ = Height above station (or ship) of the significant cloud layer

K = Effect of ice on navigation

$L_a L_a L_a$ = Latitude, in degrees and tenths, the tenths being obtained by dividing the number of minutes by 6 and neglecting the remainder

$L_o L_o L_o$ = Longitude, in degrees and tenths, the tenths being obtained as for latitude, $L_a L_a L_a$. The initial "1" is omitted if longitude of ship is 100 degrees or more.

N = Total amount of sky covered with cloud, in eighths

N_h = Amount of low cloud, in eighths, the height of which is reported by "h"

N_s = Amount, in eighths, of the significant cloud layer

PPP = Barometric pressure, in tens, units, and tenths of millibars (initial 9 or 10 omitted). The values refer to sea level and include all corrections for index errors, temperature and gravity.

P_w = Period (in seconds) of waves

pp = Amount of barometric change during the 3 hours preceding the time of observation expressed in units of one-tenth of a millibar.

Q = Octant of the globe in which the ship is located

r = Distance of ice from the ship

TT = Temperature of the air, in whole degrees Fahrenheit

$T_d T_d$ = Temperature of the dew point, in whole degrees Fahrenheit

$T_s T_s$ = Difference between air temperature and sea temperature, in whole degrees Fahrenheit

VV = Visibility or horizontal distance at which objects can be seen in daylight or at which lights can be seen at night

v_s = Speed of ship in knots

W = Past weather

ww = Present weather at the time of observation

Y = Day of the week

INSTRUCTIONS FOR ENTRY OF DATA ON FORM 1210AB AND CODING RADIO MESSAGES

TIME AND POSITION

Day of month: The date given in the column 1 of each page on Form 1210AB should be the Greenwich civil day, beginning at a given midnight and ending at the following midnight.

In crossing the 180th meridian, observers aboard westbound vessels should not make the mistake of dropping a day from the record of observation and, conversely, using the same date twice when eastbound. This is incorrect. In crossing the date line, 24 hours are dropped or repeated, as the case may be, in local time reckoning, but not, of course, in the dates of Greenwich civil time of observations, which should run consecutively. To avoid confusion regarding the dates of observations which are taken daily, the observer should record the observations consecutively according to the Greenwich dates and hours thereof, respectively. When observations are taken regularly at Greenwich midnight, there may be two midnight observations on the same local date, or none at all, depending on the vessel's course, whether eastbound or westbound when crossing the 180th meridian. The Greenwich date of midnight observations is always the day just beginning at Greenwich.

Local ship's time: These data should be entered in column 2. The chart printed on page ix of the Appendix shows the local time corresponding to Greenwich mean noon for each 15° of longitude eastward and westward; i.e., ship's time, at which the daily observations should be taken to the nearest hour. The exact local time at which Greenwich noon observations should be taken in any longitude eastward or westward may easily be determined from the table of longitude and time (Table 9) of the Appendix. The local time for 00 and 06, G.C.T. observations can be determined readily by subtracting 12 and 6 hours, respectively, from local noon time shown in the table. For 18 G.C.T. reports, however, 6 hours should be added to the local noon time.

Day of Week (Y): One figure only should be entered in column 3 of Form 1210AB to indicate the day. The appropriate code figures for each day of the week are given in the table below. The observer should be careful to record the day of the week at Greenwich and not that at the ship, unless the Greenwich day and local day are the same. When an observation is taken at 00 hours (Greenwich midnight), the day of the week should be coded as the day just beginning and not the day just ended.

Symbol Y -- Day of the Week

Code figures	Day
1	Sunday
2	Monday
3	Tuesday
4	Wednesday
5	Thursday
6	Friday
7	Saturday

Octant of Globe (Q): The correct entry in column 4 is determined by the position of the ship with respect to the Equator and to the meridian of Greenwich. The proper code figure is obtained from the table which follows:

Symbol Q -- Octant of the Globe

Code figures	Longitude	Code figures	Longitude
	North latitude:		South latitude:
0	0° W. to 90° W.	5	0° W. to 90° W.
1	90° W. to 180° W.	6	90° W. to 180° W.
2	180° E. to 90° E.	7	180° E. to 90° E.
3	90° E. to 0° E.	8	90° E. to 0° E.

Latitude ($L_aL_aL_a$) and Longitude ($L_oL_oL_o$): In columns 5 and 6 should be recorded the latitude and longitude, respectively, of the vessel at the actual time of the meteorological observation. No code table is necessary for these entries. Three figures should always be entered in each column as follows.

In the $L_aL_aL_a$ column the first 2 figures to be recorded are the latitude in whole degrees. If the latitude is less than 10°, a 0 (zero) should be entered as the first figure. The third figure is the fraction of a degree of latitude, which is recorded in tenths of a degree, and not in minutes of arc. The tenths are obtained by dividing the minutes of arc by 6 and neglecting the remainder. /Examples: (a), latitude 42°38' N. is coded 426; (b), latitude 10°20' N. is coded 103./ The differentiation between north and south latitude is shown by the figure for Q in the preceding column.

In the $L_oL_oL_o$ column the longitude is recorded in degrees and tenths in the same manner as for the latitude. If the longitude is 100°, or more, the first figure, 1, should be dropped. /Examples: (a), longitude 46°22' W. is coded 463; (b), longitude 123°41' W. is coded 236./ The differentiation between longitude less than 100° and greater than 100° and also between east and west longitude is shown by the figure entered in the Q column.

The columns for latitude and longitude should always be filled out to the best of the observer's ability, even though astronomical observations or radio compass bearings have not been obtained.

When the position is doubtful, a note should be made to that effect.

Greenwich Civil Time (GG): In column 7 the Greenwich time of the observation should be recorded to the nearest whole hour. Two figures should be entered, according to the Scale 00 to 23. Observers are reminded that observations taken at midnight G.C.T. should be recorded for the day just beginning; i.e., GG entered as 00 hours, not 24.

Total Cloud Amount (N): The proportion of sky covered by clouds, irrespective of type, should be recorded in column 8 on Form 1210AB, in tenths of sky covered according to the Scale 0 to 10. In this case, the figure 0 represents a sky that is cloudless at the time of observation; 1, a sky that is one-tenth covered and so on to ten-tenths, which represents the sky completely overcast. Fragments of clouds; i.e., less than one-tenth of sky covered, will be reported by figure 1. Observers should note, however, that cloud amount in eighths of sky covered should be entered in the column 9, symbol "N", on Form 1210AB and also sent in the radio message. The code table which follows should be used in converting tenths of sky covered by cloud to eighths.

Symbol N -- Total Cloud Amount

Symbol N_h -- Amount of Low Cloud, the height of which is reported by "h"

Symbol N_s -- Amount of Significant Cloud Layer

Code figures	Cloud Amount (Eighths of Sky Covered)	Approximate Cloud Amount (Tenths of Sky Covered)
0	None	None
1	1	1
2	2	2-3
3	3	4
4	4	5
5	5	6
6	6	7-8
7	7	9
8	8	10
9	Sky obscured	Sky obscured

NOTES: (1) "Fragments of clouds" are coded as 1.
(2) "Overcast but with Openings" is coded as 7.

In the thin types of "Mackerel" clouds, there are almost always gaps or spaces through which clear sky can be seen. When these conditions prevail, the amount of cloud should never be recorded as greater than nine-tenths even though such clouds are spread over the entire sky.

In case the sky is completely obscured by fog, an "X" should be entered in the column for "Total Cloud Amount (Tenths)" and by figure "9" in the column designated by "N". However, should the ship be enveloped in fog (or haze) which allows blue sky, sun, moon or stars to be visible and there is no trace of cloud above the fog (or haze), the cloud amount should be recorded as "0". On the other hand, if clouds are visible above the fog, an attempt should be made to estimate the total amount of cloud and this should be recorded as though no fog were present.

WIND

Wind Direction (dd): The direction of the wind to be recorded is the true direction, not the magnetic. Its direction to the nearest 10 degrees as given by the compass should, therefore, be corrected for the magnetic variation and for the deviation, if this is large, as is sometimes the case.

The direction of the wind is best ascertained by making use of the fact that the crest lines of the smallest ripples on the sea surface are perpendicular to the direction of the wind. These ripples, as every seaman knows, are very sensitive to sudden changes in the character of the wind. Accentuation of them by a localized increase in wind velocity produces an apparent darkening of the sea surface, which serves to show the rate of travel of individual gusts or puffs. With wind forces of 6 (Beaufort) or more the wind direction may also be correctly estimated from the direction of the streaks of foam which are then formed.

The true direction from which the wind is blowing should be entered to the nearest 10 degrees in column 10, symbol "dd", on Form 1210AB according to the Scale 01 to 36. See code table which follows:

Symbol dd -- True Direction, in 10's of Degrees, FROM Which Wind is Blowing (00-36)

Symbol $d_w d_w$ -- Direction, in 10's of Degrees, FROM Which Waves Come

Code figures	Direction	Code figures	Direction
00	Calm	19	185° to 194°
01	5° to 14°	20	195° to 204°-SSW
02	15° to 24°-NNE	21	205° to 214°
03	25° to 34°	22	215° to 224°
04	35° to 44°	23	225° to 234°-SW
05	45° to 54°-NE	24	235° to 244°
06	55° to 64°	25	245° to 254°-WSW
07	65° to 74°-ENE	26	255° to 264°
08	75° to 84°	27	265° to 274°-W
09	85° to 94°-E	28	275° to 284°
10	95° to 104°	29	285° to 294°-WNW
11	105° to 114°-ESE	30	295° to 304°
12	115° to 124°	31	305° to 314°
13	125° to 134°	32	315° to 324°-NW
14	135° to 144°-SE	33	325° to 334°
15	145° to 154°	34	335° to 344°-NNW
16	155° to 164°-SSE	35	345° to 354°
17	165° to 174°	36	355° to 4°-N
18	175° to 184°-S		
	Used only with $d_w d_w$		
49	Waves confused, direction indeterminate	99	Waves confused, direction indeterminate, but higher than 14 ft. ($4\frac{1}{2}$ m.)

NOTE: In case a vessel is equipped with an anemometer and the true wind speed exceeds 99 knots, 50 will be added to "dd" and only the wind speed in excess of 100 knots will be coded. For example: If direction = 163° and speed = 121 knots, the wind will be coded as "6621" (dd = 16 + 50; ff = 121 - 100).

Rapid and pronounced changes of the wind should be entered under the heading "REMARKS" on Form 1210AB. In recording any large change the observer should specify the time at which it occurred, the direction and speed of the wind in knots; for example, at 10 a.m. wind veered from 130°-18 knots through 180° to 270°-37 knots.

Observers sometimes fail to distinguish between shifting winds and variable winds. The term "shifting" applies to winds whose direction is changing in accordance with the movement or development of some well-marked cyclonic or anticyclonic system. The term "variable" applies to weak winds (force 3 or less) whose direction is indefinite, coming in feeble puffs, first from one point, then from another. The term "variable" should be applied also to the strong but short-lived winds which are associated with local squalls.

Wind Speed (ff): The appearance of the sea surface serves as the best means of estimating the true wind speed, just as it affords the best means of ascertaining correctly the wind direction. However, the appearance and roughness of the sea obviously depend upon a number of factors and not solely on the strength and duration of the wind locally and the rate at which it is changing, its direction and speed are some of the more important influences. A precise knowledge of relation of wind speed to the appearance of the sea is, however, gained by experience.

For the guidance of observers in estimating true wind force, a table which gives sea conditions as related to the various Beaufort numbers follows.

SPECIFICATIONS OF VISIBLE EFFECTS OF WIND ON SEA SURFACE

Wind Force (Beaufort)	Limits of Speed in Knots	Descriptive Terms	Sea Conditions
0	Less than 1	Calm	Sea like a mirror.
1	1-3	Light air	Ripples with the appearance of a scale are formed but without foam crests.
2	4-6	Light breeze	Small wavelets, still short but more pronounced; crests have a glassy appearance and do not break.
3	7-10	Gentle breeze	Large wavelets. Crests begin to break. Foam of glassy appearance. Perhaps scattered white horses.
4	11-16	Moderate breeze	Small waves, becoming longer; fairly frequent white horses.
5	17-21	Fresh breeze	Moderate waves, taking a more pronounced long form; many white horses are formed. (Chance of some spray.)
6	22-27	Strong breeze	Large waves begin to form;the white foam crests are more extensive everywhere. (Probably some spray.)
7	28-33	Moderate breeze	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind. Spindrift begins.
8	34-40	Fresh gale	Moderately high waves of greater length; edges of crests break into spindrift. The foam is blown in well-marked streaks along the direction of the wind.
9	41-47	Strong gale	High waves. Dense streaks of foam along the direction of the wind. Sea begins to roll. Spray may affect visibility.
10	48-55	Whole gale	Very high waves with long overhanging crests. The resulting foam in great patches is blown in dense white streaks along the direction of the wind. On the whole the surface of the sea takes a white appearance. The rolling of the sea becomes heavy and shocklike. Visibility is affected.
11	56-63	Storm	Exceptionally high waves. (Small and medium-sized ships might for a long time be lost to view behind the waves.) The sea is completely covered with long white patches of foam lying along the direction of the wind. Everywhere the edges of the wave crests are blown into froth. Visibility affected.
12	64 and above	Hurricane	The air is filled with foam and spray. Sea completely white with driving spray; visibility very seriously affected.

For Beaufort wind force 12 (64 knots and above), the observer should endeavor to estimate the true wind speed to the nearest 5 knots for entry in column 11 (ff). If the vessel is equipped with an anemometer, the true wind speed in actual knots should be recorded in column 11 on the form and reported by radio.

The true force of the wind should be entered in the column 12 indicated "Beaufort Force" on Form 1210AB according to Beaufort numbers 1-12. However, the wind force should be converted to knots before entry in column 11, ("ff") on Form 1210AB after consulting the table which follows:

Symbol ff -- Wind Speed in Knots

Code figures	Beaufort Number	Description	Equivalent Speed in Knots
00	Zero	Calm	0
02	One	Light airs	1-3
05	Two	Light breeze	4-6
09	Three	Gentle breeze	7-10
13	Four	Moderate breeze	11-16
18	Five	Fresh breeze	17-21
24	Six	Strong breeze	22-27
30	Seven	High wind (moderate gale)	28-33
37	Eight	Gale (fresh gale)	34-40
44	Nine	Strong gale	41-47
52	Ten	Whole gale	48-55
60	Eleven	Storm	56-63
68	Twelve	Hurricane	64 and above

NOTE: In case a vessel is equipped with an anemometer and the true wind speed exceeds 99 knots, 50 will be added to "dd" and only the wind speed in excess of 100 knots will be coded. For example, if the direction = 163° and speed = 121 knots, the wind will be coded as "8621" (dd = 16 + 50; ff = 121 - 100).

Use of apparent direction and force of the wind to obtain the approximate true direction and speed: At night, the observer may not always be able to distinguish the characteristic of the sea surface or, if it is raining very hard, the pattern of the wind ripples may be obliterated. In these and other circumstances, however, use may be made of the apparent wind direction and force together with the movement of the ship to determine its true direction and force by constructing a simple vector diagram or consulting Table 8 in the Appendix. For example: Let the ship's true course and speed be 250°, 15 knots and let the apparent wind be 70° off the starbard bow, force 1. Turning to Table 8 in the Appendix, we see the true wind direction is 63° (173° off the starboard bow), force 4. After consulting Code Tables for "dd and "ff", the wind direction 06 and wind speed 13 knots should be entered in the appropriate columns on Form 1210 AB.

VISIBILITY

Visibility (VV): Observations of visibility should be made in accordance with the International Scale, which is given in the Code Table for "VV", below. A code figure from this table should be entered in column 13 on Form 1210AB and used in preparing the radio message. When it is not possible to determine precisely what figure in the scale most accurately describes the condition, the entry should be made according to the best judgment of the observer.

Symbol VV -- Visibility

Code figures	Visibility Range
90	Less than 50 yds. (50 m.)
91	50 yds. (50 m.)
92	200 yds. (200 m.)
93	1/4 nautical mile (500 m.)
94	1/2 nautical mile (1,000 m.)
95	1 nautical mile (2,000 m.)
96	2 nautical miles (4,000 m.)
97	5 nautical miles (10 km.)
98	10 nautical miles (20 km.)
99	25 nautical miles or more (50 km.)

Horizontal visibility is often very useful as an indicator of the condition of the lower atmosphere. As a general rule, the visibility is good when the air temperature is lower than the sea temperature and very poor when the reverse holds true. The reason for this is that when the air temperature is lower than the sea temperature, the lowest layers of the atmosphere are being heated by the sea. This will tend to make the atmosphere thermally unstable

and favor active vertical mixing, which in turn tends to disperse haze or fog particles that may have accumulated at low levels. An unstable atmosphere is characterized by Cumuliform Clouds and a showery type of weather.

On the other hand, when the sea temperature is lower than the air temperature, it follows that the sea cools the lowest layers of the atmosphere. This will tend to make the atmosphere thermally stable and prevent active vertical mixing, which in turn favors the accumulation of haze at low levels. The cooling of the surface air also favors the production of fog. A stable atmosphere is, therefore, characterized by poor visibility and, if it is sufficiently moist, by fog, low Stratus Clouds, and drizzle.

This shows that an accurate report of visibility may often serve to supplement the description of the character of the weather as reported in the "Present weather" column.

Islands or mountains, whose distance from the observer is known, should be used whenever possible as objects on which the estimate of visibility may be based. Otherwise, use may be made of another ship or the horizon. The latter, when viewed from the level of the bridge (30 to 40 feet above sea level), appears at a distance of 6 to 7 nautical miles.

Table 10 in the Appendix gives the distance of visibility of objects at sea.

When isolated showers are within sight, but are not occurring at the ship, the observation of visibility should be made in a direction where the horizon is not obscured by falling precipitation.

WEATHER

Present Weather (ww): In column 14 on Form 1210AB, the state of weather at the time of observation must be indicated by entry of one of the numbers (00-99) from the code table for "ww" which follows. If two or more numbers are entered, they should be separated by dashes or written, one above the other. Of course, only one number (two figures) can be sent in the radio message.

When two or more numbers are entered to describe the state of weather, the observer should be guided by the instructions which follow as to which number is the more important to send in the radio message, provided, of course, that the vessel is authorized to send regular reports by radio.

Situations may occur, however, in which it is especially difficult to decide what is the proper number for the radio message. If the observer has entered more than one number for "Present weather" and, after referring to the instructions, is still in doubt as to which one to send in the radio message, he should send the highest number entered. For example, with entries of 02, 14, 25 (state of sky unchanged, precipitation within sight, showers of rain in the preceding hour), he should send the number 25 by radio.

Under "REMARKS" on Form 1210AB, the weather may be described briefly in plain language or by numbers preceded by "Weather" or "Wea". For example, "Wea 02, 14, 18, 25" would indicate state of sky unchanged, precipitation within sight, squalls during past hour, rain showers in preceding hour.

Symbol ww -- Present Weather

ww = 00 - 49 NO PRECIPITATION AT THE STATION AT THE TIME OF OBSERVATION

00 - 19: No precipitation, fog, duststorm, sandstorm or drifting snow at the station (or ship) at the time of observation or during the preceding hour, except for 09

No hydrometeors except clouds

- 00 Cloud development not observed or not observable
- 01 Clouds generally dissolving or becoming less developed
- 02 State of sky on the whole unchanged
- 03 Clouds generally forming or developing

} Characteristic change of the state of sky during the past hour

Haze, dust, sand or smoke

- 04 Visibility reduced by smoke, e.g., veldt or forest fires, industrial smoke or volcanic ashes
- 05 Dry haze
- 06 Widespread dust in suspension in the air, not raised by wind at or near the station (or ship) at the time of observation
- 07 Dust or sand raised by wind at or near the station (or ship) at the time of observation, but no well developed dust devil(s), and no duststorm or sandstorm seen
- 08 Well developed dust devil(s) seen at or near the station (or ship) within last hour, but no duststorm or sandstorm
- 09 Duststorm or sandstorm within sight of station (or ship) or at station (or ship) during the last hour

- 10 Light fog (visibility 1,000 m.; 1,100 yds. or more)
- 11 Patches of
- 12 More or less continuous

} Shallow fog at the station (or ship) not deeper than about 2 meters (6-1/2 ft.) on land or 10 meters (33 ft.) at sea

- 13 Lightning visible, no thunder heard
- 14 Precipitation within sight, but not reaching ground at the station (or ship)
- 15 Precipitation within sight, reaching ground, but distant /i.e., estimated to be more than 5 km. (3 miles) from station (or ship)/
- 16 Precipitation within sight, reaching ground, near to but not at the station (or ship)
- 17 Thunder heard, but no precipitation at the station (or ship)
- 18 Squall(s)
- 19 Funnel cloud(s) (tornado or waterspout)

} Within sight during the past hour

20 - 29: Precipitation, fog or thunderstorm at the station (or ship) during the preceding hour but NOT at the time of observation

- 20 Drizzle (not freezing)
- 21 Rain (not freezing)
- 22 Snow
- 23 Rain and snow
- 24 Freezing drizzle or freezing rain

} Not falling as showers

- 25 Shower(s) of rain
- 26 Shower(s) of snow, or of rain and snow
- 27 Shower(s) of hail or of hail and rain
- 28 Fog
- 29 Thunderstorm (with or without precipitation)

30 - 39: Duststorm, sandstorm or drifting snow

30	Slight or moderate duststorm or sandstorm	Has decreased during the preceding hour
31	Slight or moderate duststorm or sandstorm	No appreciable change during the preceding hour
32	Slight or moderate duststorm or sandstorm	Has increased during the preceding hour
33	Severe duststorm or sandstorm	Has decreased during the preceding hour
34	Severe duststorm or sandstorm	No appreciable change during the preceding hour
35	Severe duststorm or sandstorm	Has increased during the preceding hour
36	Slight or moderate drifting snow	Generally low
37	Heavy drifting snow	
38	Slight or moderate drifting snow	Generally high
39	Heavy drifting snow	

40 - 49: Fog at the time of observation

40	Fog at a distance at the time of observation, but not at the station (or ship) during the last hour, the fog extending to a level above that of the observer	
41	Fog in patches	
42	Fog, sky discernible	Has become thinner during the preceding hour
43	Fog, sky not discernible	
44	Fog, sky discernible	No appreciable change during the preceding hour
45	Fog, sky not discernible	
46	Fog, sky discernible	Has begun or has become thicker during the preceding hour
47	Fog, sky not discernible	
48	Fog, depositing rime, sky discernible	
49	Fog, depositing rime, sky not discernible	

50 - 99 PRECIPITATION AT THE STATION (OR SHIP) AT THE TIME OF OBSERVATION

50 - 59: Drizzle at time of observation

50	Drizzle, not freezing, intermittent	Slight at time of observation
51	Drizzle, not freezing, continuous	
52	Drizzle, not freezing, intermittent	Moderate at time of observation
53	Drizzle, not freezing, continuous	
54	Drizzle, not freezing, intermittent	Thick at time of observation
55	Drizzle, not freezing, continuous	
56	Drizzle, freezing, slight	
57	Drizzle, freezing, moderate or thick	
58	Drizzle and rain, slight	
59	Drizzle and rain, moderate or heavy	

60 - 69: Rain at time of observation

60	Rain, not freezing, intermittent	Slight at time of observation
61	Rain, not freezing, continuous	
62	Rain, not freezing, intermittent	Moderate at time of observation
63	Rain, not freezing, continuous	
64	Rain, not freezing, intermittent	Heavy at time of observation
65	Rain, not freezing, continuous	

66 Rain, freezing, slight
67 Rain, freezing, moderate or heavy
68 Rain or drizzle and snow, slight
69 Rain or drizzle and snow, moderate or heavy

70 - 79: Solid precipitation not in showers at time of observation

70 Intermittent fall of snow flakes } Slight at time of observation
71 Continuous fall of snow flakes }
72 Intermittent fall of snow flakes } Moderate at time of observation
73 Continuous fall of snow flakes }
74 Intermittent fall of snow flakes } Heavy at time of observation
75 Continuous fall of snow flakes }
76 Ice needles (with or without fog)
77 Granular snow (with or without fog)
78 Isolated starlike snow crystals (with or without fog)
79 Ice pellets

80 - 99: Showery precipitation, or precipitation with current or recent thunderstorm

80 Rain shower(s), slight
81 Rain shower(s), moderate or heavy
82 Rain shower(s), violent
83 Shower(s) of rain and snow mixed, slight
84 Shower(s) of rain and snow mixed, moderate or heavy
85 Snow shower(s), slight
86 Snow shower(s), moderate or heavy
87 Shower(s) of soft or small hail with or without rain or rain and snow mixed } Slight
88 Shower(s) of soft or small hail with or without rain or rain and snow mixed } Moderate or heavy
89 Shower(s) of hail with or without rain or rain and snow mixed, not associated with thunder } Slight
90 Shower(s) of hail, with or without rain or rain and snow mixed, not associated with thunder } Moderate or heavy
91 Slight rain at time of observation
92 Moderate or heavy rain at time of observation
93 Slight snow or rain and snow mixed or hail* at time of observation
94 Moderate or heavy snow, or rain and snow mixed or hail* at time of observation
Thunderstorm during the preceding hour but not at time of observation
95 Thunderstorm, slight or moderate, without hail* but with rain and/or snow at time of observation
96 Thunderstorm, slight or moderate, with hail* at time of observation
97 Thunderstorm, heavy, without hail* but with rain and/or snow at time of observation
98 Thunderstorm combined with duststorm or sandstorm at time of observation
99 Thunderstorm, heavy, with hail* at time of observation
Thunderstorm at time of observation

* Hail, small hail, soft hail

Explanatory remarks on the code table for "Present weather" and instructions as to its use: Methods of analyzing weather reports for purposes of forecasting and making meteorological studies have served to emphasize the great value of accurate "Present weather" observations from ships. This applies particularly to the correct identification of various precipitation forms.

This table consists of 100 separate descriptions which may be coded for "Present weather". In general, the descriptions have been arranged in order so that the highest number will indicate the severest weather existing at the time of observation.

The table is divided into 10 "decades"; i.e., into 10 groups, each of which contains 10 numbers. These decades, which correspond to 10 main types of weather, are numbered 0 to 9. The first digit of any number in the table indicates the decade to which that particular number belongs. There is one exception. Figure 90 is included in decade 8 -- "Showers"; while decade 9 -- "Thunderstorm", consists of only 9 numbers; i.e., 91-99.

After the observer has selected the decade which best applies to the prevailing weather conditions, he should pick out from that particular decade the number which most correctly describes the weather at the time of observation or during the hour preceding. Neither when selecting the decade nor in the determination of the complete number must account be taken of weather phenomena which occurred more than 1 hour prior to the time of observation. Occasionally it will be appropriate to select numbers from two or more different decades for entry on the observation form, as illustrated above. However, in selecting the proper decade and number for transmission in the radio message, the observer should remember that correct and explicit information regarding types of precipitation is of the most value, both to the Government forecaster and to the mariner who is constructing his own weather chart. An accurate report of precipitation forms not only tells what kind of air mass is present but also what kind of changes are taking place aloft, the knowledge of both of which is of great assistance in drawing an inference as to the weather of the future.

In selecting the proper number from the table for "Present weather", the following will be of assistance:

Decade 0: Code figures 00-03 indicate only the state of the sky observed in the hour preceding the time of observation. It should be noted that these numbers no longer indicate the amount of sky covered by cloud since cloud amount is reported by symbol "N" -- "Total Cloud Amount". These numbers should be used only when there is no other applicable figure in the table which can be used to describe "Present weather" accurately.

Code figure 04: When smoke from veldt or forest fires, industrial smoke, or volcanic ashes is the cause of restricting visibility, this number should be entered. Number 05: When the visibility is restricted by dry haze, number 05 should be reported.

Code figures 06-09 will apply only very rarely since these numbers refer primarily to phenomena that occur over land areas.

Decade 1: Code figure 10 should be used only when light fog is present with visibility 1,100 yards or more. When light fog is present, the relative humidity approximates 95-97%. Numbers 11-12 are for use when patches of fog or a more or less continuous layer of fog are observed but the fog layer is not higher than 33 feet above the sea at the time of observation.

Number 13 is self-explanatory. Code figure 14 should be used when precipitation is observed but not reaching the sea surface at the ship. This phenomenon is observed when clouds show trails of virga; i.e., wisps of falling trails of precipitation and is usually associated with Altocumulus, Altostratus or Cumulus Clouds.

Code figures 15 to 17 are self-explanatory.

Code figure 18 should be reported when squalls have been observed within the hour prior to the time of observation and there is no higher number in the table which will describe the "Present weather" more accurately. There

is one exception. In the tropics during the hurricane season, code figure 18 may be reported when the weather appears to be abnormally squally. Such conditions may indicate that a tropical storm is developing.

A squall is a strong wind that increases suddenly in speed, maintains a peak speed over a period of minutes and then decreases. Similar fluctuations in wind speed will occur at succeeding intervals. The brief increase in wind speed is of longer duration during a squall than in a gust.

Code figure 19 should be used when waterspout(s) is observed at sea during the hour preceding the time of observation. This phenomenon occurs as a small whirling storm over the ocean, whose chief characteristic is a funnel shaped cloud extending in a fully developed spout from the water surface to the base of a Cumulus Cloud. Waterspouts usually rotate in a counterclockwise direction in the northern Hemisphere as in cyclonic storms, although clockwise direction has been observed occasionally. Waterspouts are frequently observed in the tropics but are not uncommon in the higher latitudes. The water in the spout is confined to its lower portion.

Decade 2: Code figures 20-29 are to be recorded only when precipitation, fog or thunderstorm has occurred at the station during the preceding hour but NOT at the time of observation; they should never be used when any of these phenomena is occurring at the time of observation.

Decade 3: Code figures 30-39 will apply only very rarely since the numbers contained in it refer to phenomena that occur primarily over land areas.

Decade 4: Code figures 40-49 should be used when fog is observed at the time of observation and extends to a level above that of the observer. Numbers 48 and 49, however, should be entered on Form 1210AB only when fog and rime are occurring together. Rime is a freezing fog. It is identified as a white or milky, opaque granular deposit of ice forming on hulls, masts and other exposed surfaces on vessels sailing through fog in freezing weather. The minute fog droplets freeze and adhere to the cold surfaces.

Decade 5: Numbers 50-59 should be recorded only in the case of drizzle; i.e., fairly uniform precipitation consisting of tiny and extremely numerous droplets which appear almost to float in the air. Drizzle usually falls out of a continuous, dense and low layer of Stratus Cloud. It should always be carefully distinguished from fine rain. Small raindrops falling from broken shower-type clouds should never be classified as drizzle. Two ways of distinguishing drizzle from light rain are: (1) Drizzle droplets falling on absolutely calm water do not produce noticeable ripples when they strike the surface; (2) Drizzle is characteristically accompanied by a horizontal visibility of less than 2 nautical miles.

If precipitation is not occurring at the time of observation but there has been drizzle in the preceding hour, figure 20 in decade 2 should be used. If ordinary rain falls simultaneously with drizzle at the time of observation, one of the numbers 58 or 59 should be used.

Decade 6: Numbers 60-69 should be used only in the case of fairly continuous precipitation of ordinary raindrops from a continuous cloud sheet. The sky in this case is, as a rule, covered with a layer of rain clouds forming from an Altostratus system, or with a uniformly gray but relatively high canopy of clouds, generally with formless masses of cloud below (which may even be present in such quantity that the upper clouds are completely hidden).

Numbers 66 and 67 will rarely be observed over the sea, except near land. In this case, the rain freezes immediately when striking a surface, the temperature of which is 32° F. or below. When rain or drizzle and snow are occurring together at the time of observation, figure 68 or 69 should be used, depending on the intensity of the precipitation.

If no rain is falling at the time of observation, but rain has fallen during the preceding hour, one of the numbers in decade 2 should be used. If, in addition to the ordinary or large raindrops, there are also considerable amounts of very small drops, one of the numbers 58 or 59 of the preceding decade should be used.

Decade 7: Code figures 70-79 should be used only in the case of ordinary snow, grains of snow, isolated snow crystals, ice needles or pellets (sleet); i.e., occurring as intermittent or continuous precipitation in solid form, from a continuous cloud sheet at the time of observation. The sky in this case is generally covered with a layer of snow clouds forming from an Alto-stratus system, or with a uniformly gray but relatively high canopy of clouds, generally with formless masses of cloud below (which may even be present in such quantities that the upper clouds are completely hidden). Sometimes, however, as when isolated snow crystals or small snowflakes fall, the sky may be covered with a layer of Stratus or Stratocumulus.

Number 70 or 71 is to be recorded when an intermittent or continuous slight fall of snowflakes is occurring at the time of observation without causing the horizontal visibility to become less than 1,100 yards; number 72 or 73, when a moderate fall of snowflakes, intermittent or continuous, is observed and the visibility is within 550 to 1,100 yards and number 74 or 75 for a heavy, intermittent or continuous fall of snowflakes which restricts the visibility to less than 550 yards.

Code figure 76: Ice needles, with or without fog, will rarely be observed over the open sea. This phenomenon occurs over continental and polar regions in winter when the temperature is considerably below freezing. Ice needles are unbranched shafts or crystals of ice which appear to float in the air near the surface. When the sun is shining, a shimmering effect is observed and sun pillars or other optical phenomena may occur, while at night pillars of light are seen if ice needles are present above strong lights. This phenomenon is essentially a Cirrus cloud near the surface but it should not be confused with the higher cloud forms which are also composed of ice crystals. Ice fog may also be present, but ice needles and/or ice fog are rare at sea.

Number 77 should be used when precipitation consisting of small, white, opaque, snowlike grains, either flattened or oblong in shape, with or without fog, is observed. They do not break or noticeably rebound when striking a hard surface. Granular snow falls in very small amounts usually from Stratus or fog but NEVER as showers.

Code figure 78 should be used when isolated starlike snow crystals, with or without fog, are falling at an appreciable rate and reaching the surface at the time of observation, while number 79, ice pellets (sleet), is rarely, if ever, observed over the open sea. It occurs when raindrops fall through a layer of cold air near the surface, the temperature of which is below freezing. The clear ice pellets are not larger than raindrops and they rebound when striking a hard surface.

Decade 8: Numbers 80-90 should be used only in the case of precipitation of a showery character, but no thunderstorm, at the time of observation. The showery character is distinguished not only by the rapid beginning and cessation of the precipitation, and by its widely varying intensity, but also, and primarily, by the appearance of the sky -- rapid alternation between dark threatening shower clouds and short bright periods, often with deep blue sky. Sometimes there is no definite bright period between showers, which is due either to a layer of high cloud (often the forerunner of a new rain area) or to the spaces between the shower clouds being filled up with low but lighter clouds. It may also happen that the precipitation never completely ceases between the showers; the arrival of a shower cloud is then manifested by a sudden darkening of the sky and by a sudden increase in the intensity of the precipitation.

Code figures 80 to 86 are self-explanatory and the number to be reported depends on the intensity of the form of precipitation that is occurring at the hour of observation. When soft or small hail, with or without rain or rain and snow mixed is observed, number 87 or 88, depending on the intensity of the precipitation should be used.

Soft hail consists of small, white, opaque, round (seldom conical) grains of a snowlike structure. They are crisp, easily compressible and rebound when striking a hard surface. Soft hail occurs with temperatures near the freezing point and often before or together with snow.

Small hail, however, consists of small (seldom conical) grains of frozen water. They usually have a soft hail center covered with a thin layer of ice which gives them a glazed appearance. They are not crisp nor do they rebound noticeably or burst when striking a hard surface. Small hail is wet because it often occurs together with rain when temperatures are above freezing. It falls generally from Cumulonimbus clouds.

Figures 89 and 90 are to be used only when showers of hail, with or without rain (or rain and snow mixed) are occurring but no thunder has been heard at the observation time. Hail in this case consists of balls or lumps of ice, ranging in size up to 1/2 inch and often larger. They are either quite transparent or composed of alternating clear and opaque, snowlike layers. Hail usually occurs during heavy thunderstorms but NEVER when temperatures near the surface are below freezing. If a thunderstorm is occurring at the time of observation or has occurred in the preceding hour, one of the numbers 91-99 should be used.

Decade 9: Numbers 91-99 should be used only in the case of a thunderstorm; that is, precipitation at the time of observation with thunder at the same time or in the preceding hour.

One of the figures 91 to 94 should be reported when a thunderstorm has occurred in the last hour and rain, snow, rain and snow mixed, hail, small hail or soft hail is occurring at the time of observation. See decade 8 for descriptions of various forms of hail.

Numbers 95-99 are reserved for a thunderstorm occurring at the time of observation together with rain, snow, rain and snow mixed, hail, small hail or soft hail, duststorm or sandstorm.

It should be noted that the specification for figure 98 (thunderstorm combined with duststorm or sandstorm) will rarely be observed at sea. In this case, however, the observer is allowed considerable latitude in judging whether precipitation is also occurring even though it is not actually visible.

Past Weather (W): In column 14 on Form 1210AB should be entered a description of the state of weather for the interval prior to the time of observation. In 00, 06, 12 and 18 G.C.T. reports, the code figure entered for "Past weather" should cover the preceding 6 hours, while in 03, 09, 15 and 21 G.C.T. reports, the symbol "W" should indicate the weather prevailing in the 3-hour period prior to the time of observation. The code to be used in reporting "Past weather" is as follows:

Symbol W -- Past Weather

Code figures	Description
0	Clear or few clouds
1	Partly cloudy or variable sky
2	Cloudy or overcast
3	Sandstorm or duststorm or drifting or blowing snow
4	Fog, smoke or thick dust haze
5	Drizzle
6	Rain
7	Snow or rain and snow mixed or sleet
8	Shower(s)
9	Thunderstorm with or without precipitation

All code figures applicable to symbol "W" should be entered in the appropriate column on Form 1210AB. However, in preparing the radio message, the highest applicable figure should be used. The observer should bear in mind when preparing the radio message, that if the weather undergoes a complete change during the time interval in question, the code figure selected for "W" should describe the weather conditions existing before the type of weather occurring at the time of observation began. Hence, the figures for "W" and "ww" together should give as complete a description as possible of the weather observed in the 3 or 6-hour period concerned.

It should also be noted that when "Past weather" has been characterized chiefly by the presence of broken clouds, with showers occurring within sight of the ship, it is important that figure 8 be sent in the message rather than 1 (partly cloudy or variable sky), even if no showers have passed directly over the ship. In general, the occurrence of any form of precipitation or thunderstorm should be given preference in coding "Past weather" in the radio message.

BAROMETRIC PRESSURE

Barometer as read: In column 16 on Form 1210AB, the observer should record the barometer exactly as read (i.e., without application of any corrections whatever) to the nearest hundredth of an inch, tenth of a millimeter, or tenth of a millibar. Particular care must be taken to make certain that the reading obtained is correct, as even the most conscientious observer is prone on occasions to misread the barometer by 0.10 inch or 10 millibars (depending upon the scale of the barometer) or multiples thereof. Errors of this sort, usually committed when a hurried observation is made, can be eliminated if the observer will make it a practice to verify the original observation by taking a check reading.

When the barometer is pumping, the observer should take two or three pairs of readings. Each pair should contain one of the highest and one of the lowest readings obtainable. The reading to be recorded is that which is obtained from averaging the whole set.

Barometer as coded (PPP): In column 18 on Form 1210AB should be entered the reading of the barometer in tens, units and tenths of a millibar after all necessary corrections have been applied, including the correction for instrumental error furnished by the Weather Bureau. This last correction includes reduction to sea level when the barometer employed is an aneroid. However, in column 17 the initial 8, 9 or 10 of the corrected barometer reading, as the case may be, should be entered.

In radio messages, 991.7 millibars will be coded as 917; 1007.4 millibars, as 074.

If the scale of the barometer is graduated in inches, it will be necessary to use the table for "PPP" to convert inches to millibars. To do this, find in the table (in one of the columns headed "inches"), the value corresponding to the corrected barometer reading. In the column to the right will be found the equivalent value in millibars and tenths to be entered on Form 1210AB.

SYMBOL PPP—ATMOSPHERIC PRESSURE REDUCED TO SEA-LEVEL

Coded in "tens", "units", and "tenths" of millibars, initial 9 or 10 omitted. One inch = 33.8639 millibars; one millibar = 0.0295293 inch; One millimeter = 0.039370 inch; one inch = 25.40005 millimeters; one millibar = 0.7500616 millimeter; one millimeter = 1.33322387 millibars.

in.	mb.	in.	mb.	in.	mb.	in.	mb.	in.	mb.	in.	mb.	in.	mb.	in.	mb.
27.50	931.3	28.00	948.2	28.50	965.1	29.00	982.1	29.50	999.0	30.00	1015.9	30.50	1032.9	31.00	1049.8
27.51	931.6	28.01	948.5	28.51	965.5	29.01	982.4	29.51	999.3	30.01	1016.3	30.51	1033.2	31.01	1050.1
27.52	931.9	28.02	948.9	28.52	965.8	29.02	982.7	29.52	999.7	30.02	1016.6	30.52	1033.5	31.02	1050.5
27.53	932.3	28.03	949.2	28.53	966.1	29.03	983.1	29.53	1000.0	30.03	1016.9	30.53	1033.9	31.03	1050.8
27.54	932.6	28.04	949.5	28.54	966.5	29.04	983.4	29.54	1000.3	30.04	1017.3	30.54	1034.2	31.04	1051.1
27.55	933.0	28.05	949.9	28.55	966.8	29.05	983.7	29.55	1000.7	30.05	1017.6	30.55	1034.5	31.05	1051.5
27.56	933.3	28.06	950.2	28.56	967.2	29.06	984.1	29.56	1001.0	30.06	1018.0	30.56	1034.9	31.06	1051.8
27.57	933.6	28.07	950.6	28.57	967.5	29.07	984.4	29.57	1001.4	30.07	1018.3	30.57	1035.2	31.07	1052.2
27.58	934.0	28.08	950.9	28.58	967.8	29.08	984.8	29.58	1001.7	30.08	1018.6	30.58	1035.6	31.08	1052.5
27.59	934.3	28.09	951.2	28.59	968.2	29.09	985.1	29.59	1002.0	30.09	1019.0	30.59	1035.9	31.09	1052.8
27.60	934.6	28.10	951.6	28.60	968.5	29.10	985.4	29.60	1002.4	30.10	1019.3	30.60	1036.2	31.10	1053.2
27.61	935.0	28.11	951.9	28.61	968.8	29.11	985.8	29.61	1002.7	30.11	1019.6	30.61	1036.6	31.11	1053.5
27.62	935.3	28.12	952.3	28.62	969.2	29.12	986.1	29.62	1003.1	30.12	1020.0	30.62	1036.9	31.12	1053.8
27.63	935.7	28.13	952.6	28.63	969.5	29.13	986.5	29.63	1003.4	30.13	1020.3	30.63	1037.3	31.13	1054.2
27.64	936.0	28.14	952.9	28.64	969.9	29.14	986.8	29.64	1003.7	30.14	1020.7	30.64	1037.6	31.14	1054.5
27.65	936.3	28.15	953.3	28.65	970.2	29.15	987.1	29.65	1004.1	30.15	1021.0	30.65	1037.9	31.15	1054.9
27.66	936.7	28.16	953.6	28.66	970.5	29.16	987.5	29.66	1004.4	30.16	1021.3	30.66	1038.3	31.16	1055.2
27.67	937.0	28.17	953.9	28.67	970.9	29.17	987.8	29.67	1004.7	30.17	1021.7	30.67	1038.6	31.17	1055.5
27.68	937.4	28.18	954.3	28.68	971.2	29.18	988.2	29.68	1005.1	30.18	1022.0	30.68	1038.9	31.18	1055.9
27.69	937.7	28.19	954.6	28.69	971.6	29.19	988.5	29.69	1005.4	30.19	1022.4	30.69	1039.3	31.19	1056.2
27.70	938.0	28.20	955.0	28.70	971.9	29.20	988.8	29.70	1005.8	30.20	1022.7	30.70	1039.6	31.20	1056.6
27.71	938.4	28.21	955.3	28.71	972.2	29.21	989.2	29.71	1006.1	30.21	1023.0	30.71	1040.0	31.21	1056.9
27.72	938.7	28.22	955.6	28.72	972.6	29.22	989.5	29.72	1006.4	30.22	1023.4	30.72	1040.3	31.22	1057.2
27.73	939.0	28.23	956.0	28.73	972.9	29.23	989.8	29.73	1006.8	30.23	1023.7	30.73	1040.6	31.23	1057.6
27.74	939.4	28.24	956.3	28.74	973.2	29.24	990.2	29.74	1007.1	30.24	1024.0	30.74	1041.0	31.24	1057.9
27.75	939.7	28.25	956.7	28.75	973.6	29.25	990.5	29.75	1007.5	30.25	1024.4	30.75	1041.3	31.25	1058.2
27.76	940.1	28.26	957.0	28.76	973.9	29.26	990.9	29.76	1007.8	30.26	1024.7	30.76	1041.7	31.26	1058.6
27.77	940.4	28.27	957.3	28.77	974.3	29.27	991.2	29.77	1008.1	30.27	1025.1	30.77	1042.0	31.27	1058.9
27.78	940.7	28.28	957.7	28.78	974.6	29.28	991.5	29.78	1008.5	30.28	1025.4	30.78	1042.3	31.28	1059.3
27.79	941.1	28.29	958.0	28.79	974.9	29.29	991.9	29.79	1008.8	30.29	1025.7	30.79	1042.7	31.29	1059.6
27.80	941.4	28.30	958.3	28.80	975.3	29.30	992.2	29.80	1009.1	30.30	1026.1	30.80	1043.0	31.30	1060.0
27.81	941.8	28.31	958.7	28.81	975.6	29.31	992.6	29.81	1009.5	30.31	1026.4	30.81	1043.3	31.31	1060.3
27.82	942.1	28.32	959.0	28.82	976.0	29.32	992.9	29.82	1009.8	30.32	1026.8	30.82	1043.7	31.32	1060.6
27.83	942.4	28.33	959.4	28.83	976.3	29.33	993.2	29.83	1010.2	30.33	1027.1	30.83	1044.0	31.33	1061.0
27.84	942.8	28.34	959.7	28.84	976.6	29.34	993.6	29.84	1010.5	30.34	1027.4	30.84	1044.4	31.34	1061.3
27.85	943.1	28.35	960.0	28.85	977.0	29.35	993.9	29.85	1010.8	30.35	1027.8	30.85	1044.7	31.35	1061.6
27.86	943.4	28.36	960.4	28.86	977.3	29.36	994.2	29.86	1011.2	30.36	1028.1	30.86	1045.0	31.36	1062.0
27.87	943.8	28.37	960.7	28.87	977.7	29.37	994.6	29.87	1011.5	30.37	1028.4	30.87	1045.4	31.37	1062.3
27.88	944.1	28.38	961.1	28.88	978.0	29.38	994.9	29.88	1011.9	30.38	1028.8	30.88	1045.7	31.38	1062.7
27.89	944.5	28.39	961.4	28.89	978.3	29.39	995.3	29.89	1012.2	30.39	1029.1	30.89	1046.1	31.39	1063.0
27.90	944.8	28.40	961.7	28.90	978.7	29.40	995.6	29.90	1012.5	30.40	1029.5	30.90	1046.4	31.40	1063.3
27.91	945.1	28.41	962.1	28.91	979.0	29.41	995.9	29.91	1012.9	30.41	1029.8	30.91	1046.7	31.41	1063.7
27.92	945.5	28.42	962.4	28.92	979.3	29.42	996.3	29.92	1013.2	30.42	1030.1	30.92	1047.1	31.42	1064.0
27.93	945.8	28.43	962.8	28.93	979.7	29.43	996.6	29.93	1013.5	30.43	1030.5	30.93	1047.4	31.43	1064.3
27.94	946.2	28.44	963.1	28.94	980.0	29.44	997.0	29.94	1013.9	30.44	1030.8	30.94	1047.8	31.44	1064.7
27.95	946.5	28.45	963.4	28.95	980.4	29.45	997.3	29.95	1014.2	30.45	1031.2	30.95	1048.1	31.45	1065.0
27.96	946.8	28.46	963.8	28.96	980.7	29.46	997.6	29.96	1014.6	30.46	1031.5	30.96	1048.4	31.46	1065.4
27.97	947.2	28.47	964.1	28.97	981.0	29.47	998.0	29.97	1014.9	30.47	1031.8	30.97	1048.8	31.47	1065.7
27.98	947.5	28.48	964.4	28.98	981.4	29.48	998.3	29.98	1015.2	30.48	1032.2	30.98	1049.1	31.48	1066.0
27.99	947.9	28.49	964.8	28.99	981.7	29.49	998.6	29.99	1015.6	30.49	1032.5	30.99	1049.5	31.49	1066.4

In messages sent by radio, it will be seen also that the code figures may represent two values of barometric pressure, but this is true only with a very high or very low barometer reading. For example, a barometer coded 431 may be used for barometer readings of 943.1 or 1043.1 millibars. In such cases, the recipient of the radio message will be able to decide which value is intended because synoptic weather charts are available for comparison of the data. If the observer's barometer is graduated according to the millimeter scale, it will be necessary for him to refer to Table 6, entitled "Conversion of Millimeters to Millibars", which is included in the Appendix of these instructions.

TEMPERATURE

Temperature of the Air (TT): The air temperature should be read from a reliable portable thermometer or the dry-bulb of a sling psychrometer. Data therefor should be entered in the column 36 ("Dry-Bulb") on Form 1210AB to the nearest tenth of a degree, Fahrenheit. These data should also be entered to the nearest whole degree Fahrenheit (tenths omitted) in the column 19 ("TT").

If temperatures on the Centigrade scale are converted to readings in degrees Fahrenheit for entry on Form 1210AB, care should be taken in the use of Conversion Table 4 in the Appendix. Observers sometimes take temperatures from the wrong line, thus obtaining Fahrenheit readings that are in error by the equivalent of 1°, 5° or even 10° C.; for example, the reading 15.6° is by mistake converted to degrees Fahrenheit when the actual reading is 5.6° C.

When the ship is scheduled to send a meteorological observation by radio, the air temperature should be reported in whole degrees, Fahrenheit, according to the Scale 00 to 99. Temperatures below 0° F. or above 100° F. may be en-

countered on very rare occasions. In such cases, however, the complement of the actual reading is coded in the radio messages. For example: 102° F. would be coded as 02; -2° F. as 98.

The recipient of the message can determine the actual temperature reading.

CLOUDS

Amount of Low Cloud, the height of which is reported by symbol h (N_h): In column 21 should be entered the amount, in tenths of sky covered, by the low cloud, the base of which is below 8,000 feet above sea level. However, this datum should also be entered in column 22 (N_h) on Form 1210AB and coded in radio messages in eighths of sky covered according to Scale 0 to 9. See code table for symbol N_h, page 6, for converting tenths of sky covered to eighths.

When clouds of type C_L are present, and types C_M or C_H, or both, are also observed, the code figure for N_h should be selected to indicate only the amount of sky covered, in eighths by clouds of type C_L. When no C_L clouds are observed, but types C_M or C_H, or both, are present, the figure selected for N_h will refer to the lowest cloud, providing the base of the cloud is 8,000 feet or lower. Type C_H clouds, with bases 8,000 feet or lower will occur only in the polar regions.

If fragments of a cloud (i.e., covering less than 1/8 of the sky) are observed under a cloud layer covering 1/8 or more of the sky with bases below 8,000 feet, the fragments will be disregarded and the code figure for N_h selected to indicate amount of the next higher cloud type. When only fragments of clouds are present below 8,000 feet, N_h will be entered and coded as 1.

If the sky is obscured by fog, snowstorm or other phenomena, an "X" should be entered in column 21, while code figure 9 should be recorded in column 22 (N_h) on Form 1210AB and also sent in the radio message.

Types of (Low) Cloud (C_L): In column 23 on Form 1210AB should be entered the figure for the type of Stratocumulus (Sc.), Stratus (St.), Cumulus (Cu.), or Cumulonimbus (Cb.) cloud observed at the time of observation. For the convenience of observers, the plain language as well as the technical specifications of cloud types have been included in the table below.

Instructions for observing and coding clouds are contained in Circular S, "Manual of Cloud Forms and Codes for States of Sky," 2d Edition, 1948, which will be distributed to ships' observers.

The code table for C_L follows:

Symbol C_L -- Clouds of Types Stratocumulus, Stratus, Cumulus and Cumulonimbus

Code figure	Technical Language Specifications	Plain Language Specifications
0	No clouds C_L	No Stratocumulus, Stratus, Cumulus, or Cumulonimbus clouds
1	Cumulus humilis	Cumulus with little vertical development and seemingly flattened
2	Cumulus congestus, with or without Cumulus humilis or Stratocumulus at the same level of base	Cumulus of considerable development, generally towering, with or without other Cumulus or Stratocumulus; bases all at the same level
3	Cumulonimbus calvus, with or without Cumulus, Stratocumulus or Stratus	Cumulonimbus with tops lacking clearcut outlines but distinctly not cirriform or anvil-shaped; with or without Cumulus, Stratocumulus, or Stratus
4	Stratocumulus cumulogenitus or vesperalis	Stratocumulus formed by the spreading out of Cumulus; Cumulus also often present. (NOTE: Since the spreading out of the scattered parcels of air that have been warmed by the surface may take place, as in Sc vesperalis as soon as the condensation level is reached, observers should be warned that, though Cu may normally have been seen earlier, the formation of a particular piece of Sc vesperalis may not come from a Cu.)
5	Stratocumulus other than cumulogenitus and vesperalis	Stratocumulus not formed by the spreading out of Cumulus
6	Stratus and/or Fractostratus, but not Fractostratus of bad weather	Stratus or Fractostratus or both, but not Fractostratus of bad weather
7	Fractostratus and/or Fractocumulus of bad weather ("scud") usually under Altostratus and Nimbostratus	Fractostratus and/or Fractocumulus of bad weather ("scud") usually under Altostratus and Nimbostratus. (By "bad weather" is meant the conditions usually prevailing before, during or after precipitation.)
8	Cumulus humilis or congestus and Stratocumulus other than cumulogenitus and vesperalis with bases at different levels	Cumulus and Stratocumulus other than those formed by the spreading out of Cumulus, with bases at different levels
9	Cumulonimbus capillatus (often with anvil) with or without Cumulus, Stratocumulus, Stratus or "scud"	Cumulonimbus having a clearly fibrous (Cirriform) top, often anvil-shaped, with or without Cumulus, Stratocumulus, Stratus or "scud"

NOTE: When the sky is obscured by rain, snow, fog, duststorm, smoke or other phenomena and clouds of C_L type cannot be observed, a slant (/) will be reported for C_L.

Height of Low Cloud (h): The height of cloud above the sea is defined as the distance from sea level to the base of the cloud. The height of low cloud should be estimated to the nearest 100 feet, and entered in column 20 (Height of Low Cloud) on Form 1210AB. The appropriate code figure for entry in column 24 (h) should be obtained by consulting the code table which follows:

Symbol h -- Height of Base of Low Cloud Above Sea

Code figure	Feet	Meters
0	0 to 150	0 to 50
1	150 to 300	50 to 100
2	300 to 600	100 to 200
3	600 to 1000	200 to 300
4	1000 to 2000	300 to 600
5	2000 to 3000	600 to 1000
6	3000 to 5000	1000 to 1500
7	5000 to 6500	1500 to 2000
8	6500 to 8000	2000 to 2500
9	No low cloud below 8000	No low cloud below 2500

NOTES: (1) If the height of the base of cloud is exactly equal to a height given in the table, the higher code figure is used. For example, a height of 600 feet is coded as 3.

(2) If no clouds are present at the time of observation, a dash should be entered in column 20, while the figure 9 (no low clouds below 8,000 feet) recorded in column 24 on Form 1210AB and sent in the radio message.

When fog is present and the sky is obscured or clouds cannot be observed, an "X" should be recorded in column 20 and the code figure 0 entered in the column designated by "h".

Type of (Middle) Cloud (C_M): The type of Altocumulus (Ac), Altostratus (As) or Nimbostratus (Ns) cloud observed at the time of observation should be entered in column 25 (C_M) on Form 1210AB. For the convenience of observers, the plain language as well as the technical specifications have been included in the table which follows.

Instructions for observing and coding clouds are contained in Circular S, "Manual of Cloud Forms and Codes for States of Sky," 2d Edition, 1949, which will be distributed to ships' observers.

Code table for C_M follows:

Symbol C_M -- Clouds of Types Altocumulus, Altostratus and Nimbostratus

Code figure	Technical Language Specifications	Plain Language Specifications
0	No clouds C_M	No Altocumulus, Altostratus, or Nimbostratus clouds
1	Altostratus translucidus	Thin Altostratus (semitransparent everywhere) through which the sun or moon would be seen dimly as through ground glass
2	Altostratus opacus, or Nimbostratus	Thick Altostratus, or Nimbostratus (through portions of the sheet the position of the sun or moon may be indicated by a light patch)
3	Altocumulus translucidus more or less stable and at a single level	Thin (semitransparent) Altocumulus; cloud elements not changing much; at a single level
4	Altocumulus translucidus in patches (often lenticular) continually transforming and/or occurring at different levels	Thin (semitransparent) Altocumulus in patches (often almond or fish-shaped); cloud elements continually changing and/or occurring at more than one level
5	Altocumulus translucidus in bands or in a layer systematically invading the sky and usually thickening as a whole, even partly into Altocumulus opacus or duplicatus	Thin (semitransparent) Altocumulus in bands or in a layer gradually spreading over the sky and usually thickening as a whole; it may become partly opaque or double-layered
6	Altocumulus cumulogenitus	Altocumulus formed by the spreading out of Cumulus
7	Altocumulus duplicatus or opacus, not increasing; or Altostratus and Altocumulus	Any of the following cases: (a) double-layered Altocumulus, usually opaque in parts, not increasing; (b) a thick (opaque) layer of Altocumulus, not increasing; (c) Altostratus and Altocumulus both present at the same or different levels
8	Altocumulus cumuliformis (floccus or castellatus)	Altocumulus in the form of Cumulus-shaped tufts or Altocumulus with turrets
9	Altocumulus of a chaotic sky; generally at different levels; Cirrus densus in patches usually present	Altocumulus of a chaotic sky; generally at different levels; dense Cirrus in patches is usually also present

NOTE: When the sky is obscured by rain, snow, fog, duststorm, smoke or other phenomena and clouds of C_M type cannot be observed, a slant (/) is reported for C_M.

Type of (High) Cloud (C_H): In column 26 on Form 1210AB should be entered the figure for the type of Cirrus (Ci), Cirrostratus (Cs), or Cirrocumulus (Cc) cloud observed at the time of observation. For the convenience of observers, the plain language as well as the technical specifications have been included in the table which follows:

Instructions for observing and coding clouds are contained in Circular S, "Manual of Cloud Forms and Codes for States of Sky," 2d Edition, 1949, which will be distributed to ships' observers.

See code table for C_H.

Symbol C_H -- Clouds of Types Cirrus, Cirrostratus and Cirrocumulus

Code figure	Technical Language Specifications	Plain Language Specifications
0	No clouds C_H	No Cirrus, Cirrocumulus, or Cirrostratus clouds
1	Cirrus filosus, scattered and not increasing	Filaments or strands of Cirrus, scattered and not increasing (often "Mares' tails")
2	Cirrus densus in patches or twisted sheaves usually not increasing, sometimes presumably being the remains of the upper part of Cumulonimbus	Dense Cirrus in patches or twisted sheaves usually not increasing; possibly but not certainly the remains of the upper part of Cumulonimbus
3	Cirrus nothus;either the remains of Cumulonimbus or part of a distant Cumulonimbus the rest of which is not visible	Cirrus, often anvil-shaped; either the remains of the upper portions of Cumulonimbus or part of a distant Cumulonimbus the rest of which is not visible. (If there is doubt as to the Cumulonimbus origin or association, Code C_H2 should be used.)
4	Cirrus (often Cirrus uncinus) systematically invading the sky and usually thickening as a whole	Cirrus (often hook-shaped) gradually spreading over the sky and usually thickening as a whole
5	Cirrus, often in polar bands, and/or Cirrostratus systematically invading the sky and usually thickening as a whole, but the continuous layer not reaching 45° altitude	Cirrus and Cirrostratus, often in bands converging toward the horizon; or Cirrostratus alone; in either case gradually spreading over the sky and usually thickening as a whole, but the continuous layer not reaching 45° altitude
6	Cirrus, often in polar bands, and/or Cirrostratus systematically invading the sky and usually thickening as a whole, and the continuous layer exceeding 45° altitude	Cirrus and Cirrostratus, often in bands converging toward the horizon; or Cirrostratus alone; in either case gradually spreading over the sky and usually thickening as a whole, and the continuous layer exceeding 45° altitude
7	Cirrostratus covering the whole sky	Cirrostratus covering the whole sky
8	Cirrostratus not increasing and not covering the whole sky	Cirrostratus not increasing and not covering the whole sky; Cirrus and Cirrocumulus may be present
9	Cirrocumulus the dominant Cirriform cloud	Cirrocumulus alone or Cirrocumulus with some Cirrus or Cirrostratus, but the Cirrocumulus being the main Cirriform cloud present. (Cirrocumulus may be present in C_H 1 to C_H 8.)

NOTE: When the sky is obscured by rain, snow, fog, duststorm, smoke or other phenomena and clouds of type C_H cannot be observed, a slant (/) will be reported for C_H.

Ship's Course (D_s): The direction toward which the ship is moving is recorded in column 27 on Form 1210AB and coded in the radio message according to Scale 0 to 8. See the following code table.

Symbol D_s -- Ship's Course --
Direction Toward Which Ship is Moving

Code figures	True Direction
0	Ship hove to
1	NE
2	E
3	SE
4	S
5	SW
6	W
7	NW
8	N
9	No information

Ship's Speed (v_s): The average speed of the ship during the 3-hour period prior to the time of observation should be entered in column 28 on Form 1210AB and coded in the radio message according to the code table below.

Symbol v_s -- Ship's Speed

Code figures	Speed	Code figures	Speed
0	Ship stopped.	5	13 to 15 knots
1	1 to 3 knots	6	16 to 18 knots
2	4 to 6 knots	7	19 to 21 knots
3	7 to 9 knots	8	22 to 24 knots
4	10 to 12 knots	9	More than 24 knots

Characteristic of Changes of the Barometer in the Last 3 Hours (a): The character of the variation of pressure during the 3-hour period preceding the observation expressed by a single figure should be entered in column 29 on Form 1210AB and coded in the radio message. It must be determined from a barograph that is properly compensated for temperature. The instrument should be elastically suspended in order that it may not be affected by shocks and vibration incident to the motion of the ship unless the ship's barograph is of the latest marine type. Singularities in the run of the curve, obviously due to defects in the instrument (friction, backlash, etc.) or to external effects other than rapid changes in atmosphere pressure, should be disregarded.

The use of barograph sheets with 3-hour divisions is recommended.

The character of the 3-hour pressure change is described in the table below, and graphically illustrated in the diagram following. The appropriate code number for each distinctive type of curve is also given.

Symbol a -- Characteristic of Changes of Barometer in the Last 3 Hours

Code figures	Description	
0	Rising, then falling	Barometer now higher than or the same as 3 hours ago
1	Rising, then steady; or rising, then rising more slowly	
2	Unsteady	
3	Steady or rising	
4	Falling or steady, then rising; or rising, then rising more quickly	
5	Falling, then rising	Barometer now lower than 3 hours ago
6	Falling, then steady; or falling, then falling more slowly	
7	Unsteady	
8	Falling	
9	Steady or rising, then falling; or falling, then falling more quickly	

In regions where there is a marked regular diurnal variation of the barometer, the figures 2 and 7 may be used when the regular diurnal variation is interrupted in such a way that the term "unsteady" gives the best description of the character of the curve.

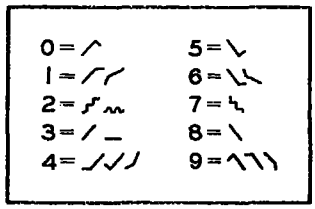


Diagram showing characteristic of changes of the barometer in the last 3 hours

When unusually rapid changes of the barometer occur between regular Greenwich observations, a statement should be added under the heading "REMARKS" describing the changes. If an unusual barometric change is accompanied by winds of force 8 or higher (force 6 or higher in tropical seas), the facts should be incorporated in the space headed "Gale and Storm Reports" on the back of Form 1210AB.

Amount of Barometer Change (pp): This quantity, which represents the exact amount of variation in pressure during the 3-hour period preceding the time of observation, is expressed in tenths of a millibar. If the scale of the barometer reads in inches, it will be necessary to convert inches to millibars by consulting the table which follows before recording these data in column 30 on Form 1210AB.

Symbol pp -- Barometer Change

(Amount of rise or fall of the barometer in the last three hours)

Amount of rise or fall		Amount of rise or fall		Amount of rise or fall		Amount of rise or fall	
Millibars	Inch	Millibars	Inch	Millibars	Inch	Millibars	Inch
0.2	0.01	5.2	0.16	10.2	0.31	15.2	0.46
.4	.01	5.4	.16	10.4	.31	15.4	.46
.6	.02	5.6	.17	10.6	.32	15.6	.47
.8	.02	5.8	.17	10.8	.32	15.8	.47
1.0	.03	6.0	.18	11.0	.33	16.0	.48
1.2	.04	6.2	.19	11.2	.34	16.2	.49
1.4	.04	6.4	.19	11.4	.34	16.4	.49
1.6	.05	6.6	.20	11.6	.35	16.6	.50
1.8	.05	6.8	.20	11.8	.35	16.8	.50
2.0	.06	7.0	.21	12.0	.36	17.0	.51
2.2	.07	7.2	.22	12.2	.37	17.2	.52
2.4	.07	7.4	.22	12.4	.37	17.4	.52
2.6	.08	7.6	.23	12.6	.38	17.6	.53
2.8	.08	7.8	.23	12.8	.38	17.8	.53
3.0	.09	8.0	.24	13.0	.39	18.0	.54
3.2	.10	8.2	.25	13.2	.40	18.2	.55
3.4	.10	8.4	.25	13.4	.40	18.4	.55
3.6	.11	8.6	.26	13.6	.41	18.6	.56
3.8	.11	8.8	.26	13.8	.41	18.8	.56
4.0	.12	9.0	.27	14.0	.42	19.0	.57
4.2	.13	9.2	.28	14.2	.43	19.2	.58
4.4	.13	9.4	.28	14.4	.43	19.4	.58
4.6	.14	9.6	.29	14.6	.44	19.6	.59
4.8	.14	9.8	.29	14.8	.44	19.8	.59
5.0	.15	10.0	.30	15.0	.45		

If the amount of change is 3.4 millibars, data for "pp" should be entered in column 30 on Form 1210AB and coded in the radio message as 34; 7.8 millibars as 78. In radio reports, however, when the amount of barometer change equals or exceeds 9.9 millibars, data for "pp" will be coded 99 and an extra group "99ppp" inserted in the message. The total amount of change is then coded for "ppp". For example, if the amount of change is 9.9 millibars, "pp 99ppp" should be coded as "99 99099"; for 11.2 millibars, "pp 99ppp" should be coded as "99 99112".

Amount of Significant Cloud (N_s): In column 31 on Form 1210AB should be entered the amount, in tenths of the cloud layer, (the type of which is indicated by symbol "C") which covers more than one-half the sky and is below 20,000 feet above sea level according to Scale 0 to 10. However, the amount of significant cloud layer should also be recorded in the column 33 (N_s), in eighths of sky covered, after consulting the code table for N_s, page 6.

If another layer of clouds is observed below the higher layer, an additional entry should be made in columns 31 and 33 on Form 1210AB. In case there is no cloud below 20,000 feet covering more than one-half the sky, data for N_s should be entered for the lowest cloud layer below 20,000 feet, regardless of the amount of sky covered. When the sky is obscured by fog, snowstorm, or other phenomena, an "X" should be entered in column 31, while code figure 9 recorded in column 33 (N_s).

Observers should note, however, that the group $8N_sCh_sh_s$ which includes data for N_s, should not be included in messages prepared for radio transmission, except when specifically requested by the Weather Bureau.

Significant Cloud (C): The code figure indicating the type of cloud* layer, the amount of which is indicated by symbol N_s, will be entered in column 35 on Form 1210AB according to the table which follows:

Symbol C -- Form of Significant Cloud

Code figures	Form of Cloud
1	Cirrus (Ci.)
2	Cirrostratus (Cs.)
3	Cirrocumulus (Cc.)
4	Altocumulus (Ac.)
5	Altostratus (As.)
6	Stratocumulus (Sc.)
7	Nimbostratus (Ns.)
8	Cumulus or Fractocumulus (Cu. or Fc.)
9	Cumulonimbus (Cb.)
0	Stratus or Fractostratus (St. or Fs.)

If the sky is cloudless at the time of observation, a dash should be entered in column headed "C" for significant cloud. When the sky is obscured by fog, snowstorm or other phenomena, a slant (/) will be entered for the type of significant cloud.

Observers should note, however, that the group $8N_sCh_sh_s$, which includes data for "C", should not be included in messages prepared for radio transmission, except when specifically requested by the Weather Bureau.

* NOTE: See Circular S, entitled "Manual of Cloud Forms and Codes for States of the Sky," 2d Edition, which will be furnished to ships' observers with these instructions.

Height of Significant Cloud Layer (h_sh_s): Observers should attempt to estimate as carefully as possible, in hundreds of feet, the height(s) of the significant layer(s) of cloud. The entry in column 35 on Form 1210AB should be made according to code table for h_sh_s which follows:

Symbol h_sh_s -- Height Above Ship of Significant Cloud Layer

Code figure	Feet	Meters	Code figure	Feet	Meters
00	Lower than 100	Lower than 30	85	16,000	5,000
01	100	30	86	20,000	6,000
02	200	60	87	23,000	7,000
03	300	90	88	26,000	8,000
04	400	120	89	30,000 or higher	9,000 or higher
05	500	150			
06	600	180	90	0 to 150	0 to 50
07	700	210	91	150 to 300	50 to 100
08	800	240	92	300 to 600	100 to 200
09	900	270	93	600 to 1,000	200 to 300
10	1,000	300	94	1,000 to 2,000	300 to 600
etc.	etc.	etc.	95	2,000 to 3,000	600 to 1,000
79	7,900	2,370	96	3,000 to 5,000	1,000 to 1,500
80	8,000	2,400	97	5,000 to 6,500	1,500 to 2,000
81	9,000	2,700	98	6,500 to 8,000	2,000 to 2,500
82	Not used	Not used	99	8,000 or more or no clouds	2,500 or more or no clouds
83	10,000	3,000			
84	13,000	4,000			

NOTES: (1) For each code figure 01 to 80, inclusive, in the above table, the height increases 100 feet (30 m.); i.e., figure 21 = 2,100 feet (630 m.); 63 = 6,300 feet (1,890 m.).

(2) Code figures 90 to 99: If the base of cloud is exactly equal to a height given in the table, the higher code figure is used. For example, a height of 600 feet is coded as 93.

When there are no clouds, a dash should be recorded in column 35. However, if the sky is obscured by fog, snowstorm, or other phenomena, the vertical visibility should be estimated and entered in the column 35 (h_sh_s) on Form 1210AB. Observers should note, however, that the group $8N_sCh_sh_s$, which includes data for h_sh_s, should not be included in messages prepared for radio transmission, except when specifically requested by the Weather Bureau.

Difference Between Sea and Air Temperature (T_sT_s): Sea water temperatures should be recorded in column 38 (Sea Water) on Form 1210AB, to the nearest two-tenths degree Farenheit; while the difference between air and sea temperatures, in degrees and tenths should be recorded in column 39. In column 42 (T_sT_s) on Form 1210AB, however, data will be entered as the difference between the air and sea temperatures in whole degrees Farenheit according to Scale 00-99. No code table is necessary.

When the air temperature is below the sea temperature, 50 is added to the value of the difference before coding and entering these data on the form. For example: If the air temperature is 5° F. above the sea temperature, T_sT_s is coded as 05; if air temperature is 11° F. below the sea temperature reading, T_sT_s is coded as 61, i.e., 11 + 50.

If sea temperatures are made from a Centigrade thermometer, the data should be read to the nearest tenth of a degree and converted to Farenheit values before entry in columns 38 and 42 on the form. See Table 4 in the Appendix.

Procedures for observing sea water temperatures, however, will be found in Circular M, 7th Edition, pages 49-50.

DEW POINT TEMPERATURE

Dew Point Temperature (T_dT_d): After the dew point temperature has been computed, the data, in degrees and tenths, Farenheit, should be entered in column 40 (Dew Point, Tenths) on Form 1210AB. Recording of the dew point temperature in column 43 (T_dT_d) and coding in radio messages, however, should be to the nearest whole degree Farenheit according to Scale 00 to 99.

Instructions for observing dry- and wet-bulb temperatures are contained in Circular M, 7th Edition, pages 48-52. The wet-bulb temperature reading at the time of observation, in degrees and tenths, Fahrenheit, should be entered in column 37 on Form 1210AB.

Dew Point: The dew point is defined as that temperature to which a given mixed volume of air and vapor must be reduced before saturation occurs, and results, after further reduction of temperature, in the condensation of some of the moisture in the form of dew, fog, frost, clouds, or precipitation.

Method of Computing Dew Point: The dry- and wet-bulb readings together form the basis for computing the dew point temperature. It should be kept in mind, however, that during dense, thick or moderate fog, it will often be found that no depression of the wet-bulb thermometer results. In such cases, the dew point temperature is the same as the temperature recorded by the dry-bulb. Hence, no computation is necessary.

To compute dew point temperatures, the following may be helpful:

Example 1: Dry-bulb ..... 46.0°
Wet-bulb ..... 43.0°
Depression ... 3.0°

Next turn to Table 7 in the Appendix, and in the column headed "Air Temperature", find the temperature reading 46°. Now continue in a line across the table until the vertical column under the depression 3.0 is reached. We see that the dew point temperature is 40, when the air temperature is 46.0° and the depression of the wet-bulb temperature is 3.0°.

In column 40 on Form 1210AB should be entered 40.0°, while in column 43 (T_dT_d) 40 (whole degrees) should be recorded.

Example 2: Dry-bulb ..... 49.2°
Wet-bulb ..... 47.7°
Depression ... 1.5°

Find the dry-bulb temperature 49° in the column headed "Air Temperature" in Table 7. Now continue in a line across the table until the vertical column under a depression 1.5° is reached. For a dry-bulb temperature of 49° and a depression of 1.5°, the dew point temperature is 46. We must now make a simple interpolation to obtain the dew point for the dry-bulb reading of 49.2°. We also note from the table that with a dry-bulb temperature of 50° and a depression of 1.5°, the dew point is 47°. Comparing the dew point temperatures at 49° and 50° as shown in the vertical column under a depression of 1.5°, we see that there is a difference of 1° between 46 and 47. We then multiply .2 (the tenths digit of 49.2) times 1 (the difference between 46 and 47), which equals .2. Adding 46.0° + .2°, the exact dew point temperature to be entered in column 40 on Form 1210AB would be 46.2° and in column 43 (T_dT_d), 46.

Example 3: Dry-bulb ..... 55.7°
Wet-bulb ..... 43.5°
Depression ... 12.2°

Find the temperatures 55 and 56 in the column headed "Air Temperature" in Table 7. Then continue in a line across the table until the vertical columns under depressions 12.0° and 12.5° are reached. We note that the table reads as follows:

Air Temperature	Depression 12.0	12.5
55	27	25
56	29	27

We must first determine the dew point for the air temperature of 55.7° and depressions of 12.0° and 12.5°, respectively. With an increase of one degree in the air temperature (55 to 56), we see that the dew point range is two degrees for depressions of 12.0° and 12.5°. Hence, at 55.7° with a depression of 12.0°, the dew point is 28.4°; i.e., 27.0° + 1.4°; with a depression of 12.5°, it is 26.4°; i.e., 25.0° + 1.4°. The value of 1.4° is obtained by multiplying the tenths digit of the dry-bulb temperature (in this case it is .7°) by the range of dew point for depressions of 12.0° and 12.5°, respectively, which in this case is 2.0°. For example, .7 x 2.0° = 1.4°

We now have the dew points at 55.7° when the depression is 12.0° and 12.5°; that is, 28.4° and 26.4°, respectively. Since the actual depression of the wet-bulb reading is 12.2°, we know that the exact dew point temperature lies between 28.4° and 26.4°, a range of 2°.

We next note that the actual depression 12.2° is only two-fifths or .4 of the range between 12.0 and 12.5 shown at the top of the vertical columns. Now we multiply .4 x 2° (2° being the range between 28.4° and 26.4°) or .8 and subtract this result from 28.4°. The actual dew point at 55.7° with a depression of 12.2 is then 27.6°; that is, 28.4° - .8°. The correct entry in column 40 on Form 1210AB would be 27.6 and in column 43 (T_dT_d), would be 28.

Example 4: Dry-bulb ..... 66.9°
Wet-bulb ..... 63.2°
Depression ... 3.7°

Find the temperatures 66° and 67° in the column headed "Air Temperature" in Table 7. Then continue in a line across the table until the vertical columns under depressions 3.5° and 4.0° are reached. We note that the table reads as follows:

Air Temperature	Depression 3.5	4.0
66	60	60
67	62	61

We must first determine the dew point for the air temperature at 66.9° and depressions of 3.5° and 4.0°, respectively. With an increase of one degree in the air temperature (66 to 67), we see that the dew point range is two degrees for a depression of a 3.5° but only a range of one degree for a depression 4.0°. Hence, at 66.9° with a depression of 3.5°, the dew point is 61.8°; i.e., 60.0° + 1.8°; with a depression of 4.0°, it is 60.9°; i.e., 60.0° + 0.9°. The value of 1.8° is obtained by multiplying the tenths digit of the dry-bulb temperature (in this case it is .9°) by the range of dew point between 66° and 67° with a depression of 3.5°, which in this case is .2°. For example, .9 x 2.0° = 1.8°. The value of .9° added to 60.0° is obtained by multiplying the tenths digit of the dry temperature (in this case it is .9°) by the range of dew point between 66° and 67° with a depression of 4.0°, which in this case is 1°. For example, .9 x 1° = .9°

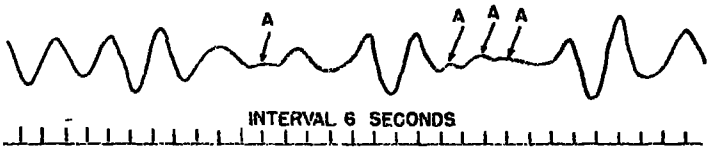
We now have dew points at 66.9° when the depression is 3.5° and 4.0°; that is, 61.8° and 60.9°, respectively. Since the actual depression of the wet-bulb reading is 3.7°, we know that the exact dew point lies between 61.8° and 60.9°, a range of 0.9°.

We next note that the actual depression 3.7° is only two-fifths or .4 of the range between 3.5° and 4.0° as shown at the top of the vertical columns. Now we multiply 0.4 x 0.9° (0.9° being the difference between 61.8° and 60.9°) or 0.36° and subtract this result from 61.8°. The actual dew point at the air temperature of 66.9° with a depression of 3.7° is then 60.44°; that is, 61.8° - 0.36°. The correct entry in the column 40 on Form 1210AB would be 60.4 and in column 43 (T_dT_d), would be 60.

WAVES

Under certain conditions it has been difficult for ships' weather observers to distinguish between swell waves (any system of waves not caused by local conditions) and sea waves resulting from local winds. Hence, observers will hereafter record the direction, period and height of the waves which they can see without trying to distinguish between sea and swell. If more than one system of waves is observed, that is, waves travelling in different direction, data for direction (d_wd_w), period (P_w) and height (H_w) of each system of waves should be recorded on Form 1210AB. Of course, during periods of darkness, some wave elements cannot be determined. In such cases, X's should be recorded in the appropriate columns on the form.

The graph below is a typical record made by a wave recorder. It shows variation of the height of the sea surface above a fixed point such as would be shown by the up and down movement of a floating body on the sea surface. It gives a representation of the normal sea surface, as waves invariably travel in irregular groups with areas almost calm of two or more wavelengths between the groups. In observing waves, it is essential for the observer to note the period and height of the highest waves in the center of each group; the flat or badly formed waves shown in the diagram between the higher waves should be disregarded when taking observations.



Direction of Waves (d_wd_w): The direction FROM WHICH waves come can be observed by sighting along their crests and adding or subtracting 90° from the direction in which the crests lie. The direction should be recorded in column 45 on Form 1210AB, in 10's of degrees, according to Scale 01-36. See code table for d_wd_w, page 7. When waveheights observed exceed 15 feet, 50 should be added to code figure for d_wd_w provided the data are to be sent in the radio message. In addition, it should be noted that when the direction of waves is indeterminate, d_wd_w should be entered and coded as 49 when waveheights are estimated to be less than 15 feet and 99 for waveheights above 15 feet.

Period of Waves (P_w): The period of waves is the only characteristic which can be measured accurately from shipboard and for that purpose, a stop watch is needed. However, fairly accurate measurements of wave periods can be made if the observer possesses a good wrist or pocket watch having a second hand. The observer should first note some small object floating on the water off the bow at some distance from the ship or, if this is impossible, a distinctive patch of foam can be used to obtain the wave period during the few minutes required for the observation. When the object or patch of foam appears on the crest of the wave, the stop watch should be started or the time noted, if an ordinary watch is used. As the crest of the wave passes, the object or foam will disappear into the trough and reappear on the next wave crest. The time at which the object appears at the top of each wave crest should be noted and this procedure should be continued until the periods of about 15 to 20 well-formed waves have been observed. The average of the individual wave periods should then be recorded in column 46 on Form 1210AB by consulting the code table for P_w. With wave periods of less than 5 seconds, accompanied with light winds, observations may be difficult but observers should enter the best estimate.

If there are no waves, i.e., the sea is calm, the letter "C" should be entered in column 46 but if the period is indeterminate, an "X" should be recorded. If the messages are to be sent by radio, "calm" or "period indeterminate" is coded as "X".

Symbol P_w -- Period of Waves

Code figures	Period
2	5 seconds or less
3	5 to 7 seconds
4	7 to 9 seconds
5	9 to 11 seconds
6	11 to 13 seconds
7	13 to 15 seconds
8	15 to 17 seconds
9	17 to 19 seconds
0	19 to 21 seconds
1	Over 21 seconds
x	Calm or period unable to be determined.

NOTE: If the exact number of seconds for the period of the waves corresponds to 2 code figures, the lower code figure is reported.

Height of Waves (H_w): Reliable estimates of waveheights can be made by observers after some experience. The mean maximum height of 15 to 20 well-formed waves should be recorded in column 47 on Form 1210AB. When waves are small compared to the length of the vessel, the following procedure is suggested. The observer should take a position at the lowest possible point, preferably amidship, where pitching of the vessel is at a minimum and also on the side of the vessel toward which the waves are approaching. In estimating the height of waves, advantage should be taken of the intervals which occur now and then when rolling of the ship temporarily ceases.

In cases of waves longer than the ship, this method fails because the ship as a whole rises over the waves. Accordingly, the following procedure is recommended. The observer should take a position so that when the vessel is on an even keel and in the trough of a wave, the approaching wave crest appears to be approximately on a level with the observer's eye and the horizon. The waveheight is then equal to the distance of the observer's eye above the water level which can be readily estimated. For example: If the height of the observer's eye is 10 feet above the trough and the next crest is level with the horizon, the waveheight is 10 feet.

Of course, when the ship is rolling, the estimated measurement of waveheight should be made at the instant when the vessel is on an even keel and the crest of the wave is in line with the horizon; otherwise, the estimate of waveheight will be too large.

Waveheights should be entered in column 47 on Form 1210AB according to Scale 0-9 except when the sea is calm, a "C" should be recorded. Observers are reminded, however, that if the waveheights exceed 15 feet, 50 is added to the code figure for $d_w d_w$ if the data are to be sent in the radio message. If the height of waves is indeterminate, H_w should be recorded and coded as "X" according to the code table which follows.

Symbol H_W -- Mean Maximum Height of Waves

Code figures	Height
0	Less than 1 foot (1/4 meter)
1	1-1/2 feet (1/2 meter)
2	3 feet (1 meter)
3	5 feet (1-1/2 meters)
4	6-1/2 feet (2 meters)
5	8 feet (2-1/2 meters)
6	9-1/2 feet (3 meters)
7	11 feet (3-1/2 meters)
8	13 feet (4 meters)
9	14 feet (4-1/2 meters)
x	Height impossible to determine.
	(When 50 is added to $d_W d_W$, the height of waves is as follows:)
0	16 feet (5 meters)
1	17-1/2 feet (5-1/2 meters)
2	19 feet (6 meters)
3	21 feet (6-1/2 meters)
4	22-1/2 feet (7 meters)
5	24 feet (7-1/2 meters)
6	25-1/2 feet (8 meters)
7	27 feet (8-1/2 meters)
8	29 feet (9 meters)
9	30-1/2 feet (9-1/2 meters)
x	Height impossible to determine.

NOTES: (1) Each code figure except "zero" covers a range of 3/4 meter; e.g., code figure 1 = 1/4 meter to 3/4 meter, code figure 2 = 3/4 meter to 1-1/4 meters.

(2) If the waveheight is exactly between the heights corresponding to 2 code figures, the lower code figure is reported.

(3) For waveheights greater than 31 feet (9-3/4 meters), the code figure for 30-1/2 feet (9-1/2 meters) is reported followed by the word "WAVES" and the actual height of the waves in feet or meters; e.g., "WAVES 37".

ICE

The new code provides for including information concerning ice whenever observed in weather reports from ships at sea. The information is added to the end of the message in plain language or by employing the group "c_2KD_ire". This group has no identifying figure; hence, if ice information is included in the radio message, the plain language remarks or the group "c_2KD_ire" must be preceded by the word "ICE". However, ice data, when observed, are to be recorded on Form 1210AB but observers should not include the ice group in their radio messages except when specifically requested by the Weather Bureau.

Descriptions of Kind of Ice (c_2): The various descriptions for kinds of ice shown in the table which follows are self-explanatory and observers should experience no difficulty in observing and recording these data in column 48 on Form 1210AB.

Symbol c_2 -- Description of Kind of Ice

Code figures	Description
0	No ice: ("0" will be used to report "ice blink", and then a direction must be reported.)
1	Slush or young ice
2	Fast ice
3	Drift ice
4	Packed (compact) slush or strips of hummock ice
5	Open lead near shore
6	Heavy fast ice
7	Heavy drift ice
8	Hummocked ice
9	Ice jamming

Effect on Navigation (K): These data should be recorded in column 49 according to the code table below. No special instructions appear necessary.

Symbol K -- Effect of the Ice on Navigation

Code figures	Description
0	Navigation unobstructed
1	Navigation unobstructed for steamers; difficult for sailing ships
2	Navigation difficult for low powered steamers; closed to sailing ships
3	Navigation possible only for powerful steamers
4	Navigation possible only for steamers constructed to withstand ice pressure
5	Navigation possible with the assistance of icebreakers
6	Channel open in the solid ice
7	Navigation temporarily closed
8	Navigation closed
9	Navigation conditions unknown (e.g., owing to bad weather)

Bearing of Ice Limit (D_i): The bearing of ice limit should be recorded in column 50 on Form 1210AB according to the code table below. If more than one ice limit is observed, data for each limit should be recorded. In such cases, additional data for symbols c_2, K, r and e will also be required for entry in the respective columns on the form.

Symbol D_i -- Bearing of Ice Limit

Code figures	Description
0	No ice limit can be stated.
1	Ice limit towards NE
2	Ice limit towards E
3	Ice limit towards SE
4	Ice limit towards S
5	Ice limit towards SW
6	Ice limit towards W
7	Ice limit towards NW
8	Ice limit towards N
9	Ice limit in several directions

NOTE: If more than 1 ice limit can be stated, the nearest or most important is reported.

Distance to Ice Limit from Reporting Ship (r): The distance to the ice limit from the ship should be estimated in nautical miles and recorded in column 51 on Form 1210AB according to the code table which follows:

Symbol r -- Distance to Ice Limit from Reporting Ship

Code figures	Distance
0	Up to 1 mile
1	1 to 2 miles
2	2 to 4 miles
3	4 to 6 miles
4	6 to 8 miles
5	8 to 12 miles
6	12 to 16 miles
7	16 to 20 miles
8	More than 20 miles
9	Unspecified or no observations

NOTE: If the exact bounding distance for the ice limit corresponds to 2 code figures, the lower code figure is reported.

Orientation of Ice Limit (e): The descriptions given in the accompanying code table are self-explanatory. A code figure should be used for entry of data in column 52 on Form 1210AB.

Symbol e -- Orientation of Ice Limit

Code figures	Orientation of Ice Limit
0	Orientation of ice limit impossible to estimate -- ship outside the ice
1	Ice edge lying in a direction NE to SW with ice situated to the NW
2	Ice edge lying in a direction E to W with ice situated to the northward
3	Ice edge lying in a direction SE to NW with ice situated to the NE
4	Ice edge lying in a direction S to N with ice situated to the eastward
5	Ice edge lying in a direction SW to NE with ice situated to the SE
6	Ice edge lying in a direction W to E with ice situated to the southward
7	Ice edge lying in a direction NW to SE with ice situated to the SW
8	Ice edge lying in a direction N to S with ice situated to the westward
9	Orientation of ice limit impossible to estimate -- ship inside the ice

GALE, STORM, FOG AND PRECIPITATION REPORTS

Gales and storms: A summary of every gale encountered should be entered in the spaces provided on the form. Gale or storm, reports are desired for winds reaching force 8, Beaufort scale, except that in tropical seas reports for winds of force 6 or higher are requested. Special accounts of storms may be prepared on a separate sheet and attached to the form. The report should especially include shifts of wind, lowest barometer, highest wind force, and also the time and ship's position and course when each occurred. Reports of this character are very useful in determining the intensity of the storm and the exact course of the center, and particularly valuable for storms of tropical origin.

Fogs: The local date and hour of entering and emerging from fog should be given in the Fog Report, together with other special information, as indicated by the headings. Under the heading "General character of fog" should be entered a word, or words, to indicate character, whether dry, wet, light, dense, low, spotted, or in banks. In case no fog is observed during the period covered by the report, a statement should be made to that effect. Negative information is sometimes of much value.

Precipitation: The beginning and ending of precipitation periods, in local date and hour, its character, whether drizzle, rain, snow, or showers and visibility data should be entered under this heading. Entries in the space provided for "Amount of Precipitation" should be omitted unless an actual measurement can be made. If the vessel is equipped with a rain gage, 12-hour precipitation amounts, in hundredths of inches, for periods ending at 00 and 12 hours G.C.T. should be recorded.

○

APPENDIX

TABLE 1.—*Correction of mercurial barometer for temperature (English measures)*

ADD

Temp. ° F.	Observed reading (inches)					Temp. ° F.	Observed reading (inches)				
	28.5	29.0	29.5	30.0	30.5		28.5	29.0	29.5	30.0	30.5
0	0.07	0.08	0.08	0.08	0.08	16	0.03	0.03	0.03	0.03	0.04
1	.07	.07	.07	.08	.08	17	.03	.03	.03	.03	.03
2	.07	.07	.07	.07	.07	18	.03	.03	.03	.03	.03
3	.07	.07	.07	.07	.07	19	.02	.02	.03	.03	.03
4	.06	.06	.07	.07	.07	20	.02	.02	.02	.02	.02
5	.06	.06	.06	.06	.07	21	.02	.02	.02	.02	.02
6	.06	.06	.06	.06	.06	22	.02	.02	.02	.02	.02
7	.06	.06	.06	.06	.06	23	.02	.02	.02	.02	.02
8	.05	.05	.06	.06	.06	24	.01	.01	.01	.01	.01
9	.05	.05	.05	.05	.05	25	.01	.01	.01	.01	.01
10	.05	.05	.05	.05	.05	26	.01	.01	.01	.01	.01
11	.05	.05	.05	.05	.05	27	------	------	------	------	------
12	.04	.04	.04	.04	.05	28	------	------	------	------	------
13	.04	.04	.04	.04	.04	29	------	------	------	------	------
14	.04	.04	.04	.04	.04	30	------	------	------	------	------
15	.04	.04	.04	.04	.04						

SUBTRACT

Temp. ° F.	Observed reading (inches)					Temp. ° F.	Observed reading (inches)				
	28.5	29.0	29.5	30.0	30.5		28.5	29.0	29.5	30.0	30.5
31	0.01	0.01	0.01	0.01	0.01	66	0.10	0.10	0.10	0.10	0.10
32	.01	.01	.01	.01	.01	67	.10	.10	.10	.10	.11
33	.01	.01	.01	.01	.01	68	.10	.10	.10	.11	.11
34	.01	.01	.01	.02	.02	69	.10	.11	.11	.11	.11
35	.02	.02	.02	.02	.02	70	.11	.11	.11	.11	.11
36	.02	.02	.02	.02	.02	71	.11	.11	.11	.12	.12
37	.02	.02	.02	.02	.02	72	.11	.11	.12	.12	.12
38	.02	.02	.02	.03	.03	73	.11	.12	.12	.12	.12
39	.03	.03	.03	.03	.03	74	.12	.12	.12	.12	.12
40	.03	.03	.03	.03	.03	75	.12	.12	.12	.13	.13
41	.03	.03	.03	.03	.03	76	.12	.12	.13	.13	.13
42	.04	.04	.04	.04	.04	77	.12	.13	.13	.13	.13
43	.04	.04	.04	.04	.04	78	.13	.13	.13	.13	.14
44	.04	.04	.04	.04	.04	79	.13	.13	.14	.14	.14
45	.04	.04	.04	.04	.04	80	.13	.14	.14	.14	.14
46	.04	.05	.05	.05	.05	81	.14	.14	.14	.14	.14
47	.05	.05	.05	.05	.05	82	.14	.14	.14	.14	.15
48	.05	.05	.05	.05	.05	83	.14	.14	.14	.15	.15
49	.05	.05	.05	.06	.06	84	.14	.14	.15	.15	.15
50	.06	.06	.06	.06	.06	85	.15	.15	.15	.15	.16
51	.06	.06	.06	.06	.06	86	.15	.15	.15	.16	.16
52	.06	.06	.06	.06	.06	87	.15	.15	.16	.16	.16
53	.06	.06	.06	.07	.07	88	.15	.16	.16	.16	.16
54	.06	.07	.07	.07	.07	89	.16	.16	.16	.16	.17
55	.07	.07	.07	.07	.07	90	.16	.16	.16	.17	.17
56	.07	.07	.07	.07	.08	91	.16	.16	.17	.17	.17
57	.07	.08	.08	.08	.08	92	.16	.17	.17	.17	.18
58	.08	.08	.08	.08	.08	93	.17	.17	.17	.17	.18
59	.08	.08	.08	.08	.08	94	.17	.17	.17	.18	.18
60	.08	.08	.08	.08	.09	95	.17	.17	.18	.18	.18
61	.08	.08	.09	.09	.09	96	.17	.18	.18	.18	.19
62	.09	.09	.09	.09	.09	97	.18	.18	.18	.18	.19
63	.09	.09	.09	.09	.10	98	.18	.18	.18	.19	.19
64	.09	.09	.10	.10	.10	99	.18	.18	.19	.19	.19
65	.09	.10	.10	.10	.10	100	.18	.19	.19	.19	.20

TABLE 2.—*Reduction of barometric reading to mean sea level*

[Reading, 30 inches. The correction is always to be added]

Height in feet	Temperature of air (dry bulb)									
	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
5	0.01	0.01	0.01	0.01	0.01	0.01	0.01			
10	.01	.01	.01	.01	.01	.01	.01	0.01	0.01	0.01
15	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
20	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
25	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
30	.04	.04	.04	.04	.03	.03	.03	.03	.03	.03
35	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04
40	.05	.05	.05	.05	.04	.04	.04	.04	.04	.04
45	.06	.05	.05	.05	.05	.05	.05	.05	.05	.05
50	.06	.06	.06	.06	.06	.06	.05	.05	.05	.05
55	.07	.07	.06	.06	.06	.06	.06	.06	.06	.06
60	.07	.07	.07	.07	.07	.07	.06	.06	.06	.06
65	.08	.08	.08	.08	.07	.07	.07	.07	.07	.07
70	.09	.08	.08	.08	.08	.08	.08	.07	.07	.07
75	.09	.09	.09	.09	.08	.08	.08	.08	.08	.08
80	.10	.10	.09	.09	.09	.09	.09	.08	.08	.08
85	.10	.10	.10	.10	.10	.10	.09	.09	.09	.09
90	.11	.11	.11	.10	.10	.10	.10	.10	.09	.09
95	.12	.11	.11	.11	.11	.11	.10	.10	.10	.10
100	.12	.12	.12	.12	.11	.11	.11	.11	.10	.10

TABLE 3.—*Reduction of the mercurial barometer to standard gravity (45°) (30 inches)*

Lat.	Cor.	Lat.	Cor.	Lat.	Cor.	Lat.	Cor.
°	*Inch*	°	*Inch*	°	*Inch*	°	*Inch*
0	−0.08	25	−0.05	45	0.00	70	+0.06
5	−.08	30	−.04	50	+.01	75	+.07
10	−.08	35	−.03	55	+.03	80	+.08
15	−.07	40	−.01	60	+.04	85	+.08
20	−.06	45	0.00	65	+.05	90	+.08

TABLE 4.—*Equivalent temperature (Centigrade and Fahrenheit)*

[C°=temperature Centigrade; F°=temperature Fahrenheit; F°=$\frac{9}{5}$C°+32°]

C°	F°	C°	F°	C°	F°	C°	F°	C°	F°
−10	14.0	0	32.0	10	50.0	20	68.0	30	86.0
−9	15.8	1	33.8	11	51.8	21	69.8	31	87.8
−8	17.6	2	35.6	12	53.6	22	71.6	32	89.6
−7	19.4	3	37.4	13	55.4	23	73.4	33	91.4
−6	21.2	4	39.2	14	57.2	24	75.2	34	93.2
−5	23.0	5	41.0	15	59.0	25	77.0	35	95.0
−4	24.8	6	42.8	16	60.8	26	78.8	36	96.8
−3	26.6	7	44.6	17	62.6	27	80.6	37	98.6
−2	28.4	8	46.4	18	64.4	28	82.4	38	100.4
−1	30.2	9	48.2	19	66.2	29	84.2	39	102.2

TABLE 5.—*Equivalent lengths (millimeters and inches)*

[1 millimeter=0.0393700 inch]

Mm	0	1	2	3	4	5	6	7	8	9
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
690	[a] 27.16	27.20	27.24	27.28	27.32	27.36	27.40	27.44	27.48	27.52
700	27.56	27.60	27.64	27.68	27.72	27.76	27.80	27.84	27.87	27.91
710	27.95	27.99	28.03	28.07	28.11	28.15	28.19	28.23	28.27	28.31
720	28.35	28.39	28.42	28.46	28.50	28.54	28.58	28.62	28.66	28.70
730	28.74	28.78	28.82	28.86	28.90	28.94	28.98	29.02	29.06	29.09
740	29.13	29.17	29.21	29.25	29.29	29.33	29.37	29.41	29.45	29.49
750	29.53	29.57	29.61	29.65	29.68	29.72	29.76	29.80	29.84	29.88
760	29.92	29.96	30.00	30.04	30.08	30.12	30.16	30.20	30.24	30.28
770	30.32	30.35	30.39	30.43	30.47	30.51	30.55	30.59	30.63	30.67
780	30.71	30.75	30.79	30.83	30.87	30.90	30.94	30.98	31.02	31.06
790	31.10	31.14	31.18	31.22	31.26	31.30	31.34	31.38	31.42	31.46

[a] For example, 690 millimeters=27.16 inches

TABLE 6.—*Conversion of millimeters (mm) to millibars (mb)*

Mm.	Mb.	Mm.	Mb.	Mm.	Mb.
696	927.9	726	967.9	756	1,007.9
697	929.3	727	969.3	757	1,009.3
698	930.6	728	970.6	758	1,010.6
699	931.9	729	971.9	759	1,011.9
700	933.3	730	973.3	760	1,013.3
701	934.6	731	974.6	761	1,014.6
702	935.9	732	975.9	762	1,015.9
703	937.3	733	977.3	763	1,017.2
704	938.6	734	978.6	764	1,018.6
705	939.9	735	979.9	765	1,019.9
706	941.3	736	981.3	766	1,021.2
707	942.6	737	982.6	767	1,022.6
708	943.9	738	983.9	768	1,023.9
709	945.3	739	985.3	769	1,025.2
710	946.6	740	986.6	770	1,026.6
711	947.9	741	987.9	771	1,027.9
712	949.3	742	989.3	772	1,029.2
713	950.6	743	990.6	773	1,030.6
714	951.9	744	991.9	774	1,031.9
715	953.3	745	993.3	775	1,033.2
716	954.6	746	994.6	776	1,034.6
717	955.9	747	995.9	777	1,035.9
718	957.3	748	997.3	778	1,037.2
719	958.6	749	998.6	779	1,038.6
720	959.9	750	999.9	780	1,039.9
721	961.3	751	1,001.3	781	1,041.2
722	962.2	752	1,002.6	782	1,042.6
723	963.6	753	1,003.9	783	1,043.9
724	965.3	754	1,005.3	784	1,045.2
725	966.6	755	1,006.6	785	1,046.6

TABLE 7.—*Temperature of dew point in degrees Fahrenheit*

[Pressure=30.0 inches]

Air temperature	Depression of wet-bulb thermometer																
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5
20	18	16	14	12	10	8	5	2	−2	−7	−13	−21	−37				
21	19	18	16	14	12	9	7	3	±0	−4	−9	−16	−27	−60			
22	20	19	17	15	13	11	8	5	+2	−2	−6	−12	−20	−36			
23	21	20	18	16	14	12	10	7	4	±0	−4	−9	−16	−26	−57		
24	23	21	19	17	15	13	11	9	6	+2	−1	−6	−12	−20	−35		
25	24	22	20	19	17	15	13	10	8	5	+1	−3	−8	−15	−25	−51	
26	25	23	22	20	18	16	14	12	9	7	3	−1	−5	−11	−18	−32	
27	26	24	23	21	19	18	16	13	11	8	5	+2	−2	−7	−14	−23	−45
28	27	25	24	22	21	19	17	15	13	10	7	4	±0	−4	−9	−17	−29
29	28	26	25	23	22	20	18	16	14	12	9	6	+3	−1	−5	−12	−20
30	29	27	26	25	23	21	20	18	16	14	11	8	5	+2	−2	−7	−14
31	30	28	27	26	24	23	21	19	17	15	13	10	8	4	±0	−4	−10
32	31	30	28	27	25	24	22	21	19	17	15	12	10	7	+3	−1	−6
33	32	31	29	28	27	25	24	22	20	18	16	14	12	9	6	+2	−2
34	33	32	30	29	28	26	25	23	22	20	18	16	13	11	8	5	+1
35	34	33	31	30	29	28	26	25	23	21	19	17	15	13	10	7	4
36	35	34	32	31	30	29	27	26	24	23	21	19	17	15	12	10	7
37	36	35	33	32	31	30	28	27	26	24	22	21	19	17	14	12	9
38	37	36	34	33	32	31	29	28	27	25	24	22	20	18	16	14	11
39	38	37	35	34	33	32	31	29	28	27	25	23	22	20	18	16	13
40	39	38	37	35	34	33	32	30	29	28	26	25	23	21	20	18	15
41	40	39	38	36	35	34	33	31	30	29	27	26	24	23	21	19	17
42	41	40	39	38	36	35	34	33	31	30	29	27	26	24	23	21	19
43	42	41	40	39	37	36	35	34	32	31	30	28	27	25	24	22	20
44	43	42	41	40	38	37	36	35	34	32	31	30	28	27	25	24	22
45	44	43	42	41	40	38	37	36	35	34	32	31	30	28	27	25	23
46	45	44	43	42	41	40	38	37	36	35	33	32	31	29	28	27	25
47	46	45	44	43	42	41	40	38	37	36	35	33	32	31	29	28	26
48	47	46	45	44	43	42	41	40	38	37	36	35	33	32	31	29	28
49	48	47	46	45	44	43	42	41	40	38	37	36	34	33	32	30	29
50	49	48	47	46	45	44	43	42	41	40	38	37	36	34	33	32	30
51	50	49	48	47	46	45	44	43	42	41	40	38	37	36	34	33	32
52	51	50	49	48	47	46	45	44	43	42	41	40	38	37	36	34	33
53	52	51	50	49	48	47	46	45	44	43	42	41	40	38	37	36	34
54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	38	37	36
55	54	53	52	51	50	50	49	48	47	45	44	43	42	41	40	38	37
56	55	54	53	53	52	51	50	49	48	47	46	44	43	42	41	40	39
57	56	55	54	54	53	52	51	50	49	48	47	46	45	43	42	41	40
58	57	56	55	55	54	53	52	51	50	49	48	47	46	45	44	42	41
59	58	57	56	56	55	54	53	52	51	50	49	48	47	46	45	44	43
60	59	58	57	57	56	55	54	53	52	51	50	49	48	47	46	45	44
61	60	59	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45
62	61	60	60	59	58	57	56	55	54	53	53	52	51	50	48	47	46
63	62	61	61	60	59	58	57	56	55	55	54	53	52	51	50	49	48
64	63	62	62	61	60	59	58	57	57	56	55	54	53	52	51	50	49
65	64	63	63	62	61	60	59	59	58	57	56	55	54	53	52	51	50
66	65	64	64	63	62	61	60	60	59	58	57	56	55	54	53	52	51
67	66	65	65	64	63	62	62	61	60	59	58	57	56	55	54	53	53
68	67	67	66	65	64	63	63	62	61	60	59	58	57	57	56	55	54
69	68	68	67	66	65	64	64	63	62	61	60	59	59	58	57	56	55
70	69	69	68	67	66	65	65	64	63	62	61	61	60	59	58	57	56
71	70	70	69	68	67	67	66	65	64	63	62	62	61	60	59	58	57
72	71	71	70	69	68	68	67	66	65	64	64	63	62	61	60	59	58
73	72	72	71	70	69	69	68	67	66	66	65	64	63	62	61	60	60
74	73	73	72	71	70	70	69	68	67	67	66	65	64	63	62	62	61
75	74	74	73	72	71	71	70	69	68	68	67	66	65	64	64	63	62
76	75	75	74	73	72	72	71	70	69	69	68	67	66	66	65	64	63
77	76	76	75	74	73	73	72	71	71	70	69	68	67	67	66	65	64
78	77	77	76	75	75	74	73	72	72	71	70	69	69	68	67	66	65
79	78	78	77	76	76	75	74	73	73	72	71	70	70	69	68	67	66
80	79	79	78	77	77	76	75	74	74	73	72	72	71	70	69	68	68

TABLE 7.—*Temperature of dew point in degrees Fahrenheit*—Continued

[Pressure=30.0 inches]

Air temperature	Depression of wet-bulb thermometer														
	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0
30	−7	−14	−25	−57											
31	−4	−10	−18	−31											
32	−1	−6	−12	−21	−42										
33	+2	−2	−7	−14	−26										
34	5	+1	−3	−9	−17	−32									
35	7	4	±0	−5	−11	−20	−41								
36	10	7	+3	−1	−6	−14	−25	−58							
37	12	9	6	+2	−3	−8	−16	−29							
38	14	11	8	5	+1	−4	−10	−19	−36						
39	16	13	11	8	4	±0	−5	−12	−22	−47					
40	18	15	13	10	7	+3	−1	−6	−14	−26					
41	19	17	15	12	10	6	+2	−2	−8	−16	−30				
42	21	19	17	14	12	9	6	+2	−3	−9	−18	−36			
43	22	20	19	16	14	11	9	5	+1	−4	−11	−21	−45		
44	24	22	20	18	16	13	11	8	4	±0	−5	−12	−24	−60	
45	25	23	22	20	18	15	13	10	7	+4	−1	−6	−14	−27	
46	27	25	23	21	20	17	15	13	10	7	+3	−2	−7	−16	−30
47	28	26	25	23	21	19	17	15	12	9	6	+2	−3	−9	−17
48	29	28	26	25	23	21	19	17	14	12	9	5	+1	−4	−10
49	30	29	28	26	24	23	21	19	16	14	11	8	5	±0	−5
50	32	30	29	27	26	24	22	21	18	16	13	11	8	+4	±0
51	33	32	30	29	27	26	24	22	20	18	16	13	10	7	+3
52	34	33	32	30	29	27	26	24	22	20	18	16	13	10	7
53	36	34	33	32	30	29	27	26	24	22	20	18	15	13	10
54	37	36	34	33	32	30	29	27	25	24	22	20	18	15	12
55	38	37	36	34	33	32	30	29	27	25	24	22	20	17	15
56	40	39	37	36	34	33	32	30	29	27	25	24	22	19	17
57	41	40	39	37	36	34	33	32	30	29	27	25	24	21	19
58	42	41	40	39	37	36	35	33	32	30	29	27	25	23	21
59	44	43	41	40	39	37	36	35	33	32	30	29	27	25	23
60	45	44	43	41	40	39	38	36	35	33	32	30	29	27	25
61	46	45	44	43	42	40	39	38	36	35	33	32	30	29	27
62	47	46	45	44	43	42	40	39	38	36	35	33	32	30	29
63	49	48	47	45	44	43	42	41	39	38	36	35	34	32	30
64	50	49	48	47	46	44	43	42	41	39	38	37	35	34	32
65	51	50	49	48	47	46	45	43	42	41	40	38	37	35	34
66	52	51	50	49	48	47	46	45	44	42	41	40	38	37	35
67	53	53	52	50	49	48	47	46	45	44	43	41	40	38	37
68	55	54	53	52	51	50	49	48	46	45	44	43	42	40	39
69	56	55	54	53	52	51	50	49	48	46	45	44	43	42	40
70	57	56	55	54	53	52	51	50	49	48	47	46	44	43	42
71	58	57	56	55	54	53	52	51	50	49	48	47	46	45	43
72	59	58	58	57	56	55	54	53	52	51	50	48	47	46	45
73	60	60	59	58	57	56	55	54	53	52	51	50	49	48	46
74	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
75	63	62	61	60	59	58	57	56	55	55	54	52	51	50	49
76	64	63	62	61	60	60	59	58	57	56	55	54	53	52	51
77	65	64	64	62	62	61	60	59	58	57	56	55	54	53	52
78	66	65	64	64	63	62	61	60	59	58	57	56	55	54	53
79	67	66	66	65	64	63	62	61	60	59	59	58	57	56	55
80	68	68	67	66	65	64	63	63	62	61	60	59	58	57	56

Air temperature	Depression of wet-bulb thermometer														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
80	79	77	76	74	73	72	70	68	67	65	63	62	60	58	56
81	80	78	77	75	74	73	71	70	68	66	65	63	61	59	57
82	81	79	78	77	75	74	72	71	69	67	66	64	62	60	59
83	82	80	79	78	76	75	73	72	70	69	67	65	64	62	60
84	83	81	80	79	77	76	74	73	71	70	68	66	65	63	61
85	84	82	81	80	78	77	75	74	72	71	69	68	66	64	62
86	85	83	82	81	79	78	76	75	73	72	70	69	67	65	64
87	86	84	83	82	80	79	78	76	75	73	72	70	68	67	65
88	87	85	84	83	81	80	79	77	76	74	73	71	69	68	66
89	88	86	85	84	82	81	80	78	77	75	74	72	71	69	67
90	89	87	86	85	83	82	81	79	78	76	75	73	72	70	69

Table 8 -- Table for Obtaining the True Direction and Force of the Wind From the Deck of a Moving Vessel

Apparent force of the wind (Beaufort Scale)	Speed of vessel (knots)	Apparent direction of the wind (degrees off the bow)																																	
		0°		10°		20°		30°		40°		50°		60°		70°		80°		90°		100°		110°		120°		130°		140°		150°		160°		170°		180°	
		True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale	True direction, degrees off the bow	True force, Beaufort Scale
0	10	180	3																																
	15	180	4																																
	20	180	5																																
	25	180	6																																
	30	180	7																																
	35	180	8																																
1	10	180	3	178	3	175	3	173	3	171	3	170	3	169	3	169	3	168	3	168	3	169	4	170	4	171	4	172	4	173	4	175	4	177	4	178	4	180	4
	15	180	4	179	4	177	4	176	4	175	4	174	4	173	4	173	4	172	4	172	4	173	4	173	4	174	4	175	4	175	4	176	5	178	5	179	5	180	5
	20	180	5	179	5	178	5	177	5	176	5	175	5	175	5	174	5	174	5	174	5	174	5	175	5	175	5	176	5	176	6	177	6	178	6	179	6	180	6
	25	180	6	179	6	178	6	178	6	177	6	176	6	176	6	176	6	176	6	176	6	176	6	176	6	176	6	177	6	177	6	178	6	179	6	179	6	180	6
	30	180	7	179	7	179	7	178	7	178	7	177	7	177	7	177	7	176	7	176	7	176	7	176	7	177	7	177	7	178	7	178	7	179	7	179	7	180	7
	35	180	7	179	7	179	7	178	7	178	7	177	8	177	8	177	8	177	8	177	8	177	8	177	8	177	8	177	8	178	8	178	8	179	8	180	8	180	8
2	10	180	2	170	2	162	2	156	2	153	3	151	3	150	3	151	3	152	3	153	4	156	4	158	4	161	4	164	4	167	4	170	4	173	4	177	4	180	4
	15	180	3	175	3	171	3	167	4	164	4	162	4	161	4	161	4	161	4	162	4	163	5	164	5	166	5	168	5	170	5	173	5	175	5	177	5	180	5
	20	180	4	177	4	174	4	171	4	169	4	167	5	166	5	166	5	166	5	166	5	167	5	168	6	169	6	171	6	172	6	174	6	176	6	178	6	180	6
	25	180	5	178	5	175	5	173	5	171	5	170	6	169	6	169	6	169	6	169	6	170	6	170	6	171	7	172	7	174	7	175	7	177	7	178	7	180	7
	30	180	6	178	6	176	6	175	6	173	6	172	6	172	7	171	7	171	7	171	7	171	7	172	7	173	7	174	7	175	8	176	8	177	8	179	8	180	8
	35	180	7	178	7	177	7	175	7	174	7	173	7	173	7	172	8	172	8	172	8	172	8	173	8	173	8	174	8	175	8	176	8	178	8	179	8	180	8
3	10	180	1	140	1	127	2	123	3	126	3	129	3	132	4	136	4	140	4	145	4	148	4	153	4	157	5	162	5	166	5	171	5	176	5	180	5		
	15	180	2	169	3	159	3	152	3	148	3	146	4	146	4	147	4	148	4	150	5	153	5	156	5	159	5	162	5	166	6	169	6	173	6	176	6	180	6
	20	180	4	174	4	166	4	161	4	158	4	156	4	155	5	155	5	156	5	157	6	159	6	161	6	163	6	165	6	168	6	171	7	174	7	177	7	180	7
	25	180	4	175	5	170	5	167	5	164	5	162	5	161	6	160	6	161	6	161	6	163	7	164	7	166	7	168	7	170	7	173	7	175	7	178	7	180	8
	30	180	6	177	6	173	6	170	6	167	6	165	6	164	6	164	7	164	7	164	7	165	7	166	8	168	8	170	8	172	8	174	8	176	8	178	8	180	8
	35	180	6	177	6	174	6	171	7	169	7	168	7	167	7	166	7	166	8	166	8	167	8	168	8	169	8	171	9	173	9	174	9	176	9	178	9	180	9
4	10	0	2	36	2	69	2	75	3	88	3	97	3	106	4	113	4	120	4	127	5	133	5	139	5	145	6	151	6	157	6	163	6	169	6	174	6	180	6
	15	180	1	126	1	115	2	116	3	118	3	121	4	125	4	129	4	134	5	138	5	143	6	147	6	152	6	156	6	161	6	166	7	171	7	176	7	180	7
	20	180	2	161	3	148	3	141	4	138	4	137	4	139	5	141	5	143	6	146	6	149	6	153	7	156	7	160	7	164	7	168	7	172	7	176	7	180	8
	25	180	4	169	4	160	4	153	4	150	5	148	5	148	6	148	6	150	6	152	7	154	7	157	7	160	8	163	8	166	8	170	8	173	8	177	8	180	8
	30	180	4	173	5	166	5	160	5	157	5	155	6	154	6	154	7	155	7	156	7	158	8	160	8	162	8	165	8	168	9	171	9	174	9	177	9	180	9
	35	180	6	174	6	169	6	164	6	161	6	159	7	158	7	158	7	158	8	159	8	160	8	162	9	164	9	167	9	169	9	172	9	175	10	177	10	180	10
5	10	0	3	22	3	40	3	56	4	70	4	81	4	92	5	101	5	110	5	118	6	126	6	133	6	140	6	147	6	154	7	160	7	167	7	173	7	180	7
	15	0	2	38	2	63	3	79	3	90	4	99	4	107	5	114	5	121	6	127	6	134	6	140	7	146	7	151	7	157	7	163	7	169	8	174	8	180	8
	20	180	1	111	2	108	3	111	3	114	4	118	4	123	5	127	6	132	6	137	7	141	7	146	7	151	8	156	8	161	8	165	8	170	8	175	8	180	8
	25	180	2	153	3	138	3	132	4	131	4	131	5	133	6	136	6	139	7	142	7	146	8	151	8	155	8	159	8	163	9	167	9	171	9	176	9	180	9
	30	180	4	164	4	152	4	145	4	142	5	141	6	141	6	143	7	145	7	148	8	151	8	154	9	157	9	161	9	165	9	168	9	172	10	176	10	180	10
	35	180	4	169	4	159	5	153	5	149	6	147	6	147	7	148	8	149	8	151	8	154	9	157	9	160	9	163	10	166	10	170	10	173	10	177	10	180	10
6	10	0	4	17	4	33	4	48	5	61	5	73	5	84	5	94	6	104	6	112	6	121	7	129	7	136	7	144	7	151	7	159	8	166	8	173	8	180	8
	15	0	3	24	3	46	4	63	4	76	4	87	5	97	5	106	6	114	6	121	7	128	7	135	7	142	8	148	8	155	8	161	8	168	8	174	8	180	8
	20	0	2	46	2	70	3	84	4	95	4	103	5	110	6	117	6	123	7	129	7	135	8	141	8	147	8	152	8	158	9	163	9	169	9	174	9	180	9
	25	180	0	101	2	104	3	108	4	112	5	116	5	121	6	126	7	131	7	136	8	141	8	145	9	150	9	155	9	160	9	165	10	170	10	175	10	180	10
	30	180	2	144	3	130	4	125	4	125	5	127	6	130	7	133	7	137	8	141	8	146	9	149	9	153	9	158	10	162	10	167	10	171	10	176	10	180	10
	35	180	4	159	4	145	4	138	5	136	6	136	6	137	7	139	8	142	8	145	9	148	9	152	10	156	10	160	10	164	11	168	11	172	11	176	11	180	11
7	10	0	5	15	5	29	5	43	6	56	6	68	6	79	6	89	7	99	7	108	7	117	8	125	8	134	8	142	8	150	8	157	8	165	8	172	8	180	9
	15	0	4	19	4	37	5	53	5	67	5	79	6	89	6	99	7	108	7	116	8	123	8	130	8	137	9	143	9	149	9	156	10	162	10	168	10	174	10	180	10
	20	0	4	23	4	50	4	67	5	80	5	91	6	100	6	108	7	116	8	123	8	130	8	137	9	143	9	149	9	156	10	162	10	168	10	174	10	180	10
	25	0	2	47	3	70	4	85	4	95	5	103	6	110	7	117	7	123	8	129	8	135	9	141	9	147	10	152	10	158	10	163	10	169	10	175	10	180	10
	30	0	0	69	2	97	3	108	4	109	5	114	6	119	7	124	8	129	8	134	9	140	9	145	10	150	10	155	10	160	11	165	11	170	11	175	11	180	11
	35	180	2	133	3	121	4	120	5	121	6	124	7	127	7	131	8	135	9	139	9	143	10	148	10	152	11	157	11	161	11	166	11	171	11	175	12	180	12
8	10	0	6	14	6	27	7	40	7	53	7	64	7	75	7	86	8	96	8	105	8	114	8	123	9	132	9	140	9	148	9	156	9	164	9	172	9	180	9
	15	0	6	16	6	32	6	47	6	61	6	73	7	84	7	94	8	103	8	112	8	120	9	128	9	136	9	144	10	151	10	158	10	166	10	173	10	180	10
	20	0	5	21	5	40	5	57	6	71	6	83	7	93	7	102	8	110	8	119	9	126	9	134	10	140	10	147	10	154	10	160	10	167	11	174	11	180	11
	25	0	4	29	4	52	4	69	5	82	6	93	7	103	7	110	8	117	9	124	9	131	10	137	10	144	10	150	11	156	11	162	11	168	11	174	11	180	11
	30	0	3	45	3	62	4	84	5	94	6	102	7	110	8	116	8	123	9	129	10	135	10	141	10	147	11	152	11	158	11	163	11	169	12	174	12	180	12
	35	0	1	78	3	91	4	99	5	106	6	112	7	117	8	123	9	128	9	133	10	139	10	144	11	149	11	154	12	159	12	165	12	170	12	175	12	180	12
9	10	0	8	13	8	25	8	38	8	50	8	62	8	73	9	83	9	93	9	103	9	112	9	121	10	130	10	139	10	147	10	155	10	164	10	172	10	180	10
	15	0	7	16	7	30	7	43	7	57	8	69	8	80	8	90	9	100	9	109	9	117	10	126	10	134	10	142	10	150	11	157	11	165	11	173	11	180	11
	20	0	6	18	6	35	6	51	7	64	7	76	8	87	8	97	8	106	9	115	10	123	10	130	10	138	11	145	11	152	11	159	11	166	11	173	11	180	11
	25	0	5	23	6	43	6	59	6	73	7	85	8	95	8	104	9	113	9	120	10	127	10	134	11	141	11	148	11	154	12	161	12	167	12	174	12	180	12
	30	0	4	30	4	53	5	70	6	82	7	93	8	102	8	110	9	117	10	124	10	131	11	137	11	144	12	149	12	156	12	162	12	168	12	174	12	180	12
	35	0	3	42	4	67	4	82	6	99	7	101	8	109	8	116	9	122	10	128	11	134	11	140	11	146	12	152	12	158	12	163	12	169	12	174	12	180	12
10	10	0	9	13	9	25	9	37	9	49	9	60	9	71	9	81	10	91	10	101	10	111	10	120	11	129	11	137	11	146	11	155	11	163	11	172	11	180	11
	15	0	8	14	8	28	8	41	8	54	9	66	9	76	9	87	10	97	10	106	10	115	11	124	11	132	11	141	11	149	11	157	11	165	12	172	12	180	12
	20	0	7	16	7	32	7	46	8	60	8	72	9	83	9	93	10	102	10	111	10	120	11	128	11	136	11	143	12	151	12	158	12	165	12	173	12	180	12
	25	0	6	19	6	37	7	53	7	66	8	78	8	89	9	99	10	108	10	118	11	124	11	131	11	139	12	146	12	153	12	160	12	166	12	173	12	180	12
	30	0	6	23	6	44	6	60	7	74	8	85	8	95	9	104	10	113	10	120	11	127	11	134	12	141	12	148	12	154	12	161	12	167	12	174	12	180	12
	35	0	4	30	5	53	6	70	6	82	7	93	8	102	9	110	10	117	11	124	11	131	12	137	12	144	12	150	12	156	12	162	12	168	12	174	12	180	12
11	10	0	10	12	10	24	10	36	10	47	10	58	10	69	11	79	11	89	11	99	11	109	11	118	11	126	12	136	12	145	12	154	12	163	12	171	12	180	12
	15	0	9	13	9	26	9	39	10	51	10	63	10	74	10	84	11	94	11	104	11	113	11	122	12	131	12	139	12	148	12	156	12	164	12	172	12	180	12
	20	0	8	15	9	29	9	43	9	56	9	68	10	79	10	89	11	99	11	108	11	117	12	126	12	134	12	142	12	150	12	157	12	165	12	172	12	180	12
	25	0	8	17	8	33	8	48	9	61	9	73	10	84	10	94	11	104	11	113	12	121	12	129	12	136	12	144	12	151	12	159	12	166	12	173	12	180	12
	30	0	7	20	7	36	8	54	8	67	9	79	9	90	10	99	11	108	11	116	12	124	12	132	12	139	12	146	12	153	12	160	12	167	12	173	12	180	12
	35	0	6	23	6	43	7	60	8	74	8	85	9	95	10	104	11	112	11	120	12	127	12	134	12	141	12	148	12	154	12	161	12	167	12	174	12	180	12
12	10	0	11	12	11	23	11	35	11	46	11	57	11	68	12	78	12	88	12	98	12	108	12	117	12	127	12	136	12	145	12	154	12	162	12	171	12	180	12
	15	0	10	13	10	25	11	37	11	49	11	61	11	72	11	82	12	92	12	102	12	111	12	121	12	129	12	138	12	147	12	155	12	163	12	172	12	180	12
	20	0	10	14	10	26	10	41	10	55	11	65	11	76	11	87	12	97	12	106	12	115	12	124	12	132	12	140	12	149	12	156	12	164	12	172	12	180	12
	25	0	9	16	9	31	9	45	10	58	10	70	11	81	11	91	12	101	12	110	12	118	12	127	12	135	12	142	12	150	12	158	12	165	12	173	12	180	12
	30	0	8	17	9	34	9	49	9	62	10	74	11	85	11	95	12	104	12	113	12	121	12	129	12	137	12	144	12	152	12	159	12	166	12	173	12	180	12
	35	0	8	20	8	38	8	54	9	68	10	80	10	90	11	100	12	108	12	117	12	124	12	132	12	139	12	146	12	153	12	160	12	167	12	173	12	180	12

TABLE 9.—*Time of observation*

WEST LONGITUDE, A. M., CIVIL DATE

Ship's longitude	Local mean time, a. m.	Ship's longitude	Local mean time, a. m.	Ship's longitude	Local mean time, a. m.	Ship's longitude	Local mean time, a. m.
°W.	h. m.	°W.	h. m.	°W.	h. m.	°W.	h. m.
0	Noon	45	9 00	90	6 00	135	3 00
1	11 56	46	8 56	91	5 56	136	2 56
2	11 52	47	8 52	92	5 52	137	2 52
3	11 48	48	8 48	93	5 48	138	2 48
4	11 44	49	8 44	94	5 44	139	2 44
5	11 40	50	8 40	95	5 40	140	2 40
6	11 36	51	8 36	96	5 36	141	2 36
7	11 32	52	8 32	97	5 32	142	2 32
8	11 28	53	8 28	98	5 28	143	2 28
9	11 24	54	8 24	99	5 24	144	2 24
10	11 20	55	8 20	100	5 20	145	2 20
11	11 16	56	8 16	101	5 16	146	2 16
12	11 12	57	8 12	102	5 12	147	2 12
13	11 08	58	8 08	103	5 08	148	2 08
14	11 04	59	8 04	104	5 04	149	2 04
15	11 00	60	8 00	105	5 00	150	2 00
16	10 56	61	7 56	106	4 56	151	1 56
17	10 52	62	7 52	107	4 52	152	1 52
18	10 48	63	7 48	108	4 48	153	1 48
19	10 44	64	7 44	109	4 44	154	1 44
20	10 40	65	7 40	110	4 40	155	1 40
21	10 36	66	7 36	111	4 36	156	1 36
22	10 32	67	7 32	112	4 32	157	1 32
23	10 28	68	7 28	113	4 28	158	1 28
24	10 24	69	7 24	114	4 24	159	1 24
25	10 20	70	7 20	115	4 20	160	1 20
26	10 16	71	7 16	116	4 16	161	1 16
27	10 12	72	7 12	117	4 12	162	1 12
28	10 08	73	7 08	118	4 08	163	1 08
29	10 04	74	7 04	119	4 04	164	1 04
30	10 00	75	7 00	120	4 00	165	1 00
31	9 56	76	6 56	121	3 56	166	12 56
32	9 52	77	6 52	122	3 52	167	12 52
33	9 48	78	6 48	123	3 48	168	12 48
34	9 44	79	6 44	124	3 44	169	12 44
35	9 40	80	6 40	125	3 40	170	12 40
36	9 36	81	6 36	126	3 36	171	12 36
37	9 32	82	6 32	127	3 32	172	12 32
38	9 28	83	6 28	128	3 28	173	12 28
39	9 24	84	6 24	129	3 24	174	12 24
40	9 20	85	6 20	130	3 20	175	12 20
41	9 16	86	6 16	131	3 16	176	12 16
42	9 12	87	6 12	132	3 12	177	12 12
43	9 08	88	6 08	133	3 08	178	12 08
44	9 04	89	6 04	134	3 04	179	12 04

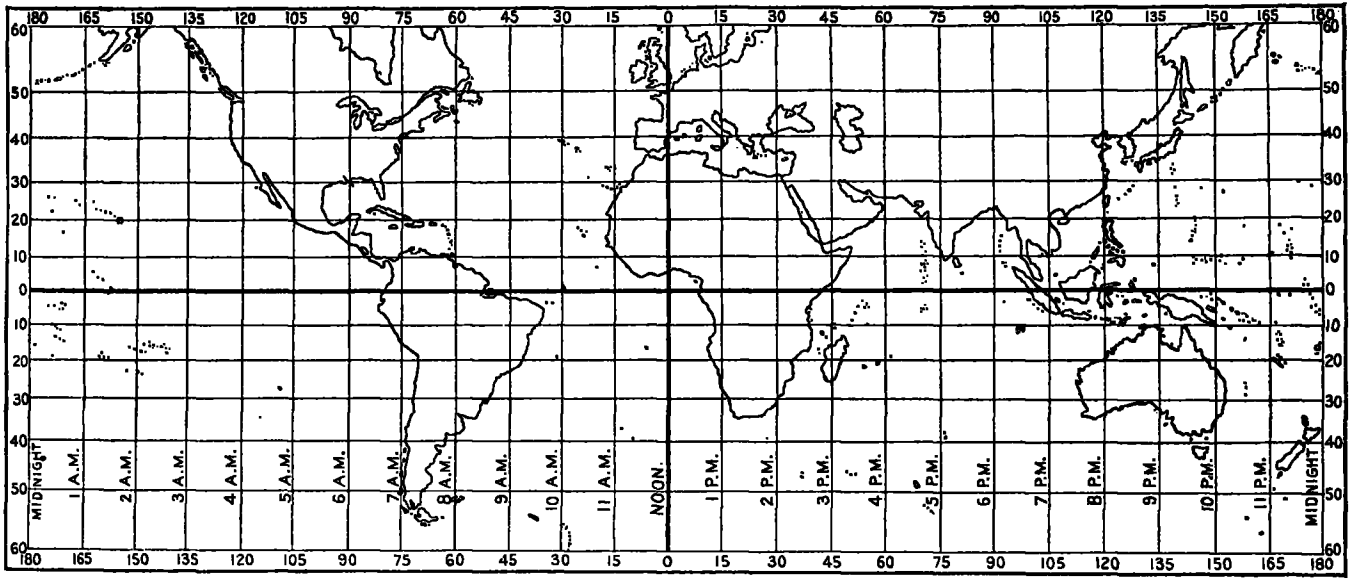
TABLE 9.—*Time of observation*—Continued

EAST LONGITUDE, P. M., CIVIL DATE

Ship's longitude	Local mean time, p. m.	Ship's longitude	Local mean time, p. m.	Ship's longitude	Local mean time, p. m.	Ship's longitude	Local mean time, p. m.
° *E.*	*h. m.*	° *E.*	*h. m.*	° *E.*	*h. m.*	° *E.*	*h. m.*
1	12 04	46	3 04	91	6 04	136	9 04
2	12 08	47	3 08	92	6 08	137	9 08
3	12 12	48	3 12	93	6 12	138	0 12
4	12 16	49	3 16	94	6 16	139	9 16
5	12 20	50	3 20	95	6 20	140	9 20
6	12 24	51	3 24	96	6 24	141	9 24
7	12 28	52	3 28	97	6 28	142	9 28
8	12 32	53	3 32	98	6 32	143	9 32
9	12 36	54	3 36	99	6 36	144	9 36
10	12 40	55	3 40	100	6 40	145	9 40
11	12 44	56	3 44	101	6 44	146	9 44
12	12 48	57	3 48	102	6 48	147	9 48
13	12 52	58	3 52	103	6 52	148	9 52
14	12 56	59	3 56	104	6 56	149	9 56
15	1 00	60	4 00	105	7 00	150	10 00
16	1 04	61	4 04	106	7 04	151	10 04
17	1 08	62	4 08	107	7 08	152	10 08
18	1 12	63	4 12	108	7 12	153	10 12
19	1 16	64	4 16	109	7 16	154	10 16
20	1 20	65	4 20	110	7 20	155	10 20
21	1 24	66	4 24	111	7 24	156	10 24
22	1 28	67	4 28	112	7 28	157	10 28
23	1 32	68	4 32	113	7 32	158	10 32
24	1 36	69	4 36	114	7 36	159	10 36
25	1 40	70	4 40	115	7 40	160	10 40
26	1 44	71	4 44	116	7 44	161	10 44
27	1 48	72	4 48	117	7 48	162	10 48
28	1 52	73	4 52	118	7 52	163	10 52
29	1 56	74	4 56	119	7 56	164	10 56
30	2 00	75	5 00	120	8 00	165	11 00
31	2 04	76	5 04	121	8 04	166	11 04
32	2 08	77	5 08	122	8 08	167	11 08
33	2 12	78	5 12	123	8 12	168	11 12
34	2 16	79	5 16	124	8 16	169	11 16
35	2 20	80	5 20	125	8 20	170	11 20
36	2 24	81	5 24	126	8 24	171	11 24
37	2 28	82	5 28	127	8 28	172	11 28
38	2 32	83	5 32	128	8 32	173	11 32
39	2 36	84	5 36	129	8 36	174	11 36
40	2 40	85	5 40	130	8 40	175	11 40
41	2 44	86	5 44	131	8 44	176	11 44
42	2 48	87	5 48	132	8 48	177	11 48
43	2 52	88	5 52	133	8 52	178	11 52
44	2 56	89	5 56	134	8 56	179	11 56
45	3 00	90	6 00	135	9 00	180	Mid.

TABLE 10.—*Distance of visibility of objects at sea (in nautical miles)*

Height of observer's eye above sea level (in feet)	Height of object above sea level (in feet)													
	10	20	30	40	60	80	100	150	200	300	400	600	800	1,000
10	7.2	8.7	9.9	10.8	12.5	13.9	15.1	17.7	19.8	23.5	26.5	31.6	36.0	39.8
15	8.0	9.5	10.7	11.6	13.3	14.7	15.9	18.5	20.6	24.3	27.3	32.4	36.8	40.6
20	8.7	10.2	11.4	12.3	14.0	15.4	16.6	19.2	21.3	25.0	28.0	33.1	37.5	41.3
25	9.3	10.8	12.0	12.9	14.6	16.0	17.2	19.8	21.9	25.6	28.6	33.7	38.1	41.9
30	9.9	11.4	12.6	13.5	15.2	16.6	17.8	20.4	22.5	26.2	29.2	34.3	38.7	42.5
35	10.4	11.9	13.1	14.0	15.7	17.1	18.3	20.9	23.0	26.7	29.7	34.8	39.2	43.0
40	10.8	12.3	13.5	14.4	16.1	17.5	18.7	21.3	23.4	27.1	30.1	35.2	39.6	43.4
45	11.3	12.8	14.0	14.9	16.6	18.0	19.2	21.8	23.9	27.6	30.6	35.7	40.1	43.9
50	11.7	13.2	14.4	15.3	17.0	18.4	19.6	22.2	24.3	28.0	31.0	36.1	40.5	44.3
60	12.5	14.0	15.2	16.1	17.8	19.2	20.4	23.0	25.1	28.8	31.8	36.9	41.3	45.1
70	13.2	14.7	15.9	16.8	18.5	19.9	21.1	23.7	25.8	29.5	32.5	37.6	42.0	45.8
80	13.9	15.4	16.6	17.5	19.2	20.6	21.8	24.4	26.5	30.2	33.2	38.3	42.7	46.5
90	14.5	16.0	17.2	18.1	19.8	21.2	22.4	25.0	27.1	30.8	33.8	38.9	43.3	47.1
100	15.1	16.6	17.8	18.7	20.4	21.8	23.0	25.6	27.7	31.4	34.4	39.5	43.9	47.7



This chart gives the local time corresponding to Greenwich mean noon.

W B Form 1210 AB

U S DEPARTMENT OF COMM

RECORD OF SHIP'S WE

VESSEL ______ ______ ______ ______ ______ ______ ______ ______ ______ ______ ______
(Nationality, Type, and Name)

Barometer {Aner / Merc} No. ______ {W B / List} Height above Sea Level ______ ______ (ft) Last compared at ______

Indicate method of obtaining WIND SPEED – ☐ Anemometer, ☐ Estimated; WATER TEMPERATURES – ☐ Bucket, ☐ Intake; AIR TEMPE

			Position of Ship						Wind						Pressure				Clouds						
Day of Month	Local Ship's Time	Day of Week	Octant	Latitude	Longitude	Greenwich Mean Time	Total Cloud Amt (Tenths)	Total Cloud Amt (Eighths)	Direction (00 - 36)	Speed (Knots)	Beaufort Force	Visibility	Present Weather	Past Weather	Barometer as read (Units)		Barometer Corrected (Mbs)	Air Temperature (°F)	Height of Low Cloud (100's of ft)	Amt of Low (Tenths)	Amt of Low (Eighths)	Low	Hght of Low	Middle	High
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
—	—	Y	Q	LaLaLa	LoLoLo	G G	—	N	d d	f f	—	V V	w w	W	—	—	P P P	T T	—	—	N_h	C_L	h	C_M	C_H

Remarks ______
Enter data and time of special phenomena such as wind shifts, frontal passages, etc

IMPORTANT – Make special gale and fog repo

ERCE, WEATHER BUREAU

ATHER OBSERVATIONS

MONTH ______________________, 19____ OBSERVER ______________________________

______________ on ______________, 19___ Correction Rating, __________ to be added, or __________ subtracted

RATURES — ☐ Stationary Thermometer, ☐ Psychrometer, ☐ Other (describe) ______________________________

				Significant Cloud					Temperature °F								Waves				Ice					
Course of Ship	Speed of Ship	Pressure Tendency	Pressure Change	Amount (Tenths)	Group Indicator	Amt (Eighths)	Type	Height	Dry Bulb	Wet Bulb	Sea Water	Difference Sea-Air (Tenths)	Dewpoint (Tenths)	Group Indicator	Difference Sea-Air (Coded)	Dewpoint (Coded)	Group Indicator	Direction	Period	Height	Kind	Effect on Navigation	Bearing of Ice Limit	Distance to Ice Limit	Orientation of Ice Limit	Sent by Radio (Yes-No)
27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
D_s	v_s	a	p p	—	8	N_s	C	h_s h_s	—	—	—	—	—	0	T_s T_s	T_d T_d	1	d_w d_w	P_w	H_w	c_e	K	D_i	r	e	—
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