TM 11-2424

WAR DEPARTMENT TECHNICAL MANUAL

INSTRUCTIONS FOR MODULATED AUDIO FREQUENCY RADIOSONDE OBSERVATIONS (WBAN RAOB MANUAL)

WAR DEPARTMENT • FEBRUARY 1945

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INSTRUCTIONS FOR MODULATED AUDIO FREQUENCY RADIOSONDE OBSERVATIONS (WBAN RAOB MANUAL)

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TM 11–2424, Instruction for Modulated Audio Frequency Radiosonde Observations (WBAN RAOB Manual) is published for the information and guidance of all concerned.

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BY ORDER OF THE SECRETARY OF WAR:

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For explanation of symbols, see FM 21–6.

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PART I

TABLES

LIST OF ILLUSTRATIONS

***Administrative only. Not available to general public.**

Chapter I. THE RADIOSONDE

1100. GENERAL

1101. The radiosonde consists of a set of meteorological instruments combined with a small radio transmitter and assembled in a small cardboard box. The assembly is carried aloft by a free balloon. During the observation, values indicating the pressure, temperature, and relative humidity of the air are transmitted to the ground receiving station

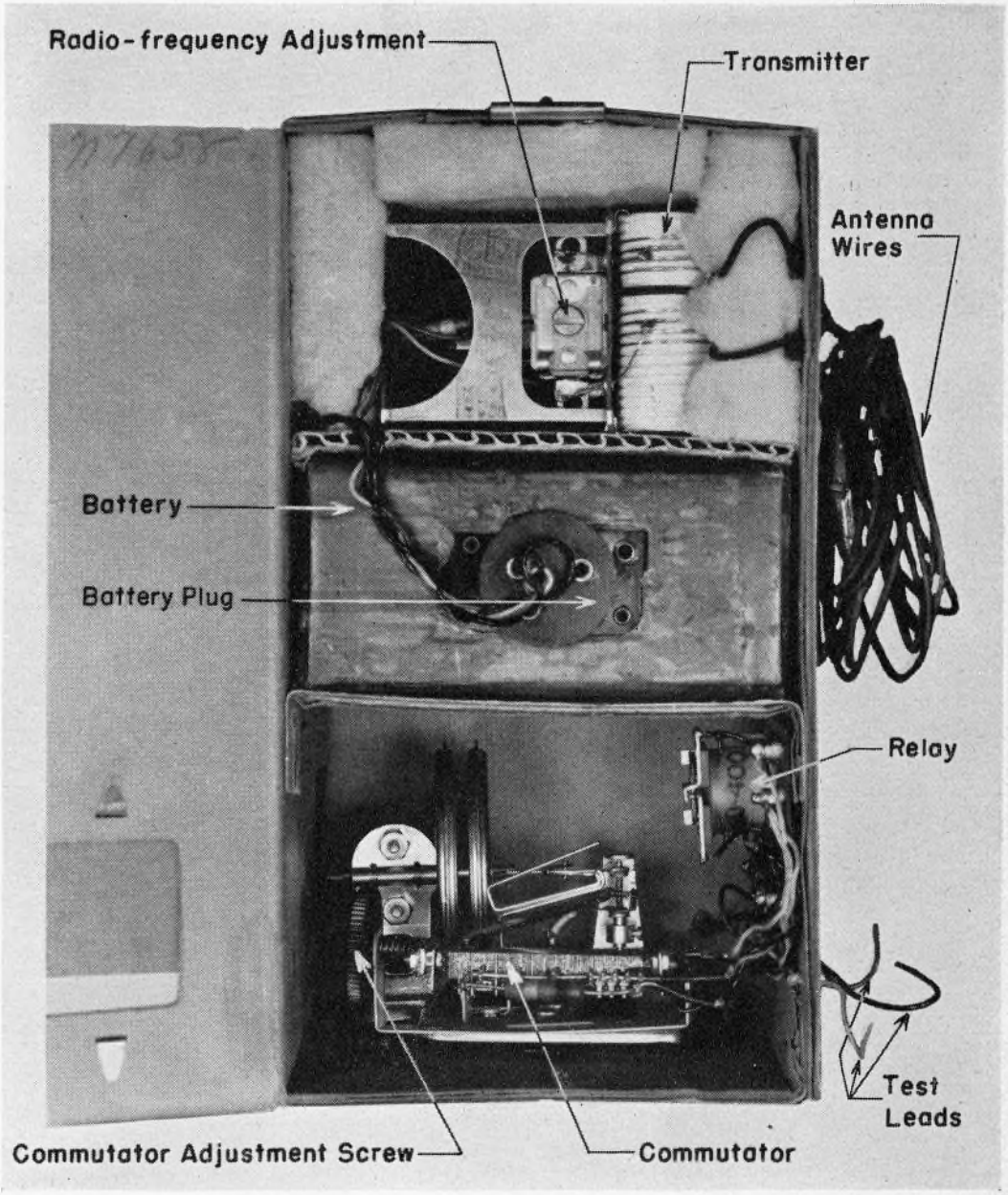

FIGURE 1–1.—Friez radiosonde showing transmitter, battery, and baroswitch sections.

where they are automatically recorded. At the extreme altitude, the balloon bursts and the radiosonde descends to the surface of the earth on a small parachute.

1200. COMPONENT PARTS

1210. Radio Transmitter.—The radiosonde transmitter, one type of which is shown in figure 6–6, emits a radio signal at a frequency of 72.2 megacycles. The signal is modulated by varying the resistance in the meterological control circuit by means of resistors sensitive to temperature and relative humidity changes, and two fixed resistors. The fixed resistors are in circuits termed the high and low reference circuits, respectively. Figures 1–2 and 1–3 show schematically the meteorological control circuits of the two models of radiosondes now in general use.

1220. Baroswitch.—The baroswitch, shown in figures 6–4 and 6–5, has two functions in the radiosonde: (1) To indicate pressure values during the sounding, and (2) to switch into the control circuit in a definite order the temperature, humidity, low reference, and high reference resistors. One side of the pressure diaphragm is fixed to a rigid support, the other side of the distending diaphragm engages a contact arm through a suitable linkage. As the radiosonde ascends through levels of decreasing atmospheric pressure, the diaphragm of the baroswitch causes the contact arm to move across a commutator.

1221. The baroswitch commutator consists of either 80 (Friez) or 95 (W. I. T.) metallic segments separated by dielectric material. One metallic segment and the succeeding adjacent nonconducting segment comprise one "contact." The 80 (or 95) contacts are correlated with the indicated pressure values in a manner such that when the number of the contact is known the corresponding indicated pressure can be determined from a calibration chart as shown in figure 9–6.

1222. By referring to figures 1–2 and 1–3, it can be seen that when the point of the contact arm rests on any one of several metallic

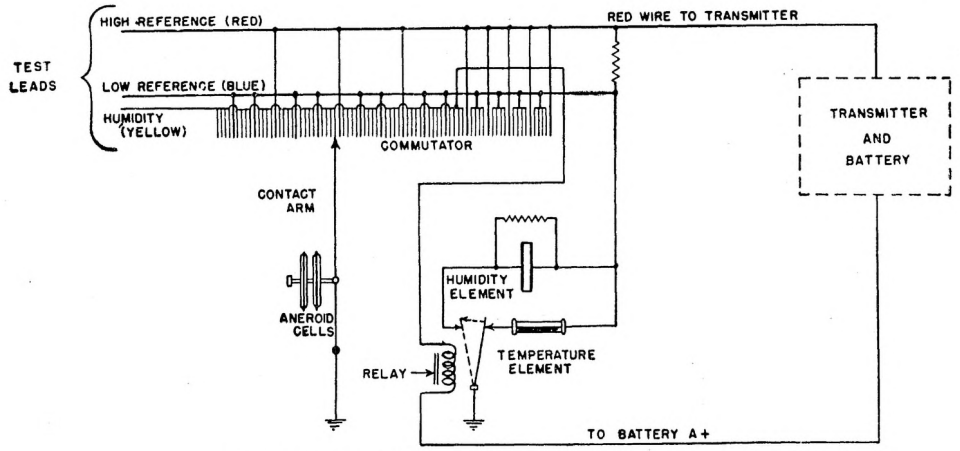

FIGURE 1–2.—Schematic diagram of Friez radiosonde.

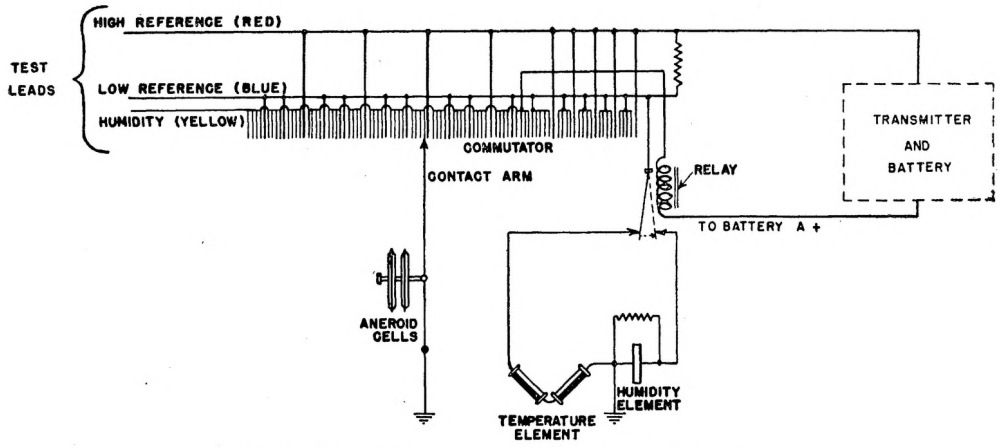

FIGURE 1–3.—Schematic diagram of W. I. T. radiosonde.

segments, a relay is energized so that the humidity resistor is connected into the meteorological control circuit and that the other metallic segments are connected to the high and low reference circuits. When the contact point rests on a nonconducting segment, the temperature resistor is in the control circuit.

1230. Temperature Element.—The temperature resistor or element is made of a ceramic material, the resistance of which increases as the temperature decreases. Figures 6–1 and 6–2 show the two types of temperature elements now in general use.

1231. For each model of radiosonde, a temperature evaluator is provided. This evaluator is a two-scale slide rule designed to convert the recorded temperature ordinate into degrees centigrade. As indicated in figures 1–4 and 1–5, one scale of the evaluator represents the temperature ordinates, the other centigrade temperatures. During a prerelease check of the radiosonde, known as the "baseline check," the temperature evaluator is set with the instrument shelter temperature opposite the corresponding recorded temperature ordinate. From this setting, the temperature for any level of the sounding can be

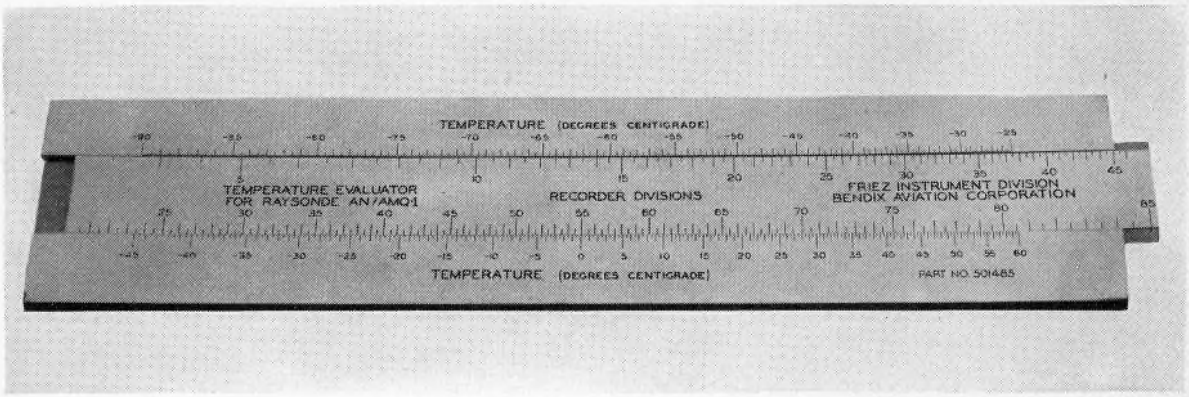

FIGURE 1–4.—Temperature evaluator used with Friez radiosonde.

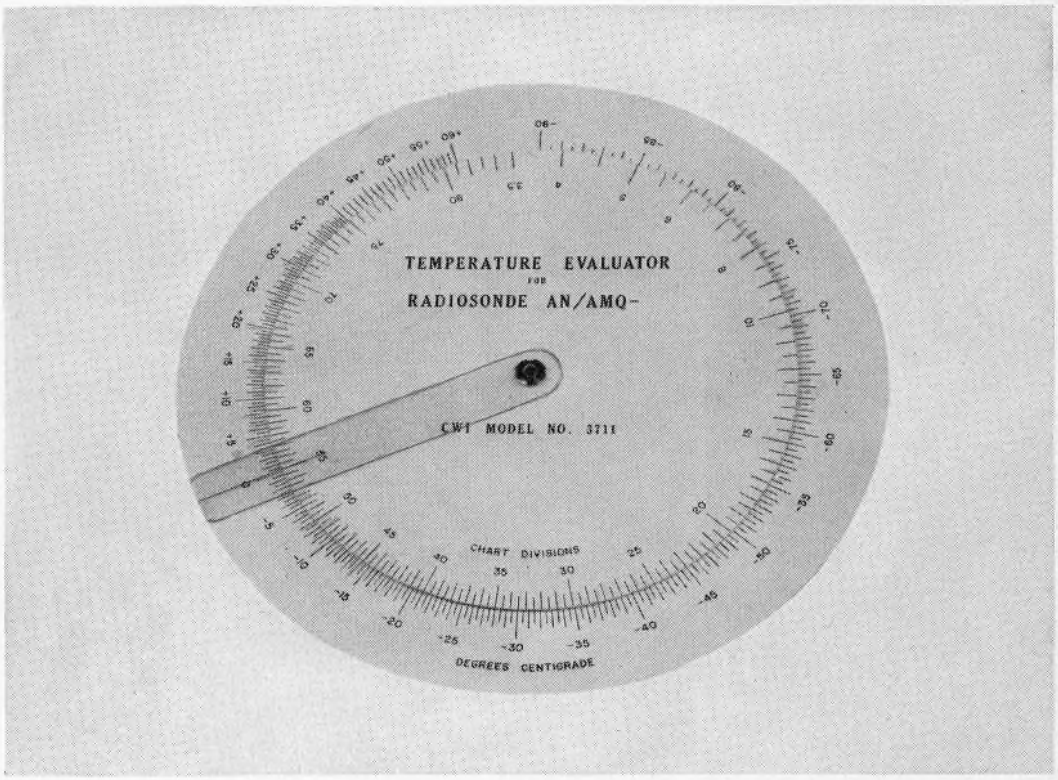

FIGURE 1–5.—Temperature evaluator used with W. I. T. radiosonde.

determined by reading the temperature value opposite the temperature ordinate recorded for the level. Throughout this manual, the term ordinate is used as equivalent to the terms "recorder ordinate," "chart division," and "frequency division" which are found on the several types of evaluators and calibration charts used.

1240. Humidity Element.—The humidity resistor or hygrometer element consists of a chemically coated plastic strip with metallized edges. The resistance across the chemical film changes with variations in the relative humidity and the temperature of the air in which it is exposed. The effect of temperature is eliminated by the use of a special graph, from which the relative humidity of a given level of the sounding can be determined as a function of both the temperature and the humidity ordinate. Figure 9–6 shows a radiosonde calibration chart containing both the humidity evaluation graph and the pressure calibration curve.

1250. Ventilation Chamber.—The temperature and humidity elements are installed in the ventilation chamber of the radiosonde. The elements are surrounded by a cylindrical shield designed to reduce the effects of radiation and insolation on the measurements. The methods of mounting the temperature and humidity elements are shown in figures 6–1 and 6–2.

Chapter II. RADIOSONDE GROUND EQUIPMENT

2100. GENERAL

2101. The radiosonde ground equipment consists of an antenna, shortwave radio receiver, electronic frequency unit, and a recorder. A voltage stabilizer is also used when improved regulation is necessary because of fluctuations in the available power supply. These units are

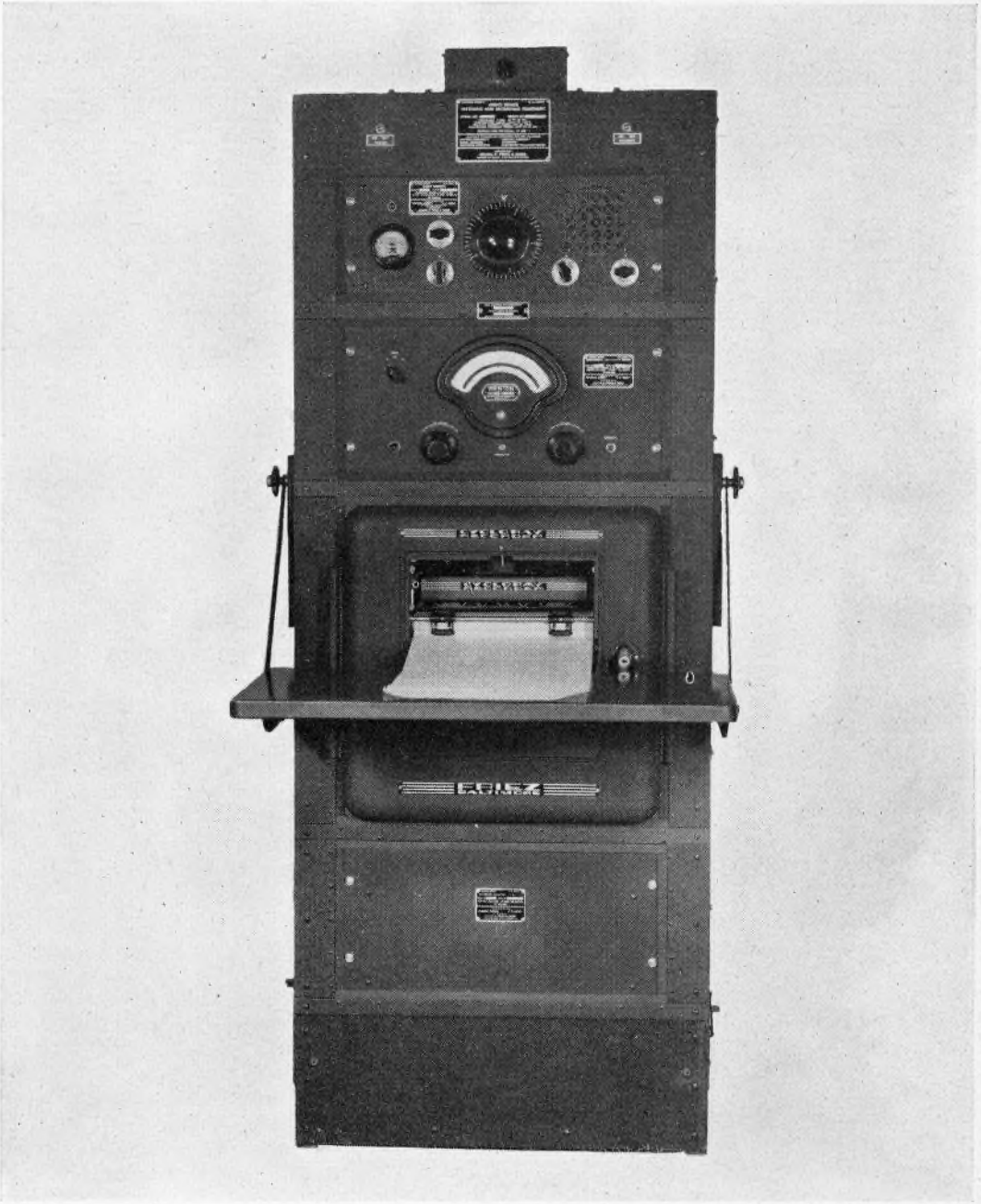

FIGURE 2–1.—Ground equipment showing super-regenerative receiver, electronic frequency unit and microammeter recorder

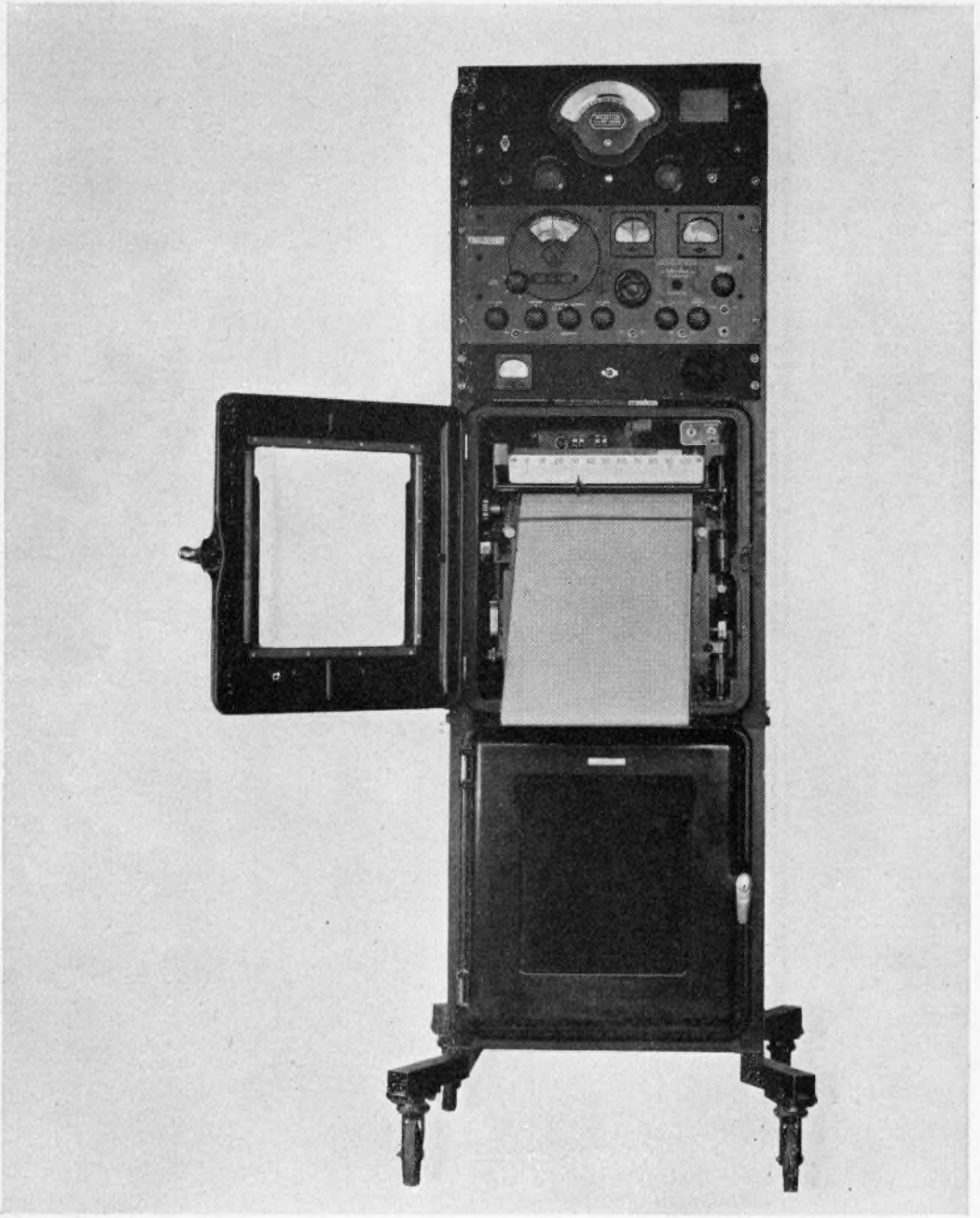

FIGURE 2–2.—Ground equipment showing superheterodyne receiver, electronic frequency unit, and potentiometer recorder.

used in the process of receiving and recording the radiosonde signals.

2200. ANTENNAS

2210. General.—The dipole and wire-doublet antennas are the two types of radiosonde antennas in general use.

2220. Dipole Antenna.—The standard vertical dipole antenna consists of a metal rod and a metal skirt, each approximately one quarter wave length in length. A gas-filled or a solid coaxial cable transmission line is used with this type of antenna to reduce loss of signal strength.

2230. Wire-Doublet Antenna.—The wire-doublet antenna, consisting of two legs, each of which has a length of approximately one quarter wave length, is used for standby or emergency purposes. Coaxial cable transmission line also produces better results with this an-

tenna, although twisted-pair telephone wire may be used successfully for the transmission line provided its length is kept at a minimum to avoid loss of signal strength.

2300. RECEIVERS

2301. Super-regenerative and superheterodyne receivers with especially designed audio-amplifiers are used for radiosonde reception on the 72.2-megacycle frequency. Super-regenerative receivers are considered the better type for radiosonde observations since they require less frequent tuning than the superheterodyne type, permitting the observer to spend more time in evaluating the data as the record is made. However, at stations having considerable interference, the superheterodyne receiver usually gives better results since it provides greater selectivity.

2400. ELECTRONIC FREQUENCY UNITS

2401. The electronic frequency units in general use all embody the same operating principle. A pulsating direct current proportional to the frequency of the applied alternating current voltage (input signal) operates a visual meter and a recorder. A current output of approximately 500 micro-amperes is required for full-scale deflection of 100 ordinates. The several types of frequency units in service differ principally in mechanical design. Elaborate voltage regulation is required so that the output current is controlled by the input signal without being affected by variations in the power supply.

2500. RECORDERS

2510. General.—The two radiosonde recorders in general use are the microammeter and potentiometer types.

2520. Microammeter Recorder.—The microammeter recorder is designed to register the position of a microammeter pointer. The position of the pointer depends on the current output of the electronic frequency unit. A photoelectric scanning device causes an impression to be printed on the recorder chart paper at a point corresponding in value to the position of the pointer.

2530. Potentiometer Recorder.—In the potentiometer recorder, the output of the electronic frequency unit is balanced against an automatically operated slidewire potentiometer. The balancing mechanism moves a pen to the point on the recorder chart paper corresponding to the adjustment of the potentiometer.

Chapter III. RADIOSONDE BATTERIES

3100. GENERAL

3101. Power is supplied to the radiosonde transmitter by a small, compact dry cell battery designed to produce a maximum output at a minimum weight. This battery is necessarily more delicate, has a shorter shelf life, and therefore requires greater care and better storage conditions than the larger types of dry-cell batteries. The effective life of the radiosonde battery is greatly reduced by the low temperatures to which it is exposed in the upper atmosphere. The observer must, therefore, avoid wasting the energy of the battery.

3102. The radiosonde battery consists of two parts: The "A" section, which supplies approximately 3 volts to the filament of the transmitter tube, and the "B" section, which supplies approximately 90 volts to the plate of the tube.

3200. TYPES OF RADIOSONDE BATTERIES

3201. Table 3–1 lists the types of radiosonde dry-cell batteries now in general use.

TABLE 3–1.—*Types of radiosonde batteries.*

Type No.	Manufacturer	Nominal "A" voltage	Nominal "B" voltage	Nominal weight, grams
BA–67	National Carbon Co	3	90	700
4X2V60	Burgess Battery Co	3	90	350
4X2W60	do	3	90	700
X–542	National Carbon Co	3	90	450

3202. Figures 1–1 and 6–3 show radiosondes with the batteries installed in the battery compartments.

3300. TESTING RADIOSONDE BATTERIES

3310. Receipt of Batteries.—Instructions regarding the receipt of radiosonde batteries, incorrect or missing invoices or packing slips, damages sustained in shipping, and shortages will be found in the addendum as required.

3311. Dry-cell radiosonde batteries sealed with a pliofilm or plastic wrapper or in plastic pouches usually will not be tested until just before installation in the radiosonde. However, in certain cases specified as required in the addendum, the seal will be broken and the battery tested prior to the expiration of the guarantee period, even though the battery is not to be used immediately.

3311.1. Batteries which are not sealed at the socket will be tested upon receipt.

3320. Required Voltages.—Each radiosonde battery will be tested just prior to installing it in the radiosonde to minimize any loss due to battery failure. In every case the battery will be tested with the voltmeter furnished for this purpose. (See sec. 5700.) Since the voltmeter places a load on the battery, it should not remain connected longer than is necessary to test the battery.

3321. Battery voltages should ordinarily be considered too low for use in raobs when the "A" voltage is less than 2.5 volts, and the "B" voltage is less than 82 volts. However, in the event that the supply of serviceable batteries becomes exhausted, batteries having slightly lower voltages than those specified above may be used.

3322. Batteries will be rejected if the voltage is observed to be falling when connected to a radiosonde battery voltmeter for a period of one-half minute.

3323. All corrosion and foreign material will be removed from the plugs and sockets prior to connecting them. The battery plug will be removed at right angles to the top of the battery plug by grasping the edge of the plug and not the wires. If it becomes necessary to remove the plug by mechanical means, the caps of the plug and socket should remain parallel to avoid binding the prongs and damaging the electrical circuit. If a metal object, such as a screw-driver, is used for removing the battery plug from the socket, care must also be taken to avoid shorting the 90-volt section through the 3-volt side of the voltmeter or through the filament of the radiosonde transmitter tube.

3330. Disposition of Defective Batteries.—Instructions regarding the disposition of defective or damaged radiosonde batteries are contained in the addendum.

3400. STORAGE OF RADIOSONDE BATTERIES

3410. General.—Humidity and temperature conditions during storage are the major factors

affecting the shelf life and performance of a radiosonde battery.

3411. Exposure in air having high or abnormally low relative humidity will cause deterioration of the battery with resultant reduction in its ampere-hour output.

3412. High temperatures increase chemical action, thus reducing the shelf life of the battery. Low temperatures arrest chemical action, thereby increasing the shelf life of the battery. Consequently, batteries should be stored at the lowest temperature practicable.

3413. The combination of high temperatures and high relative humidities not only shortens the life of the battery, but is favorable to the formation of corrosion, electrical leakage, and open circuits.

3414. Uniform temperatures below 36° F. (2° C.) and relative humidities between 50 and 80 percent provide ideal storage conditions. Since such conditions are not available at most stations, it is necessary for each station to utilize the most suitable conditions which are available.

3420. Stations with Low Surface Temperatures.—At stations with low surface temperatures, batteries can be placed in water-tight containers and the containers packed in snow or ice to avoid extreme temperature fluctuations during long storage periods. Alternate thawing and freezing must be avoided. Batteries stored at low temperatures should be exposed to room temperature for several days prior to use so that all parts will acquire the higher temperature.

3430. Stations in Tropical Regions.—In tropical or semi-tropical regions, excessively high and variable temperatures should be avoided. Subterranean storage is desirable provided excessive dampness can be avoided. Ventilated areas under buildings are more suitable than the interiors of buildings where temperatures vary greatly. The batteries will be stored in closed shipping cartons in order to take advantage of the additional protection from high humidities, and from colloidal salt at coastal stations. If excelsior or sawdust is used for packing, the material must be dried out occasionally to avoid molding and the resulting generation of heat after the material has become saturated with moisture.

3440. Use of Electric Refrigerators.—With the proper precautions, the storage of batteries in electric refrigerators may be accomplished satisfactorily, provided space is available for this purpose. Keep the refrigerator closed as much as possible to avoid large variations in temperature and relative humidity. Adjust the controls of the refrigerator to a temperature of about 36° F. (2° C.). Protect the batteries from the possibility of damage due to water dripping from the refrigerator coils. Do not remove the batteries from the refrigerator for short intervals during the storage period, because the effect of condensation on the cells and connections is detrimental. Batteries stored in refrigerators will be exposed to room temperature for several days before use.

3500. PREPARATION OF RADIOSONDE BATTERY FOR USE

3510. Surface Temperatures above 0° C.—When the surface temperature is above freezing, the battery will be installed at room temperature just prior to exposing the radiosonde at atmospheric conditions.

3520. Surface Temperatures below 0° C.—When the surface temperature is below 0° C., the battery will be heated to a temperature not exceeding 55° C. (131° F.) for a period of 1 hour immediately prior to beginning the baseline check. The battery will be installed in the radiosonde immediately before exposing the radiosonde in the instrument shelter.

3530. Surface Temperatures below −20° C.—When the surface temperature is below −20° C., the battery should not be installed until immediately prior to beginning the baseline check. However, since some types of scotch tape will not adhere to the case of the radiosonde when applied under extremely low temperatures, modifications of this procedure may be necessary. Limited amounts of tape can usually be applied by warming the edge of the case with the bare hand.

3600. REPAIR OF RADIOSONDE BATTERIES

3610. Stations Authorized to Make Repairs.—Remote stations with poor transportation facilities and large battery inventories may find it impossible to use batteries prior to the expiration of the guarantee period. Such stations are authorized to repair dry-cell radiosonde batteries.

3620. Repair of Burgess Batteries.—When a Burgess battery is found defective at a remote station, the battery case should be opened to determine the cause. If the voltmeter shows zero voltage, a check should be made for an open circuit, which can be resoldered. If the voltage is low, the voltages of the individual cells should be checked. If a relatively few are found defective, they should be replaced by good cells taken from another defective battery. In replacing these cells, the parts of each cell and the wires should be cleaned. The connections are then made by placing together the two parts which are to be joined and touching them

with the tip of a hot soldering iron containing molten solder. The joint must be made rapidly since excessive heating will damage the cell. Upon completion of the repairs, the battery case should be sealed with scotch or gummed tape.

3630. Repair of National Carbon Co. Batteries.—Since it is impracticable to test or replace the individual cells in the National Carbon Co. battery, each group of the layer cells should be checked as a unit and replaced by a serviceable group having the same number of cells. Checks for open circuits should be made if a zero voltage is indicated by the voltmeter for either section of the battery.

Chapter IV. BALLOONS

4100. GENERAL

4110. Types of Balloons Used for Raobs.—Two types of meteorological balloons are in general use for raobs. The large sounding balloon, which is used to carry the equipment aloft, weighs approximately 350 grams and has an average diameter of 2 to 3 feet before inflation and 5 to 6 feet after inflation. The ballast balloon used to retard the ascensional rate in the lower levels of the observation consists of a 10-gram ceiling balloon containing a sand ballast.

4111. A sounding balloon weighing 700 grams is occasionally used in place of the 350-gram balloon. This balloon has a diameter of 6 to 7 feet after inflation.

4120. Use of Neoprene in Balloons.—A synthetic rubber known as "neoprene" has replaced latex in the manufacture of meteorological balloons. All references in this manual are to balloons made of neoprene.

4121. A loss in the elasticity of the rubber in neoprene balloons results from aging and exposure to low or moderate temperatures in transit, storage, and during the sounding. Neoprene balloons, therefore, require conditioning by heating prior to use in order to avoid premature bursting. It is important that meteorological data be obtained to the highest possible level.

4200. STORAGE OF BALLOONS

4201. The 350-gram balloons will be stored in their original semiairtight containers at the highest available temperature not in excess of 49° C. (120° F.). The balloons will be stored so that those from the oldest shipment on hand will be used first, in order to reduce deterioration resulting from age. The 10-gram balloons should be stored in closed cartons under the same conditions as the 350-gram balloons.

4300. CONDITIONING OF BALLOONS

4310. General.—There are several satisfactory methods for conditioning neoprene balloons. The treatments described below have been found to give the most satisfactory results.

4311. The 350-gram balloons should remain sealed in their original containers until the treatment is to be started. If the balloon has been exposed to temperatures below 0° C., it should be stored at room temperature for not less than 6 hours prior to its removal from the container to avoid damage resulting from removing the folds while the rubber is in a stiffened condition.

4320. Double-Boiler Treatment.—Use a double-boiler arrangement of sufficient size (at least 3-quart size) to permit the heating and turning of two 350-gram balloons. Fill the lower container about three-fourths full of water and heat to the boiling point. Place the smaller container holding the balloons into the larger container and heat the balloons for 30 minutes. Change the positions of the balloons frequently to insure uniform heating.

4330. Hot Water Bath Treatment.—Use a container of at least 3-gallon capacity. Fill the container about three-fourths full of water and heat to the boiling point. To prevent air from entering the balloon when it is removed from its container, insert a small wooden plug, about the size of the inflation nozzle, in the neck of the balloon. (If a suitable plug is not available, a cloth ribbon or heavy twine may be used to close the neck of the balloon. The ribbon or twine should be tied sufficiently tight to prevent air or water from entering the balloon during the treatment but it should not be tied so tightly that the neck will be cut when the rubber becomes soft.) If air is found in the balloon, remove it by rolling up the balloon.

4331. While the neck is closed with the plug or twine, submerge the entire balloon, except the neck, in the boiling water. Support the balloon by the neck. Stir constantly so that the balloon will not rest on the bottom of the container where the temperature may be sufficiently high to burn the neoprene.

4332. A 5-minute treatment is usually sufficient to soften the rubber. Shake all free water from the balloon before beginning the inflation.

4440. Direct Heat Treatment.—If facilities cannot be obtained for heating balloons with boiling water, the direct heat treatment may be used. The balloons can be heated by placing them over a heater, radiator, or electric lamp, care being taken to shield the balloon from direct contact. Lighting fixture globes which do not make direct contact with the bulb may also be used. A 150- or 200-watt bulb is required to produce sufficient heat. Tempera-

tures as near as possible to the boiling point of water should be used. The value of lower temperatures for conditioning purposes is doubtful. However, if lower temperatures must be used, the value of the treatment can be determined by noting the bursting elevations attained. An average weekly bursting elevation of 20,000 meters has been obtained with standard 350-gram neoprene balloons which have been properly heated.

4441. Care must be taken to see that the temperature does not exceed 120° C. (248° F.) since the neoprene will burn at higher temperatures. The treatment should be continued for at least 30 minutes if the temperature is 100° C. (212° F.) and for a proportionately longer period if it is below 100° C. The balloons must be turned at intervals to insure uniform heating, since the performance of the balloon depends on the uniformity of the envelope at the time of inflation. Excessively long periods of heating at temperatures near 100° C. will result in deterioration of the rubber.

4450. Conditioning Chamber.—Figure 4–1 shows a suitable balloon conditioning chamber which can be constructed from material readily available at most stations. The wooden box is 11½ inches wide, 13 inches deep, and 14 inches high, inside dimensions. The balloons are placed on a sliding shelf made of a piece of plastic screen mounted on a wooden frame. The top edge of the shelf is 2½ inches above the top of the 200-watt bulb. A cone-shaped metal shield is used to provide even distribution of heat and is mounted so that its center is 1 inch above the top of the bulb.

4451. Tests showed that when the box had been stored at room temperature, the 200-watt bulb produced a temperature of approximately 118° C. (244° F.), at a point 3 inches below the top of the box, after the lamp had been on for 1 hour with the door of the box closed.

4452. Two balloons can be conditioned at one time in the box shown in figure 4–1. The balloons should be placed on the shelf and heated for 1 hour. They should be moved frequently to insure even heating during the conditioning period.

4453. If plastic screen is not available, the sliding shelf may be constructed of thin, sanded wooden slats spaced to provide adequate ventilation.

4460. Treatment of 10-gram Balloons.—Since the bursting diameter of the ballast balloon is controlled by the amount of gas in the balloon, the special heat treatment is usually un-

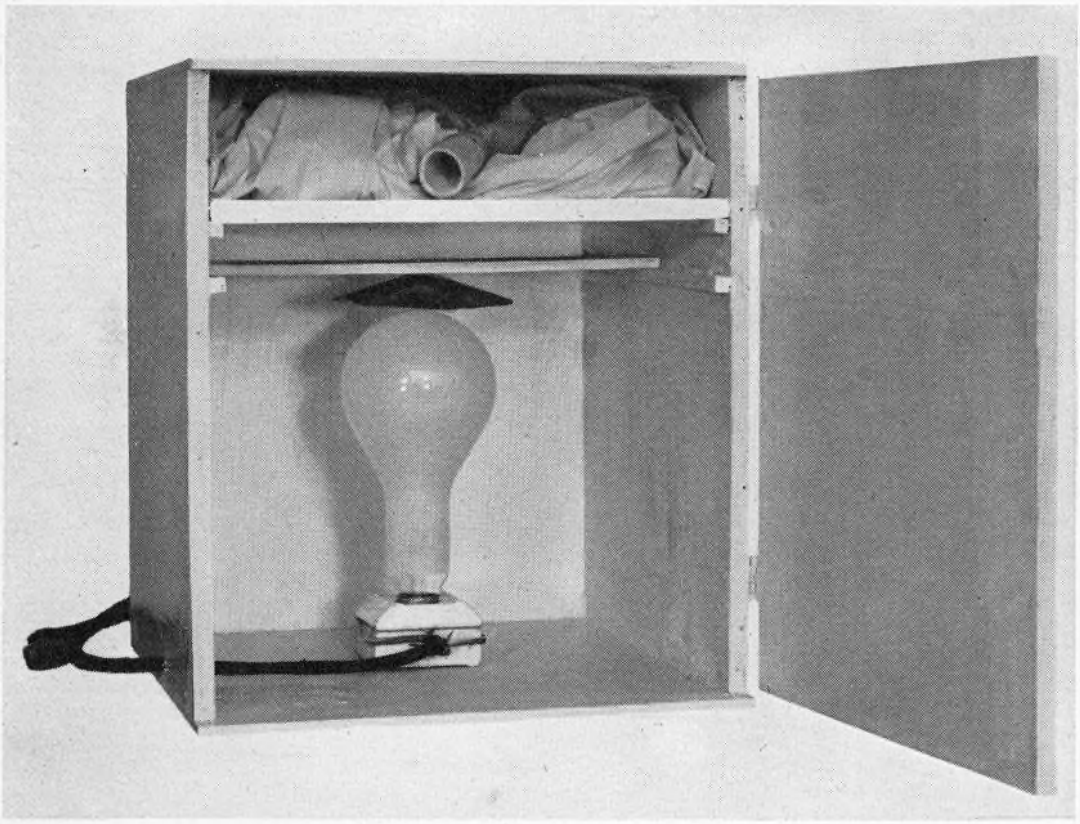

FIGURE 4–1.—Box for heat-conditioning of balloons.

necessary for the 10-gram balloons used for this purpose. The storage temperature will affect the bursting elevation. Therefore, when the optimum inflation circumference for obtaining the desired bursting elevation has been determined by experience, it is important that the 10-gram balloons be stored at approximately the same temperature to insure consistent bursting at the desired elevation.

4500. INFLATION OF BALLOONS

4510. Handling of Balloons.—Meteorological sounding balloons are extremely delicate especially when in a softened condition after the heat treatment. A slight abrasion, although not sufficient to cause perceptible damage, may cause the balloon to burst during inflation or prematurely during the sounding. Careful handling of balloons is therefore essential.

4511. All sharp edges and rough surfaces should be removed from the equipment used to heat the balloons. Balloons should be handled only by the necks and should not be permitted to come into contact with grease, oil, abrasive material, or rough surfaces. If it becomes necessary to lay a balloon down after it has been removed from the carton, it should be placed on clean paper. The balloons should not be exposed to direct sunlight except as may be necessary during the actual inflation or release.

4520. Inflation of 350-gram Balloons.—All excess air should be removed from the balloon. If the hot-water bath treatment has been used, the neck should remain closed until the inflation nozzle is to be inserted.

4521. If the gas regulator or outlet valve is equipped with a low-pressure gage, open the valve to a pressure not exceeding 20 pounds per square inch. If hydrogen is used directly from a generator, open the gage to a pressure not exceeding 10 pounds per square inch. If no low-pressure outlet gage is available, adjust the flow of the gas so that a period of at least 10 minutes is required to completely inflate the balloon with helium or so that 20 minutes are required if hydrogen is used.

4522. Place the balloon in a position where it will not come into contact with sharp objects or rough surfaces. Hold the balloon by the neck until it is supported by the gas. Check that the correct weights have been attached to the nozzle.

4523. When the balloon is about one-half inflated, close the gas valve. Listen for gas leaks and examine the balloon for defects. Serious defects may result from foreign material in the rubber, a break in a double layer of rubber or a deformity in a small area of rubber film. Discoloration should not be considered as a defect unless experience indicates that certain types of discolorations result in premature bursting. If the balloon is defective, begin inflating a second balloon; otherwise, proceed with inflation.

4524. Close the outlet valve as soon as the inflation weights are raised from their support. Listen momentarily for escaping gas from the balloon.

4525. Use a 6-foot length of double cord (16-ply cotton twine) for tying the balloon. Make one turn of the doubled cord around the neck of the balloon just above the inflation nozzle and at a position about one-fourth of the length of the neck from the balloon. Adjust the doubled cord so that free ends of about 5 feet and 1 foot in length, respectively, are available. Pull the cord as tight as possible and tie with a square knot. Make another turn around the neck and tie again. Remove the nozzle, fold the neck upward at its midpoint, and again tie as above.

4526. Adjust the 5-foot portion of the doubled cord to equal lengths and tie securely to the cords provided at the top center of the parachute. Check the parachute for crossed or tangled shroud lines. Tie a 50-foot length of cord securely to the free ends of the parachute shroud lines, just below the knot. (See par. 4610 regarding use of a shorter cord.) Place the other end of the 50-foot cord in a convenient position for tying to the radiosonde. (See par. 7830.)

4527. The ballast balloon is then tied just below the parachute to the 50-foot cord unless it is later to be tied below the radiosonde. (See pars. 4552 and 4553.)

4530. Lift for 350-gram Balloon.—The total lift of a balloon is the sum of the inflation weights and the weights of the balloon, inflation nozzle, and that part of the hose supported by the balloon. This sum, less the weight of the balloon, is the lift available for carrying the train.

4531. The free lift of a balloon is the lift which remains available after the complete train is supported by the balloon. The free lift, therefore, directly affects the ascensional rate.

4532. The ascensional rate of a balloon is affected by atmospheric conditions, shape of the balloon and weight of the train. Since these factors are variable, the optimum lift to be used for any given sounding can best be determined by experience.

4533. For good weather conditions, the total lift should be so adjusted that the average ascensional rate below the 400-millibar level will approach but not exceed an average of 200 meters per minute. Therefore, a radiosonde released at or near sea level should reach the 400-millibar level in approximately 40 minutes. When precipitation or icing is occurring or expected, an effort will be made to provide sufficient lift to

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insure that the balloon will not descend or float as a result of the additional load.

4534. Under good weather conditions, a free lift of approximately 400 grams will normally provide an average ascensional rate under 200 meters per minute when helium is used. (Hydrogen will produce slightly higher ascensional rates than helium with the same free lift.) For example, the average weight of the train without ballast balloon and using a type 4X2V60 battery is approximately 1,100 grams. A total lift (excluding the raob balloon) of 1,500 grams will provide a free lift of approximately 400 grams. The total lift should be increased by about 100 grams, if a type X–542 battery is used. If a type 4X2W60 or type BA67 battery is used, the total weight of the train would be increased by about 350 grams; therefore, a total lift of approximately 1,850 grams would be required to obtain a free lift of 400 grams.

4534.1. Since the weights of radiosondes, batteries, and parachutes are changed from time to time, the observer should check the weights given in paragraph 4534 against those of the items actually supplied to the station.

4535. An increased lift of 100 grams is normally sufficient to compensate for the increase in weight of the train resulting from moisture. This will vary with the type of parachute and type of cord used as well as with the downward force exerted on the balloon and train when precipitation is also occurring. Under light or moderate icing conditions an increase in the lift of from 200 to 300 grams will usually be sufficient. Under severe icing conditions an increase of up to 800 grams in free lift may be necessary to insure a successful sounding.

4536. When a ballast balloon is used, the total lift should be increased by approximately three-fourths of the weight of the ballast to maintain a normal ascensional rate.

4537. Ascensional rates are important because too high a rate decreases the accuracy and value of a record while too low a rate may result in the loss of important data due to weak signals because of distance or low angles during high winds. Observers should study this problem so that they will be able to make the proper adjustments in lifts to obtain ascensional rates near the desired value.

4538. The gas from an inflated balloon slowly escapes through pores in the rubber. If the release is delayed for more than thirty minutes after the inflation of the balloon, a check of the total lift should be made prior to the release and the balloon reinflated to the proper lift if a change has occurred.

4539. If a balloon is inflated and not used to make a scheduled sounding, the gas should be released from the balloon. If hydrogen has been used for inflating the balloon, deflation should be accomplished in the open air. If an inflated balloon is retained for the next raob (normally twelve hours later) fatigue of the rubber will result in premature bursting.

4540. Patching of Balloons.—The cost of a balloon is small compared to the loss which would be incurred if the sounding failed as the result of premature bursting of the balloon. Therefore, 350-gram balloons containing pinholes should be patched only in case of an emergency resulting from a shortage of balloons.

4550. Ballast Balloon.—The purpose of the ballast balloon is to reduce the ascensional rate between the surface and the 400-millibar level and at the same time to permit the use of sufficient lift to insure rapid ascensional rates in the higher levels, with consequent reduction in the loss of the upper level data due to fading signals. The use of ballast balloons is also important because higher ascensional rates can be obtained in the upper levels and thus the period during which the larger balloons are exposed to extremely low temperatures is reduced. The ballast balloon should be used unless precipitation or icing is expected or the surface wind velocity is so great that a successful release cannot be made because of the additional weight.

4551. The 10-gram balloon is used as the raob ballast balloon. From 300 to 500 grams of fine, dry sand are poured into the balloon. (Water will not be used for ballast at land stations.) The balloon is then inflated to approximately 20 inches in the greater diameter. The inflated diameter should be such that the balloon will burst between the 400- and 500-millibar levels. Air may be used for inflating the ballast balloon.

4552. For releases during high winds, it will be more convenient to suspend the ballast balloon below the radiosonde, since the 350-gram balloon will be able to rise more rapidly before it is required to carry the weight of the entire train.

4553. If the ballast balloon is suspended beneath the radiosonde, the neck of the balloon should be tied in the center of a piece of cord 6 feet long. The cord should be passed through the support ring on top of the radiosonde and tied so as to form a loop around the radiosonde. The loop is then adjusted so the radiosonde will hang in its normal position.

4553.1. The ballast balloon should be located in the train so that it will not set up motions which will disturb the radiosonde.

4600. MAKING THE RELEASE

4610. Position of Radiosonde in the Train.—The radiosonde should be suspended not less than 50 feet below the 350-gram balloon unless high surface winds or obstructions make

it impossible to obtain a successful release with a long train. (See par. 7380.) This length is required to reduce the possibility of measuring erroneous temperatures in the vicinity of the balloon. A long cord reduces the amount of agitation to which the radiosonde is subjected when the balloon passes through turbulent air. A long cord also has an advantage in making an overhead release since it permits the balloon to gain a greater elevation before it must support the weight of the radiosonde.

4620. The Release.—Release procedures must necessarily be varied with conditions surrounding the site from which the release is made. The release should be made from the ground level when this is practicable.

4621. The observer should be familiar with all obstructions and air traffic over the area before attempting a release. Before the balloon is removed from the inflation shelter, the wind direction and velocity should be determined and a point selected from which the radiosonde will not strike obstructions or encounter downdrafts.

4622. Release During Light Winds.—Firmly tie the 4-foot cord, which has already been attached to the ring of the radiosonde and the upper leg of the antenna, to the 50-foot cord which has been tied to the shroud lines of the parachute. Take the balloon from the inflation shelter to a point free from overhead obstructions. Pay out the train slowly until the radiosonde is reached. Hold the radiosonde by the ring or support strap. Observe the direction in which the balloon tends to move and select a new position if obstructions are in the path the balloon will follow. Release the radiosonde when all checks have been completed.

4623. Release During Moderate or High Winds.—The two-man overhead release should be used during moderate or high winds. The radiosonde should be tied to the train and the visual checks prior to release made in front of the shelter before the balloon is removed. If precipitation is occurring, the checks may be completed in the inflation shelter, provided the temperature is approximately the same as in the instrument shelter.

4623.1. The release point and plan of release should be determined by the two observers. After the checks have been completed the observers will proceed to the point of release and make the release as rapidly as possible. The first observer places the radiosonde, right side up in his left hand, taking care not to cover the ventilation chamber, and grasps the cord with his right hand at a point just above the top of the antenna. The second observer removes the balloon from the inflation shelter, grasping the balloon firmly by the neck. The first observer adjusts his movements so that a slight tension is exerted on the cord in his right hand to avoid having the train become tangled. As soon as the selected spot is reached, the first observer shorts the low or high reference, if the wind permits, as provided in section 7854. The second observer holds the balloon directly upwind from the radiosonde and checks the path the balloon will follow. If obstructions will be encountered he will request the first observer to assume a new position.

4623.2. As soon as the first observer is in position facing downwind, with the radiosonde in his left hand, the cord in his right hand, and while the train is taut, he gives the ready signal. The second observer gives the release signal at the instant he lets go of the balloon. Upon receipt of the release signal and when the train slackens, the first observer runs downwind with the radiosonde until his right hand detects that the balloon has again taken up the slack. At this instant he raises the radiosonde with his left hand and brings the cord forward with his right hand. If the movements of both hands are coordinated, the radiosonde will follow the balloon without any noticeable jolt.

4623.3. If the balloon does not rise, the second observer should give the "hold" signal. The first observer should also attempt to observe the position of the balloon a moment prior to the release. After some experience, the approximate position of the balloon can be determined by the angle of the tension of cord in the observer's right hand.

4623.4. If the balloon has not risen sufficiently so that the radiosonde will clear the surface or obstructions, the radiosonde should not be released. If the cord breaks, a second balloon should be inflated and a new train assembled. A new baseline check should be made. If the original relationships still exist the same radiosonde should be used, otherwise the standby radiosonde should be prepared for the next attempt.

4623.5. If the wind is gusty, the balloon should be released at time of or just before reaching the lowest velocity. The amount of variation can be determined by the force on the balloon. The second observer should time the moment of release to take advantage of the reduced velocity.

4623.6. If obstructions prevent the observer from running downwind the possibility of a jar at the instant of release is increased. The observer holding the radiosonde should stand in a position from which he can observe the movement of the balloon. At the instant the balloon takes up the slack, he should follow through with the radiosonde to reduce the jolt and any possible damage to the radiosonde which may affect the accuracy of the record.

4624. Roof Releases.—The same methods as used for ground releases can also be used with

some modifications for roof releases. The roof edge of areas used for releases should be properly guarded. Since the radiosonde can usually be taken to the edge of the roof to obtain the necessary clearance from the ground, running with the radiosonde is not recommended. The balloon should be released from the windward side of the building in a position which will take advantage of rising air currents and avoid descending air currents after the release has been made. Rising air currents will frequently aid in raising the balloon sufficiently to avoid the full effects of the downdraft on the lee side of the building.

4630. Balloon Covers.—The full-flap type balloon cover has been designed to protect the 350-gram balloon while carrying it to the point of release and to aid in releasing the balloon in high winds. The cover weighs approximately 1,200 grams and can therefore be used as part of the inflation weight. In a protected inflation shelter, it is usually found more convenient to cover the balloon after the inflation has been completed.

4631. The cover is so designed that the balloon can be moved and controlled by holding two of the flaps in each hand. At the moment of releasing the balloon, release the two flaps held by one hand nearest the windward side of the balloon. Care should be taken to hold the flaps in such a manner that the two flaps held by one hand are on the same side of the cord.

4632. If a balloon cover has not been provided for the station, one can be improvized from a muslin sheet or similar material. The sheet is placed over the balloon in the inflation room. The four corners of the sheet are brought together near the neck of the balloon, thus enclosing the balloon. The release is completed in a manner similar to that used with the specially designed cover.

Chapter V. ACCESSORIES

5100. GENERAL

5101. A number of accessories are provided in order that standard procedures may be followed at all stations in the preparation of the radiosonde for flight. These items include the following which, although of different designs in the three services, are fundamentally the same:

(*1*) Instrument shelter.
(*2*) Inflation equipment.
(*3*) Inflation equipment.
(*4*) Test switch.
(*5*) Test batteries.
(*6*) Battery voltmeter.

5200. INSTRUMENT SHELTER

5202. The instrument shelter is used for the exposure of the radiosonde to atmospheric conditions prior to and during the baseline check. Figures 7–2 and 7–3 show internal views of the instrument shelter with radiosonde, test switch, centigrade psychrometer, and psychrometer fan in the proper positions for making the baseline check.

5300. INFLATION SHELTER

5301. Plans for inflation shelters are provided separately by the three services. In general, inflation of the 350-gram balloon requires a protected space of not less than 10 x 10 x 10 feet, with suitable doors to allow for the removal of the balloon. It is essential for the inside walls of the shelter to be covered with a smooth material in order to avoid damaging the balloon during the necessary handling.

5302. The doors of the shelter should be faced in a direction away from that of the highest prevailing winds to insure the least difficulty and the greatest protection to the balloon during its removal from the inflation shelter.

5303. A satisfactory temporary inflation shelter can be readily constructed using a framework of poles or pipes. Canvas or strong cloth can be lashed to the inside of the frame and across the top to provide a smooth surface for the protection of the inflated balloon.

5304. Where inflation of the 350-gram balloon is performed in a hangar or other large room, a canopy made from a sheet or blanket will aid in the handling of the inflated balloon. The sheet should be supported with its center tied up and the corners extended to form the canopy. This arrangement will provide a resting place for the balloon after inflation and will serve to prevent damage due to striking rough surfaces.

5305. When hydrogen is used for inflating balloons, it is absolutely essential that no safety measure for the avoidance of explosions be overlooked. No smoking, flames, or sparks from electrical apparatus should be permitted near the inflation shelter. Electric fixtures should be of the flash-proof type. All metal parts of the inflation equipment should be grounded to eliminate sparks from static electricity, since a high potential of static electricity may be generated by the friction of hydrogen escaping at high velocity through a small orifice. When a hydrogen generator is used, precautions against explosion which are given in the instruction manuals must be rigidly adhered to for the safety of all concerned.

5400. INFLATION EQUIPMENT

5401. Inflation weights and a nozzle are provided for use in inflating the 350-gram balloon. The equipment supplied to stations differs slightly according to the service concerned. In general, it is the practice to supply a large weight of 1,200 or 1,500 grams and smaller weights of 100, 200, 300, and 500 grams for use in combination with the large weight as required. The inflation nozzle may be supplied either as part of the large inflation weight or separately.

5500. TEST SWITCH

5510. General.—The radiosonde test switch provides a means of obtaining a record of the temperature, low reference, humidity, and high reference ordinate values during the baseline check.

5520. Motor Test Switch.—The electric-motor-driven test switch is the type in most common use. This test switch uses an electric motor to close successively, by means of a cam arrangement, two (or three) microswitches for the purpose of completing the radiosonde humidity, low reference, and high reference cir-

cuits, if the latter is provided. The temperature signal is transmitted when all the microswitches are open. The usual arrangement provides a speed of one revolution per minute so that about 15 seconds are allowed each circuit during each minute.

5530. Relay Test Switch.—The remote-control-relay test switch is at present used only at certain stations. This type of test switch contains a relay for switching successively the temperature, low reference, humidity, and high reference circuits into the control circuit of the radiosonde transmitter. The time allotted each circuit is controlled by the observer at the ground equipment by means of a push-button switch provided for activating the relay.

5540. Storage of Test Switch.—The test switch will be stored indoors between observations.

5600. TEST BATTERIES

5601. Test batteries, sometimes installed in a suitable case, are supplied to stations to reduce the expenditure involved in testing radiosondes before or during preparations for flight. A set consisting of two 1½-volt dry-cell batteries and two 45-volt "B" batteries will normally provide a sufficient power supply for the average amount of testing for one year at a cost equal to one radiosonde battery. Therefore, serviceable radiosonde batteries should not be used for test purposes except in case of emergency.

5602. Test batteries should be checked at intervals with the radiosonde battery voltmeter to determine whether sufficient voltage is available. Batteries found to test below 2.5 volts in the "A" section or 82 volts in the "B" section should be replaced. Erroneous audio frequencies may result if lower voltages are used.

5603. Occasionally radiosondes are rejected as outside of the adjustable low reference range because of a low "B" voltage from the test batteries. In addition, it has been found that radiosonde relays often will not operate with an "A" voltage of less than 2.4 volts. Final rejections of radiosondes for these reasons should not be made when using the test batteries until the battery voltages have been checked.

5700. BATTERY VOLTMETER

5701. Voltmeters for testing radiosonde batteries are provided with either a single dual-scale meter or with two meters. In either type battery voltmeter, a shunt resistor of approximately 10 ohms is provided across the "A" terminals and one of about 7,500 ohms is provided across the "B" terminals. The meter is thus equipped to show the same load voltages as would be obtained with an operating radiosonde. This arrangement is important since open circuit readings of battery voltages do not provide a positive indication of the condition of the battery for use.

Chapter VI. TESTING AND STORAGE OF RADIOSONDES

6100. GENERAL

6110. Receipt of Radiosondes. — Radiosondes, unless sealed in individual moisture-proof pouches, will be tested upon receipt. Radiosondes received in moisture-proof pouches will not be removed from their pouches for testing more than twelve hours before they are to be used for raob or standby purposes.

6111. Necessary instructions regarding the certification of invoices or packing slips, damages sustained in shipping and shortages are contained in the addendum.

6120. Repairs to Radiosondes.—Only the repairs authorized in sec. 6400 and in the addendum will be made to radiosondes.

6130. Rejected Radiosondes.—A list of the defects discovered in each radiosonde will be placed in its battery compartment. Defects will not be indicated by markings on the radiosonde case. Rejected radiosondes will be disposed of as provided in the addendum.

6140. Testing of Radiosondes.—The visual inspection and performance tests described in the following paragraphs will be made without exception. When defects are noted, the performance tests will be completed insofar as the defects permit.

6200. VISUAL INSPECTION

6210. General.—The visual inspection checks will be completed in the following order, after the flaps and front door of the radiosonde have been opened and the insulating material removed from the front of the transmitter and battery compartments.

6220. Serial Numbers.—Check that the serial numbers on the calibration chart and radiosonde agree, and that the number of the baroswitch, which is on or near the baroswitch assembly, agrees with the corresponding number on the calibration chart. If the baroswitch numbers disagree, the radiosonde will be rejected. If the baroswitch numbers agree but the serial numbers do not, accept the radiosonde and change the serial number on the calibration chart to agree with that found on the radiosonde.

6230. Temperature Section.—See figure 6–1 or 6–2. Check the temperature section for the following defects:

(1) Cracked or chipped temperature element.

(2) Broken or disconnected leads.

(3) Insufficient tension to insure good electrical contact in the clips of any radiosonde whose temperature element is mounted in Fahnestock clips.

(4) Oxidation at the connection of leads and clips.

6231. Replace all damaged temperature elements with elements of the same type and manufacture. Scrape off any oxidation found on the leads of replacement temperature elements. The element should be centered in the ventilation chamber to prevent its touching the sides. Reject any radiosonde having temperature section defects that cannot be repaired by a simple soldering operation or by replacing the temperature element.

6240. Hygrometer Section.—See figure 6–1 or 6–2. Check the hygrometer section as follows:

(1) The hygrometer element mounting clamps must be in working order and have sufficient tension to prevent the element from falling out.

(2) Any oxidation at the points where the clamps contact the edges of the element must be removed.

(3) All electrical leads must be securely soldered.

6241. Each radiosonde is supplied with a hygrometer element individually sealed in a vial containing relatively dry air. The seal of the vial will not be broken until the element is to be installed in the radiosonde prior to the baseline check, in accordance with paragraph 7450.

6250. Relay.—See figure 1–1 or 6–3. Remove all foreign matter from the relay contacts, and from between the armature and the pole. Check to see that the spring has sufficient tension to move the armature and that the armature pivot functions properly. Do not attempt to adjust the relay. Reject any radiosonde having a defective relay.

6260. Baroswitch Section.—See figure 6–4 or 6–5. Inspect the baroswitch section to determine that:

(1) The aneroid cells are rigidly mounted on the base and that the base is securely fixed to the radiosonde case.

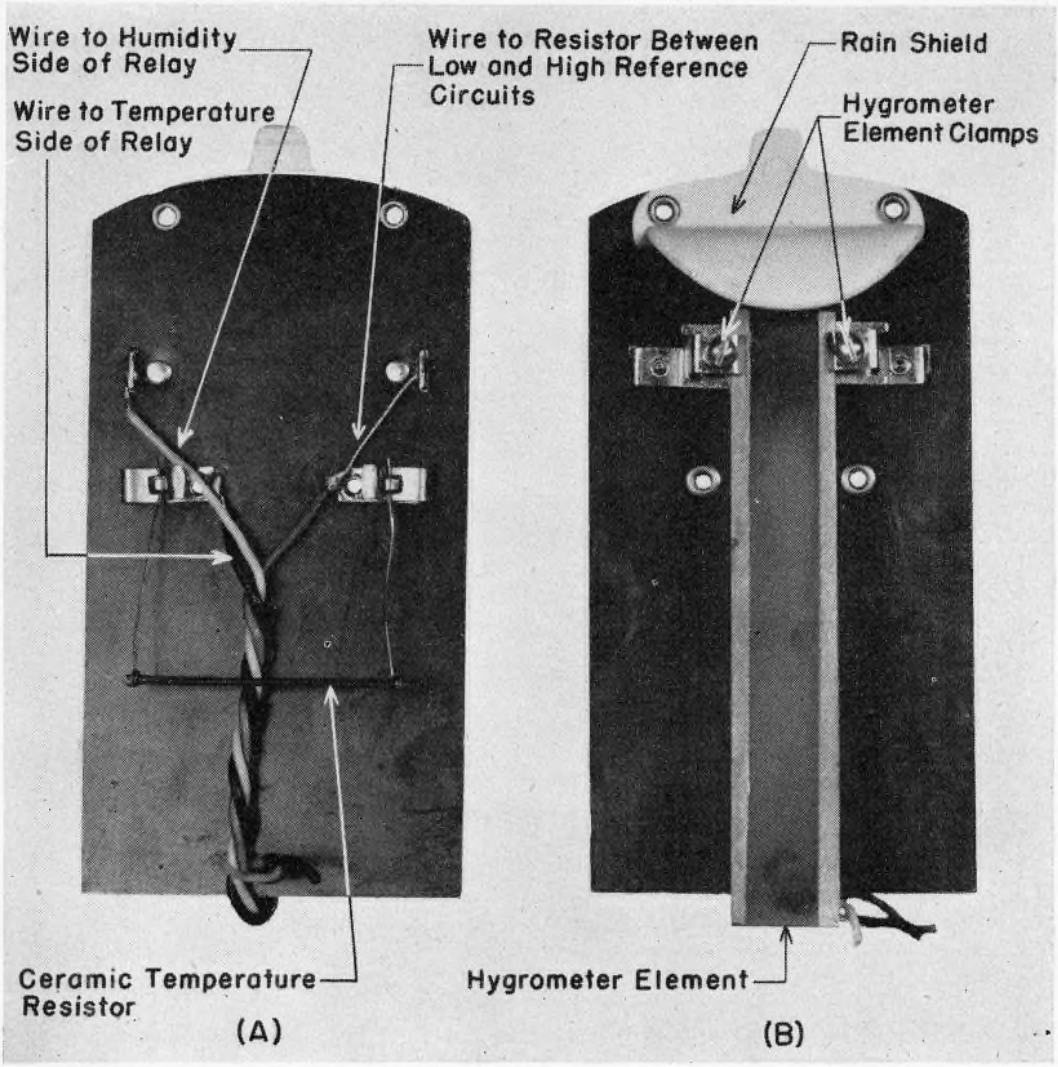


FIGURE 6–1.—Temperature and humidity elements of Friez radiosonde, (*a*) temperature side; (*b*) humidity side.

(2) The commutator is set in its frame in a plane parallel to that described by the movement of the contact arm.

(3) The contact arm returns to its original position when moved a few contacts higher or lower on the commutator. In making this test do not move the contact arm far enough to place a strain on the pressure cells.

(4) A normal amount of tension is present in the contact arm as determined by raising the arm with a pencil. Reject any radiosonde having a bent contact arm or disengaged linkage, since the pressure calibration will have been affected.

(5) The contact point is within two contacts of the setting corresponding to the pressure at the elevation of the radiosonde. If the contact point is more than five contacts to the right or to the left of the proper setting, reject the radiosonde. If the contact point is from two to five contacts to the right or left of the proper setting, adjust the point to the correct setting and set the radiosonde aside for a period of about one week. If at the end of this time, the contact point is within two contacts of the correct setting, accept the radiosonde; otherwise, reject it. The method of determining the setting of the contact point for the pressure at the elevation of the radiosonde is explained in paragraphs 7344–7346, inclusive.

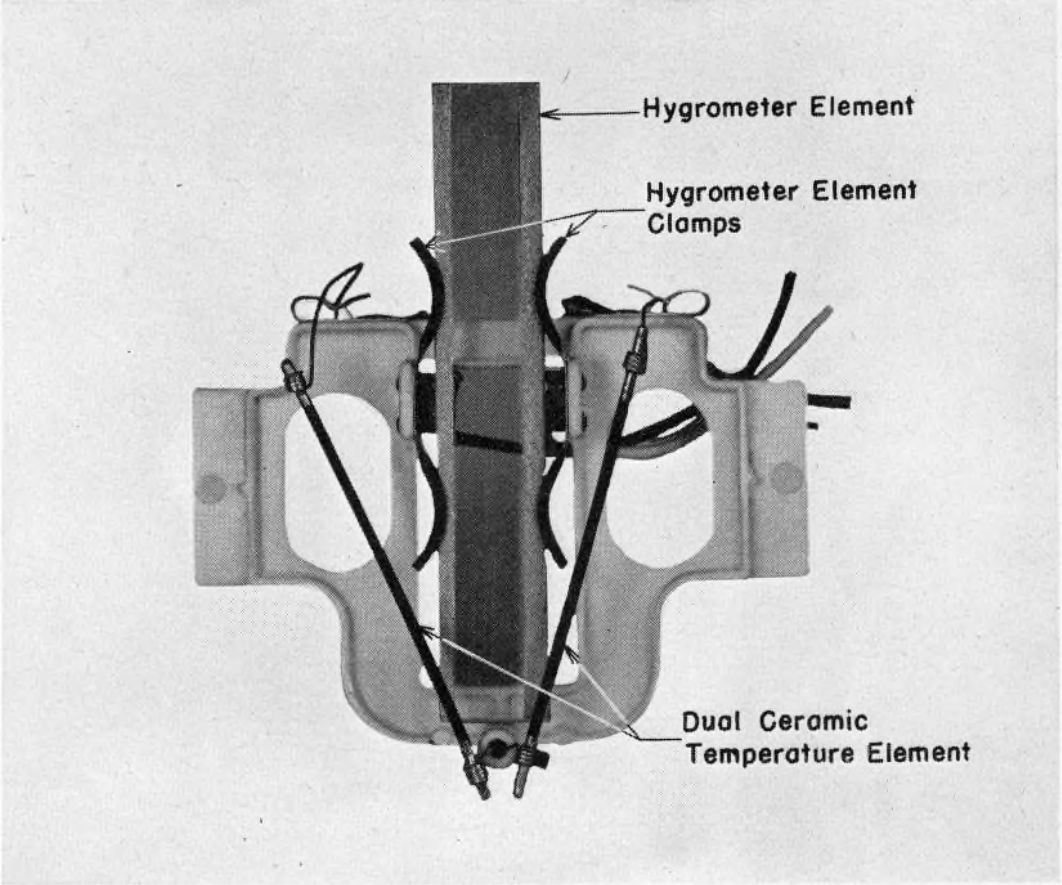


FIGURE 6–2.—Temperature and humidity elements of W. I. T. radiosonde.

(6) The commutator adjustment screw operates properly. The spring in this assembly must allow the commutator to follow the action of the screw.

(7) The commutator is free of any irregularity which cannot be removed by light polishing with crocus paper.

6261. Draw a pencil line across a thin piece of paper placed over the commutator surface. If any irregularities can be felt when the line is drawn, the radiosonde should be rejected unless the irregularity can be removed by polishing with crocus paper. Never rub the finger across the commutator surface since any oil left on the surface may cause poor switching during the sounding.

6270. Transmitter and Circuits.—It is not necessary to remove the transmitter from its case for purposes of testing and inspecting. The radiosonde should be furnished with large pads of insulating material for the transmitter and battery compartments. A radiosonde should not be used without this insulating material.

6271. Visually check that all wiring leading to the transmitter is properly connected and that the wires within the compartment are sufficiently long that no strain will be placed on the antenna coil when the knots in the antenna are pulled against the case, and that no strain will be placed on the transmitter when the battery is installed.

6272. The circuits in the radiosonde are identified by the color of the insulation of the wires. These colors are as follows:

6272.1. Blue Wire.—Blue wire is used in the low reference circuit and should be connected to the metallic segment of every commutator contact which is a multiple of 5, but not including multiples of 15, and to the metallic segment of every contact above 60 on a Friez radiosonde (above 70 on a W. I. T. radiosonde) which is not a multiple of 5.

6272.2. Red Wire.—Red wire is used in the high reference circuit and should be connected to the metallic segment of every contact which is a multiple of 15, except that above 60 on a Friez radiosonde (above 70 on a W. I. T. radio-

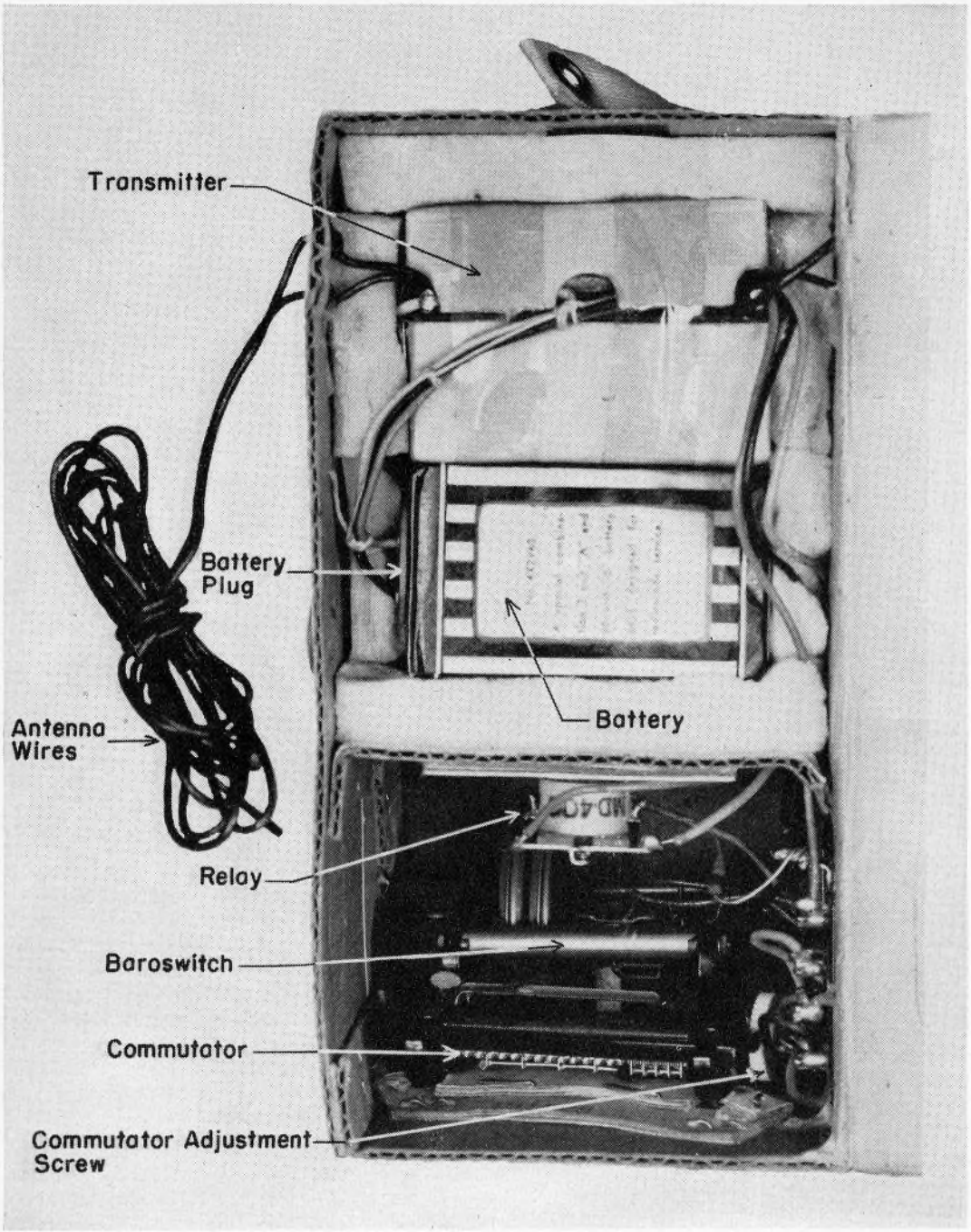


FIGURE 6–3.—W. I. T. radiosonde showing transmitter, battery, and baroswitch sections.

sonde), it should be connected to the metallic segment of every contact that is a multiple of 5.

6272.3. Yellow Wire.—Yellow wire is used in the humidity circuit and should be connected to the metallic segment of every contact through 59 on a Friez radiosonde (through 69 on a W. I. T. radiosonde), which is not a multiple of 5.

6272.4. Black Wire.—The black wire is the ground wire and is used to complete the humidity, high reference, and low reference circuits during circuit tests, baseline checks and while the radiosonde is in flight. Inspect each radiosonde to determine that the black wire is connected to the metallic frame of the Friez baroswitch unit, or to the fine copper wire con-

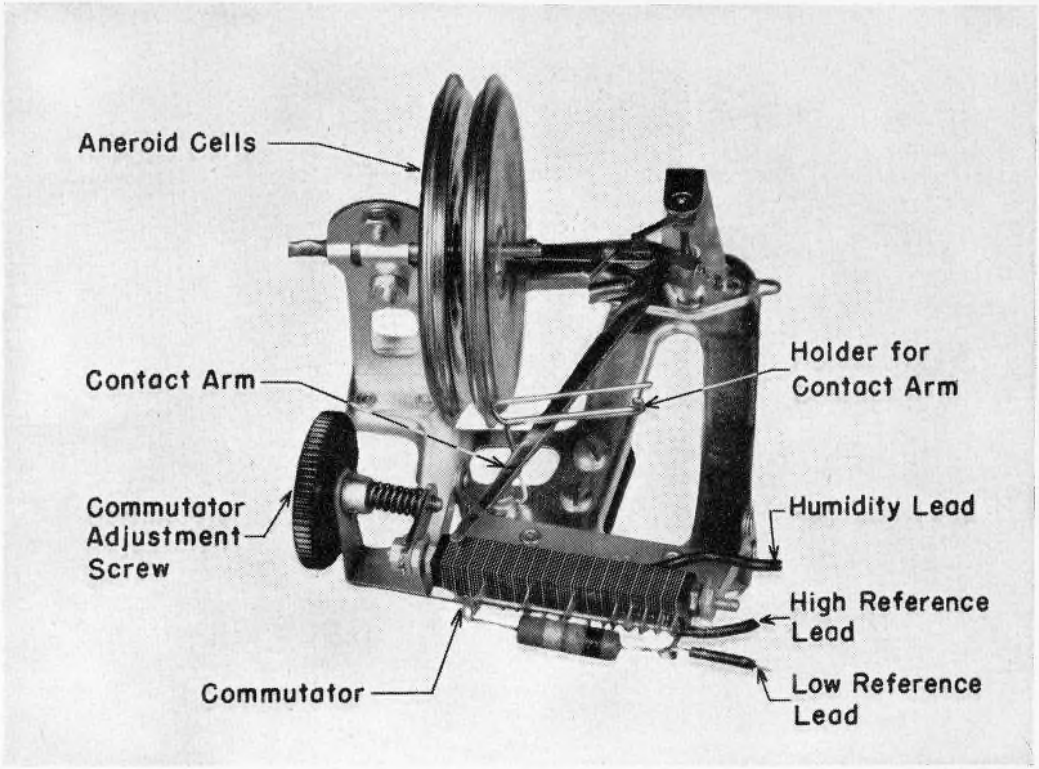


FIGURE 6–4.—Baroswitch section of Friez radiosonde.

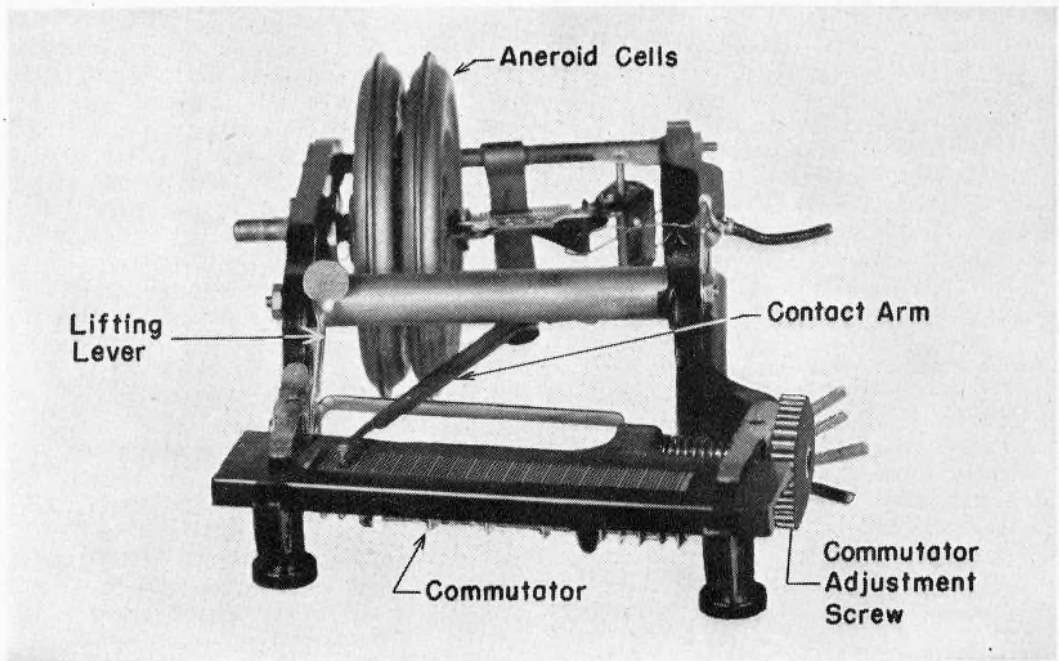


FIGURE 6–5.—Baroswitch section of W. I. T. radiosonde.

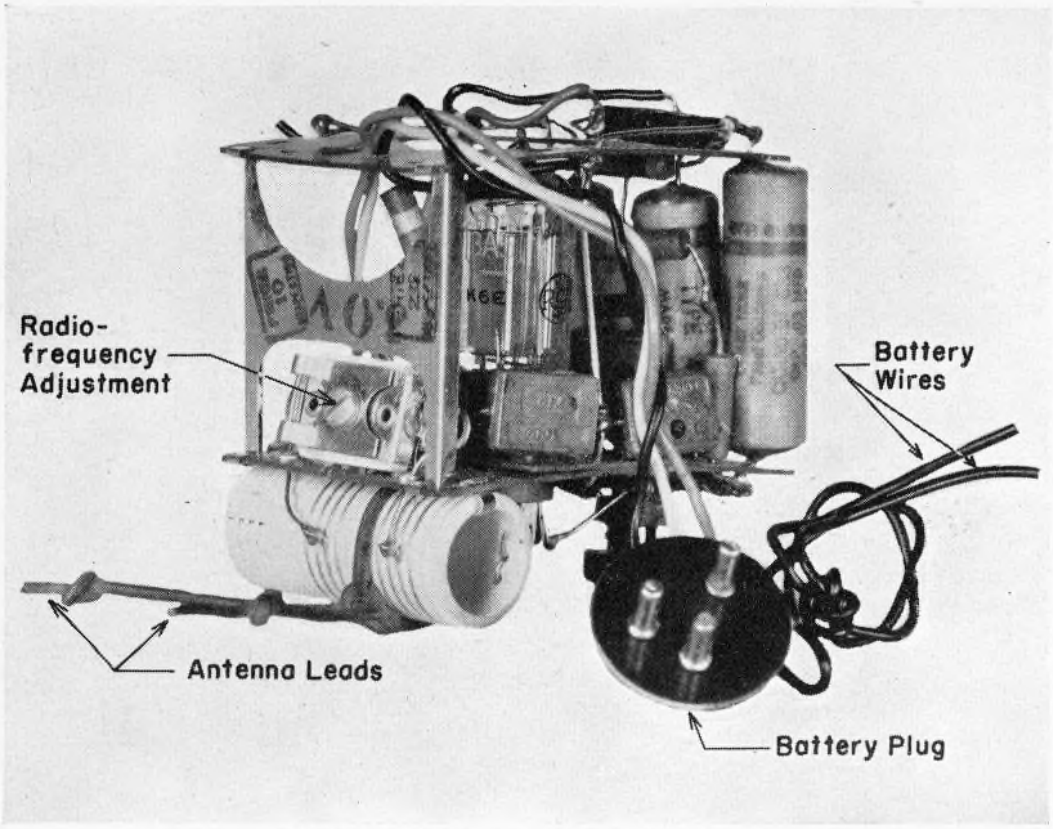


FIGURE 6–6.—Friez radiosonde transmitter section.

nected to the contact arm of the W. I. T. radiosonde. The black wire should also be connected to the brass rivet or screw, the head of which is located on the outside of the case and marked "G" or "GND."

6273. Test Leads.—For purposes of testing and obtaining the baseline check, a ground wire and test leads from the humidity and low reference circuits extend through the side of the radiosonde case. Some radiosondes also have a test lead connected to the high reference circuit. Each of the test leads has the characteristic color of the circuit to which it is connected.

6300. PERFORMANCE TEST

6310. General.—Turn on the receiver and the electronic frequency unit. After their operating temperatures have been reached (about 30 minutes), make an adjustment of the frequency unit to the 60-cycle value.

6311. Adjustment of Frequency Unit to 60-cycle Value.—Turn the input switch to the 60-cycle position. By means of the frequency unit controls (labeled "coarse" and "fine" or "continuous" and "step"), adjust to the visual meter value that is correct for the frequency unit. This value is the one determined by the technician at the time of the latest calibration of the ground equipment.

6311.1. If the 60-cycle value has not been supplied for the frequency unit, set the visual meter to read 30.0 with the input switch on 60 cycles, provided 60 cycles is the nominal frequency of the power supply. On other line frequencies, set the visual meter to read one-half of the nominal value of the line frequency.

6311.2. At a station having an extremely variable power supply frequency, the 60-cycle setting does not provide a satisfactory check of the radiosonde low reference frequency, as required by paragraph 6330. In this case, therefore, the check will be made without reference to this value by leaving the adjustment controls unchanged during tests and comparing the values indicated by other radiosondes on hand. Any radiosondes showing large deviations from the other radiosondes should be rejected. However, considerable care is required, and the instructions provided for use when a satisfactory 60-cycle value can be obtained should be used as a guide in this case. The 60-cycle value will be used for checks, if a stable power supply is available.

6312. The radiosonde transmitter is turned on by twisting together the battery wires ex-

tending through the case. These wires should always be disconnected before plugging in the battery. This precaution will prevent burning out the transmitter tube if an attempt is made to insert the 3-volt prong into the 90-volt socket of the battery and will also prevent accidental discharge of the battery.

6313. Connect the radiosonde battery plug to a test battery with voltages not less than 2.5 and 82.0 volts for the A and B sections, respectively. If a test battery with lower voltages is used, the readings of the low reference and other circuits may appear to be outside the prescribed limits.

6314. Raise the contact arm and connect the battery wires. Tune in the radiosonde signal in accordance with instructions for tuning given in section 8200 or section 8300. Turn the input switch to "X."

6320. Transmitter.—If a signal is not received, check that the receiver is operating and that all tuning controls and switches are properly adjusted. If the trouble is not found, test for a defective relay by connecting the red or blue test lead to the black test lead or to the grounded rivet on the side of the case. If a signal is not now received, the radiosonde will be rejected.

6330. Low Reference.—Connect the blue test lead to the black. The low reference signal should be received between 89.5 and 98.0 ordinates. (The visual meter should still be adjusted for "true frequency" as stated in paragraphs 6311–6311.2, inclusive.) If the signal falls outside these limits, reject the radiosonde, after first determining that weak test batteries are not the cause. If the low reference value is within the limits, adjust the visual meter to read 95.0 and then determine that the frequency unit controls still have sufficient adjustment range to compensate for any normal low reference drifts and shifts. If they do not have sufficient range, reject the radiosonde.

6340. Stability Check.—While the radiosonde is transmitting the low reference signal, tap the radiosonde lightly. If a permanent shift of low reference occurs, reject the radiosonde.

6350. High Reference.—Connect the red and black test leads. (If the radiosonde does not have a high reference test lead, connect the black lead to the red wire at the right end of the commutator.) The high reference signal should be received between 96.0 and 98.0 ordinates. If it lies outside these limits, reject the radiosonde.

6360. Temperature.—With all test leads disconnected (and the contact point still raised from the commutator), the radiosonde should transmit a temperature signal. The temperature element must give a value within the limits stated below for the type of radiosonde under test. Using the temperature evaluator proper for the type of radiosonde being tested, as indicated in the addendum, set the ordinate corresponding to the temperature signal opposite the temperature of the air at the radiosonde. For a Friez radiosonde, the 25° C. line should fall between 68.2 and 74.3 ordinates. For a W. I. T. radiosonde the 25° C. line should fall between 67.0 and 72.6 ordinates. If the indicated temperature value is not within these limits, replace the temperature element with another element of the same type and manufacture. If the replacement element also indicates a value outside the limits, reject the radiosonde.

6370. Humidity.—Connect the yellow and black test leads. A steady signal termed "motorboating" should be received at approximately five ordinates. Short across the humidity clamps and then connect the yellow and black test leads. A low reference signal should be received. Disconnect the yellow and black test leads.

6371. A motorboating signal may also be transmitted by a radiosonde having a hygrometer element installed, if the temperature or relative humidity, or both, of the air are extremely low. In such cases, a motorboating humidity signal indicates that the relative humidity of the air is equal to or lower than the minimum value the radiosonde can measure at the given temperature.

6371.1. The exact ordinate at which motorboating occurs varies with radiosondes and ground equipment, but usually has a value of about five ordinates. Radiosonde signals will be described as motorboating only when they are of an ordinate value equal to that indicated by the humidity circuit of the radiosonde when no hygrometer element is mounted in the clamps.

6380. Commutator.—Lower the contact arm and move the commutator back and forth by means of the adjustment screw. Alternate temperature and humidity, or reference, signals should be received. If the humidity or reference signals are not received, lightly polish the commutator and the contact point and inspect the relay to determine whether foreign matter is preventing its closing. If improper functioning persists, reject the radiosonde. (If necessary, polish the relay contact points in accordance with the procedure given in par. 7340.)

6381. After completion of the performance tests, disconnect the battery wires and the test battery.

6400. REPAIR OF RADIOSONDES

6410. General.—Rejected radiosondes should be examined to determine whether repairs can be made to them at the station. A list of the repairs that may be made by station personnel

will be found in the addendum. It is desirable that the number of rejected radiosondes be as low as possible, consistent with accurate performance.

6411. With the exception of the temperature resistor and hygrometer element the individual units or parts, such as resistors, condensers, or radio tube, must not be replaced or interchanged. The assembled radiosonde has been checked at the factory for performance according to definite standards. After any major repairs, the radiosonde must be recalibrated with specialized equipment not available to station personnel.

6420. Performance-Defect Relationships.—Table 6–1 lists the indications of common defects in radiosondes. The table is based on the radiosonde performance under the following conditions:

(1) An air temperature of approximately 25° C. at the radiosonde.

(2) No hygrometer element in the radiosonde and the mounting clamps not shorted.

(3) The contact arm point raised from the commutator.

(4) The radiosonde connected to a test battery with at least 2.5 volts on the A section and 82 volts on the B section.

(5) The battery wires connected.

(6) Low reference always adjusted to 95.0 on the visual meter, when the defects permit.

TABLE 6–1.—*Radiosonde performance-defect table*

	Performance				Defect
	Low reference	Temperature	Humidity	High reference	
1	#	#	#	#	1. Open circuit in red wire at or near transmitter.
2	#	#	*90–97. 5	#	2. Open circuit in black wire at or near transmitter.
3	#	#	#	*97	3. Broken circuit in resistor connecting red and blue wires.
4	†95	75	MB	95	4. Blue wire shorted to red wire somewhere.
5	†95	95	95	97	5. Blue wire shorted to ground somewhere.
6	†95	95	95	95	6. Red wire shorted to ground somewhere.
7	100+	100+	97	*97	7. Red wire shorted to yellow wire somewhere.
8	†95	100+	95	97	8. Yellow wire shorted to blue wire somewhere.
9	†95	MB	MB	97	9. Yellow wire shorted to ground in relay battery circuit.
10	†95	#	MB	97	10. Temperature resistor circuit broken.

# denotes no audio signal, not even motorboating, visual meter reads zero or value of noise level.
MB denotes motorboating, a signal indicated at approximately 5 ordinates.
*Low reference cannot be adjusted to 95.0 in these cases; therefore, the readings of the other circuits are those that would be indicated when the "true frequency" adjustment has been made as provided in par. 6311.
† denotes that low reference has been set to 95.0 as provided in par. 6420 (6).

6430. Relay Defects.—The indications of a defective relay are not included in table 6–1. A defective relay, or one out of adjustment, may be indicated as shown below when there is no hygrometer element in the mounting clamps and the clamps are not shorted. No attempt should be made to adjust the relay.

(1) Temperature ordinate is received for both temperature and humidity.

(2) Motorboating ordinate is received for both temperature and humidity.

(3) No audible signal is received for temperature or humidity, or both.

6500. STORAGE OF RADIOSONDES

6510. General.—A radiosonde is a precision instrument which will maintain its calibration only when stored under proper conditions. At continental stations the best storage conditions are usually found in the office quarters. Best results will be obtained from radiosondes stored at low humidities and moderate temperatures.

6511. The case of the radiosonde should be closed, with the flaps tied down during storage. Whenever possible, the radiosondes should be stored in the shipping cartons because of the additional protection afforded.

6520. Excessive Humidities.—It is especially important that radiosondes be protected from excessive humidities, as prolonged exposure to such conditions will cause corrosion of the metal parts of the instrument. This will affect the electrical circuits and therefore the accuracy of the radiosonde.

6530. Excessive Temperatures.—Radiosondes should not be stored at temperatures above 38° C. (100° F.) such as may be encountered near the ceiling of a heated room. Higher temperatures may soften the wax on the audio-frequency coil, thus permitting movement of the coil, which will affect the calibration of the radiosonde. Extremely low temperatures will not damage the radiosonde unless temperature changes cause condensation and subsequent formation of ice. Radiosondes

stored at low temperatures will be brought into a warm room several hours before they are to be tested and prepared for flight.

6540. Order of Use by Serial Number.—Radiosondes should be so stored that the oldest serviceable radiosonde on hand, usually the one with the lowest serial number, is readily available for use. However, the moisture-proof pouches of individually-sealed radiosondes will not be opened merely for checking the radiosonde serial numbers. Arrangements should be made to use these radiosondes by cartons according to age as indicated by the serial numbers on the outside of each carton.

Chapter VII. PROCEDURE THROUGH RELEASE

7100. GENERAL

7110. Observation Schedules—Raobs will be made at 0400 and 1600 G. C. T., plus or minus 1 hour. However, when unfavorable weather conditions or other reasons prevent a release from being made on scheduled time, a release will be made as promptly as possible thereafter, but in no case later than 1000 or 2200 G. C. T., respectively.

7111. If, owing to unfavorable weather conditions, the time of release conflicts with the regular six-hourly synoptic surface weather observation or any other routine duty and the services of available assistants are required to make a successful release, the radiosonde will be released first, and the routine duties taken up as soon thereafter as possible.

7200. PRELIMINARY PREPARATIONS

7210. General.—Before beginning preparations for the raob, the observer will familiarize himself with the wind and weather conditions and the expected air traffic. He will decide on the lift and ballast to be used, and the method and place of making the release. He will consider the length of exposure required for the various pieces of equipment, and determine the order in which the preliminary steps are to be performed. The order must be adapted to the arrangements and needs of the station, and of the particular observation. Several of these operations can be carried on at the same time, and all must be started sufficiently early that the release can be made on schedule, whenever possible.

7220. Exposure of Test Switch.—Place the test switch in the shelter and connect it to the power source, but with the switch turned off. This should be done in sufficient time that the test switch will have been exposed for at least 1 hour before the baseline check is begun.

7230. Check of Ground Equipment.—Turn on the radiosonde ground equipment. The ground equipment must warm up for at least 30 minutes before the baseline check is begun.

7231. Inspect all units of the ground equipment to make certain that they are operating properly.

7240. Check of Cycloray Recorder.—If a Friez Cycloray recorder is used, check that the main-drive, paper-drive, and ribbon-drive motors are operating properly. Note whether there is sufficient paper in the recorder for the raob.

7241. Each roll of Cycloray recorder paper is marked "Six Feet Remaining" at that distance from the end of the paper. If this warning mark appears after the baseline check is begun, sufficient paper usually remains for completing the observation.

7241.1. When a new roll of paper is installed in the Cycloray recorder, the paper must be allowed to feed out for at least 15 minutes in order to be certain that it is aligned properly and that it does not creep or drift to one side. (The newer recorders have a pointer to indicate the position of the zero line of the paper when correctly aligned. A mark may be made on the paper feed roller of older recorders to serve the same purpose.)

7242. After the recorder has warmed up and the paper has become properly aligned, check the zero recording.

7242.1. With the input switch turned to "SC," the ordinate value of the zero line printed by the Cycloray recorder should agree with the latest calibration data issued to the station. If the zero recording does not appear at the proper position, recheck the alignment of the paper. Then, if necessary, adjust the zero recording to the proper value by means of the zero adjustment knob located in the front of the recorder compartment.

7250. Check of L&N Recorder.—If an L&N Speedomax recorder is used, check that the paper-drive and balancing motors are operating properly. Check the ink supply and the feeding of the recorder pen. Note whether there is sufficient paper in the recorder for the raob.

7251. Each roll of L&N recorder paper is marked "Approximately 82 Inches to End of Roll" at that distance from the end of the paper. If this warning mark appears after the baseline check is started, the amount of paper remaining is usually sufficient for completing the observation.

7251.1. When a new roll of paper is installed in the L&N recorder, it is only necessary that the paper be correctly placed over the sprockets, since the sprockets will keep the paper in alignment. The paper must be kept taut to prevent its slipping off the sprockets.

7252. After the recorder has warmed up and the paper has become properly aligned, check the zero recording.

7252.1. Balance the galvanometer needle of the L&N recorder at the zero point. Check the sensitivity of the recorder, and adjust it if the

sensitivity is less than the required 0.2 ordinate operating sensitivity. When the input switch is at "SC," the recorder pen should rest at the zero line printed on the paper. However, on some recorders, the limiting switch may open before the balancing motor returns the pen to the zero line. In such a case, turn the violin string disk by hand until it rests against the stop. The pen should now be at zero. If it is not, examine the recorder for slippage of the pen carriage on the violin string and for slippage of the violin string disk on its shaft.

7252.2. The sensitivity adjustments of the L&N recorder will not be changed during or after the baseline check since questionable records will result.

7300. PREPARATION OF RADIOSONDES

7310. General.—Obtain the oldest serviceable radiosonde on hand for use in the observation and select the next oldest for use as a standby radiosonde. (See par. 6540.) Prepare these radiosondes in accordance with the following instructions.

7320. Test of Radiosondes.—Make a complete visual inspection of the radiosondes in accordance with section 6200, and performance test as provided in section 6300. It is important that all radiosondes be visually inspected and that the circuits be tested before the radiosondes are prepared for use. This procedure will disclose any deteriorations or breakdowns that might have occurred while the radiosondes were in storage at the station. Special attention should be given to checking the calibration chart to make certain that charts were not exchanged during the testing of the instruments.

7330. Interference.—While the performance tests are being made, the radio frequency of the radiosonde signal should be checked to be sure that it is not near the frequency of any interfering signal. This is especially important whenever it is necessary to release a second radiosonde while the signal from the first is being transmitted.

7331. A reference log should be kept of the main tuning dial readings where interference has been found to occur. When a radiosonde signal is tuned in, turn the main tuning dial to each side of the peak tuning position to determine whether any other signal is within 15 dial divisions on the super-regenerative receiver or within 1 megacycle on the superheterodyne receiver. If it is found that interference is occurring or commonly occurs within this range, use another radiosonde or change the radio frequency of the radiosonde.

7332. Radiosonde transmitting frequencies are set for best performance at the factory, and should not be changed unless it is absolutely necessary to avoid interference. Any changes that are necessary should be made very carefully, as it will be found that at some positions of the adjusting condenser the transmitted signal will be very unstable, or will not be received at all. This is especially true if the maximum adjustment is made in either direction.

7332.1. On the Friez radiosonde, the transmitting frequency is changed by turning the screw on the small condenser which is located adjacent to the antenna coil. (See figs. 1–1 or 6–6.) The coil and the condenser are installed on the front of the transmitter and are readily located. The reading of the receiver dial at peak tuning is increased when the screw is turned to the left or loosened, and decreased when the screw is turned to the right or tightened.

7332.2. On the W. I. T. radiosonde, the transmitting frequency is adjusted by turning with a screw driver the slotted plate of the small condenser located adjacent to the tank coil. The coil and the adjusting condenser can be seen through one of the openings in the top of the cardboard transmitter case. The observer should note whether the receiver tuning dial reading at peak tuning increases or decreases as the slotted plate is turned in one direction or the other.

7340. Relay and Baroswitch.—Using the crocus paper furnished with the radiosonde, polish the four contact points of the relay by gently drawing the crocus paper once or twice over each point. Clean the points of foreign matter by placing a piece of bond paper between the points and moving the paper back and forth several times.

7341. Polish the contact point by lowering it to the commutator and sliding crocus paper, with the abrasive side up, back and forth several times between them.

7342. Raise the contact arm. Polish the entire face of the commutator by placing the finger over the crocus paper and moving the paper back and forth along the entire length of the commutator. Remove any particles that may be present as a result of the polishing operation with a clean cloth or tissue paper. Lower the contact arm to the commutator. The fingers should never be rubbed across the commutator, since any oil left on the surface may cause poor switching during the sounding.

7343. Adjust the commutator to the correct setting of the contact point in accordance with paragraphs 7344–7346. Tap the radiosonde lightly and note whether the contact point remains at the proper setting. If not, readjust the commutator. Raise the contact arm.

613388°—45——3

7344. Determination of Commutator Contact Setting.—The commutator contact setting for the pressure at the elevation of the radiosonde will be made as follows:

7344.1. Obtain the station barometric pressure from the station barograph. If the barograph is adjusted for sea-level pressure, the station pressure must be obtained from the mercurial barometer.

7344.2. The station pressure will be corrected to the elevation of the radiosonde. Refer to table 7–1 to determine the correction corresponding to the difference in height. The table is based on the relationship of 1 millibar per 8.5 meters difference in elevation. The correction should be added to the station pressure when the elevation of the radiosonde is lower than that of the station, and subtracted when the radiosonde elevation is higher. For purposes of applying these corrections, a difference in elevation of 3 meters or less will be ignored.

TABLE 7–1

Difference between station elevation and elevation of instrument shelter (meters):	*Pressure correction (millibars)*
3	0.4
4	.5
5	.6
6	.7
7	.8
8	.9
9	1.1
10	1.2

7344.3. From the radiosonde calibration chart, determine to the nearest one-tenth of a contact the pressure contact corresponding to the pressure at the elevation of the radiosonde as determined in paragraph 7344.2. Using the adjustment screw, move the commutator until the contact point is to the left of the required point. Then, turn the adjustment screw until the contact point rests at the required setting after the radiosonde has been lightly tapped. If the commutator cannot be adjusted to the correct setting by means of the adjustment screw, reject the radiosonde.

7345. Commutator Contact.—A contact on the commutator extends from the left edge of one metallic segment to the right edge of the next succeeding insulator segment. In determining proportional parts of a commutator contact, it may be helpful to keep in mind that in a humidity-temperature combination the temperature portion comprises three-fourths of the total contact, and the humidity portion, one-fourth. In a reference-temperature combination, the temperature portion comprises six-tenths of the total contact, and the reference portion, four-tenths.

7346. Calibration Chart Contact.—A contact on the calibration chart is represented by the distance from the lower edge of one printed line to the lower edge of the next printed line. Figure 7–1 illustrates the relationship between the commutator and the calibration chart contacts.

7350. Installation of Battery.—Test and prepare for use the oldest serviceable radiosonde battery at the station. (See secs. 3320 and 3500.)

7351. Make sure that the battery wires are disconnected. Install the battery in its compartment and insert the battery plug. If necessary, pack paper around the battery to prevent any possibility of its movement during flight. Any such movement will cause shifting or unstable signals. Replace the insulating material around the battery and transmitter. Note that this battery is the one to be used in making the baseline check and flight. (Changing of the battery after a baseline check will necessitate the making of a new baseline check.)

7360. Sealing of Case.—Make sure that the flap or slide in front of the commutator adjust-

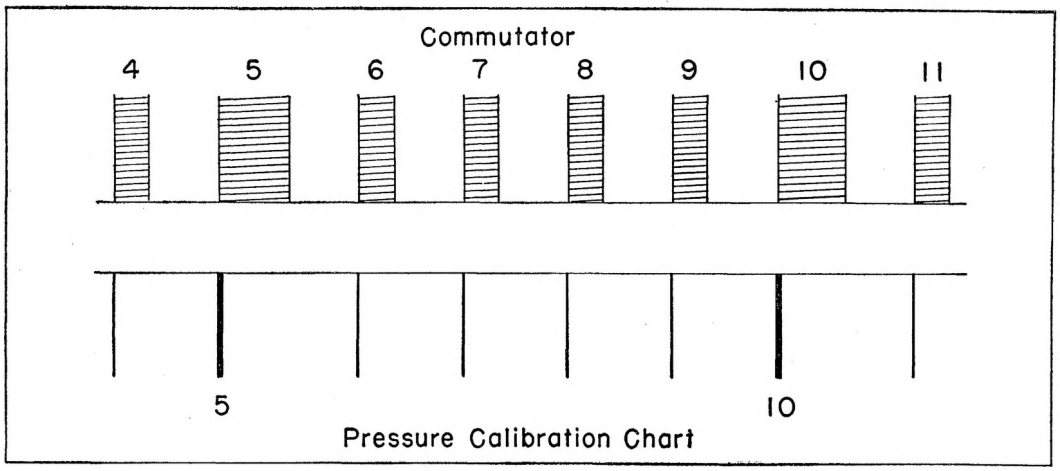


FIGURE 7–1.—Diagram showing relationship between radiosonde commutator and calibration chart.

ing screw can be easily opened later. Close the door of the radiosonde. Use a short piece of scotch tape to hold the door shut. Seal the edges of the door with scotch tape.

7361. Check the wall of the radiosonde case between the ventilation chamber and the baroswitch compartment. If a hole opening into the baroswitch compartment is found, seal it with a small piece of scotch tape.

7370. Recovery Tags.—If a radiosonde or a parachute recovery tag, or both, is to be used, enter the required information in the spaces provided. Attach a short piece of twine to the eyelet of each tag, for the use of the finder in mailing the recovered radiosonde. Fold the tag in half and place it under the upper ventilation chamber flap. Place a piece of scotch tape across the tag to hold it in place. Tie both flaps firmly in position with the cords provided.

NOTE.—Do not tie the tag to the support ring of the radiosonde. Experience shows that this practice frequently results in erroneous temperature data because of an obstructed ventilation chamber.

7371. Information regarding the use of recovery tags is contained in the addendum.

7380. Radiosonde Antenna.—Tie a piece of cotton cord about four feet long to the support ring in the top of the radiosonde. Extend the upper leg of the antenna along this cord and fasten it in several loops in the cord. The antenna leg should be loose enough that there will be no tension on it which would result in tilting the radiosonde when supported by the cord. At the same time, the antenna leg should not be tied so loosely that it would be free to move appreciably during flight. Extend the lower leg of the antenna downward and tape it to the side of the case. If high or gusty surface winds are expected at the time of release, the lower leg of the antenna should be stiffened with scotch tape or taped to narrow strips of cardboard. This will make the antenna leg stiff enough so that it will not remain out of position if thrown over the radiosonde or the cord at release, yet leaves it flexible enough to be handled in the instrument shelter.

7390. Standby Radiosonde.—The standby radiosonde should be similarly checked and tested, except that the installation of the battery, sealing of the case, placing of recovery tags, and preparation of the antenna should be omitted. The door of the standby radiosonde should be held shut with a rubber band or with a piece of cord.

7400. EXPOSURE OF RADIOSONDES TO ATMOSPHERIC CONDITIONS

7410. General.—The radiosondes will be placed in the instrument shelter for exposure to atmospheric conditions at least 30 minutes before beginning the baseline check. The standby radiosonde will be placed on the floor of the instrument shelter.

7420. Connections to Test Switch.—The radiosonde to be used in the observation will be placed on the test switch in a position such that the ventilation chamber is not obstructed and is near the psychrometer. See figures 7–2 and 7–3 for illustrations showing the radiosonde in position for the baseline check.

7421. Connect the radiosonde test leads to the proper leads of the test switch, making sure that all clips are tight and that good electrical contacts are obtained.

7422. When a four lead test switch is used with a radiosonde having four test leads, the radiosonde will be connected to the test switch so that the test circuits will be completed in the following order:

(1) Low reference;
(2) Temperature;
(3) High reference;
(4) Humidity.

7423. When a four lead test switch is used with a radiosonde having three test leads (that is, with no high reference test lead), the test switch high reference lead should be disconnected from its clip and connected to the same clip as the test switch low reference lead.

NOTE.—The test switch high reference lead will not be cut off, since it will be needed when using radiosondes with four test leads.

In this case, the circuits will be completed in the following order:

(1) Low reference;
(2) Temperature;
(3) Low reference;
(4) Humidity.

7423.1. In this case, it may be necessary to connect the two low reference microswitches of the test switch in parallel if the two low reference values differ. This connection must be removed when radiosondes with four test leads are used.

7424. When a three lead test switch is used with a four test lead radiosonde, the radiosonde high reference test lead will be left unconnected. The other leads will be connected so that the circuits are completed in the following order:

(1) Low reference;
(2) Temperature;
(3) Humidity.

7425. When a three lead test switch is used with a three lead radiosonde, connect the leads so that the circuits are completed in the following order:

(1) Low reference;
(2) Temperature;
(3) Humidity.

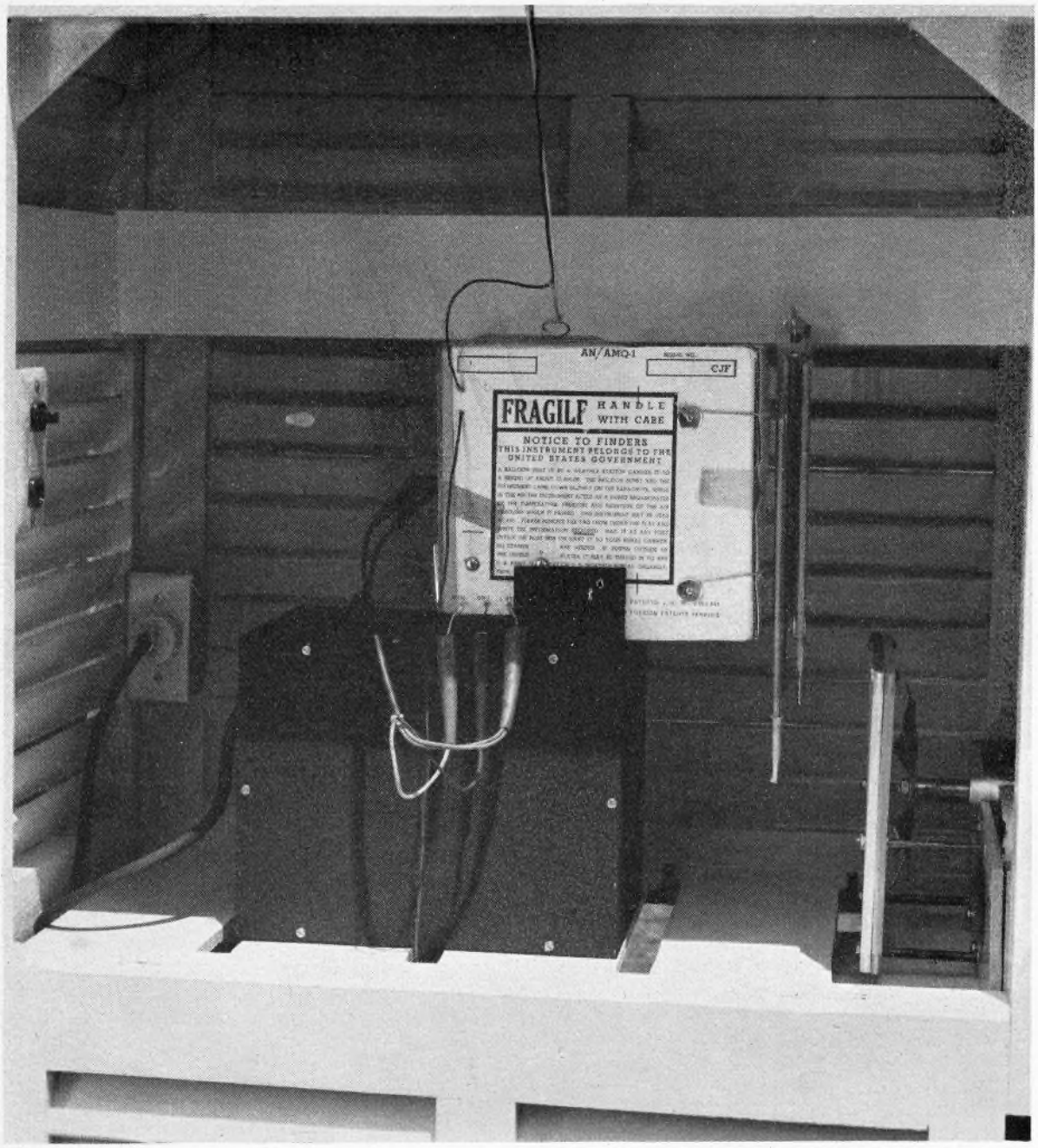


FIGURE 7–2.—Instrument shelter with radiosonde, relay test switch, psychrometer and fan in position for baseline check.

7430. Position of Antenna.—Stretch out the radiosonde antenna legs. Remove all kinks and hold the antenna legs taut by means of wooden wedges or with clips attached to rubber bands. (Any movement of the antenna legs may cause unstable or shifting audio frequencies during the baseline check.)

7440. Stand-by Radiosonde.—The stand-by radiosonde should be exposed on the floor of the instrument shelter, out of the way of other equipment in the shelter.

7450. Exposure of Hygrometer Element.—Install the hygrometer element in the radiosonde early enough before the baseline check to insure that the prescribed exposure time will have elapsed. Table 7–2 shows the length of exposure required before making the baseline check, as well as the maximum permissible exposure

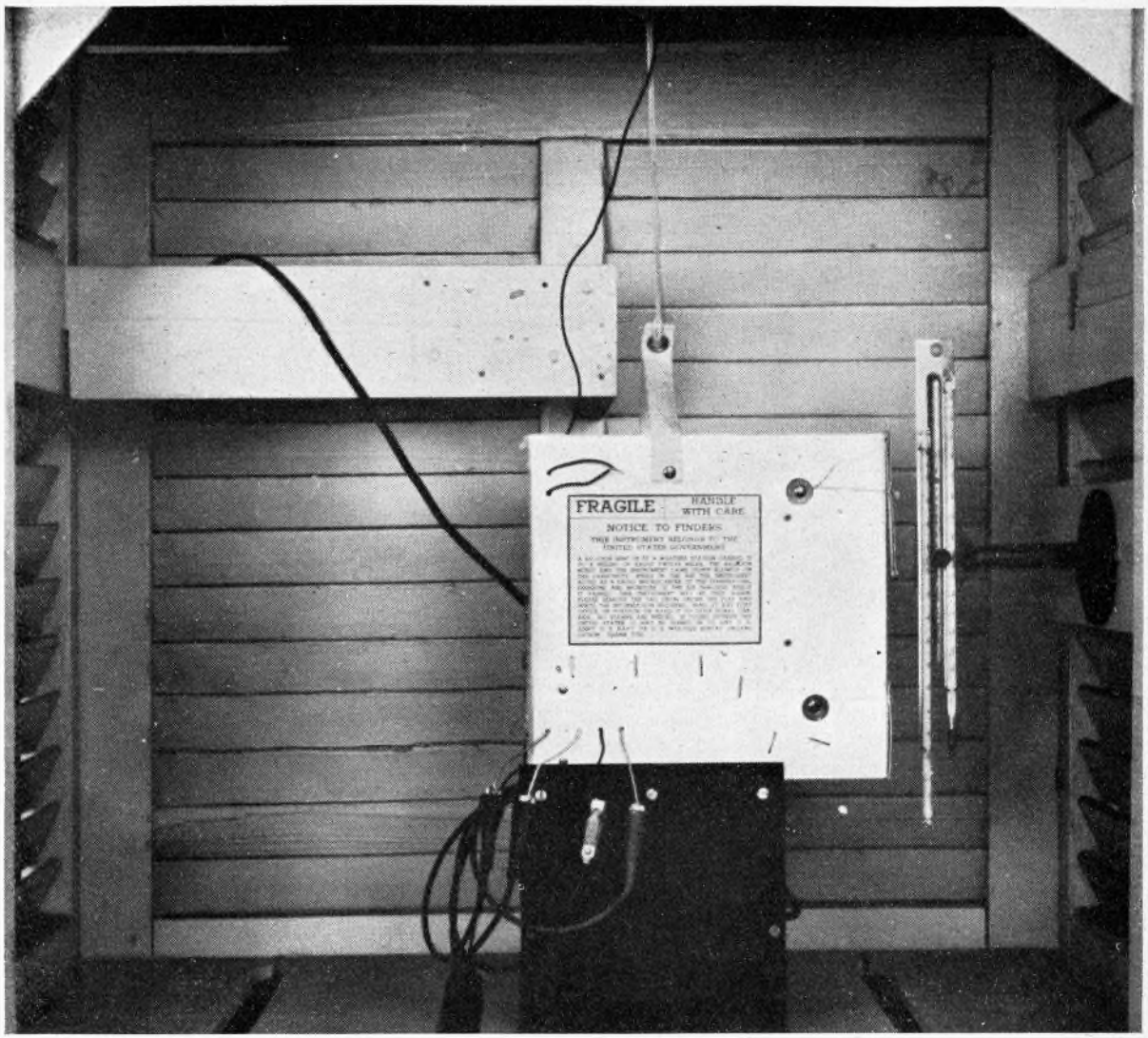


FIGURE 7–3.—Instrument shelter with radiosonde, motor test switch, and small whirling psychrometer in position for baseline check.

time for a given hygrometer element before release. A hygrometer element will not be used for a raob if the total time of exposure prior to release exceeds that given in the table, nor will the baseline check be started until the minimum exposure time has elapsed.

TABLE 7–2.—*Length of exposure for hygrometer element.*

Air temperature:	*Length of exposure before baseline*	*Maximum exposure before release*
20° C. and above	15–30 min.	1 hr.
0° C. to 20° C	15–30 min.	1½ hrs.
−10° C. to 0° C	30–45 min.	2 hrs.
−10° C. and below	45–60 min.	3 hrs.

7451. Break the seal on the hygrometer element vial by gently tapping the sealing wax just below the stopper. When this portion of the sealing wax has been removed, the stopper can be twisted and extracted. Handle the hygrometer element by the metal edges. Do not allow the fingers or any other object to touch the clear portion of the element. If the element is touched, it will be discarded.

7452. During exposure the hygrometer element should not be subjected to large changes of temperature and relative humidity, such as would be the case if the radiosonde were carried into a heated room. However, during low temperatures (below 0° C.) when the hygrometer element requires an exposure of more than 30 minutes, the element may be installed indoors provided the radiosonde is taken to the instrument shelter without delay.

7453. During periods in which the air temperature is below 0° C., two or three hygrometer elements sealed in vials should be stored in the instrument shelter. In case a second element

is required, one of these hygrometer elements may be used if it has been stored in the shelter for at least 6 hours. (See par. 7743.1.)

7500. PREPARATION OF TRAIN

7501. Prepare and inflate the raob and ballast balloons and prepare the rest of the train in accordance with the instructions in Chapter IV.

7600. CAUTION FOR AIRCRAFT

7610. Release at Controlled Airports.—To reduce the possibility of the raob balloon's becoming a hazard to aircraft in flight, observers will inform the local control tower 30 minutes before the intended release and at the same time determine the traffic anticipated at the proposed time of release. If, after considering the traffic conditions anticipated at the proposed time of release, the ascensional rate and direction of drift of the balloon, it is believed that release cannot safely be made at the proposed time, the baseline check will not be started until conditions have improved to such an extent that a safe release can be made upon its completion. Observers will be guided by the advice of the control tower personnel. Arrangements will be made for the control tower to flash a green (release) or red (hold) light at the predetermined time of release to indicate whether anticipated traffic conditions at that time have changed since the time of release was agreed upon. When the release is about to be made and it is found that the traffic pattern has changed, making it inadvisable to release at the time previously agreed upon, the radiosonde will not be released.

7620. Release at noncontrolled Airports or Offices.—Raob stations on airways but not at controlled airports will acquaint themselves with traffic conditions by consulting, whenever teletype or interphone facilities are available, with the airway controller (ATC) having jurisdiction over the airway on which the airport or office is situated.

7630. Release at Military Establishments.—These provisions for release will be observed at military establishments, where control officers will be consulted and informed in accordance with the foregoing.

7700. MAKING THE BASELINE CHECK

7710. General.—Turn the input switch to "SC" and check the zero setting of the recorder immediately before beginning the baseline check. (See par. 7242.1 or 7252.1.) A short portion of the zero record will be included as part of the baseline check record.

7711. Turn on the test switch. Check the position of the radiosonde, test switch, and the radiosonde antenna wires. Connect the battery wires and make sure that the contact arm is not touching the commutator.

7720. Preliminary Check Temperature Readings.—Read the dry- and wet-bulb temperatures to the nearest one-tenth of a degree. These values are to be used only as a rough check of the temperature and relative humidity limits during the making of the baseline check. (The baseline check dry- and wet-bulb readings will be made immediately after the completion of the baseline check.)

7721. If the dry-bulb temperature is lower than −10° C., the dry- and wet-bulb temperatures will be taken from Fahrenheit thermometers. These values will be used in computing the relative humidity from Fahrenheit psychrometric tables. The dry-bulb temperature will be converted to degrees and tenths centigrade and this value will be used for all other computations. The temperatures required by this and the preceding paragraph will not be entered on any form.

7730. The Baseline Check.—Turn the input switch to "X." Tune the receiver, adjusting the controls for maximum signal strength and stability. (See sec. 8200 or sec. 8300 for instructions on tuning the radiosonde receiver.)

7730.1. If, because of the presence or proximity of interfering signals, it is necessary to change the transmitting frequency of the radiosonde during or after the baseline check, a complete new baseline check will be made.

7731. While the first low reference signal is being received, adjust the frequency unit controls so that the trace is recorded at 95.0. Check the value of each successive low reference trace and adjust to 95.0 whenever necessary.

7732. If an unstable record is received for any of the transmitted circuits, check, in the order given, the following:

(1) The receiver tuning.

(2) The position of the radiosonde antenna.

(3) The test switch. (It may be possible that varying internal resistances in the test switch are causing the trouble.)

7732.1. If varying resistances in the test switch are suspected, disconnect the test switch and make the baseline check manually.

7732.2. When making a baseline check manually, use a short wire jumper with alligator clips to connect each of the other test leads to the black test lead. Allow each circuit to transmit for about 15 seconds by using the following procedure:

(1) Connect the black to the blue test lead (low reference).

(2) Disconnect all test leads (temperature).

(3) Connect the black to the red test lead (high reference).

(4) Connect the black to the yellow test lead (humidity).

Repeat this sequence until a satisfactory baseline record is received. It is important, while the signal from each of the circuits is being transmitted, that the observer stand at least six feet away from the shelter, since any movement near the radiosonde will affect the signal.

7732.3. If a manual baseline check cannot be obtained, the radiosonde should be rejected, and the baseline check commenced with the standby radiosonde. The hygrometer element from the first radiosonde may be removed and installed in the standby instrument, if it is certain that the maximum exposure time shown in table 7–2 will not be exceeded.

7732.4. If a stable baseline check is obtained manually, the test switch is probably at fault and should be checked for varying internal resistance before the next raob.

7740. Requirements for Satisfactory Baseline Check.—During the baseline check, repeat the record from all circuits until the following conditions for a satisfactory baseline check are satisfied. Not less than two consecutive traces from all elements but humidity must be in respective agreement while the low reference is recorded at 95.0. Meanwhile, the humidity record must conform to one of the following conditions:

7740.1. Two consecutive traces must be in agreement (see Fig. 7–4); or three consecutive

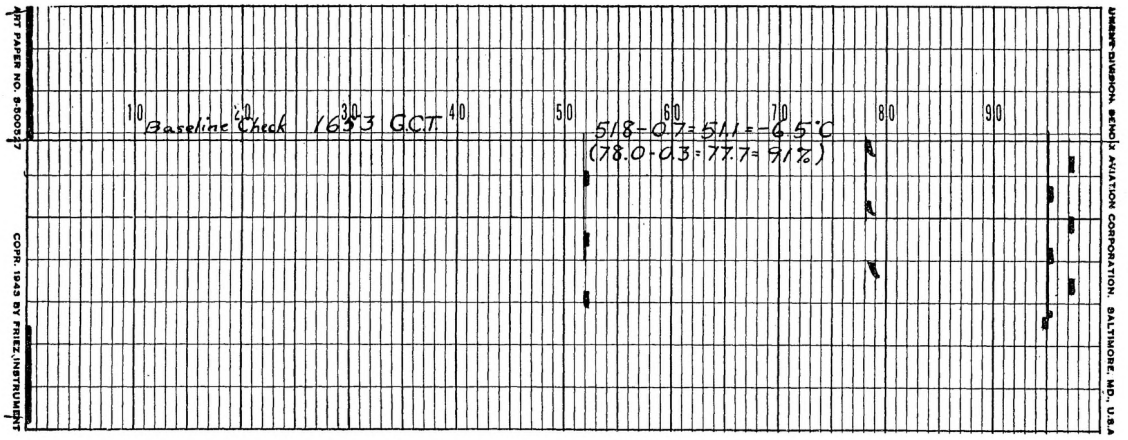


FIGURE 7–4.—Baseline check record showing two humidity traces in agreement (radiosonde with high reference test lead).

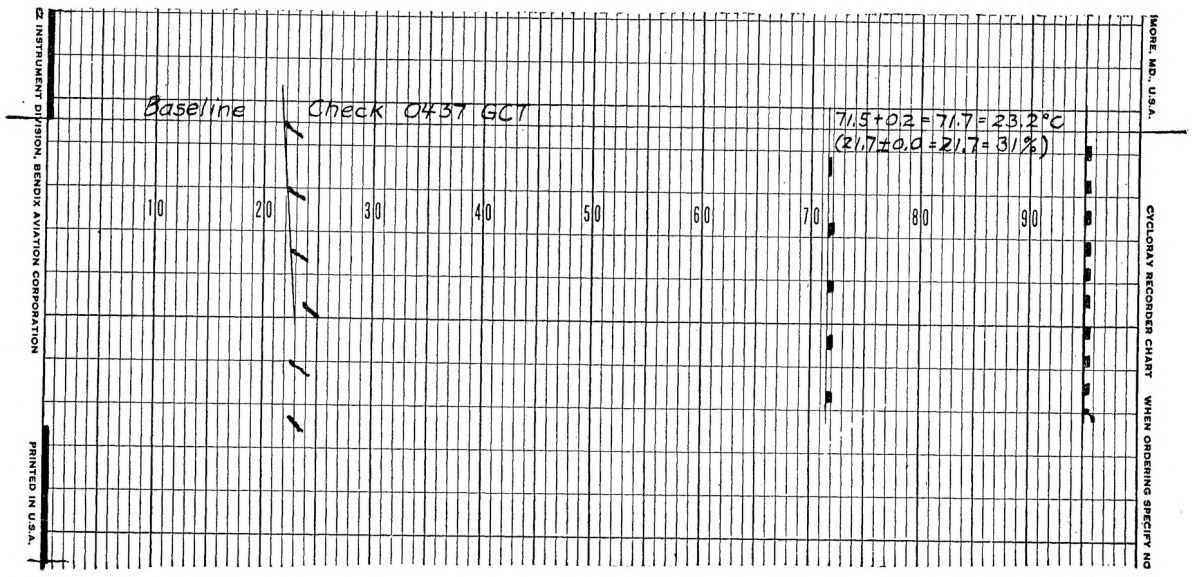


FIGURE 7–5.—Baseline check record showing three humidity traces in trend (radiosonde without high reference test lead).

traces must show a trend in the same direction, that is, rising or falling. (See Fig. 7–5.)

7740.2. Verify any indications on the radiosonde that the humidity is changing by making psychrometric readings. This is of especial importance when the relative humidity is indicated to be rising, since a hygrometer element that has not been exposed for a sufficient length of time will indicate rising values.

7740.3. The trace for each circuit in the baseline check should be at least $\frac{1}{16}$ inch in length.

7741. While the baseline record is being made, use the check temperature values obtained in accordance with paragraph 7720 to determine whether the temperature element is within the limits required by the provisions of paragraph 6360. (Friez radiosonde: 68.2–74.3 ordinates at 25° C. W. I. T. radiosonde: 67.0–72.6 ordinates at 25° C.) If the values are near the stated limiting values, the baseline temperature data obtained in accordance with paragraph 7750 should be used to determine whether to replace the temperature element or reject the radiosonde.

7742. Check that the relative humidity obtained from the psychrometric readings is within 10 percent (R. H.) of the value indicated by the radiosonde. When the radiosonde humidity ordinate is recorded as motorboating, the psychrometric value may be any amount less than the value corresponding to the motorboating ordinate, but must not be more than 10 percent higher than the motorboating value.

7743. If the agreement between the radiosonde and psychrometric relative humidity values is not within the 10 percent limit specified in paragraph 7742, the hygrometer element will be rejected and another element installed in the radiosonde.

7743.1. When a hygrometer element taken from a vial that has been stored in the shelter for at least 6 hours is installed in the radiosonde, the baseline check may be commenced after the element has been exposed 15 minutes or more. In such a case, the baseline check will be at least 5 minutes in duration.

7744. When the requirements for a satisfactory baseline check have been met, turn the input switch to "SC." Enter the time on the back of WBAN–30 under "Baseline Check Readings." Allow all units of the ground equipment to remain in operation.

7745. Disconnect the radiosonde battery wires and turn off the test switch.

7750. Baseline Check Temperature Readings.—Read the dry- and wet-bulb temperatures to the nearest one-tenth of a degree immediately after terminating the baseline check. Compute the relative humidity. Use these values as the baseline check data, and enter them on WBAN–30, in the spaces provided and on the recorder record in the appropriate places.

7751. If the temperature is lower than −10° C., the readings will be made in °F., converted to °C., and both sets of readings entered on the back of WBAN–30. The Fahrenheit readings will be used to compute the relative humidity.

7760. Evaluation of Baseline Check Data.—Evaluate the baseline data on the recorder record. If the paper has not fed out sufficiently, read the baseline check temperature and humidity ordinates as closely as possible, and compare them with the baseline check temperature and humidity values to determine whether they are within the limits for the temperature resistor and hygrometer element. (See pars. 6360 (or 7741) and 7742.)

7761. When the recorder paper has fed out sufficiently, evaluate the baseline check according to the following paragraphs.

7761.1. Draw straight lines connecting the left edges of the temperature, humidity, and reference traces which comprise the baseline check.

7761.2. Draw a horizontal line across the recorder record at the top of the last relative humidity contact.

7761.3. At approximately the tenth ordinate and immediately above the horizontal line, enter the notation "Baseline Check," followed by the time (G. C. T.) that the baseline check was obtained.

7761.4. Read the temperature ordinate to tenths. Enter this value immediately above the horizontal line, and immediately to the right of the temperature traces. Enter the proper recorder correction. Enter an equal sign and the corrected temperature ordinate value. Enter another equal sign followed by the baseline check dry-bulb temperature value. For example:

$$60.1-0.1=60.0=8.3^\circ \text{ C.}$$

7761.5. Read the humidity ordinate value at the intersection of the horizontal line and the line connecting the left edges of the humidity traces. Enter this value in parentheses just below the horizontal line, under the temperature ordinate value, followed by the applicable recorder correction, the corrected ordinate, and the baseline relative humidity values, humidity correction, and psychrometric humidity value; for example:

$$(40.0-0.3=39.7=40\%+4\%=44\%).$$

The radiosonde baseline check humidity correction will be determined in accordance with paragraph 7765.

7761.51. If the humidity trace is recorded as motorboating, it will be evaluated as MB.

7761.6. The entries of the baseline humidity data may be spaced out to prevent obliteration of any part of the baseline record.

7762. Using the baseline temperature and ordinate values, make a final setting of the temperature evaluator and check that the temperature value is within the limits stated in paragraph 6360 (or 7741). (If the temperature evaluator is made of cardboard, it can be locked by means of a large paper clip or clamp.) Enter the ordinate value in the proper space on WBAN–30.

7763. If a radiosonde which shows values outside the prescribed temperature ordinate range is released, a second release will be made.

7764. Enter the corrected values of the baseline temperature and relative humidity ordinates on the back of WBAN–30, under "Baseline Check Readings." If the relative humidity ordinate is evaluated as motorboating, enter "MB" in the space for this datum.

7765. Determine the difference between the humidity value indicated by the radiosonde (including cut-off values when motorboating occurs) and the psychrometic value. This difference is the correction to be applied to the radiosonde humidity values in flight until a new correction is established. A plus sign will be placed before this difference when the value indicated by the radiosonde is lower than that of the psychrometer, and a minus sign when it is higher. When the psychrometric value is less than the cut-off value, and the radiosonde is motorboating, the correction will be considered zero. Enter the correction, with the proper sign prefixed on the back of WBAN–30. Note that the amount of correction required must not be greater than 10 percent.

7766. If a radiosonde which shows relative humidity values outside of the prescribed range is inadvertently released, the record will be evaluated, and the relative humidity considered missing.

7800. MAKING THE RELEASE

7810. Raob NOTAMS.—Prior to the release of a radiosonde, all raob stations located at airports having CAA broadcasting facilities will file a "notice to airmen" (NOTAM) with the CAA communicator. This NOTAM will state the probable time of the balloon's release and the time it is expected to reach an altitude of 10,000 feet m. s. l. If it becomes apparent that the time of the release will be delayed more than 15 minutes, a correction to the first NOTAM will be filed at once. These NOTAMS will be broadcast and transmitted to local interphone and teletype circuits. No transmission will be made to long-line circuits, except as may be necessary to notify the Airway Traffic Control Center concerned.

7820. Preliminaries.—Determine the pressure at the elevation of the instrument shelter, and the proper contact point setting for this pressure. Lower the contact arm and adjust the commutator to the proper setting. Lock in place, or seal with scotch tape, the slide or flap in front of the commutator adjustment screw.

7821. Disconnect the radiosonde test leads from the test switch. Clip off the bare portions only of the radiosonde test leads except about one thirty-second of an inch of the high reference test lead. If the radiosonde has no high reference test lead, leave the short portion on the low reference test lead. This will be used to secure the release point on the recorder record.

7830. Assembly of Train.—Tie the 50-foot cord extending from the parachute to the 4-foot cord fastened to the radiosonde. Tie the ballast balloon and all other elements of the train in their proper positions. (See sec. 4600.)

7840. Check of Train.—Take the assembled train to a point where all obstructions will be cleared at release. Make a rapid visual check of the train.

7841. Note that:

(*1*) All knots are secure.

(*2*) The parachute is properly unfurled with all shrouds clear.

(*3*) The upper leg of the antenna is securely fastened to the cord and neither too tight nor too loose.

(*4*) The lower leg of the antenna is hanging straight and has no kinks.

(*5*) The contact arm is resting on the commutator.

(*6*) The ventilation flaps are secured in an open position.

(*7*) The recovery tags are securely fastened beneath the flap.

(*8*) The radiosonde door is sealed with scotch tape.

7842. Connect the battery wires.

7850. The Release.—The observer at the recorder will turn the input switch to "X," tune the receiver, and check that a steady trace of the proper circuit is being received.

7851. The observer at the recorder should note that the value of the circuit being received agrees closely with the value of the same circuit as transmitted during the baseline check.

7851.1. If there has been a change in the temperature ordinate value which is not accompanied by a proportional shift in low reference, and which cannot be accounted for by any difference that may exist between these values at

the release point and in the instrument shelter, the radiosonde should not be released. Prepare the standby radiosonde immediately and check the doubtful radiosonde later.

7852. When the observer at the recorder is satisfied with the operation of the radiosonde, he will have the control tower give the observer with the radiosonde the prearranged release signal, if traffic conditions have not changed since the arrangements were made. If there is no control tower, the observer at the recorder will indicate to the observer at the radiosonde that the release may be made.

7853. When the observer at the radiosonde has received the signal that the radiosonde is operating satisfactorily, he should await the release signal, either from the observer at the recorder or from the control tower.

7854. When the release signal is received, the observer with the radiosonde will briefly touch the exposed tip of the reference wire to the grounded rivet on the side of the case to mark the point of release on the recorder record.

7854.1. If the contact point is on a high reference contact, or if conditions are such that it is not possible to ground the reference test lead, the observer at the recorder should turn the input selector to "SC" momentarily prior to release, and turn it back to "X" at the moment of release.

7854.2. If there is no observer at the recorder, the observer releasing the balloon should note the time at which the radiosonde is released and later, on his return to the recorder, note the time at which a given contact is being recorded. The surface level on the record can then be located by making use of the known rate of paper feed.

NOTE.—The horizontal lines printed on the latest type of Cycloray recorder paper are 1 minute apart, those on older types are one-fourth of a minute apart. The horizontal lines on L&N recorder paper are 1 minute apart. The paper feed rates given here are for recorders operating on 60-cycle current. If the power supply is of some other frequency, the paper feed rate will differ proportionally.

7855. Make a final check of the release conditions, especially with regard to any change in the wind or in the position of any mobile obstructions.

7856. Make the release and note the time. (See sec. 4620 for suggestions on releasing.)

7860. Surface Observation at Release.—Make a complete surface observation as soon as possible after the time of release. The complete surface observation will include pressure, dry- and wet-bulb temperatures, wind direction and velocity, types and amount of clouds, cloud directions, weather phenomena, and restrictions to visibility. These data will be entered in the appropriate spaces on the back of WBAN–30.

7861. When no clouds are present, the word "cloudless" will be entered. When clouds are present, they will be entered in accordance with the classifications and notations adopted for synoptic reports. The type of cloud will be preceded by an "L," "M," or "H" to denote "low," "middle," and "high," respectively. The amounts of clouds will be expressed in tenths of sky covered. (The maximum possible coverage for all cloud layers present is 10 tenths.) When the sky is overcast with breaks, the amount will be recorded as 9+; when clouds covering less than one-tenth of the sky are present, the amount will be recorded as 1—. Direction of the clouds will be recorded to the nearest 10° and separated from the cloud type by a slant. Calm will be recorded as "00" and unknown as "U". Examples: 10L4/360°, 1–M2/U. Cloud classifications are contained in the 1942 Weather Code, part II, tables 50, 51 and 62.

7870. Entry of Clouds and Weather.—In the spaces under this heading on the back of WBAN–30 will be entered notes regarding all significant weather phenomena, such as marked cloud changes, precipitation or thunderstorms, and restrictions to visibility occurring during the raob or within one hour of the beginning and termination of it. The times of beginnings and endings will be recorded if they are within the period beginning one hour before release and ending one hour after the termination of the sounding. If the beginning or ending, or both, extend beyond this period, they will be described as "cont'd" for "continued." Cloud observations made at the time of release will not be repeated in these spaces.

7871. If it is possible to observe the entry of the raob balloon into the base of any clouds that may be present, this should be done. The observer at the recorder should turn the input switch to "SC" momentarily to mark on the recorder record the point of the balloon's entry into the cloud layer.

Chapter VIII. OBTAINING THE RECORDER RECORD

8100. GENERAL

8110. Importance of Proper Tuning.—The observer at the recorder must pay primary attention to the task of obtaining an accurate and continuous record. Although it is often possible for an experienced observer to spend considerable time evaluating the record during the ascent, this should not be done if it is necessary to neglect the tuning of the receiver. As the radiosonde moves away from the earth's surface, the radio frequency usually drifts slightly, and careful tuning is required.

8120. Proper Use of Antennas.—If more than one antenna is available, the one providing the most satisfactory signal should be used for the flight. Often, because of its location with respect to the path of the radiosonde signal, one antenna will pick up a stronger signal than another. If the radiosonde signal fades or weakens during the observation, switch to the standby antenna, to make sure that the antenna giving the better results is connected to the receiver.

8200. TUNING THE SUPER-REGENERATIVE RECEIVER (NATIONAL 1-10RS)

8210. Controls.—The controls of the super-regenerative radiosonde receiver together with a brief description of them and their operation, are given below.

(*a*) *Receiver Power Switches.*—The master switch of the ground equipment should be at "ON." If the receiver is equipped with "AC" and "B+" switches, set both to "ON." The pilot lamp above the S-meter is lighted when these switches are in the proper positions, provided there is no failure in the receiver or power circuits.

(*b*) *Regeneration Control.*—Adjust the regeneration control to as low a reading as will produce maximum steadiness of the recorder or visual meter indication and maximum signal strength on the S-meter. (If the optimum setting has not been determined, set at about "3.") It is important to keep the regeneration setting low, since too high a setting will cause undesirable oscillation in the receiver, a condition which can be detected by the presence of squealing noises in the speaker and marked unsteadiness of the recorder, visual meter, and S-meter indications. If the S-meter reading is more than "9," adjust the reading to this value by reducing the audio gain. Usually, it will be found that a particular setting of the regeneration control will produce the best results. However, it will be necessary to vary this setting when a weak signal is being received.

(*c*) *Audio Gain Control.*—Adjust the audio gain so that the S-meter indicates about "5." The gain should be set for only as strong a signal as required to give a steady recorder indication. In many cases it may be necessary to increase the audio gain while a low or high reference signal is being received, and to reduce it while a low ordinate temperature or humidity signal is being received. During some types of interference, a steadier record can be obtained by reducing the audio gain.

(*d*) *R. F. Trimmer.*—Adjust the R. F. trimmer for maximum steadiness of the recorder or visual meter indication, and for maximum signal strength on the S-meter. If the S-meter reading is more than "9," adjust the reading to this value by reducing the audio gain. It will usually be found that a particular setting of the R. F. trimmer will produce the best results for the antenna and lead-in system used. This setting should be determined while a weak signal is being received.

(*e*) *Speaker Volume Control.*—If the speaker volume control is on the front control panel, it should be adjusted to the position best suited to the comfort of the observer and any co-workers. If the control is located at the rear of the receiver, the optimum setting should be determined during a flight and the control left at this setting. This adjustment has no effect on the strength or steadiness of the radiosonde signal since it affects only the speaker output.

(*f*) *Main Tuning Dial.*—On most receivers the radiosonde signal will be located in the range 300 to 340 on the main tuning dial. This range will differ with individual receivers and the exact readings will vary with radiosondes. Adjust the dial for maximum steadiness of the recorder or visual meter indication, and for maximum signal strength on the S-meter. If the S-meter reading is more than "9," reduce the audio gain. Check over a range of about 30 divisions to either side of the peak tuning point to make sure that the receiver is not tuned to a side band. While a fairly strong signal

may be received on a side band when the transmitter is near the receiver, such a signal fades rapidly as the radiosonde ascends.

(*g*) *S-meter.*—This meter indicates the strength of the incoming signal, and is therefore used in determining the optimum settings for the tuning controls. It should be noted that evidence of satisfactory tuning consists of a steady indication on the visual meter and an unwavering trace on the recorder record.

8300. TUNING THE SUPERHETERODYNE RECEIVER (HALLICRAFTERS S–27RS OR S–36RS)

8310. Control Adustments for F. M. Reception.—The controls of the superheterodyne radiosonde receiver, together with a brief description of them and their operation for F. M. reception, are given below:

(*a*) *Band Switch.*—Set on "2" to receive the radiosonde signal of 72.2 megacycles.

(*b*) *Selectivity Switch.*—Set to "BROAD." If interference becomes great enough to prevent the obtaining of a steady record, set to "SHARP." This will usually require readjustment of the tuning control. This control is the A. C. power switch, as well as the sensitivity selector, and the lamps behind the three dials should be lighted when the switch is turned away from the "A. C. OFF" position.

(*c*) *Send-Receive Switch.*—Set to "REC." The receiver will not operate with this switch in the "SEND" position.

(*d*) *A. M.-F. M. Switch.*—Set to "F. M.".

(*e*) *A. V. C. Switch.*—Inoperative for F. M. reception.

(*f*) *A. N. L. Switch.*—Inoperative for F. M. reception.

(*g*) *B. F. O. Switch.*—Inoperative for radiosonde work.

(*h*) *R. F. Gain.*—Set the R. F. gain control to full position by gently turning the knob in the clockwise direction beyond "9" until a slight resistance is encountered. Then, with a slight additional pressure, turn past this position. A click of the switch will be heard as the maximum position is reached.

(*i*) *Antenna Trimmer Control.*—Set at a previously determined optimum value for the particular antenna and lead-in system used. If this setting is unknown or has not been determined, adjust the antenna trimmer for the maximum output of the speaker.

(*j*) *A. F. Gain.*—Set at about "5." Increase or reduce as required to obtain a steady record. It may often be found necessary to increase the A. F. gain while a reference signal is being received and to reduce it while a low ordinate temperature or humidity signal is being received.

(*k*) *Pitch Control.*—This control is inoperative for radiosonde work.

(*l*) *Speaker Volume Control.*—The speaker volume control is located in the position labeled "TONE." (The tone control is inoperative for radiosonde work.) Adjust this control to the position best suited to the comfort of the observer and any co-workers. The speaker volume control has no effect on the strength or steadiness of the radiosonde signal since it affects only the speaker output.

(*m*) *Main Tuning Dial.*—This dial indicates the radio frequency of the received signal. It is adjusted by means of the tuning control.

(*n*) *Vernier Dial.*—This dial, located immediately above the tuning control, aids in more closely marking the tuning position of a received signal. It is controlled by the tuning control and operates in conjunction with the main tuning dial.

(*o*) *Carrier Indicator or Tuning Meter.*—This meter is also known as the "S-meter," and serves as an aid in obtaining correct tuning.

(*p*) *Speaker.*—The speaker is also an aid in determining the tuning control setting for maximum sensitivity and steadiness of the recorder indication. It is most useful in locating a signal when the receiver is first being tuned or when the signal becomes temporarily lost due to interference or shifting frequency.

(*q*) *Tuning Control.*—With the band switch on "2," check over a range of 2 to 3 megacycles to each side of the radiosonde signal to make sure that the receiver is not tuned to a side band. While a fairly strong signal is received on a side band when the radiosonde is near the receiver, such a signal fades rapidly as the radiosonde ascends. For peak tuning, adjust the tuning control and observe the action of the carrier indicator pointer. The pointer will start from the red zero and move to a maximum on one side as the signal frequency is approached. Then, it will reverse and move to a maximum in the opposite direction, and finally fall back to zero as the signal is lost. When the pointer reaches the red zero line in its travel from a maximum in one direction to a maximum in the other direction, the receiver is tuned to the exact signal frequency. The steadiest indication on the recorder record and visual meter can usually be obtained with the receiver tuned slightly to one side of the signal frequency. Locate this tuning position, by tuning from one side of the exact signal frequency to the other side and use the point giving the steadiest record. Care must be taken with this type of receiver that the signal is properly tuned and not distorted. Frequently, with a low ordinate signal being received, such distortion will cause the signal to be recorded at twice the proper ordinate. Often, readjustment of the tuning

control is required each time the radiosonde signal switches from a high to a low ordinate value, and vice versa.

8320. Adjustment of Controls for A. M. Reception.—In some rare cases, a weak signal may be tuned in more sharply if A. M. tuning is used. When using A. M. tuning change the positions of the controls as indicated below. The other controls remain unchanged from the positions stated in sec. 8310.

(*a*) *A. M.–F. M. Switch.*—Set to "A. M."

(*b*) *Selectivity Switch.*—Set to either "SHARP" or "BROAD," whichever produces the better results.

(*c*) *A. V. C. Switch.*—Set to "ON."

(*d*) *A. N. L. Switch.*—Set to "ON."

(*e*) *Carrier Indicator.*—For A. M. tuning, the carrier indicator meter operates as an S-meter and the pointer indicates in the scale beginning with the black zero. The meter operates as an S-meter only if the R. F. gain is set at maximum.

(*f*) *Tuning Control.*—Adjust the tuning control so that maximum deflection of the carrier indicator pointer is obtained. It is often better to adjust slightly to one side or the other of this point to obtain maximum steadiness of record.

(*g*) *A. F. Gain.*—Increase or decrease the A. F. gain as required to obtain a steady record. It may often be found necessary to increase the A. F. gain while a high ordinate signal is being received and to reduce it when receiving a low ordinate signal. The carrier indicator reading should be near but not above "9," and never below "3" in such cases.

8321. If no material improvement in reception is noted when using A. M. tuning, return to F. M. tuning, since this receiver usually operates more efficiently for radiosonde work when the F. M. circuit is used.

8400. ADJUSTING FREQUENCY UNIT

8410. Setting Low Reference to 95.0.—As each low reference is recorded, first note that the receiver is properly tuned and that the trace is being recorded clearly. Then, if required, adjust the low reference to 95.0, making sure that this adjustment is completed in time to allow a portion of the adjusted trace to record, before the signal switches to the temperature circuit. If the ascensional rate is so high that the recorded low reference traces are too short to provide a readable record both before and after adjustment, no adjustment should be attempted. Similarly, do not attempt to make an adjustment when the low reference trace is so scattered that there is doubt as to the actual value of the low reference ordinate.

8500. DRIFT OF RECORDER PAPER

8510. Checking Recorder Zero Setting.—From time to time check the alignment of the recorder paper. If it appears that the paper is drifting, turn the input switch to "SC" momentarily to obtain a zero recording. The switch should be held at "SC" long enough for the recorder microammeter needle to reach the zero setting. This check should be made at a point in the record where no significant data will be lost, preferably during a long temperature trace.

8600. TERMINATION OF THE RECORDER RECORD

8610. Bursting Point.—Keep the receiver in tune in order to obtain the bursting point of the balloon when possible. If the bursting point is recorded, obtain the descent record as stated in paragraph 8620.

8620. Descent Record.—On nighttime raobs, obtain the descent record through the first high reference contact after the bursting point. On daytime raobs obtain the descent record to the 400-millibar level, or as close to that level as possible, if the descent temperatures near the bursting point are lower by 3° or more than the ascent temperatures at the corresponding points. If the temperature difference is less than 3°, obtain the descent record for at least 5 contacts, continuing further, if necessary, to the first high reference contact.

8630. Zero Recording.—After the termination of the observation, turn the input switch to "SC" and obtain a recording of the recorder zero. A short portion of the zero recording after the termination of the observation will be submitted as part of the record.

8631. Check the zero recording to determine whether paper drift corrections are required. If the maximum paper drift, as indicated by a change in the position of the zero recording is more than 0.3 of an ordinate, paper drift corrections will be applied to all temperature ordinates. (See par. 9532.)

8632. If a Cycloray recorder is used, the zero record should be continued until the paper has moved out of the recorder far enough to permit a portion of the zero record to be cut off with the remainder of the flight record. The paper should be allowed to feed out of the recorder since the paper will be out of alignment if it is pulled out manually.

8700. OBSERVATIONS BY VISUAL METER

8710. Recorder Failure Prior to Baseline Check.—If the recorder fails prior to the start-

ing of the baseline check, and repairs cannot be made immediately, obtain the baseline check and flight ordinate values by reading the visual meter of the frequency unit. Proceed as follows:

(*a*) Carefully read the ordinate value for the temperature, humidity, low reference, or high reference portion of each contact as nearly as possible at the instant before the visual meter pointer moves to the next portion of a contact. If the low reference is adjusted, a reading should be made before and after adjustment.

(*b*) Tabulate these readings in any convenient manner. The right edge of the recorder paper may be used for this purpose. In any case, preserve the tabulated values for forwarding with the other forms for the observation.

(*c*) Using a uniform time scale of one contact per minute, plot a point for each of these tabulated values on a length of recorder paper. (See fig. 8–1, which shows, for example, that contact No. 7 consists of a temperature value of 71.4 ordinates and a humidity value of 63.9.) These two values are plotted in the third full minute space after release.

(*d*) Evaluate the plotted record in the same manner as a recorder record, applying visual meter corrections, if required, instead of recorder corrections. (See ch. IX.)

8720. Recorder Failure During Flight.—If the recorder becomes inoperative during the observation, the remainder of the flight will be obtained by visual readings made in the manner described in paragraph 8710. However, if the visual meter and recorder were not in agreement at 95.0 before the failure, a correction in the amount of the disagreement must be applied to all values between the last low reference contact before the failure and the first low reference after the failure.

8721. For example, assume that at the last low reference before the failure the visual meter

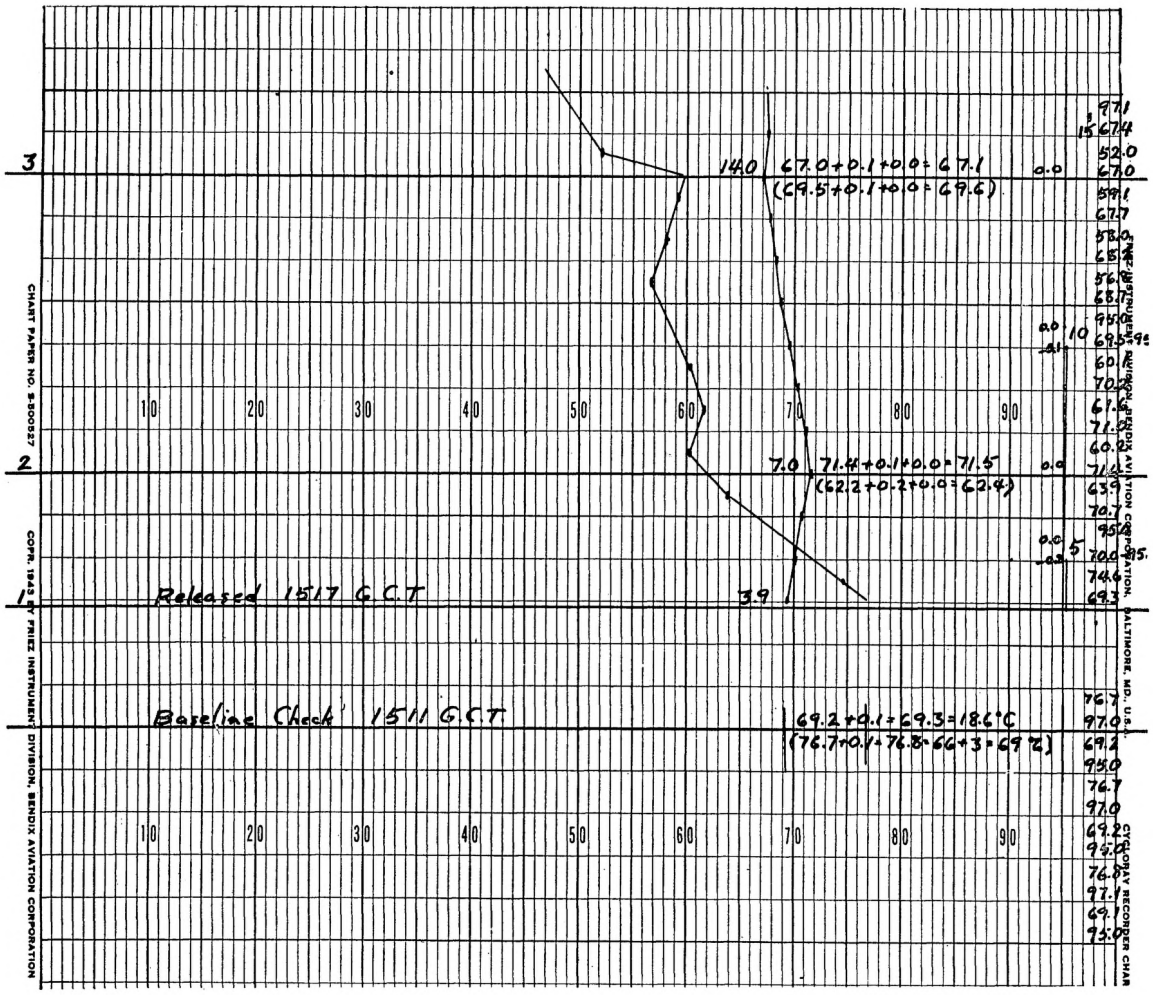


FIGURE 8–1.—Portion of raob record plotted from visual meter readings.

and recorder disagree by 5.0 ordinates, or that the visual meter indicates 90.0 when the recorder indicates 95.0. Also, assume that at the first low reference after the failure the visual meter indicates 88.0, that is, a drift of 2.0 ordinates has occurred. The recorded temperature and humidity values must be corrected by the proportional part of 2.0 ordinates and the visual readings by the proportional part of 7.0 ordinates. In other words, the 2.0 ordinates are considered as a drift and the 5.0 ordinates as a shift at the contact on which visual readings were begun. On the low reference contact, adjust the visual meter to 95.0 and apply drift and shift corrections in the same manner as for the recorder record. (See pars. 9520 and 9521.)

Chapter IX. EVALUATING THE RECORDER RECORD

9100. GENERAL

9101. A raob that may be regarded as satisfactory, that is, one not necessitating a second release, must satisfy certain conditions of height and limitations of doubtful and missing data. These conditions and limitations are described in the following paragraphs. While evaluating the recorder record, the observer will be alert for evidences of conditions that will necessitate a second release. When a second release is required but not made, the reasons therefor will be given fully in a note on the recorder record.

9110. SATISFACTORY RAOB—CRITERIA

9111. A raob must satisfy the conditions stated below. If the conditions are not satisfied, a second radiosonde will be released as promptly as possible (see pars. 7110 and 7111 for instructions concerning delayed observations). However, if owing to unfavorable atmospheric conditions or other reasons it is apparent that a height greater than 3 km. above the elevation of the station cannot be attained in subsequent attempts, an additional release will not be made. The descent record will be used only for computing corrections to the ascent temperatures; it will not be used for computing the sounding when the ascent record is poor or missing.

9112. Data must be sufficient to permit computation of the raob to an elevation of at least 3 km. above the elevation of the station.

9113. There must be not more than five consecutive contacts of missing or doubtful temperature data between the surface level and an elevation of 3 km. above the station.

9114. If, because of prevailing weather conditions, the relative humidity is of decided importance, there must be not more than five consecutive contacts of missing relative humidity data between the surface level and an elevation of 3 km. above the station. In many instances, the record might be considered satisfactory even though the relative humidity record were entirely missing from the observation.

9115. When a second release is made, the calibration chart and the recorder record pertaining to the first radiosonde will be submitted with the rest of the station's forms in accordance with the provisions of chapter X. The chart and record will be properly labeled and include the surface data at release and the baseline check. A complete explanation of the circumstances attending the failure of the radiosonde will be entered under the identifying data on the recorder record.

9120. CLASSIFICATION OF DATA AS DOUBTFUL AND MISSING

9120.1. When abnormal functioning of the radiosonde or ground equipment occurs, the accuracy of the raob data will be classified in accordance with the following paragraphs. A precise determination of the accuracy of the data will often be difficult or impossible. Classification, therefore, will be based upon the possible error characteristic of common situations.

9121. Temperature.—If the possible error is 1° C. or less, the data will be considered accurate.

9121.1. If the possible error is more than 1° C., but not more than 3° C., the data will be considered doubtful.

9121.2. If the possible error is more than 3° C., the data will be considered missing.

9122. Relative Humidity.—If the possible error is 10 percent or less, the data will be considered accurate.

9122.1. If the possible error is more than 10 percent, the data will be considered missing.

9122.2. Relative humidity data will be classified as missing whenever the radiosonde fails to transmit relative humidity data (including motorboating values) while the temperature is −40° or higher.

9122.3. Relative humidity data will not be classified as doubtful.

9123. Sources of Possible Error.—Data may be subject to possible error because of any of the following conditions:

9123.1. The temperature or relative humidity trace (for reasons other than motorboating) may be entirely missing or scattered to such an extent that the actual ordinate values cannot be determined. If the stratum is more than five contacts in extent, the data will be classified as missing. If it is not more than five contacts, the data will be classified as accurate, doubtful, or missing, in accordance with paragraphs 9121 and 9122.

9123.2. The low reference trace may be entirely missing or scattered to such an extent

that the actual ordinate value cannot be determined, thereby introducing a possible error in the value of the temperature and relative humidity ordinates. This condition often occurs near the end of a sounding when the radiosonde signal may be so weak that the reference traces are not readable. In such cases, the error at the low reference ordinate is proportionately larger than at the temperature or relative humidity ordinate. For example, an unreadable low reference trace may have drifted three ordinates, but a temperature trace evaluated as 20 ordinates would be only slightly more than 0.6 ordinate or 1° C. in error.

9123.3. A shift may occur in the temperature or relative humidity traces unaccompanied by a corresponding proportional shift in the low reference trace. The magnitude of possible error in the relative humidity or temperature ordinate is determined in such cases by the magnitude of the shift.

9123.4. A shift of the low reference trace may occur unaccompanied by a corresponding proportional shift in the temperature and relative humidity traces. The possible error in the latter traces will be less than the amount of the shift in low reference.

9123.5. Since temperature is a factor in the evaluation of relative humidity from the calibration chart, any error in the temperature data will introduce an error in the relative humidity evaluation.

9123.6. When a pressure cell in the radiosonde is leaking, the temperature and tropopause appear higher and the maximum altitude of the raob greater than might normally be expected. In such cases, it is frequently difficult to determine exactly where the leaking in the pressure cell commenced. All data may, therefore, be in error; and, in accordance with the provisions of paragraphs 9112 and 9113, a second release may be required if the point where leakage began cannot be determined.

9123.7. Whenever the radiosonde fails to switch from temperature to relative humidity over a portion of the record not more than five contacts in extent, the temperature data will be considered accurate. The pressure contact values of significant levels in this portion of the record will be computed by determining the proportional parts of the distance between the reference traces. If the continuous temperature trace is more than five contacts in extent, the temperature data will be classified as accurate, doubtful, or missing, depending upon the amount of possible error involved.

9123.8. If the radiosonde should cease to switch and thereafter only a continuous temperature trace is recorded, the data will be considered missing and the computations terminated at the last contact at which switching occurred.

9123.9. Whenever any portion of the temperature record is classified as doubtful, the computations will be continued in the normal manner, except that more than five consecutive contacts of doubtful temperature data between the surface and 3,000 meters above the elevation of the station will necessitate a second raob.

9125. Termination Owing to Missing Data.—Whenever a stratum of missing temperature data is followed by a satisfactory record, the computations will be continued, provided the stratum of missing data does not exceed the following limits:

1. From surface to 3,000 meters above the elevation of the station.	5 contacts of recorder record.
2. From 3,000 meters above the surface to 7,000 meters above sea level.	2,000 meters.
3. From 7,000 meters above sea level to the termination of the flight.	3,000 meters.

If the tropopause occurs in a stratum of missing temperature data more than 1,500 meters thick, the computations will be terminated. Whenever the limits above are exceeded, the computations will be terminated at the beginning of the stratum of missing data. If the stratum of temperature data classified as missing is less than these limits, the computations will be continued in the normal manner.

9125.1. When relative humidity data are classified as missing, the computation of a sounding will be continued in the normal manner, except as provided in paragraph 9114.

9130. Entry of Surface Data, Etc., on Recorder Record.—Within the first 7 inches of the record to be submitted, and at a place where the entries do not interfere with the baseline check data, enter the name of the station, date, and time of release G. C. T., radiosonde serial number, reason for termination of the sounding, and name of computer and verifier. Begin each entry at about the tenth ordinate line on the recorder paper, as shown in figure 9–1.

9131. Enter the complete surface observation at release just below the release level at about the tenth ordinate line. These entries will comprise pressure at the floor of the instrument shelter and the corresponding contact number, temperature, relative humidity, weather, wind, and clouds. If the elevation of the point of release is more than 3 meters different from that of the floor of the instrument shelter, the contact corresponding to the release point, com-

613388°—45——4

puted in accordance with paragraph 7344.2, will be entered in parentheses beside the contact corresponding to the pressure at the floor of the instrument shelter. Weather will be recorded in the same symbols as are used in airway weather reports and described in Weather Bureau Circular N. Wind will be entered to 16 points and in meters to tenths per second. Clouds will be entered in accordance with the provisions of paragraph 7861. "Cloudless" will be entered when no clouds are present.

9132. Notes and comments pertinent to the observation may be entered on the recorder below the station identification data. Observers are encouraged to make such entries on the record as will assist in clarifying, qualifying, or explaining any unusual aspects of the record. The provisions of this paragraph will not be construed as authorizing the solicitation of such instructions and opinions as should properly be made the subject of a letter.

9200. SELECTION OF SIGNIFICANT LEVELS

(See figs. 9–1 to 9–7)

9201. Draw a horizontal line completely across the recorder record through each significant level selected in accordance with the following instructions. When selections have been completed, inspect the temperature trace between each pair of consecutive significant levels to determine whether additional levels need be selected.

9202. Surface.—Place a level at the point of the balloon's release.

9210. Temperature.—Place levels at significant changes in the lapse rate. The significance of any point may be determined by placing a straightedge over the adjacent points of change. If the departure of the point in question from the linearity represented by the straightedge equals 1° C. in the troposphere and 2° C. in the stratosphere, the point will be considered as at a significant change in lapse rate. (See fig. 9–2.)

9211. Place levels at the bases and tops of all significant temperature inversions and isothermal layers. The significance of temperature inversions and isothermal layers will be determined in accordance with the preceding paragraph. It should be noted that it is not sufficient to place a level at the base of a temperature inversion or an isothermal layer and not place one at the top also, or vice versa; nor is it correct to place a level at the middle of such layers only.

9212. Place levels at the extreme maximum and minimum temperatures recorded.

9220. Relative Humidity.—Place levels at points indicating significant changes in the vertical relative humidity gradient. If the departure of any point from the linearity represented by a straightedge placed over adjacent points of change equals 10 percent, the point will be considered significant. (See fig. 9–2.)

9221. Place a level between the −37° and −40° portion of the record or the highest usable humidity contact below this portion.

9222. Relative humidity will not be evaluated on the recorder record for levels whose temperature is lower than −40°.

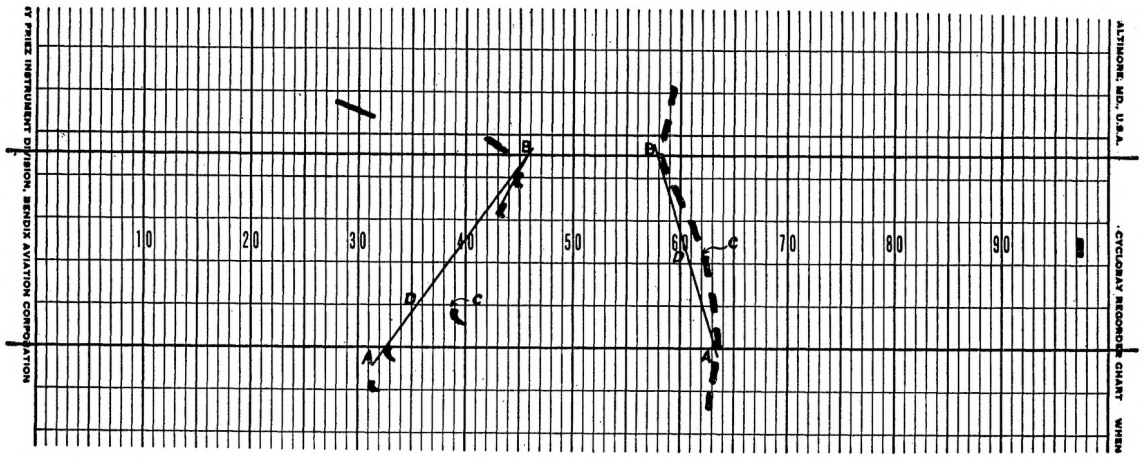


FIGURE 9–2.—Determining the significance of a point on the recorder record.

NOTE.—Levels Nos. 4 and 5 have been selected, and it is desired to determine whether any point between the levels departs by 1° in temperature or 10 percent in relative humidity from the linearity represented by the straightedge AB, which is laid over the adjacent points of change. The temperature and relative humidity are evaluated at the points D and C. A difference of more than 1° in temperature but less than 10 percent in relative humidity is noted between the two points. A level accordingly is placed at C on the temperature trace.

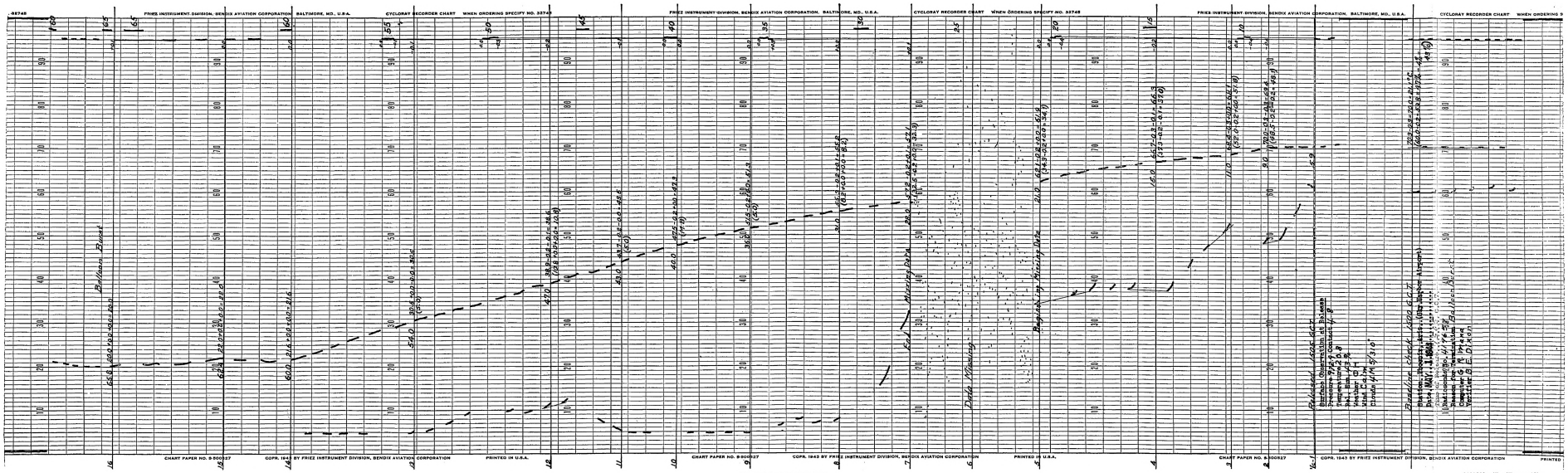


FIGURE 9-1.—Recorder record.

9223. Motorboating Relative Humidity (See fig. 9–3).—The motorboating ordinate recorded will vary slightly with radiosondes and recorders. The points at which the relative humidity trace reaches or leaves motorboating values are termed cut-off points. The cut-off point will be considered as at an ordinate of 5.0 for any radiosonde whose motorboating ordinate is actually more or less than 5.0.

9223.1. Place levels at cut-off points that bound motorboating strata four contacts or more in extent. Levels need not be placed for strata of lesser extent unless the cut-off values pertaining to the strata differ by more than 10 percent from the relative humidity values of succeeding and preceding levels.

9223.2. A level need not be placed at the exact point of cut-off if temperature or other considerations make it desirable that a level be placed within a fraction of a contact above or below this point. The level will be considered as at the cut-off point and the relative humidity ordinate evaluated as 5.0. If the relative humidity trace varies between motorboating and nonmotorboating values, and the variations do not exceed the cut-off value by more than 10 percent, the stratum may be considered either wholly above or wholly below the cut-off point. Decision will be based on the predominant values.

9230. Additional Levels.—Place additional levels as follows:

9231. Within every motorboating stratum of more than four contacts; a level need not be placed within a motorboating stratum four contacts or less in extent, unless some point within the stratum is otherwise significant. A level placed in accordance with paragraph 9223.2 will be considered the lower boundary of the motorboating stratum.

9232. If the radiosonde should descend owing to icing or turbulence and then reascend, a level will be placed at the highest complete contact of the first ascent and another level at the same contact of the second or last ascent.

9233. Where necessary to reduce the difference in pressure between any two successive levels to 100 millibars or less.

9234. At the bursting point of the balloon or at the highest usable point of the record. If the bursting point occurs at a reference or a relative humidity contact, the temperature trace

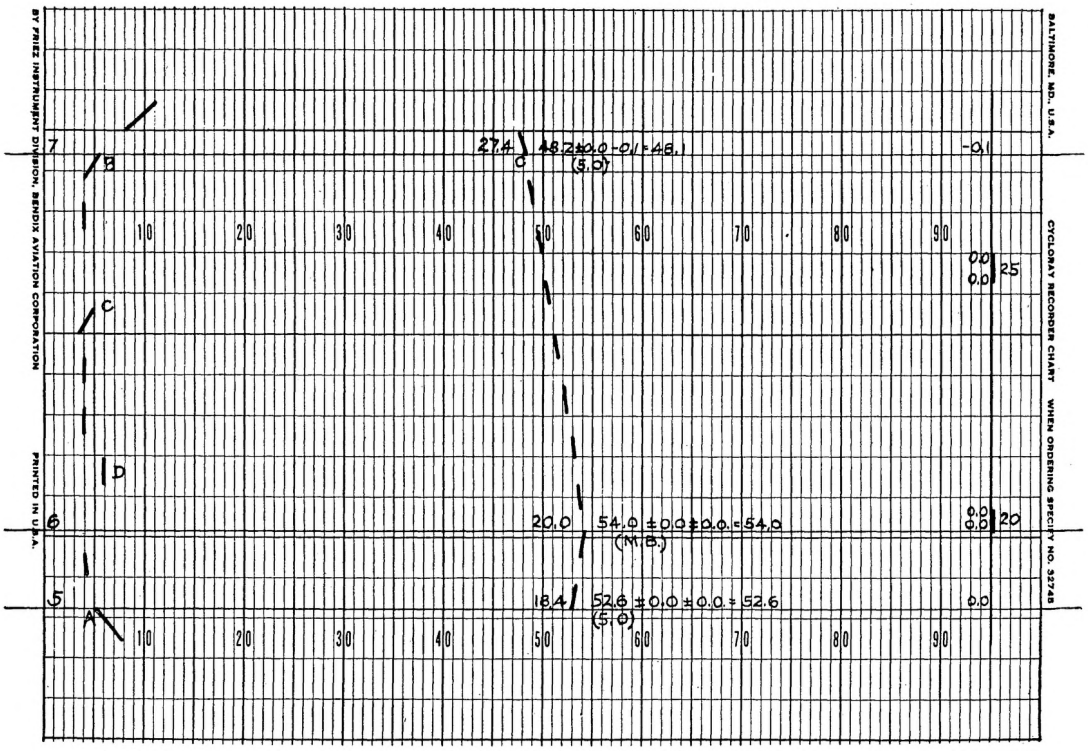


FIGURE 9–3.—Placing levels at cut-off points and in a motorboating stratum.

NOTE.—The stratum AB is adjudged to be predominantly motorboating despite the points at D and C. Level No. 6 placed at the top of the inversion satisfies the requirement for one level in every motorboating stratum more than four contacts in extent. Point A is at a cut-off point and therefore evaluated as 5.0. No drift or recorder corrections are applied. This is also true of level No. 6, which is evaluated as MB. Level No. 7 is placed slightly above the cut-off point because of the change in temperature lapse rate at C. B nevertheless is evaluated as at the cut-off point and assigned an ordinate value of 5.0.

will be extrapolated to the bursting point if this can be done accurately. If it cannot be done with accuracy because the temperature has been varying considerably, or for other reasons, the flight will be terminated at the top of the last temperature contact.

9235. At the base of any cloud layer that the balloon is seen to enter; this level will have been marked by the observer at the recorder in accordance with paragraph 7871.

9236. At the beginnings and endings of strata whose temperature or relative humidity data, or both, are classified as missing or doubtful. On the levels bounding missing strata, enter the notation "Beginning (or end) missing (or doubtful) data." This notation will be made close to the evaluated data but in a position where it will not interfere with or obliterate any part of the record or the evaluations.

9237. Within each stratum classified as missing. Since it will not be possible to evaluate data pertaining to such levels, the exact points at which the levels are placed is unimportant, but it is necessary that they be assigned a level number to aid in constructing the adiabatic chart and coding the raob message. For these purposes, only one level will be placed within each stratum of data classified as missing. Enter "Data missing" on the levels.

9238. At the base of strata in which icing occurs.

9238.1 Indications of Icing.—The occurrence of icing under favorable conditions of temperature and relative humidity is usually indicated by a decrease in the ascensional rate of the raob balloon and a consequent lengthening of the contacts on the recorder record. Since a decrease in the ascensional rate can be caused by turbulence as well as icing, the temperature and relative humidity will be examined critically before assuming that the decrease is owing to icing. It will be noted that there should be a progressive increase in the length of the contacts to support the assumption that the accretion of ice is increasing. This increase cannot usually be exhibited in less than four contacts. Moreover, the temperature should be close to freezing or below, and the relative humidity high. The selection of a level at the base of a stratum within which icing occurs should be correlated with the selection of RAICG and RAFRZ data, in accordance with the provisions of Chapter XI.

9240. DESCENT RECORD

(See fig. 9–4)

9241. On daytime raobs, if any point on the descent record between the bursting point of the balloon and the 400-millibar surface is lower by 3° or more than the corresponding point on the ascent, corrections will be applied to the ascent temperatures. These corrections will be applied only above the 400-millibar surface and will be determined as follows:

9242. Select a point on the descent record one or two contacts below the bursting point of the balloon. It is not advisable to select the last contact reached because of the poor ventilation at that point. Draw a short horizontal line through the point selected. Select as many additional salient points on the descent record as can be clearly identified with corresponding points on the ascent record. Draw a short horizontal line through the points. Because of hysteresis, or lag, in the baroswitch section, these points will not necessarily be of the same pressure contact value as the corresponding points on the ascent record.

9243. When the bursting point of the balloon is above the tropopause, ascent temperature corrections will not be applied unless the temperature difference between the ascent and descent records can be established for at least two points between the bursting point and the 400-millibar surface. If the bursting point occurs between the 400-millibar surface and the tropopause, the temperature difference for at least one point must be determined.

9300. CONTACT NUMBERS AND DRIFT LINE

(See fig. 9–1)

9310. At each high and low reference contact, write the contact number (5, 10, 15, 20, etc.) to the right of the reference trace, provided the contact number is a multiple of 5. Connect each successive recorded low reference contact with a straight line, termed the "drift line," drawn from the upper left edge of the lower low reference contact to the lower left edge of the succeeding one, regardless of whether intervening low reference contacts are missing. This procedure will be altered as explained below if a shift has occurred between successive low reference contacts. (See par. 9350.)

9320. At the top and bottom of each low reference contact and immediately to the left of it, enter to tenths of ordinates, with proper sign prefixed, the difference between the low reference ordinate and the ninety-fifth. This difference is termed "the low reference drift correction."

9330. Draw the drift line vertically—that is, parallel to the printed ordinate lines—from the lower left edge of the first low reference after release to the surface level, unless there is evidence to indicate that there has been a shift between release and the first low reference. This may be indicated by an abrupt shift in the temperature trace or the displaced position of

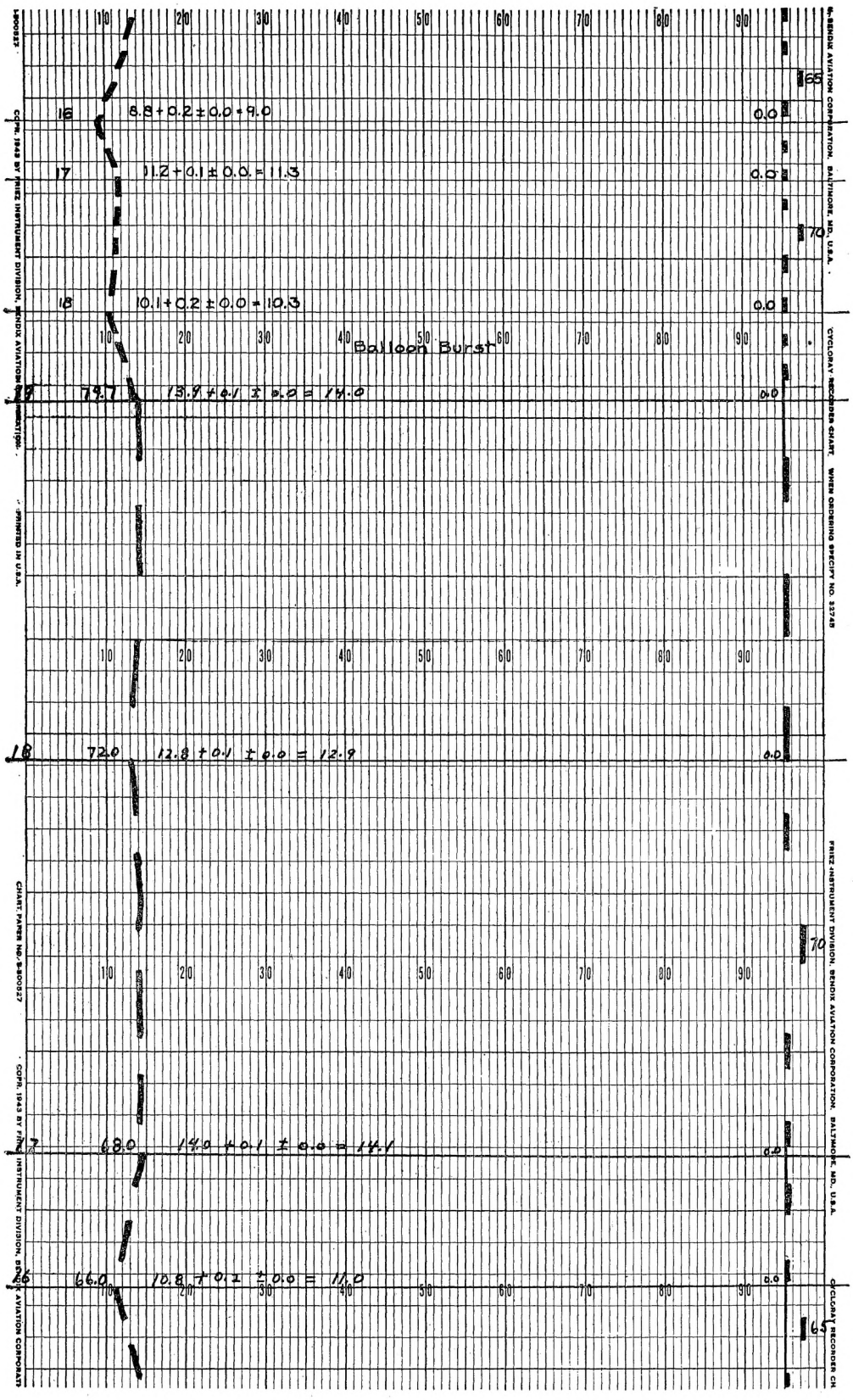


FIGURE 9–4.—Descent record.

any high reference trace that might have been recorded between release and the first low reference. The high reference ordinate differs from the low reference ordinate by an amount that is practically constant for a given radiosonde.

9340. If the record indicates that there has been an abrupt shift, draw the drift line accordingly. Inspect the record to determine that there has been a shift of all elements and the shifts are proportional to their ordinate values. Determine carefully that there has not been an independent shift of the temperature trace. (See par. 9350.)

9350. If there has been a drift as well as a shift, draw the drift line as follows (see fig. 9–5):

(1) Multiply the amount of shift of the temperature ordinate by the ordinate of the low reference before the shift, and divide the product by the temperature ordinate before the shift, thus:

$$\frac{\textit{Shift of temperature ordinate} \times \textit{low reference before shift}}{\textit{Temperature ordinate before shift}} = \textit{Correction for shift to be applied to the following low reference contact.}$$

(2) At the following low reference place a point an amount equal to and in a direction opposite from the computed low reference shift. The difference between this point and the preceding low reference is the amount of drift which occurred in addition to the shift. Draw the drift line from the preceding low reference toward this point, but stop at the level of the shift. Then displace the drift line the same direction and amount as the computed low reference shift. Continue the drift line to the left edge of the following low reference.

9360. Missing Low Reference Contacts.—If one or more low reference contacts are missing, draw the drift line between the first readable low reference contact above and below them. If all the low reference contacts should become unreadable, but the temperature and relative humidity record continues readable, the drift line may be drawn vertically—that is, parallel to the printed ordinate lines—from the last readable low reference contact to the termination of the sounding, provided there has been little or no drifting and shifting and the temperature record indicates little possibility of a shift having occurred after the low reference contacts became unreadable. Under these circumstances, the data will be classified as accurate, doubtful, or missing, in accordance with paragraph 9121.

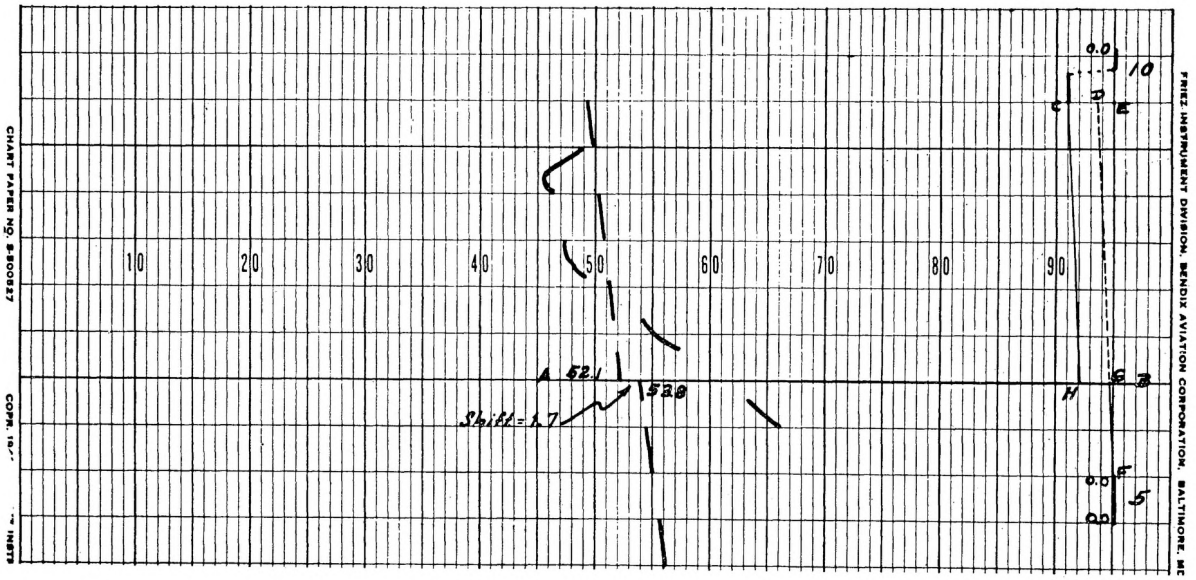


FIGURE 9–5.—Determination of drift-shift correction.

NOTE.—At the point of shift, the line AB is drawn through the temperature trace and drift line. The shift of the temperature trace is 1.7 ordinates; the temperature ordinate before the shift, 53.8; and the preceding low reference ordinate value, 95.0. Substituting the values in the formula above: $\frac{1.7 \times 95}{53.8} = 2.6$ (amount of shift at low reference). Point C at the base of the first low reference following the shift was displaced to the right—that is, in a direction opposite to that of the shift—2.6 ordinates. This point is marked "D." CD is the shift. DE, or the remainder, is the drift. The points D and F are lined up and a solid line drawn from F to G. G is then displaced to the left 2.6 ordinates to the point H. The points C and H are connected with a solid line and the line CH used as the drift line for any levels placed between them. The line FG is the drift line applicable to any levels coming between them.

9361. If the record indicates that an appreciable amount of shifting or drifting occurred, the drift line will be drawn in the same manner and the data examined very carefully with a view to classifying them as doubtful or missing, since the possible error in such cases may be appreciably large.

9400. ENTERING DATA ON SIGNIFICANT LEVELS

9410. Level Number.—Number each significant level, making the surface level number 1. Write the appropriate number upon the level and at the extreme left of the recorder record. In cases of multiple ascents (see par. 9232), assign a level number one higher to the first level on the last ascent than the last level on the first ascent.

9411. On all levels except the surface, enter to the left of the drift line the ordinate difference between the drift line and the ninety-fifth ordinate. Place a plus sign before the difference if the drift line is to the left of the ninety-fifth ordinate and a minus sign if it is to the right.

9420. Pressure Contact Value.—At each significant level, determine the pressure contact value to the nearest tenth by counting the contacts from the preceding reference contact, numbered in accordance with paragraph 9310, to the given level. A contact begins at the base of the relative humidity or reference portion and ends at the top of the temperature portion. Determine proportional parts of a contact with reference to the whole contact as it appears on the recorder record; that is, the relative humidity portion of a contact will not necessarily be considered as one-fourth of the whole contact—it may be as little as one-tenth or as much as nine-tenths.

9421. Enter the values of the pressure contacts immediately to the left of the temperature trace and upon the levels.

9422. On the surface level, enter the value of the pressure contact at release, as it appears on the recorder record. Enter this value on the back of WBAN–30 also, under the heading "Contact from Recorder Record." Beside this, enter under "Contact from Calibration Chart" the contact corresponding to the pressure at the time and point of release. (See par. 9131.) The fractional value of the contact at release will usually be estimated by comparing it with the length of the following contact, except that when conditions of wind and precipitation make this impossible the most reasonable value will be assigned to the contact.

9423. Discrepant Contact at Release.—Compare the value of the contact at release, as determined from the recorder record, with the computed value, as determined from the calibration chart in accordance with paragraph 9422.

9423.1. If the difference between these two values is 0.2 contact or less, no corrections need be applied to the computed pressure contact values for the significant levels.

9423.2. If the difference is between 0.3 and 0.5 contact, inclusive, apply the difference to the pressure contact value. For example, if the record shows that the radiosonde was released with the contact point set at 5.0 contact and the calibration chart indicates that this setting should have been 4.5 contact, the pressure contact at the surface level will be entered as $5.0-0.5=4.5$. In the same manner, this correction of -0.5 contact will then be applied to the pressure contact values of all other significant levels.

9423.3. If the difference is more than 0.5 contact, the pressure calibration curve will be displaced in accordance with the following instructions:

9424. Displacing Calibration Curve (see fig. 9–6).—On the calibration chart, plot a point at the intersection of the actual contact at release and the corresponding pressure. Measure the distance vertically from this point to the curve on the calibration chart. Displace the curve vertically in an amount equal to this distance at a number of points throughout its length, and draw a new curve through the points. Cross out the old curve, and use the new curve for computing all values of pressure.

9430. Evaluation of Temperature Ordinate.—Owing to the effect of solar heating, daytime recorder records frequently show zigzag fluctuations in the temperature traces. When evaluating such traces, use the left or low temperature values. A penciled line connecting the low temperature values of the traces may be drawn to aid in the evaluation, taking care to avoid eliminating the larger fluctuations that indicate actual variations in the temperature of the air. Data evaluated in accordance with the provisions of this paragraph will not be considered "doubtful" or "missing." (See fig. 9–7.)

9431. Enter the temperature ordinate values to tenths immediately to the right of the temperature trace and upon the levels.

9440. Evaluation of Relative Humidity Ordinates.—The relative humidity ordinates will usually be read at a point where the significant levels intersect a straight line connecting the tops of the relative humidity traces above and below them. (See figs. 9–8 and 9–9.)

9441. When the relative humidity is changing rapidly, the effects of polarization (usually manifest during the first portion of each relative humidity trace by a drift to the left) may be neglected. Under these circumstances the relative humidity trace may be evaluated at the point closest to the level. (See fig. 9–10.)

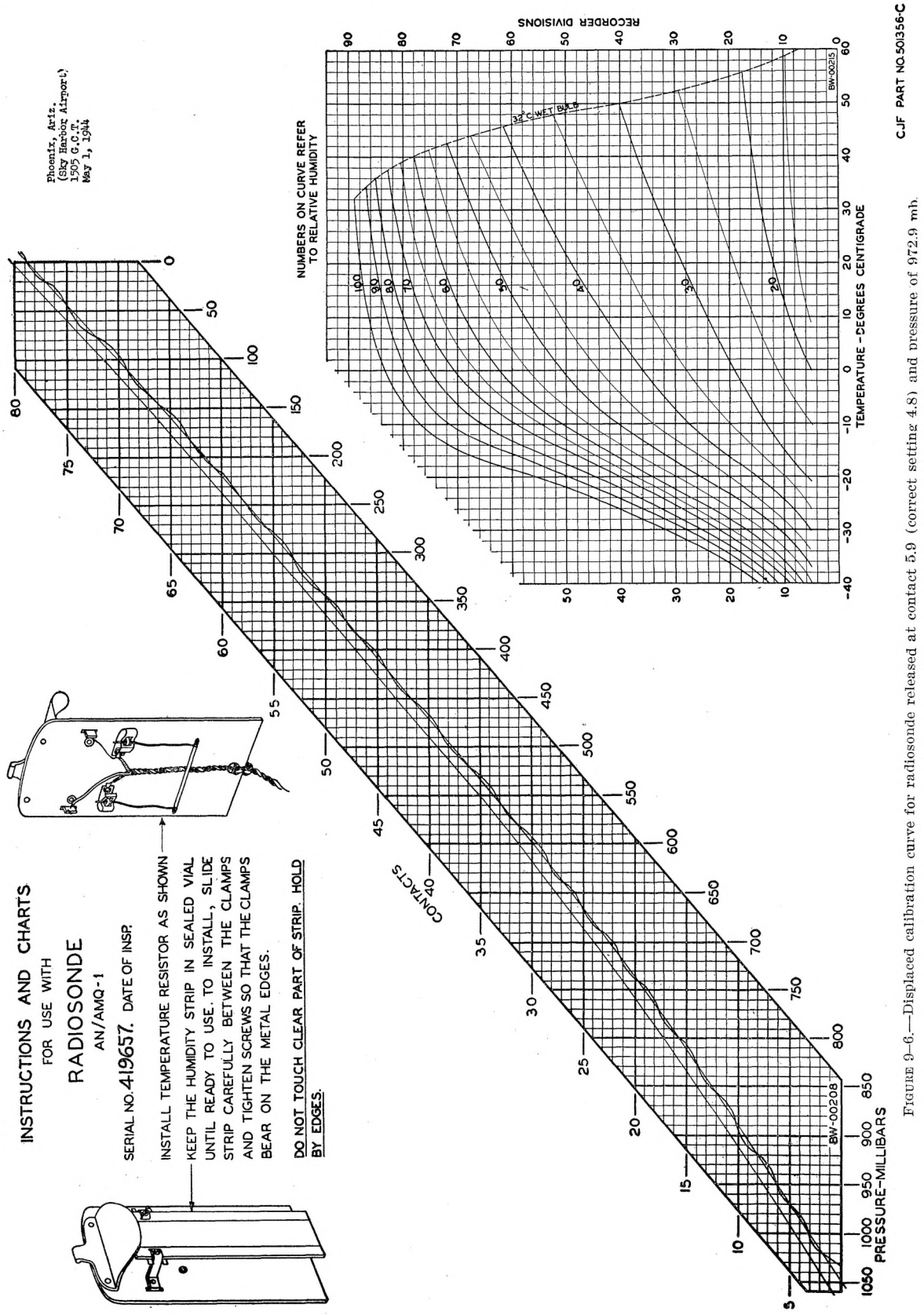


FIGURE 9–6.—Displaced calibration curve for radiosonde released at contact 5.9 (correct setting 4.8) and pressure of 972.9 mb.

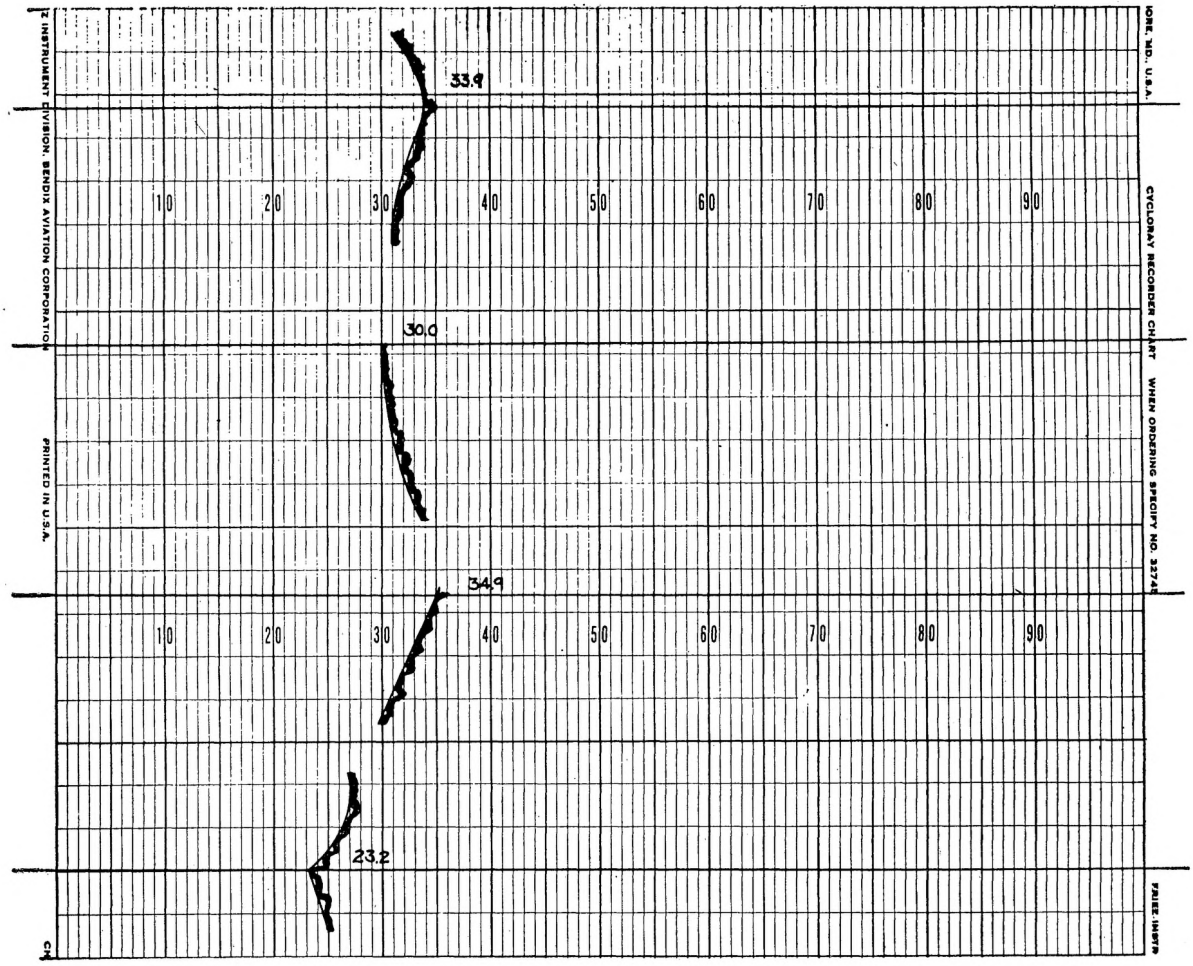


FIGURE 9–7.—Evaluation of zigzag temperature trace.

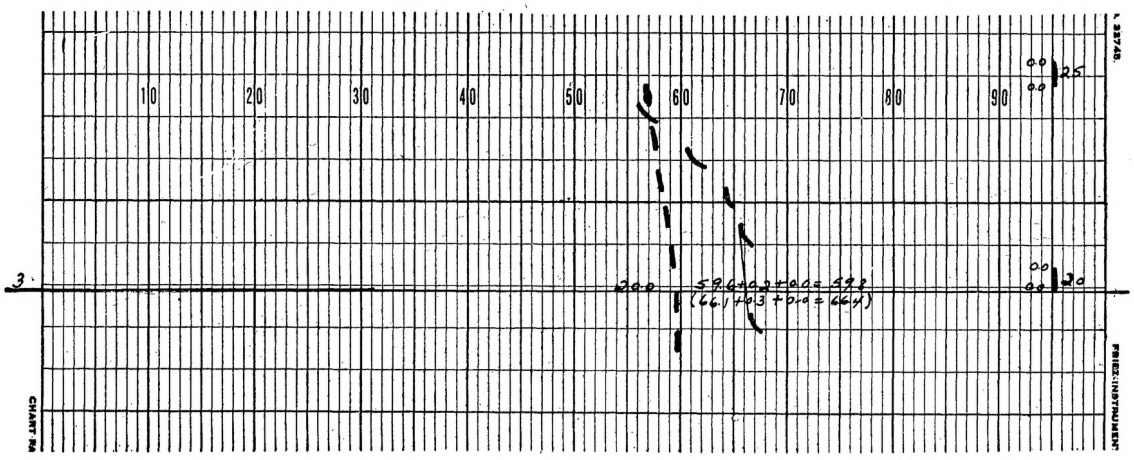


FIGURE 9–8.—Evaluation of relative humidity trace, example No. 1.

NOTE.—*Level No. 3, Example No. 1.*—The relative humidity ordinate is found by drawing a straight line from the top of the humidity contact below level No. 3 to the top of the relative humidity contact above the level. The polarization effect is very apparent in this example. Polarization is indicated by a decrease of the relative humidity ordinate.

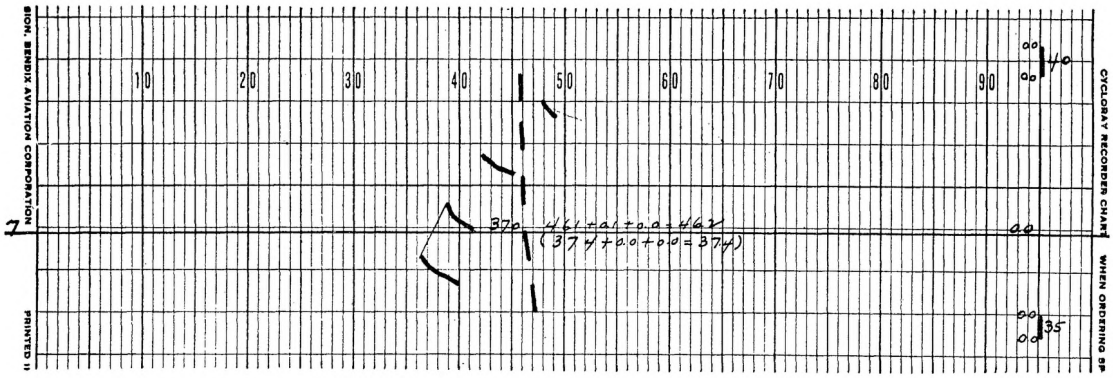


FIGURE 9–9.—Evaluation of relative humidity trace, example No. 2.

NOTE.—*Level No. 7, Example No. 2.*—The relative humidity ordinate is found by drawing a straight line from the top of the relative humidity contact below level No. 7 to the top of the relative humidity contact above the level. Although the trend of the relative humidity is rising, each individual contact shows definite evidence of polarization.

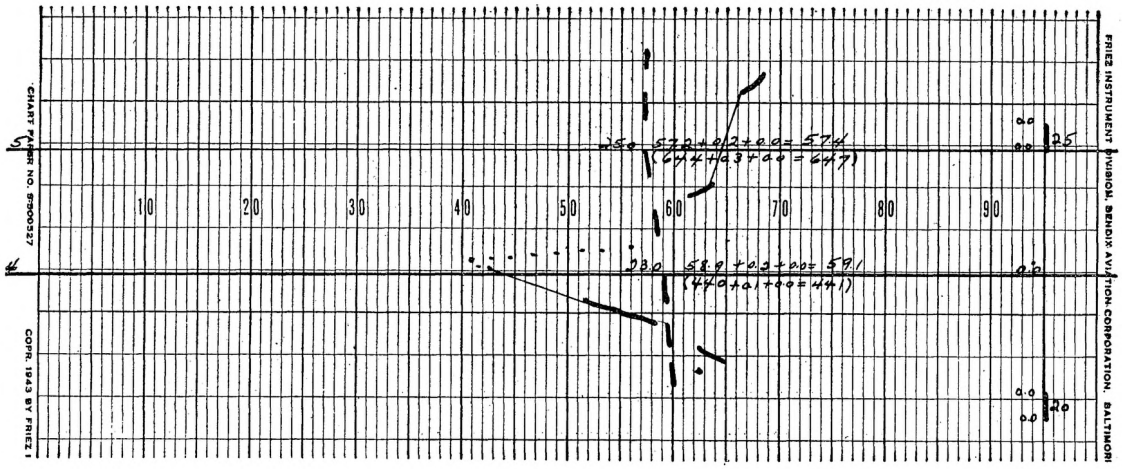


FIGURE 9–10.—Evaluation of relative humidity trace, example No. 3.

NOTE.—*Level No. 4, Example No. 3.*—The relative humidity ordinate is found by drawing a straight line from the top of the relative humidity contact below level No. 4 to the bottom of the relative humidity contact above the level. At the relative humidity contact above level No. 4, the effect of polarization cannot be recognized because of extreme relative humidity changes while the contact was recording. Therefore, the polarization is disregarded in this case, and all points along the curve formed by the humidity trace may be used.

Level No. 5.—The relative humidity ordinate is found by drawing a straight line from the top of the relative humidity contact below level No. 5 to the bottom of the relative humidity contact above the level. As in level No. 4, the polarization effect is disguised by changes in relative humidity. The indicated increase is caused by an actual increase in humidity, and, as such, masks polarization, which always appears as a decrease in the ordinate of relative humidity.

9442. Whenever a significant level occurs at a high or low reference contact, the relative humidity will usually be interpolated between the adjacent relative humidity traces. When the temperature lapse rate is uniform, the relative humidity interpolation will be made by connecting the adjacent relative humidity traces in accordance with paragraph 9440 above. When the temperature record shows an inversion or the beginning or ending of an isothermal layer at a reference contact, the relative humidity record below the level will be extrapolated, and the ordinate of relative humidity obtained at the intersection of the level and the extrapolated trace. Usually, the base of an inversion will coincide with a point of maximum relative humidity value for the stratum and the top of an inversion with a point of minimum value. (See fig. 9–11.)

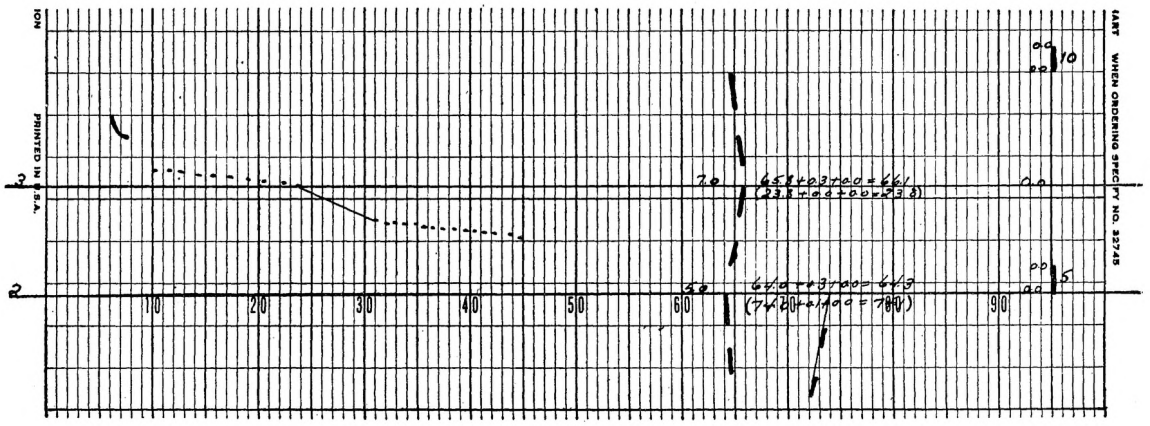


FIGURE 9–11.—Evaluation of relative humidity trace, example No. 4.

NOTE.—*Level No. 2, Example No. 4.*—The relative humidity ordinate is found by the extrapolation, rather than the interpolation, method illustrated in the previous examples. In this example, extrapolation is necessary to obtain the maximum value of relative humidity. The maximum value should occur at or near the base of an inversion of this type.

Level No. 3, Example No. 4.—The relative humidity ordinate is found by drawing a straight line from the top of the humidity contact below the level to the bottom of the humidity contact above the level. Polarization is again disregarded because of the extreme change in the recorded relative humidity.

9443. Read the relative humidity ordinate values to the nearest tenth and enter them immediately to the right of the temperature trace and below the levels. These values, and their recorder and drift corrections, will be enclosed in parentheses.

9444. If at any level the relative humidity trace is believed to be at a cut-off point, the ordinate will be evaluated as 5.0. Recorder and drift corrections will not be applied to this value.

9445. If at any level the relative humidity trace is believed to be in a motorboating stratum, but not at cut-off points, the relative humidity ordinate will be evaluated as MB and entered on the recorder record. No corrections of any kind will be applied.

9500. APPLICATIONS OF CORRECTIONS TO TEMPERATURE AND RELATIVE HUMIDITY ORDINATES

9510. Recorder Corrections.—Enter the applicable recorder corrections, with proper sign prefixed, to the right of the temperature and relative humidity ordinates.

9520. Drift and Shift Corrections.—Corrections for shifts will be applied as though the shift had been a drift.

9521. Drift corrections will be based on temperature ordinate values after recorder corrections have been applied. The ordinate difference between the drift line and the ninety-fifth ordinate, at the point where each significant level intersects it, will be placed, with proper sign prefixed, immediately to the left of the drift line and on the significant level.

9522. Computation of Drift Corrections.—Multiply the temperature ordinate value for each level (after application of recorder corrections) by the drift at low reference, as found in paragraph 9521. Divide the product by the ordinate value of the paper drift line, and place the dividend, with proper sign prefixed, immediately after the recorder correction applied to the temperature ordinate. This will be followed by an equals (=) sign, and the corrected temperature ordinate, thus: $30.0-0.1+0.2=30.1$, where the recorder correction is -0.1 and the drift correction is $+0.2$.

9522.1. To facilitate the computation of drift corrections, 90 may be used as the divisor if the low reference drift is to the left and does not exceed 7 ordinates. If the drift is to the right, 100 may be used as the divisor.

9522.2. If the reference drift is less than 3.0 ordinates, correction charts based on 95 as the divisor may be used.

9530. PAPER DRIFT CORRECTIONS

9531. Paper drift corrections will be computed if the check of the zero recording made in accordance with paragraph 8631 indicates a drift of 0.3 ordinate or more at any level of the sounding.

9532. If paper drift corrections are required, they will be placed, with proper sign prefixed, after the temperature and humidity ordinates to which recorder and drift corrections have been applied. An equals (=) sign will be placed after them, followed by the corrected temperature ordinate, thus: $30.0-0.1+0.2=30.1-0.3=29.8$, where -0.1 is the recorder correction, $+0.2$ is the drift correction, and -0.3 is the correction for paper drift.

9533. Computation of Paper Drift Corrections.—Draw the paper drift line from the left

edge of the top of the zero trace before release to the bottom of the next zero trace, which may have been obtained before the termination of the sounding in accordance with paragraph 8510. Continue this drift line from the top of each zero trace to the bottom of the next following zero trace through the termination of the sounding.

9533.1. Enter the paper drift correction on each level immediately to the right of the paper drift line. The correction will be the ordinate difference between the drift line and the correct ordinate value of the zero setting. If the recorder at zero prints to the left of the true ordinate of the zero setting, a positive correction will be required. If it prints to the right, a negative correction will be required.

9533.2. Subtract from 95.0 the temperature ordinate value to be corrected. Multiply the remainder by the paper drift correction at the given level and divide the product by 95. The quotient will be the required correction for the temperature ordinate. For example, if the temperature ordinate (after application of recorder and drift corrections) at a given level is 40.3, and the paper drift is 0.7 ordinate, the correction would be computed as follows:

$$95.0-40.3=54.7,\ \frac{54.7\times 0.7}{95}=0.4,$$

the required paper drift correction for an ordinate of 40.3.

9540. Descent Temperature Data.—Points on the descent record selected in accordance with paragraph 9242 will be evaluated for temperature only, with the exception of the first point below the level at the maximum elevation of the sounding. Since it will usually not be possible to identify this point with a corresponding point of the ascent record, the pressure corresponding to its contact will be determined from the calibration chart in order to plot the corresponding temperature difference in accordance with paragraph 10212.33. If this point should correspond to a level on the ascent record, it will not be necessary to secure the corresponding pressure.

9541. Enter to the left of the points selected, in accordance with paragraph 9242, the level numbers of the corresponding points on the ascent record. To the right of the temperature trace, enter the complete temperature ordinate data in a manner similar to the entry of such data on the ascent record. Recorder and drift corrections will be computed in a manner similar to that for the ascent record data.

9542. Corrected descent temperature ordinates will be entered on WBAN–30 in the "Remarks" column of the ascent levels to which they pertain. Above the data, enter the notation "Descent temperature." Allow sufficient room to the right of the descent temperature ordinates for the two additional entries required by the provisions of paragraph 10212.32. Beneath the ordinate pertaining to the first point selected below the level at the termination of the sounding, enter the corresponding pressure, if required, in accordance with paragraph 9540.

9550. Termination of the Sounding.—Enter the reason for the termination of the sounding slightly above the last ascent level evaluated.

9600. Recorder Record and Calibration Chart.—The recorder record will be folded uniformly to facilitate inspection and filing. It will be folded evenly, accordion fashion, in 7-inch folds in order that the entire record may be examined by turning over the folds. The first fold, upon which the identifying data are entered, should face outward. The calibration chart will be folded once, with the pressure graph folded toward the relative humidity graph on the inside. The recorder record will be placed inside the folded calibration chart. (See fig. 9–12.)

9610. The name of the station, date, and time of release G. C. T. will be entered on the calibration chart just below the serial number on the inside of the chart, or, if space is not available, these data will be entered in a convenient space near the serial number. After the calibration chart has been folded once with the blank side out and the fold at the bottom, the name of the station and date and time of release G. C. T., will be entered in the upper right corner as shown in figure 9–12.

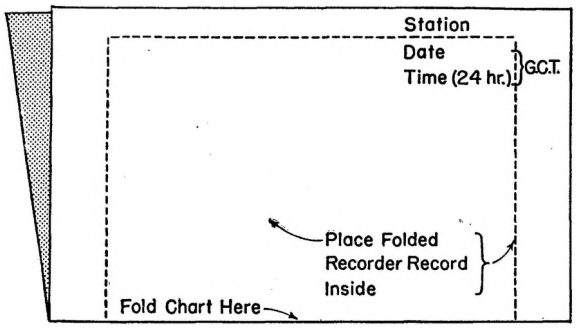


FIGURE 9–12.—Example of folded calibration chart showing position of labels. Dashed lines show recorder record inside folded chart (proportion approximate).

Chapter X. PREPARATION OF FORMS

10100. GENERAL

10110. Prepare all forms neatly and legibly, using well-sharpened pencils (No. 3). Rubber stamps will be used, when available, for entering the date and the name of the station. Enter identification data on both sides of WBAN–30, both sections of WBAN–31, and all pages of WBAN–32. Black pencil will be used unless specific exception is made in these instructions.

10111. Enter the date and time of the raob on the recorder record and calibration chart, and on all forms except WBAN–32, in accordance with the 24-hour clock, G. C. T., to the nearest minute. Instructions for making these entries on WBAN–32 are given in section 10700. The time of release will be considered the time of the raob. The date will always conform with the time expressed in G. C. T. Midnight will be indicated as 0000 and considered as the beginning of the day; e. g., midnight of the 7th-8th will be entered as 0000 on the 8th. In no case will midnight be indicated as 2400. A colon will not be used between the hour and minutes. On WBAN–30, the actual release time and date will also be entered in terms of the time zone in which the station is situated. The meridian of the appropriate time zone will be entered in the space "__th mer."

10112. Enter the name of the station on all forms and on the recorder record and calibration chart. At airports and military establishments the name of the city to which each is customarily considered to be attached will be entered followed in parentheses by the name of the field or establishment; e. g., Seattle, Wash. (Sand Point); Medford, Oreg. (Municipal Airport); Fort Bragg, N. C. (Pope Field).

10113. On WBAN–30 and WBAN–31, enter the latitude and longitude of the station in degrees and minutes, indicating by N or S in the case of latitude, and W or E in the case of longitude, the appropriate direction.

10114. Ascension Number.—Ascension numbers required on WBAN–30 and WBAN–31A and B will be numbered consecutively through the year, becoming No. 1 for the first raob of each year. Special raobs and all raobs that have attained to a height of 3 km. or more will be given an ascension number. If a raob terminates below 3 km. above the elevation of the station, and a second radiosonde is released that attains to a greater height, the first sounding will not be evaluated or given an ascension number. If, because of unfavorable weather conditions or other reasons, a second radiosonde is not released, the first will be given an ascension number, evaluated, and the data transmitted. If conditions should later improve to such an extent that a second raob is taken, and this extends to a higher elevation than the first, forms pertaining to both raobs will be forwarded in accordance with instructions. Forms for the first raob will retain the ascension number already given it, and those for the second will be numbered one higher.

10115. Enter the initials and surname, and military rank or rating if any, of the computer and verifier wherever required on raob forms and recorder records.

10116. All forms for special raobs will be marked "Special."

10117. Forms will not be folded except as required by instructions.

10118. So far as possible an observer other than the one doing the original work will check all forms completely.

10119. Instructions for mailing forms will be found in the addendum.

10200. WBAN-30 RAOB COMPUTATION DATA

(See Figs. 10–2 and 10–3.)

10201. WBAN–30 is one of the basic forms used in raob computations. Data from the recorder record are entered on the front, which is headed "Raob Computation Data," evaluated, and then transcribed to the adiabatic chart for additional computations. Isentropic data, balloon data, check readings, surface observation data, etc., are entered on the back.

10202. Horizontal lines on the front of the form are numbered close to the left edge in the column headed "Level Number." Surface data at release will be entered on the horizontal line labeled "Sfc. 1." The pressure contact, ordinate of temperature, and ordinate of relative humidity for each upper level evaluated on the recorder record will be entered opposite its corresponding level number. The surface is the first significant level.

10203. When a level is placed on a recorder record to indicate missing data, "Data missing" will be entered on WBAN–30 at approximately the middle of the line corresponding to the level, thus furnishing a level number for the level in the missing stratum. The beginning and ending of doubtful data will be plainly

shown in the column headed "Remarks" by entering "Beginning (or Ending) Doubtful Data" on the levels bounding the stratum.

10210. Entry of Basic Data.—Entries will be made in the columns headed Pressure, Temperature, Relative Humidity, and Mixing Ratio in accordance with the following instructions:

10211. PRESSURE

10211.1. Contact.—No entry will be made under this heading on the surface level. For each upper level enter the value to the nearest tenth of a pressure contact.

10211.2. Millibars.—On the surface level enter the surface pressure to whole millibars, corrected to the elevation of the floor of the instrument shelter, at the time of release. Obtain this datum from the back of the form under "Surface Observation at Release." For each upper level enter the pressure to whole millibars corresponding to the pressure contact of the level as found from the calibration curve.

10212. TEMPERATURE

10212.1. Ordinate.—No entry will be made under this heading on the surface level. For each upper level enter the ordinate readings to tenths as obtained from the recorder record after corrections for drift, etc., have been applied.

10212.2. Ascent.—On the surface level enter the dry-bulb temperature as obtained from the back of the form under "Surface Observation at Release." For each upper level enter the temperature to tenths, corresponding to the temperature ordinate of the level, as obtained from the temperature evaluator.

10212.3. Corrections.—If corrections are not applied to the ascent temperature of daytime raobs, no entries will be made in this column. When corrections are applied, no entry will be made for levels at and between the surface and 400 millibars.

10212.31. Determine the correction for levels above 400 millibars as follows:

10212.32. Enter the temperature to tenths to the right of the corresponding descent temperature ordinate referred to in paragraph 9542. To the right of these entries, enter the difference between these descent temperatures and the corresponding ascent temperatures. If the descent temperatures are higher than the ascent temperatures, a plus (+) sign will be placed before the corresponding differences; if they are lower, no sign will be entered before the differences.

10212.33. On the WBAN–31B used in the sounding, lay off a scale of temperature differences at the extreme left so spaced that 1 kilometer is equal to 1° C. of temperature difference; that is, consider 24 km. equals +1°, 23 km. equals 0°; 22 km. equals −1°, etc. (see fig. 10–1). Plot the temperature differences against the ascent pressures to which they pertain. The correction at 400 millibars will be considered 0°. Connect the points by solid straight lines. Since a correction will not have been obtained for the level at the bursting point of the balloon, project the slope of the correction curve segment immediately beneath it to that level. If the temperature for any portion of the descent is higher than that indicated for the corresponding portion of the ascent, the ascent temperature will be regarded as correct. The required correction will be obtained by noting the intersection of each significant level (above 400 millibars) with the correction curve, and referring this intersection to the scale laid off at the bottom of the chart. When corrections are required but were not obtained, the data above 400 millibars will be regarded as doubtful. In classifying these data as doubtful, it is assumed that the differences in excess of −3° (which would require a "missing" classification) are confined to a relatively shallow stratum of the sounding.

10212.4. Corrected.—If daytime corrections are necessary, the algebraic sum of the ascent temperature and the correction will be entered in degrees and tenths; the corrected temperature will be used in all computations and for transmission purposes. If corrections are not necessary, this column will be left blank.

10213. RELATIVE HUMIDITY

10213.1. Ordinate.—No entry will be made on the surface level. For each upper level enter the ordinate readings to tenths. Enter "MB" if a level is evaluated as motorboating; enter "M" if the relative humidity data are missing; and 5.0 if the level has been evaluated as at the cut-off point, regardless of its actual recorded value.

10213.2. Uncorrected.—No entry will be made on the surface level. For each upper level enter the relative humidity to whole percent as obtained from the calibration chart. Relative humidity values at cut-off points will be evaluated in the same manner as other ordinates, but if the relative humidity ordinate is evaluated as "MB" or "M," a dash will be entered.

10213.3 Correction.—No entry will be made under this heading on the surface level. If the radiosonde was not motorboating at the time of the base-line check, enter the correction determined at that time on the line for the first upper level, provided this correction was not changed in the meantime. Entry of the correction for succeeding levels will be made only

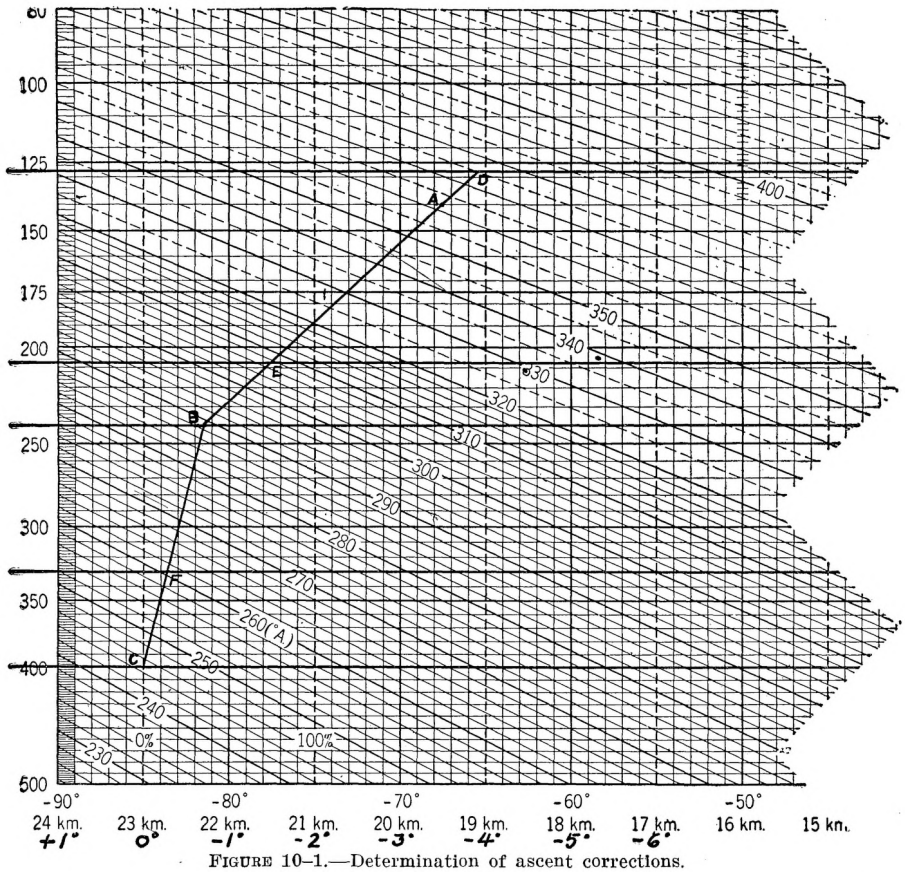


FIGURE 10–1.—Determination of ascent corrections.

NOTE.—Ascent temperature corrections are required whenever the temperature at any point above 400 millibars is more than 3° lower on the descent record than the temperature at the corresponding point on the ascent record. In the example above, point A was selected on the descent record at approximately one contact lower than the bursting point of the balloon (see par. 9242). The temperature at this contact, which corresponded to 140 millibars, was evaluated in accordance with paragraph 10212.32. The difference between this temperature and the corresponding temperature on the ascent record was plotted at 140 millibars, in accordance with paragraph 10212.33. The next lower identifiable salient point on the descent record occurred at the tropopause, the temperature difference of which is plotted at point B. The temperature difference at 400 millibars, point C, is regarded as zero (see par. 10212.33). The points A, B, and C are connected with straight lines. The line AB is projected along the same slope to D to obtain the correction applicable to the level at the maximum altitude of the sounding. The corrections applicable to the levels at D, E, and F are read on the scale at the bottom of the chart laid off in accordance with paragraph 10212.33. The correction at D is —3.9°; at E, —1.5°; at F, —0.3°. The negative signs indicate that in all cases the descent temperatures were lower than temperatures at corresponding points on the ascent record.

when the value of the correction is changed by the radiosonde's indicating values of relative humidity in excess of 100 percent.

10213.31. If the radiosonde was motorboating at the time of the base-line check, a correction will not be applied to upper levels unless values in excess of 100 percent are reached. The amount of this excess will be entered as a minus correction on the first level to which it pertains and applied to all succeeding levels until a new correction is established. This procedure also applies to flights in which the radiosonde was not motorboating at the time of release, but, in the course of the ensuing flight, values in excess of 100 percent were indicated. All corrections will be entered in this column on the lines pertaining to the first levels to whose relative humidity value the corrections are to be applied.

10213.32. If at any level the relative humidity correction varies by 20 percent or more from the correction established at the baseline check, the relative humidity will not be computed for that level. The relative humidity data for that level and all levels thereafter will be classified as missing.

10213.4. Corrected.—On the surface level enter the relative humidity at the time of release, as recorded on the back of the form. The surface relative humidity will be entered regardless of existing surface temperature. At each upper level enter the algebraic sum of the un-

corrected relative humidity and the correction. It will be noted that when corrections are applied in accordance with the foregoing instructions, values of relative humidity in excess of 100 percent will never be entered in the *corrected* column. Enter "MB" when a level is evaluated as motorboating, and "M" when data are missing.

10214. MIXING RATIO

10214.1. The mixing ratio for each level will be computed to the nearest 0.1 g./kg., by means of a mixing ratio slide rule furnished for that purpose, from the values of pressure, corrected relative humidity, and corrected temperature pertaining to the level.

10214.2. Mixing ratio data will not be computed for levels evaluated as motorboating. Enter MB to indicate that the relative humidity was motorboating, and M to indicate that the temperature or relative humidity was missing.

10300. WBAN–31A–B—ADIABATIC CHART

(See figs. 10–4 and 10–5)

10301. The adiabatic chart consists of two sections: WBAN–31A, covering a pressure range of 1050 to 400 millibars, inclusive; and WBAN–31B, 500 to 10 millibars, inclusive. These charts furnish a graphical means of computing many of the functions of pressure, temperature, and relative humidity. In addition, they serve as final forms on which to represent and synchronize the instrumental and visual observations made during a raob.

10302. The horizontal lines represent pressure; and the vertical lines, temperature. Space is provided on the left side of the chart for plotting values of relative humidity and on the right side for entering computed values of mixing ratio. The sloping lines on the chart are dry adiabatic lines. Along the lower edge and below the temperature scale is a height scale expressed in kilometers above sea level. All heights are expressed in terms of the unit 0.98 dynamic meter, which is approximately equal to the geometric meter. In this manual it will be understood that meters are expressed in 0.98 dynamic meters. The pressure scale has been subdivided into intervals of 2 millibars. These intervals have been projected across the chart and repeated along the 35°, 20°, 4°, −11°, −20°, −35°, and −50° temperature lines through certain values of pressure to facilitate the reading of pressure data at fixed levels. Short vertical lines, or tabs, have been printed on the 1000, 950, 900, 850, 800, 750, 650, 550, and 450 isobars. These short vertical tabs are used to obtain the virtual temperature increment for the strata in which they occur.

10303. In the following paragraphs, surface pressure and surface altitude refer to the value of these data at the floor of the instrument shelter.

10304. Whenever the observation extends to a pressure lower than 400 millibars, the highest level on WBAN–31A must be replotted as the lowest level on WBAN–31B in order to preserve the continuity of the record. If this level does not occur exactly at 400 millibars, temperature and relative humidity should be read on WBAN–31B at that pressure and plotted on the 400 millibar level of WBAN–31A. The temperature and relative humidity curves on the latter form will be drawn to these points as though they were plotted on a significant level.

10305. The limits of doubtful data on the adiabatic chart will be clearly indicated by entering "Beginning (or Ending) doubtful data" close to the temperature curve and on the levels bounding the stratum of doubtful data. Strata of missing data will be similarly indicated. Curves through strata of doubtful data will be drawn as solid lines.

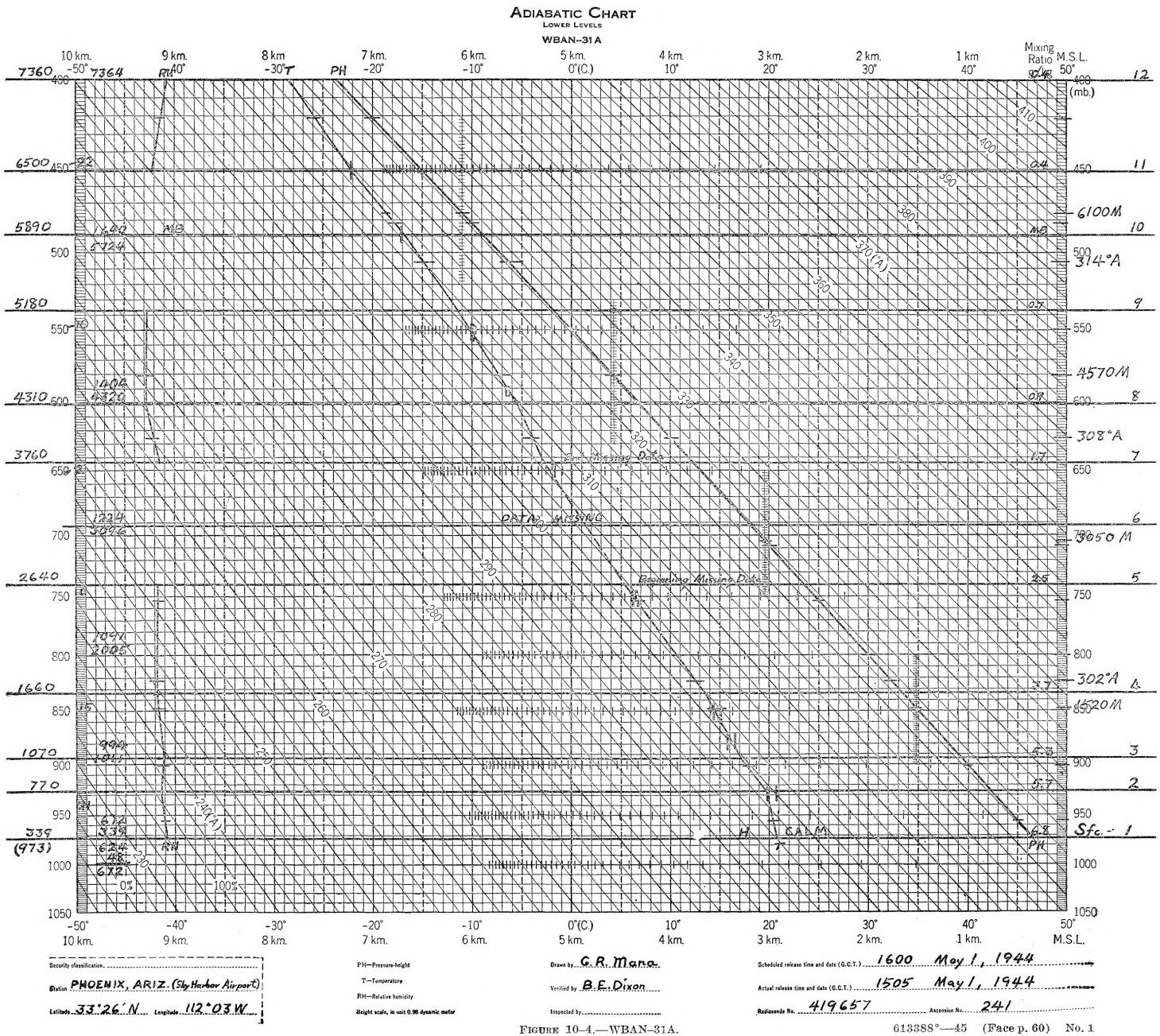
10310. PLOTTING DATA ON THE ADIABATIC CHARTS

10311. Pressure.—Draw a line completely across the adiabatic chart at a point corresponding to the surface pressure shown on the front of WBAN–30. Label this line in the right margin: "Sfc–1." In the left margin enter the surface pressure in parentheses immediately below the line. The height of the instrument shelter in whole meters will be entered on this line immediately above the surface pressure.

10311.1. Draw lines across the chart at the pressures of significant levels, and number them in the right margin (note that the level at the surface has been numbered (1)). Levels placed in strata of missing data will be drawn approximately midway between the upper and lower significant levels bounding the strata.

10311.2. Below the line at the level of the maximum elevation, and in the left margin, enter the corresponding value of pressure in parentheses.

10312. Temperature.—On each significant level plot the corresponding temperature to tenths and connect each successive point with a solid straight line. The completed temperature curve will be labeled "T" at top and bottom on both sections of the chart. Curves will be drawn as dashed lines through strata whose data are classified as missing. For this purpose it will be assumed that the temperature lapse rate is represented by a straight line between the two known temperature values bounding the missing portion.



Security classification.....

Station PHOENIX, ARIZ. (Sky Harbor Airport)

Latitude 33°26' N. Longitude 112°03' W.

PH—Pressure-height
T—Temperature
RH—Relative humidity
Height scale, in unit 0.98 dynamic meter

Drawn by C. R. Mara.
Verified by B. E. Dixon
Inspected by.....

Scheduled release time and date (G.C.T.) 1600 May 1, 1944
Actual release time and date (G.C.T.) 1505 May 1, 1944
Radiosonde No. 419657 Ascension No. 241

FIGURE 10–4.—WBAN–31A.

613388°—45 (Face p. 60) No. 1

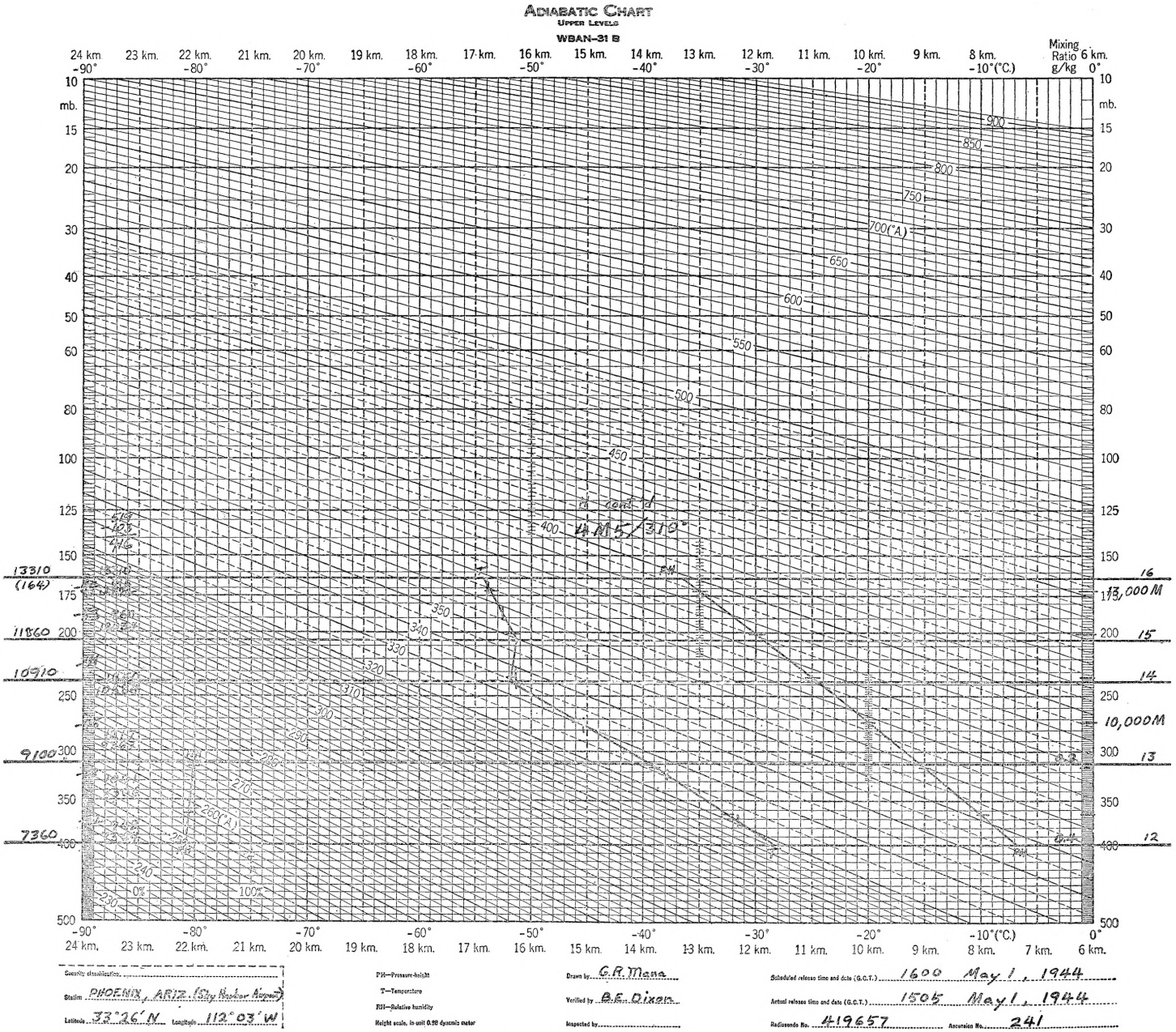


FIGURE 10–5.—WBAN–31B.

WB Form 1103

U. S. DEPARTMENT OF COMMERCE
WEATHER BUREAU

RAOB COMPUTATION DATA

WBAN–30

Scheduled release time and date May 1, 1944 1600 G. C. T.
Actual release time and date May 1, 1944 1505 G. C. T. Ascension No. 241
Actual release time and date May 1, 1944 0805 105th mer. Radiosonde No. 419657

Security classification
Station Phoenix, Ariz. (Sky Harbor Airport)
Latitude 33° 26' N Long. 112° 03' W

CODE CHECK	LEVEL No.	ALTITUDE [1]	PRESSURE		TEMPERATURE				RELATIVE HUMIDITY				MIXING RATIO g/kg.	REMARKS
			Contact	Millibars	Ordinate	Ascent °C	Correction °C [2]	Corrected °C [2]	Ordinate	Uncorrected %	Correction %	Corrected %		
						SIGNIFICANT LEVELS								
1	Sfc. 1	339		973		20.8						43	6.8	
2	2	770	9.0	927	69.4	19.8			48.1	40	-4	36	5.7	
	3	1070	11.0	894	68.1	17.1			51.8	43		39	5.3	
4	4	1660	15.0	834	66.3	13.5			37.0	36		32	3.7	
5	5	2640	21.0	740	61.9	5.3			34.1	37		33	2.5	Begin Misg Data
	6					DATA MISSING								
7	7	3760	28.0	644	57.1	-2.7			32.3	39		35	1.7	End Misg Data
	8	4310	31.0	601	55.2	-5.5			5.2	25		21	0.9	
9	9	5180	36.0	537	51.3	-11.4			5.0	26		22	0.7	
	10	5890	40.0	489	47.3	-16.8			MB	—		MB	MB	
11	11	6500	43.0	451	43.5	-22.1			5.0	32		28	0.4	
12	12	7360	47.0	400	38.6	-28.5			10.8	46		42	0.4	
1	13	9100	54.0	312	30.5	-39.4			5.0	5.3		49	0.2	
3	14	10910	60.0	238	21.6	-51.9								
	15	11860	62.4	206	22.0	-51.3								
5	16	13310	65.8	164	20.0	-54.3								
	17													
	18													
	19													
	20													
	21													
	22													
	23													
	24													
	25													
	26													
	27													
	28													
	29													
	30													

MANDATORY LEVELS FOR TRANSMISSION

Code Check	Level No.	Altitude	Pressure Millibars	Temperature (corrected)	Relative Humidity (corrected)	Mixing Ratio
3	1	1520	848	14.4	33	4.0
6	2	3050	704	M	M	
8	3	4570	581	-7.3	22	0.8
10	4	6100	476	-18.7	MB	
2	5	10000	273	-45.6		
4	6	13000	172	-53.7		
	7					
	8					
	9					
	10					

CODED MESSAGE FOR TRANSMISSION (NOT ENCIPHERED)

ALTITUDE 500 MB. SFC.: Meters 5724; Feet 18 779

27815	97321	43594	27203	48143
34143	40053	9999/	0499/	9999/
44533	81572	37612	76691	51722
00784	10171	16857	34037	52599
71708	90799	10404	10178	67464
50878				
27865	01461	12894	73961	38021
72041	64041	10177	28265	24321
86349	89699	10174	05004	10175
05328				

[1] Unit of altitude: 0.98 dynamic meter; hence, approximately in meters above sea level. [2] For use with daytime observations (when required).

Computed by G. R. Mana Verified by B. E. Dixon

FIGURE 10–2.—WBAN–30, front.

613388°—45——5

Name of station: Phoenix, Ariz. (Sky Harbor Airport)

Date May 1, 1944 G. C. T. 241 Ascension No.

SURFACE OBSERVATION AT RELEASE

TIME OF RELEASE G. C. T.	STATION PRESSURE		Correction*	Pressure at Inst. Shelter	Contact From		Temperature		Rel. Hum. %	Surface Wind		Clouds and Weather
	Inches	Millibars	Millibars	Millibars	Calib. Chart	Recorder Record	Dry °F	Wet °F		Dir.	Vel. (mps)	
1505	28.75	973.6	-0.7	972.9	4.8	5.9	20.8°C	13.4°C	43	Calm		4 M S / 310° H

* For difference in elevation between barometer and instrument shelter.

BALLOON DATA (grams)

Total lift *	1800
Weight of train *	1100
Net wt. of ballast	400
Free lift with ballast attached	300
Free lift without ballast	700

* Exclusive of Raob Balloon and Ballast.

CLOUDS AND WEATHER

From one hour before release to one hour after termination of flight

G. C. T.	Notes	G. C. T.	Notes
Cont'd	H		

BASELINE CHECK READINGS

TIME G.C.T.	TEMPERATURE			RELATIVE HUMIDITY			
	Ordinate	Dry °F	Wet °F	Ordinate	Raob (%)	Cor. (%)	Psychrometer (%)
1500	70.0	21.1 °C	13.7 °C	59.8	47	-4	43

PRESSURES AT FIXED LEVELS ABOVE SEA LEVEL

ALTITUDE Feet	ALTITUDE Meters	PRESSURE (mb) from adiabatic chart (for check)	Z Meters	MEAN VIRTUAL TEMPERATURE °(C)	COMPUTED PRESSURE (mb) FOR TRANSMISSION
5,000	1520	848	509	17	848
10,000	3050	705	1045	7	704
15,000	4570	581	250	-6	581
20,000	6100	476	376	-17	476

DATA FOR ISENTROPIC SURFACES

θ = 302 °A	θ = 308 °A	θ = ____ °A
P = 824 mb P_s = 650 mb	P = 626 mb P_s = 488 mb	P = ____ mb P_s = ____ mb
RH = 32 % check P_s = 646 mb	RH = 29 % check P_s = 488 mb	RH = ____ % check P_s = ____ mb
t = 12.7 °C 10.05T = 2871	t = 3.9 °C 10.05T = 2704	t = ____ °C 10.05T = ____
H = 1760 (0.98 gdm) $\frac{\phi gdm}{10}$ = 172	H = 4000 (0.98 gdm) $\frac{\phi gdm}{10}$ = 392	H = ____ (0.98 gdm) $\frac{\phi gdm}{10}$ = ____
w = 3.57 g/kg ψ = Sum 3043 (10^4 ergs/gram)	w = 1.31 g/kg ψ = Sum 3096 (10^4 ergs/gram)	w = ____ g/kg ψ = Sum ____ (10^4 ergs/gram)

θ = Potential temperature; P = Actual pressure; P_s = Condensation pressure; RH = Relative humidity; t = temperature in degrees centigrade; H = Height above mean sea level; w = Mixing ratio; T = Absolute temperature; ϕgdm = Height (geodynamic) in dynamic meters; ψ = Stream function.

FIGURE 10–3.—WBAN–30, back.

10312.1. When the flight is made during daytime and requires corrections to the ascent temperature, care should be exercised that the corrected temperatures are plotted above 400 millibars. When corrected temperatures are used, the curves will be labeled "corrected T" at top and bottom. When corrections to the ascent temperatures are known to be required but were not obtained, draw the uncorrected temperature curve as a solid line. The data above 400 millibars will be considered doubtful and so labeled. Explain the circumstances in a note on the chart.

10312.2. Whenever the slope of the temperature curve is greater than the dry adiabatic lines—that is, when the lapse rate is superadiabatic (see fig. 10–6)—pressure data and all points pertaining to the temperature curve will be rechecked to discover any possible error in plotting points or evaluating the sounding. If this recheck does not discover any error, the word "rechecked," with arrows pointing to the beginning and end of the superadiabatic slope, will be placed beneath the segment of the temperature curve whose slope was rechecked.

10312.3. Whenever two temperature values occur at the same pressure (as when the balloon is forced down and reascends), both values will be plotted on the adiabatic chart if the difference is 1° or more. The temperature curve for the first ascent will end, and for the last ascent resume, at their corresponding temperatures. Use the lower temperature for purposes of computations, transmission, and tabulation. If the difference is less than 1°, the lower temperature will be plotted and the higher value ignored.

10313. Relative Humidity.—On each significant level plot the corresponding relative humidity and connect each successive point with a straight line. Enter "MB" on significant levels at the 50-percent line to indicate motorboating and "M" to indicate missing data, unless the curve is drawn through the motorboating stratum in accordance with paragraph 10313.1.

10313.1. The relative humidity curve will not be drawn through a stratum of motorboating data more than four contacts in extent; that is, the curve will terminate with the relative humidity evaluated at the beginning of the stratum and resume at the top. Neither dashed nor solid lines will be drawn through strata whose data are classified as missing.

10313.2. If the stratum of motorboating or missing data is four contacts or less in extent, the curve will always be drawn through the stratum as a solid line.

10313.3. Whenever two values of relative humidity occur at the same pressure (as when the balloon is forced down and reascends), both values will be plotted on the adiabatic chart. The relative humidity curve for the first ascent will end and for the last ascent resume, at their respective values. The value to be used in all computations, etc., pertaining to this level will be that corresponding to the temperature selected in accordance with paragraph 10312.3.

10313.4. The completed relative humidity curve will be labeled "RH" at top and bottom of both charts.

10313.5. When the relative humidity curve terminates at the highest level on WBAN–31A, this single value will not be plotted on WBAN–31B.

10314. Mixing Ratio.—The value of the mixing ratio computed for each significant level will be entered numerically to the nearest 0.1 g./kg. on the level to which it pertains under the caption "Mixing Ratio g./kg." printed in the upper right corner of the chart. A mixing

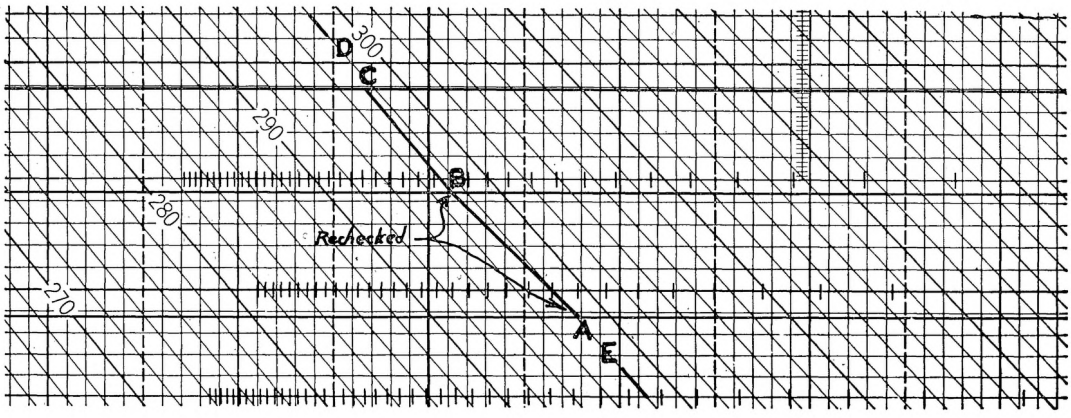


FIGURE 10–6.—Superadiabatic segment of temperature curve.

NOTE.—The temperature segment AB is superadiabatic because its slope is greater than the slope of the adiabatic line DE. The computations have been rechecked; and no error having been found, "Rechecked," with arrows pointing to the beginning and end of the superadiabatic slope, is placed under the segment. (See par. 10312.2.)

ratio curve will not be drawn. Whenever appropriate, enter "M" or "MB" to indicate "missing" or "motorboating."

10320. THE PRESSURE-HEIGHT CURVE

10321. A pressure-height curve, based on pressure, temperature, and relative humidity data, is computed for each raob and drawn on the adiabatic chart. It provides a means of determining the altitude of significant levels and other data entered on the chart. These altitudes are in meters above mean sea level. The pressure-height curve will be computed by use of WBAN computation tables exclusively, which have been furnished for this purpose. From these tables the thicknesses of various strata between the surface and the maximum altitude of the raob can be determined. These strata are divided into three types, which are listed below:

1. The stratum between the surface at the level of the instrument shelter and the next higher standard isobaric surface (determined from tables 3 and 6).
2. The strata between adjacent standard isobaric surfaces (determined from table 4).
3. The stratum between the highest standard isobaric surface below the maximum elevation of the sounding and the level at the maximum elevation (determined from tables 5 and 6).

10322. The standard isobaric surfaces are those listed in table 4. The tables give the thicknesses—that is, the distances in meters—between the respective isobaric surfaces and the levels referred to above. The addition of these distances plus the elevation of the instrument shelter above mean sea level gives the actual elevation of the respective surfaces above mean sea level.

10330. COMPUTATION OF THE PRESSURE-HEIGHT CURVE

10331. Mean Temperature (see fig. 10–7).—Estimate the mean temperature for each stratum by laying a transparent straightedge over the temperature curve on the adiabatic chart. The straightedge should be kept parallel to the vertical temperature lines and moved from left to right until the edge intersecting the temperature curve produces equal areas to the left and right of it. These areas will be bounded by the straightedge, segments of the temperature curve,

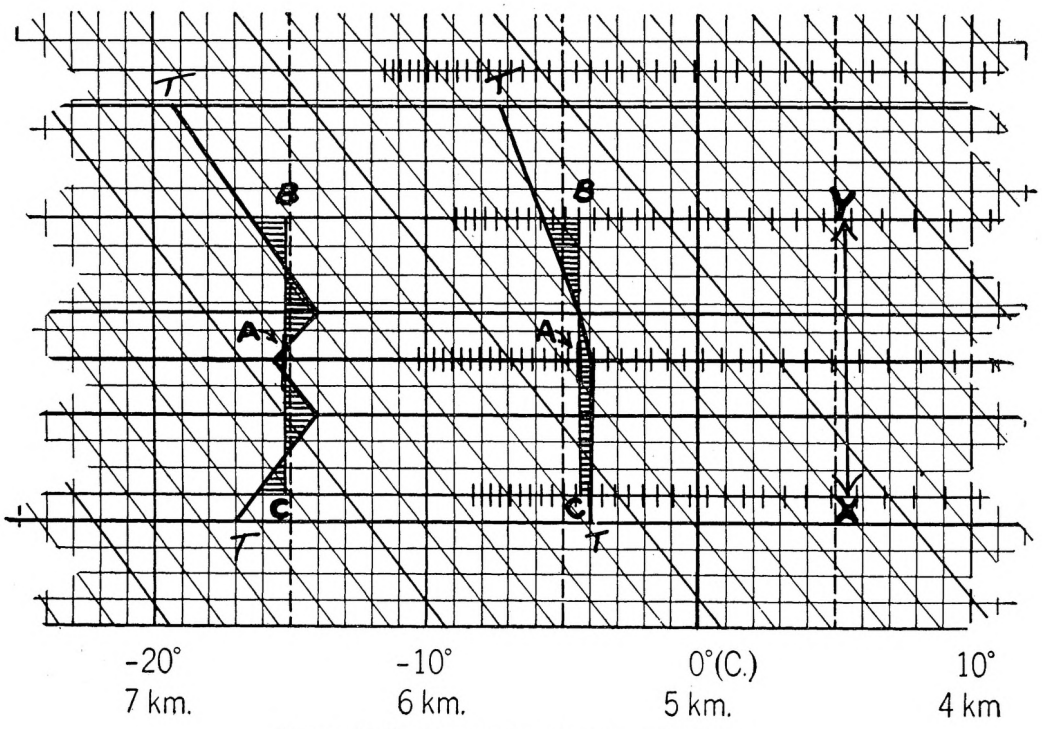


FIGURE 10–7.—Computation of mean temperature.

NOTE.—The straightedge BC is so adjusted that the sum of the shaded area on the right of it equals the sum of the shaded area on the left. The one-quarter inch vertical dash A is then placed at the midpoint of the stratum XY. (See par. 10331.)

and the isobaric surfaces bounding the stratum. When the straightedge has been adjusted to provide for equal areas, draw a one-quarter inch vertical dash along the side of the straightedge and near the middle of the stratum. The temperature at this dash is the mean temperature of the stratum. The mean temperature for missing portions of the record will be estimated by assuming that the temperature lapse rate is represented by a straight line between the two known temperature values bounding the missing portion.

10332. Mean Virtual Temperature (see fig. 10–8).—The mean virtual temperature for each stratum is found by displacing to the right—that is, toward higher temperature—the dashes representing the mean temperature of the stratum. Determining the amount of this displacement, which is based on the mean relative humidity and the mean temperature of the stratum, is done as follows:

(1) Find the distance between the vertical tabs bounding the dash denoting the mean temperature. (See par. 10302.) If there are no printed vertical tabs immediately above or below the dash, and none embracing it, the mean virtual temperature will be the same as the mean temperature.

(2) Estimate the mean percentage of relative humidity for the stratum, estimating so well as possible the value of missing and motorboating portions of the record.

(3) Multiply the distance found in (1) by the mean percentage found in (2).

(4) At a distance found in (3), draw a dash parallel to, and to the right of, the mean temperature dash for each stratum. The mean virtual temperature of the stratum will be read at the displaced dash.

10332.1. For example, if the relative humidity is 100 percent, the full distance between the vertical tabs will be added to the mean temperature to obtain the mean virtual temperature; if the relative humidity is 50 percent, one-half the distance will be added, etc. If the mean virtual temperature is being determined for a complete stratum—that is, one bounded by standard isobaric surfaces—the tabs to be used will be those printed on the isobars intermediate between these standard isobars. If the mean virtual temperature is being determined for an incomplete stratum, the tabs to be used will be those nearest the midpoint of the stratum.

10332.2. The mean virtual temperature should be read to the nearest whole degree and entered at the midpoint of the stratum between the −48° and −50° lines of the temperature scale on WBAN–31A, and between the −88° and −90° lines on WBAN–31B.

10340. Determination of the Thicknesses and Elevations of the Strata (see fig. 10–9.)

10341. Find the thickness of the stratum between the surface and the next higher standard isobaric surface (and the elevation, meters m. s. l., of the latter) in accordance with the following instructions:

(1) Enter the surface elevation in meters above mean sea level immediately above the surface level and between the −45° and −49° vertical temperature lines.

(2) Find the value in table 3 corresponding to the surface pressure. Enter this value below the surface isobar and beneath

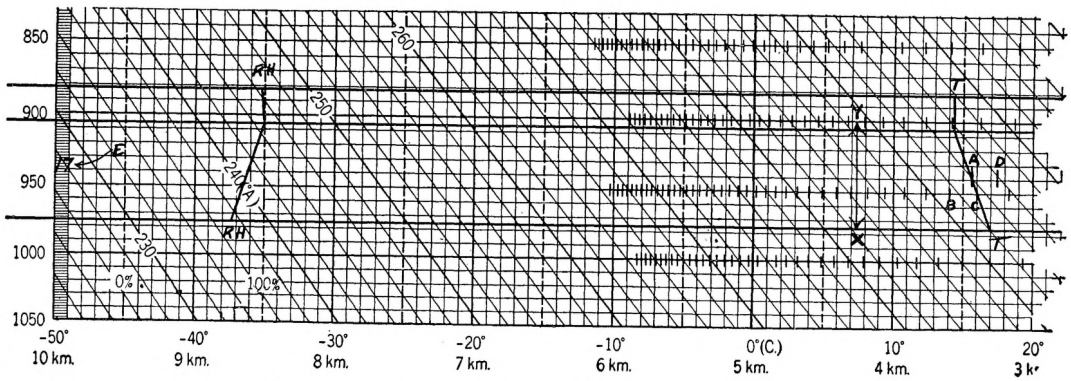


FIGURE 10–8.—Computation of mean virtual temperature.

NOTE.—The mean temperature of the stratum, XY, is indicated by the vertical dash A, which is placed at the midpoint of the stratum. It is estimated that the mean relative humidity for the stratum is 90 percent. The tabs B–C are used in computing the mean virtual temperature because they are closest to A. Dash D is therefore placed to the right of A a distance equal to 90 percent of the distance between BC. The temperature at D (17°) is entered to whole degrees at the midpoint of the stratum, at E. (See par. 10332.2.)

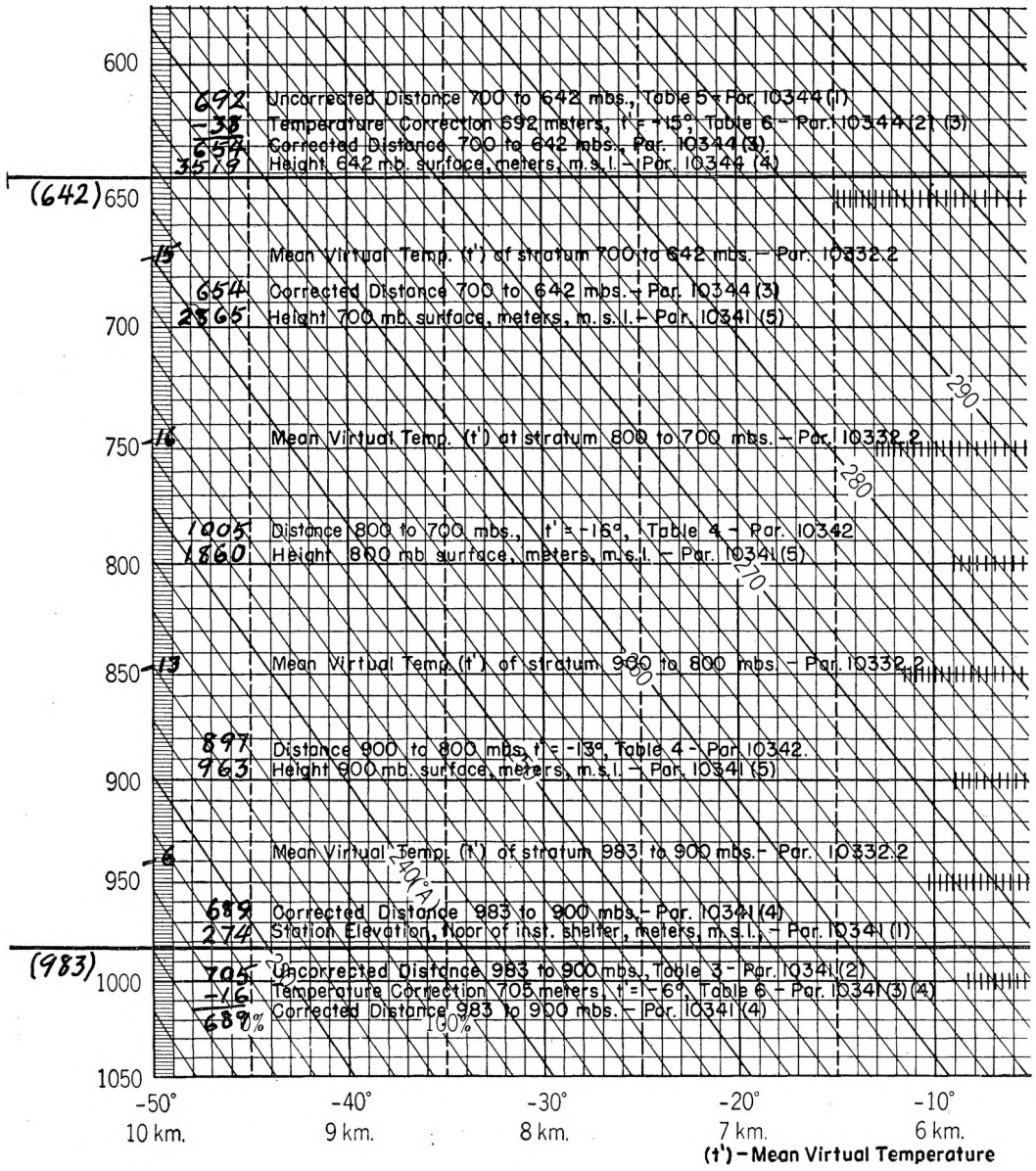


FIGURE 10–9.—Determination of thickness of strata.

the surface elevation entry. This value will be the thickness of the stratum, uncorrected for temperature, between the surface level and the next higher standard isobaric surface.

(3) Find the temperature correction for this thickness in table 6. The mean virtual temperature and the thickness of the stratum are the arguments for determining this correction.

(4) The correction found in table 6 will be entered under the uncorrected thickness of the stratum, preceded by a minus sign if the mean virtual temperature is below 0°. If the correction is negative, subtract it from the uncorrected thickness; if it is positive, add it to the uncorrected thickness. The sum or remainder will be placed above the surface elevation entered in accordance with (1) above.

(5) Enter the sum of the surface elevation and the corrected thickness of the stratum upon the next higher standard isobaric surface. This value is the height of the standard isobaric surface above mean sea level.

10342. Find the thickness of strata between standard isobaric surfaces as given in table 4.

The mean virtual temperatures of these strata are the only arguments needed to determine their thicknesses. In determining the thickness of any given stratum, use the section in table 4 that lies between the pair of dashed lines, the upper and lower of which are labeled with the pressure at the corresponding isobaric surfaces of the stratum. The value found in table 4 will be entered between the −45° and −49° vertical temperature lines on WBAN–31A, and between the −85° and −89° lines on WBAN–31B, approximately one-quarter inch above the lower isobaric surface bounding the stratum.

10343. Compute the elevation of each of the standard isobaric surfaces by adding the thickness of each stratum to the elevation of the base of the stratum, progressing upward to the highest standard isobar below the level at the maximum elevation of the sounding. Enter the elevation data thus found immediately above the isobars to which they relate and below the values entered in accordance with paragraph 10342.

10344. Find the thickness of the stratum between the highest standard isobaric surface and the level at the maximum elevation of the raob (when this level does not coincide with a standard isobaric surface) in accordance with the following instructions:

(1) From table 5 find the uncorrected thickness of this stratum, using as the sole argument the pressure at the maximum elevation of the raob. Enter this value from table 5 about one inch above the level drawn at the maximum altitude of the raob.

(2) By use of table 6, the thickness found in table 5 will be corrected for temperature in the same manner as the corresponding thickness in the stratum bounded by the surface and the next higher standard isobar. The arguments are the mean virtual temperature and the uncorrected thickness of the stratum.

(3) The correction found in table 6 will be entered, preceded by a minus sign if the mean virtual temperature is below 0°, under the uncorrected thickness of the stratum. If the correction is negative, subtract it from the uncorrected thickness; if it is positive, add it to the uncorrected thickness. The sum or remainder will be placed above the altitude of the highest standard isobaric surface.

(4) The corrected thickness will be added to this altitude and the sum entered on the level at the maximum altitude of the sounding. This will be the altitude of that level.

10350. Plotting the Pressure-Height Curve.—Plot the surface elevation on the surface level against the height scale printed along the lower edge of the adiabatic chart. In the same manner, plot the height of each standard isobaric surface and of the level at the maximum altitude of the sounding. Connect successive points by straight lines and label the curve "PH" at top and bottom of each section of the adiabatic chart.

10351. Whenever the pressure-height curve is based on estimated mean virtual temperature, the estimated portion of the curve will be drawn as a solid line through missing or doubtful portions of the record.

10360. Height of Significant Levels.—The height of each upper significant level to the nearest 10 meters above mean sea level will be determined by noting the point of intersection of the level with the pressure-height curve. Read on the height scale at the bottom of the chart the value corresponding to this point and enter the value on the level in the left margin of the chart.

10361. The height of these significant levels will then be transcribed to WBAN–30 in the column headed "Altitude."

10370. Height of the 500-Millibar Surface.—Enter to the nearest meter, in the space provided on the front of WBAN–30. Convert this height to feet and enter in the adjacent space.

10380. PRESSURES AT FIXED LEVELS

10381. The pressures at the 1520-, 3050-, 4570-, and 6100-meter (5,000-, 10,000-, 15,000-, and 20,000-foot) levels will be computed and entered on WBAN–30 in accordance with the following instructions. These pressures will be computed regardless of whether they occur in a missing portion of the record. If the elevation of the station is more than 1,520 meters m. s. l., and the necessary tables are available, the station pressure reduced to the 5,000-foot plane will be used for transmission purposes and for entry on WBAN–30 under "Computed Pressure for Transmission." The spaces provided for additional entries required for the 1520-meter level will be dashed. If pressure reduction tables are not available, all spaces will be dashed.

10381.1. Locate the exact point where the pressure-height curve crosses the 1520-meter line printed on the adiabatic chart. Using a sharply pointed blue pencil, draw a one-quarter inch line across this intersection and at the same pressure draw a one-quarter inch line across the temperature and relative humidity curves. Draw a line through the pressure scale at the right of the adiabatic chart, extending it into the margin about one-quarter inch. In the margin, label this line 1520m.

10382. The other fixed levels, including the 10-, 13-, and 16-km. levels, will be located and labelled in a similar manner.

10400. ENTRY OF DATA FOR FIXED LEVELS ON BACK OF WBAN–30

(See fig. 10–3.)

10410. Mean Virtual Temperature.—The mean virtual temperature for each of the strata listed below will be determined by the same method used in the computation of the pressure-height curve. The dashes denoting the mean virtual temperatures will be made with a blue pencil. When one or more fixed levels occur in a missing portion of a record, the mean virtual temperature will be estimated (see pars. 10331 and 10332(2)).

10411. Determine the mean virtual temperatures for the following strata and enter them in the appropriate spaces:

(1) Between the 1520-meter level and the standard isobaric surface immediately below. When the surface pressure is less than 900 millibars, the mean virtual temperature will be determined for the stratum between the 1520-meter level and the next higher standard isobaric level (800 millibars).

(2) Between the 3050-meter level and the standard isobaric surface immediately below.

(3) Between the 4570-meter level and the standard isobaric surface immediately below.

(4) Between the 6100-meter level and the standard isobaric surface immediately below.

10420. "Z" Meters.—Determine the thickness in meters of each of the above strata by (1) subtracting the height of the standard isobaric surface immediately below the fixed level from the height of the fixed level; or, (2) when the surface pressure lies between the 900- and 800-millibar standard isobaric surfaces, by subtracting 1520 from the height of the 800-millibar standard isobaric surface. Enter the values of Z meters in the appropriate spaces.

10430. Read the pressure for each fixed level directly from the adiabatic chart and enter the values in the proper spaces. These pressures will not be used for transmission purposes.

10440. Computed Pressures for Transmission.

10441. The pressures at the fixed levels are computed by use of WBAN Raob Computation Tables (tables 7 to 12), and used for transmission in the raob message.

10442. The horizontal lines on the tables are pressures in millibars, the vertical lines are mean virtual temperatures (° C.), and the slanting lines represent elevations in Z meters above (or, in the case of table 12, below) the level of the specified standard pressure level. Example: assume that the 1520-meter level lies above the 900-millibar surface; that the mean virtual temperature for the layer between the 1520-meter surface and the 900-millibar surface is 1° C.; and that the thickness of the same layer (Z meters) is 485 meters. Then, by noting (on table 7) the intersection of the 1° C. line with the 485 Z meter line (interpolating), it will be found that the pressure for the 1520-meter level is 847 millibars as read on the horizontal lines.

10443. Enter the computed values to the nearest whole millibar in the proper spaces.

10444. The computed pressures should agree within 1 millibar of those obtained from the adiabatic chart. If the differences are greater than one millibar, the data in all columns will be rechecked for possible error. If no error is found, the pressure-height curve will be recomputed.

10450. Entry of Fixed Level Data for Transmission on Front of WBAN–30 (see fig. 10–2).

10451. In the appropriate spaces under the heading "Mandatory Levels," enter the altitude and the computed pressures for the 1520-, 3050-, 4570-, and 6100-meter levels, and the altitudes and pressures as taken directly from the adiabatic chart for the 10-, 13-, and 16-km. levels.

10452. From the adiabatic chart, obtain the temperature to tenths and the relative humidity to whole percent at each fixed level, and enter the data in the appropriate spaces. Enter "M" if the data are missing, and "MB" if the relative humidity is motorboating.

10453. Using the temperature, relative humidity, and pressure of each fixed level, compute the mixing ratio to tenths and enter in the proper spaces. The mixing ratio will not be computed if the relative humidity is motorboating or missing.

10500. ISENTROPIC DATA

10510. Isentropic data are computed for values of potential temperature specified in the current Raob Code. The values in effect at the time of the raob will be entered in the appropriate spaces on the back of WBAN–30. The potential temperature lines on the adiabatic chart are the same as the dry adiabatic lines, some of which have their value in potential temperature (degrees Absolute) printed on them.

10520. Abstraction of Isentropic Data from the Adiabatic Chart.

10521. The isentropic surface for a given potential temperature will be found at the point of intersection of the corresponding potential temperature line on the adiabatic chart with the temperature curve of the raob. (See figs. 10–10 and 10–11.)

10522. Mark this point of intersection with a one-quarter inch horizontal dash, using a blue pencil; similar dashes should be placed at the corresponding points of the relative humidity and pressure-height curves, and on the pressure scale at the right edge of the chart. This latter dash should be labeled in the margin with the value of potential temperature pertaining to the isentropic surface.

10523. If the adiabat corresponding to a given potential temperature intersects the temperature curve at two or more points, the point of intersection at the highest elevation will be used for computing isentropic data.

10524. Enter the pressure to the nearest whole millibar, the relative humidity to the nearest whole percent (M or MB when appropriate), the temperature to degrees and tenths, and the height of the isentropic surface to the nearest 10 meters mean sea level, in the appropriate spaces of WBAN–30.

10525. Data for isentropic levels in strata of missing or doubtful temperature record will not be computed.

10526. The following examples are typical situations that may be encountered in obtaining these data from the adiabatic chart:

10527. Using the pressure and relative humidity data as found above, and the temperature at the isentropic surface, compute the mixing ratio to hundredths and enter this value in the appropriate spaces of WBAN–30.

10528. Repeat the above procedure for each of the required isentropic surfaces.

10530. COMPUTATION OF CONDENSATION PRESSURE AND ENTRY ON WBAN–30

10531. Compute the condensation pressure by use of the Isentropic Computation Charts (tables 16 and 17). The chart for Θ (potential temperature) =295° will be used for potential temperatures ranging from 285° to 307°, and the chart Θ=315° will be used for potential temperatures ranging from 308° to 320°. The vertical lines on the charts are relative humidity (percent); the horizontal lines are the condensation pressures in millibars; and the curved lines represent actual pressures in millibars at the isentropic surface.

10532. Find the value of pressure corresponding to the pressure of the isentropic surface on the sloping lines of the chart. Find the value

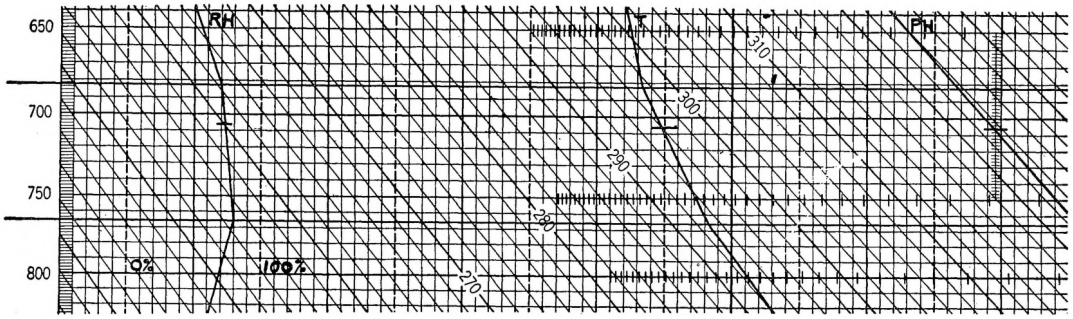


FIGURE 10–10.—Isentropic surface, normal.

NOTE.—The actual pressure at the point of intersection of the temperature curve with the 296° A. potential temperature surface is 706 millibars, the relative humidity 73 percent, the temperature —5.2°, and the height 3060 meters m. s. l. These points are indicated by one-quarter inch blue dashes. The dash in the right margin (not shown in the illustration) is labeled with the value of potential temperature for the isentropic surface.

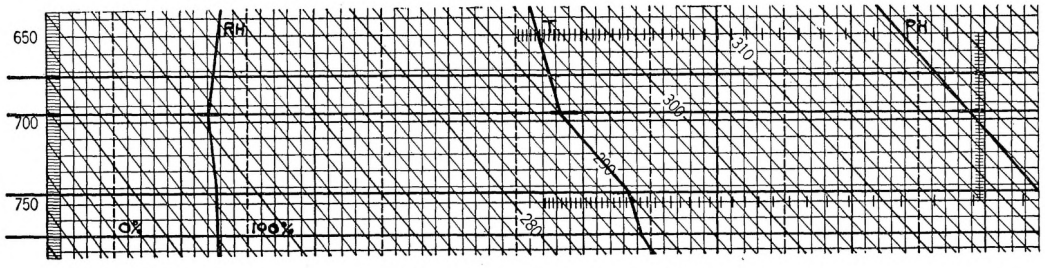


FIGURE 10–11.—Isentropic surface, adiabatic.

NOTE.—An adiabatic lapse rate occurs at the approximate specified value of potential temperature (290° A.). At such times, the data for the isentropic level will be taken at the top of the adiabatic layer. In this case the pressure would be 695 millibars, the relative humidity 71 percent, the temperture —11.7°, and the height 3120 meters, m. s. l.

of relative humidity pertaining to the isentropic surface along the upper margin of the chart. Follow the pressure value upward along the sloping line and the relative humidity value vertically downward. The point of intersection is the condensation pressure, which is read on the horizontal lines at the scale on the left edge of the chart. Read the condensation pressure to the nearest millibar and enter it on WBAN–30.

10533. If the pressure for a given isentropic surface exceeds the range of pressures on the computation chart, a pseudoadiabatic diagram may be used in computing the condensation pressure. This is done by finding the saturation mixing ratio curve corresponding to the value of the mixing ratio at the isentropic surface. The pressure at the point of intersection of this mixing ratio curve and the potential temperature of the isentropic surface in question will be the required condensation pressure.

10534. In all cases where the condensation pressure falls within the limits of the appropriate isentropic computation chart, an additional check of the condensation pressure will be made by use of a pseudoadiabatic diagram. This check pressure will be entered in the appropriate space. If the value of the condensation pressure computed by use of the isentropic chart differs by 10 millibars or more from that found by use of the pseudoadiabatic diagram, a recheck of all data will be made until the difference is reconciled.

10540. Computation of Stream Function Data and Entry on WBAN–30.

10541. Refer to "Table 13: 10.05T, for Various Temperatures, t, in °C." and find the value corresponding to the temperature at the isentropic surface. Enter this value in the space opposite "10.05T."

10541. Refer to "Table 14 $\frac{\phi gdm}{10}$ for Various Heights (above sea level) Expressed in Terms of the Unit 0.98 Dynamic Meter," and find the value corresponding to the height of the isentropic surface. Enter this value in the space opposite "$\frac{\phi gdm}{10}$."

10543. Obtain the stream function for the given potential temperature by taking the sum of the entries opposite "10.05T" and "$\frac{\phi gdm}{10}$." The result thus obtained will be represented by four digits without a decimal point, and will be entered in the space opposite "ψ=Sum."

10544. It should be noted as a check on any computed value of the stream function that the first two digits thereof are almost invariably the same as the first two digits of the potential temperature serving as the basis. The difference should never exceed one unit in the second digit. The first three digits of the stream function will be approximately equal in numerical value to the three digits of the potential temperature. The difference between the values of the stream functions for two isentropic surfaces should be nearly constant, but will vary slightly in the last digit with change in atmospheric temperature and pressure conditions. Observers should note changes in the values of the stream function as they correlate with such conditions, thus providing a means of checking the results.

10600. NOTES, METEOROLOGICAL, ETC.

10610. All pertinent notes on the general meteorological conditions recorded on the back of WBAN–30 will be entered on the adiabatic chart. The notes will be entered at the altitudes of the phenomena close to the temperature curve when the observer knows or can estimate them with reasonable accuracy. When the altitudes of the phenomena are not known, enter the notes above the level at the maximum elevation of the sounding. Use the same symbols for recording clouds, weather, and notes as those employed in Weather Bureau Circular N. Whenever known, the height of cloud bases will appear in the body of the chart, regardless of whether the heights were obtained by means of measurements made with balloons and ceiling lights or from reports made by pilots. Phenomena whose heights are estimated will be entered close to the temperature curve on short dashed lines that intersect the temperature and pressure height curves at the proper elevation. When the altitudes are known, the phenomena will be entered on short unbroken lines, provided a significant level does not coincide with the same point. When appropriate, "Height estd." will follow the phenomena. Make all entries in meters above sea level.

10620. Depending upon their nature and the time of their occurrence, notes will be entered on the adiabatic chart as follows:

10630. Before Release.—Enter the notes in chronological order in a column running upward, followed by the time (G. C. T.) appropriate to each. The first notes appearing in this group (beginning at the bottom) will relate to conditions that had their beginnings or endings approximately one hour before release.

10640. At Release.—Record on the surface pressure line, to the left of the temperature curve, any meteorological conditions (except wind) prevailing on the ground at the time of release, as recorded on the back of WBAN–30. Enter the surface wind direction to 16 points and velocity in m. p. s., at the time of release, on the surface pressure line at a point immedi-

RAOB SUMMARY

WBAN-32

Page 1

Month and year January 1944

Local time at this station is 105 th meridian time.

To convert to G. C. T., add/~~subtract~~ 7 hours.

Security classification

Station Phoenix, Ariz. (Sky Harbor Airport)

Lat. 33° 26' N Long. 112° 03' W

Punch Card No.	Index number or QLaLaLaLo	Elevation floor of instrument shelter, tens of meters	Year	Month	Day	Hour	Actual time of release, G. C. T.	Surface Pres.	Surface Temp.	Surface Rel. hum.	500 Pres.	500 Temp.	500 Rel. hum.	1,000 Pres.	1,000 Temp.	1,000 Rel. hum.	1,500 Pres.	1,500 Temp.	1,500 Rel. hum.	2,000 Pres.	2,000 Temp.	2,000 Rel. hum.	2,500 Pres.	2,500 Temp.	2,500 Rel. hum.	Initials of computer	Initials of verifier
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 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	54 55 56 57	58 59 60	61 62 63	64 65 66 67	68 69 70	71 72 73	74 75 76 77	78 79 80		
1	00278	339	44	01	01	16	15	0975	001.0	090	957	005.3	091	903	004.8	051	851	004.7	034	801	000.7	043	754	-03.4	050	GRM	BED
1					02	16	15	0978	002.0	087	958	005.9	083	903	006.2	055	851	003.4	043	802	002.2	024	756	001.2	034	GRM	B.E.D.
1					03																						

RAOB SUMMARY

WBAN-32

Page 2

Security classification

Station Phoenix, Ariz. (Sky Harbor Airport)

Lat. 33° 26' N Long. 112° 03' W

Month and year January 1944

Local time at this station is 105 th meridian time.

To convert to G. C. T., add/~~subtract~~ 7 hours.

Punch Card No.	Index number or QLaLaLaLo	Elevation floor of instrument shelter, tens of meters	Year	Month	Day	Hour	Actual time of release, G. C. T.	3,000 Pres.	3,000 Temp	3,000 Rel. hum.	4,000 Pres.	4,000 Temp.	4,000 Rel. hum.	5,000 Pres.	5,000 Temp.	5,000 Rel. hum.	6,000 Pres.	6,000 Temp.	6,000 Rel. hum.	7,000 Pres.	7,000 Temp.	7,000 Rel. hum.	8,000 Pres.	8,000 Temp.	8,000 Rel. hum.
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 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	54 55 56 57	58 59 60	61 62 63	64 65 66 67	68 69 70	71 72 73	74 75 76 77	78 79 80
2	00278	339	44	01	01	16	15	0708	-05.8	033	626	-12.9	024	551	-19.7	(022)	482	-23.7	(024)	423	-31.3	(028)	369	-39.0	(032)
2					02	16	15	0710	-00.8	036	626	-04.3	021	550	-10.8	023	482	-18.7	026	422	-25.8	M	367	-34.4	038
2					03			0																	

RAOB SUMMARY

WBAN-32

Page 3

Month and year January 1944

Local time at this station is 105 th meridian time.

To convert to G. C. T., add/~~subtract~~ 7 hours.

Security classification

Station Phoenix, Ariz. (Sky Harbor Airport)

Lat. 33° 26' N Long. 112° 03' W

Punch Card No.	Index number or QLaLaLaLo	Elevation floor of instrument shelter, tens of meters	Year	Month	Day	Hour	Actual time of release, G. C. T.	9,000 Pres.	9,000 Temp.	9,000 Rel. hum.	10,000 Pres.	10,000 Temp.	10,000 Rel. hum.	11,000 Pres.	11,000 Temp.	11,000 Rel. hum.	12,000 Pres.	12,000 Temp.	12,000 Rel. hum.	13,000 Pres.	13,000 Temp.	13,000 Rel. hum.	14,000 Pres.	14,000 Temp.	14,000 Rel. hum.
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 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	54 55 56 57	58 59 60	61 62 63	64 65 66 67	68 69 70	71 72 73	74 75 76 77	78 79 80
3	00278	339	44	01	01	16	15	0320	-44.7		276	-44.7		237	-47.1		203	-49.8		173	-52.4		147	-55.0	
3					02	16	15	0316	-43.2		273	-51.0		232	-57.5		199	-56.0		170	-57.5		144	-61.5	
3					03			0																	

F'7Z85 10-12.—WBAN-32.

ately to the right of the surface temperature. Notes which cannot be correlated on the adiabatic chart with respect to altitude will be recorded about 1 inch above the level at the maximum elevation. If the clouds observed at the time of release are not entered in the body of the chart because their bases are unknown, they will be entered at the top of the chart above the notes pertaining to conditions before release. The entries will be in ascending order of height. Above these will be entered notes on beginnings and endings of thunderstorms, precipitation, and obstructions to vision occurring at the time of release. Miscellaneous notes, such as distant lightning, distant thunderstorms, etc., will then be entered.

10650. After Release.—At the top of the chart and above the notes pertaining to conditions at release, enter notes concerning phenomena that have their beginnings or endings after release but not later than approximately one hour after the termination of the sounding. These notes will be on significant changes that occurred after release, such as marked changes in cloud conditions, the beginning or ending of precipitation, fog, thunderstorm, the passage of fronts, etc.

10700. WBAN–32—RAOB SUMMARY FORM

(See fig. 10–12)

10710. Entries of pressure, temperature, and relative humidity data at standard altitudes or levels are made on this form from daily raobs. The form consists of five pages with columns corresponding to standard levels extending from the surface to 32 kilometers m. s. l. A separate form will be prepared from the 0400 G. C. T. and 1600 G. C. T. (or as otherwise scheduled) observations. Page 1 of the form will always be submitted. The other pages will be submitted or not, according as there are data from at least one sounding entered on them. All entries will be made with a sharply pointed No. 3 pencil. Each form will be summarized promptly upon the close of the month to which it pertains.

10711. Enter the name of the station and the elevation to the nearest whole meter, the latitude and longitude, and the month and year in which the observations are made, on the appropriate lines at the top of the form. In the upper left corner, nonmobile stations will enter their time zone and the number of hours to be added to or subtracted from local time to convert to G. C. T. Mobile stations will place dashes in the spaces provided for these data. Enter the latitude and longitude in degrees and minutes, followed by "N" or "S" in the case of latitude and "W" or "E" in the case of longitude, whichever are appropriate.

10712. Enter the initials of the computer and verifier of each raob in the columns at the right side of page 1.

10720. ENTRIES UNDER "IDENTIFICATION"

10721. Index Number or $QL_aL_al_ol_o$.—Stations that have been assigned an index number will enter it, preceded by the necessary number of zeros to total five digits, in the column headed "Index number." Stations that have not been assigned an index number will enter their latitude and longitude in accordance with the following paragraphs. This is required for the first entry of the month only, except as noted in par. 10722.

10722. Mobile stations will enter their latitude and longitude for each raob. The first digit in this column will indicate the octant of the globe (**Q**) in accordance with the following table:

TABLE 10–1.—*Octant of the globe*

Code figure:	*Longitude*	
0	0° to 90° west	North latitude.
1	90° to 180° west	
2	180° to 90° east	
3	90° to 0° east	
5	0° to 90° west	South latitude.
6	90° to 180° west	
7	180° to 90° east	
8	90° to 0° east	

10723. Enter the latitude (L_aL_a) to whole degrees, followed by the longitude (l_ol_o) to whole degrees, supplying zeros as may be necessary to make each entry total two digits; e. g., 5° would be entered as 05. If the latitude or longitude is 100° or more, the first figure, 1, will be dropped; e. g., 115° would be entered as 15.

Example: Station at latitude 37°30′ N., longitude 125°10′ W. Octant of the globe=1.

(Since the station is in the north latitudes (37°30′ N.), the code figure for the octant of the globe (see table above) lies between 0 and 3, inclusive. The longitude (125°10′ W.) lies between the values 90° to 180° west, which corresponds to code figure 1.)

Latitude and longitude expressed to whole degrees:

Latitude 37°30′ N.=38°.*

Longitude 125°10′ W.=25 (the octant indicates that this value is really 125°).

Required identification group for entry under "Station Index Number": 13825.

*When the value of latitude or longitude ends in 30′, the value in degrees will be increased by 1 if the final digit is odd but will remain unchanged if the final digit is even.

10730. Elevation Floor of Instrument Shelter.—Enter this datum in tens of meters—that is, 193 meters will be entered as 019; 1190 meters will be entered as 119.

10740. Year, Month, and Day.—Enter these data to two digits each. Examples: January 11, 1945, will be entered 45 01 11. December 3, 1945, will be entered 45 12 03. The date will agree with the scheduled time of release, rather than the actual time. Entries for the year and month will be made for the first entry of the month only.

10750. Hour.—Enter the scheduled time (G. C. T.) of release to the nearest whole hour and to two digits, regardless of the actual time of release. That is, 04 or 16 (for 0400 and 1600 G. C. T.) will be entered even though the raob is delayed several hours. On forms for special observations, this entry will be the same as that of the actual time of release.

10760. Actual Time of Release.—Enter this datum to the nearest whole hour (G. C. T.), to two digits.

10770. ENTRIES UNDER "DATA FOR STANDARD LEVELS"

10771. Each standard level in meters m. s. l. is printed at the top of the columns to which it applies. Pressure, temperature, and relative humidity data at corresponding levels (except the surface level) will be taken from the adiabatic chart and entered in this form promptly upon completion of the raob.

10771.1. When more than one raob is taken for a single observation (as when the first does not attain to a height of 3 km. above the station), data pertaining to the highest raob only will be entered for the scheduled observation.

10771.2. Data for the surface level will be taken from the front of WBAN–30. Data will not be entered in the surface column unless they are available for one or more upper standard levels.

10771.3. Enter pressure in whole millibars for all levels (including the surface), temperature in degrees and tenths, and relative humidity in whole percent.

10771.4. Entries made in the columns on WBAN–32 must contain the same number of digits as there are small figures at the head of each column. This is required for punch-card purposes. Thus, for the pressure data in the surface column, the figures 20, 21, 22, and 23 at the head of the column indicate that four digits must be entered in that column. The zeros printed in some columns will be counted as a digit. Whenever the value entered in a column has less than the required number of digits, an appropriate number of zeros will precede the value. Minus signs will be considered a digit; decimal points will not.

Examples:

Pressure of 1010 millibars at the surface entered as 1010.
Pressure of 66 millibars at the 19000-meter level entered as 66.
Pressure of 315 millibars at the 9000-meter level entered as 0315.
Temperature of 2.4° C. at the 500-meter level entered as 002.4.
Temperature of —7.3° C. at the 1500-meter level entered as —07.3.
Temperature of —57.3° C. at the 14000-meter level entered as —57.3.
Relative humidity of 100 percent at the surface entered as 100.
Relative humidity of 85 percent at the 500-meter level entered as 085.
Relative humidity of 9 percent at the 6000-meter level entered as 009.
Relative humidity of 100 percent at the 1000-meter level entered as 100.

10772. Missing and Doubtful Data.—If a scheduled observation has not been taken, or all the data are doubtful, enter "RAOB not taken" (followed by the reason) or "Data doubtful" on the appropriate line of the first page of WBAN–32. Draw a line through the corresponding spaces on the other pages of the form.

10773. Doubtful data (temperature believed to be more than 1° and relative humidity more than 10 percent in error) will not be entered in this form. Pressure data based on estimated mean virtual temperature for strata not in excess of those listed in paragraph 9125 are considered accurate and will be entered, provided an accurate temperature record follows above the missing or doubtful portion. These pressure data will be entered even though temperature and relative humidity data for the same level must be omitted. Enter "M" in the temperature and relative humidity columns to indicate missing or doubtful data.

10774. If the relative humidity data are missing owing to motorboating (as indicated on WBAN–31A–B by the omission of a segment of the curve), values taken from a chart furnished for this purpose and applicable to specified radiosondes will be entered instead of "M." Care will be exercised to use the chart only for the radiosonde to which it applies. Data taken from the chart will be enclosed in parentheses on WBAN–32.

10774.1. The charts applicable to the radiosondes currently in use are tables 19 and 20 of WBAN Computation Tables.

10774.2. The required value of relative humidity for any level missing owing to motorboating will be found by noting the point of intersection of the curve on the chart with the temperature for the same level. Read the relative humidity at the side of the chart on the vertical scale corresponding to this point of in-

tersection. Enter this value enclosed in parentheses.

10775. When taking data from the adiabatic chart, draw a ¼-inch dash with a sharply pointed red pencil across the pressure-height, temperature, and relative humidity curves and across the pressure scale printed along the right margin of the adiabatic chart. Enter data for each level required on WBAN–32 from the surface to the maximum altitude of the sounding. If the raob terminates or a missing portion of the record begins within the limits, listed below, of a higher standard level on WBAN–32, data will be entered for the level.

Termination of Raob:	*Limits (Meters)*
Between surface and 5 km	20
Between 5 km. and 10 km	30
Between 10 km. and 15 km	50
Above 15 km	100

10775.1. For the above entries, temperature and relative humidity data will be used as recorded on WBAN–30 for the termination of the raob or the beginning of the missing portion of the record. The pressure datum will be secured by extrapolating the pressure-height curve linearly to the higher standard surface. No attempt will be made to extrapolate downward the resumption of a record.

10776. Summarizing.—Summarize all elements of WBAN–32. The initials and surname and military rank, grade, or rating, if any, of the computer and verifier of the completed form will be entered in the lower margin.

10776.1. Number of observations.—Enter the number of entries for each level in the appropriate space at the base of each column.

10776.2. Sums.—Enter the sum for all columns. Place a minus sign (−) before all negative values. Plus signs (+) will not be used. Include relative humidity data in the sums regardless of whether they are in parentheses. Enter the sums of pressure and relative humidity to whole numbers; temperature, to tenths.

10776.3. Means.—Compute the means by dividing the sums by the number of entries in each column. Where appropriate, place minus signs before means of temperature. Compute means of temperature and pressure only for columns having 5 or more entries. Compute means of relative humidity only for columns having at least 16 actual values as distinguished from those derived from the curve referred to in paragraph 10774. Enter the means of temperature and pressure to tenths, and relative humidity to whole numbers.

10776.4. Temperature Extremes.—Underline the maximum temperature of each standard level with a red pencil and the minimum temperature with a blue pencil. Data will not be underlined in columns having only a single entry.

10777. MEAN MONTHLY ADIABATIC CHARTS

10777.1. General.—Adiabatic charts will be drawn each month based on monthly mean values of pressure, temperature, and relative humidity, as computed on WBAN–32. A separate chart will be prepared from WBAN–32 for the 0400 and 1600 G. C. T. (or as otherwise scheduled) observations. These charts will be mailed with WBAN–32. Enter the name of the station and the month, year, and scheduled time of release (G. C. T.). Enter the following note in the margin at the bottom of each chart: "Prepared from means taken from WBAN–32."

10777.2. Construction of Chart.—Draw lines across the chart at mean values of pressure for the standard levels on WBAN–32. On these lines in the left margin of the chart enter the mean values of pressure, and altitude in meters m. s. l., of the levels to which they pertain. In the right margin enter the number of observations (determined by the number of entries of pressure) for each level. Plot the corresponding mean values of temperature and relative humidity on the appropriate levels, and draw straight lines between successive points. Label the top and bottom of each curve "T" and "RH," respectively. Construct the pressure-height curve by plotting a point on each level corresponding to its altitude above mean sea level, and draw straight lines between successive points. Values for all curves at the 400-millibar level will be obtained in a manner similar to that of daily raobs. (See par. 10304.)

10800. CHECKING FORMS

10810. All raob forms will be carefully checked in detail by an observer other than the computer, so far as possible, before the forms are mailed. After checking the forms, the verifier will print his name in the space labeled "Verifier."

10811. The verifier will not change readings when the differences are 0.2 or less of the smallest printed divisions on the various charts and scales when the differences obviously arise from variation in personal judgment. When differences exceed 0.2 division, the readings will be reconsidered and corrected, if necessary. In general, it is expected that the differences between the readings of two observers will not exceed 0.1 division, especially where the divisions are relatively wide.

10812. Errors on the adiabatic chart deriving from errors on other forms need not be corrected on the chart if a displacement of 0.2 or less of a printed division would result. If a displacement greater than 0.2 is involved, the affected part of the chart will be redrawn. In some such

cases, errors may be corrected on WBAN–30 and not necessitate changes on the adiabatic chart.

10813. In checking the various forms, it has been found that the errors listed below occur frequently. Their sources, therefore, will be checked most carefully.

(*1*) Identifications (such as station, date, curve-label, etc.) omitted or incorrect.
(*2*) Failure to insert all significant levels.
(*3*) Abstracting data from the calibration curves.
(*4*) Reading of ordinate and contact number from the recorder record.
(*5*) Plotting of levels and points on adiabatic chart.
(*6*) Errors in arithmetic.
(*7*) Failure to make all changes resulting from changes made on other forms.

10900. PREPARATION OF FORMS FOR MAILING

10910. Raob forms will be prepared for mailing to cover the following periods in each month:

(1) 1st to 10th
(2) 11th to 20th
(3) 21st to last day of the month
} Inclusive.

10911. The forms to be mailed are WBAN–30, WBAN–31A, and B, and the recorder records with their calibration charts.

10920. Mail all forms for each period in one 14½″ by 18″ envelope. Arrange WBAN–31A and B chronologically, the earliest date uppermost, and folded once with the fold parallel to the vertical temperature lines, in such a manner that the edges of the innermost form meet. Do not crease these forms. Each calibration chart should be folded once, with the blank side out. The recorder record should then be placed within the folds of its corresponding chart.

10921. Arrange WBAN–30 and the recorder record and calibration chart in chronological order, and place them between the fold of the innermost adiabatic chart, after which insert all forms in the envelope with the fold of the adiabatic charts uppermost. Reinforce the envelope with gummed kraft tape after sealing.

10922. Instructions for mailing these forms and WBAN–32 will be found in the addendum.

Chapter XI. TRANSMISSION OF RAOB MESSAGES

11100. The code to be used in the transmission of raob messages will be specified in the addendum.

11101. Accuracy is essential in these messages. Whenever possible, all raob forms will be checked before transmission of the message.

11110. Code Check.—In the column headed "Code Check" on WBAN–30, number the transmitted levels in the order in which they appear in the message. The surface level will be No. 1.

11111. The coded message will be entered on the front of WBAN–30. Each group in the message will be entered on a segment of the broken lines provided for the entries. Corrections will be made in red without obliterating or erasing the data as they originally appeared in the transmitted message.

11112. If a level was not computed at the 400-millibar surface, the data required for transmission will be taken from the adiabatic chart and entered on WBAN–30 under "Mandatory Levels for Transmission." Note that the entry of mandatory levels for transmission on WBAN–30 is in the ascending order of height.

11120. Selecting Levels for Transmission.—The time allotted for transmission of raobs is limited. Therefore, only essential levels will be transmitted. Careful judgment must be exercised in selecting levels for transmission, since more levels are usually evaluated than are required by those who use the transmitted messages.

11121. Whenever a series of relatively thin strata (approximately 100 meters) having different lapse rates occur adjacent to one another, data only for the lowermost and uppermost of such levels will be transmitted, unless required by the provisions of paragraph 11122.

11122. Select levels for transmission in accordance with the following criteria:

(1) Highest and lowest values of temperature and relative humidity on the plotted curves.

(2) Bases of clouds and icing.

(3) Levels bounding motorboating humidity and missing data strata more than four contacts in extent.

(4) A level within each stratum required by (3) above.

(5) Levels required by the raob code, since these will often make unnecessary the transmission of levels otherwise required.

11123. In the troposphere the temperature at any level intermediate between two transmitted levels should not differ by more than 2° C. from that obtained by linear interpolation between the latter levels. In the stratosphere the difference should not exceed 5° C. Relative humidity at any level intermediate between two transmitted levels should not differ by more than 10 percent from that obtained by linear interpolation between the latter levels.

11130. Data termed "doubtful" or "missing" on WBAN–30 will be so indicated in the message.

11140. When for any reason the raob message cannot be transmitted at the regularly scheduled time, a "no raob" message, taken from the Raob Code, indicating the reason therefor, will be filed instead.

11150. If observations are permanently discontinued at a station, "no raob" messages will continue to be filed until the station reports are finally discontinued on the sequence.

11160. Additional Raobs. — Whenever a height of less than 3 kilometers above the station is attained in the regular observation, the data will not be transmitted if a second raob is taken. Otherwise, the data obtained in the regularly scheduled observation, even though less than 3 kilometers above the station, will be transmitted at the scheduled time, provided the minimum height has been reached that is specified in the current Raob Code instructions.

11161. Messages based on special or extra raobs will not be transmitted unless specifically authorized. No message will be filed later than 18 hours after the scheduled time of release.

11170. Correction Messages.—Whenever an error is found to have been transmitted, a correction message will be filed as soon as possible for transmission.

11200. TRANSMISSION OF FREEZING LEVEL AND ICING DATA IN HOURLY REPORTS

11210. These data will be reported as remarks in the first hourly (or 3-hourly) airway observation following their determination. The report will be made incident to every raob when the surface temperature is above 0° C. and the sounding extends to the freezing level. The freezing level will be taken as occurring at 0° C.

11211. The altitude of the freezing level will be reported in hundreds of feet m. s. l.; and the value of relative humidity, to the nearest percent. The report will be preceded by the phrase contraction "RAFRZ" (raob lowest freezing level). "RH" will be used to denote relative humidity; e. g., "RAFRZ 31 m. s. l. RH 93" (raob lowest freezing level 3,100 feet m. s. l.; relative

613388°—45——6

humidity at that level, 93 percent. Missing relative humidity at the freezing level will be transmitted as "MISG." If motorboating is occurring, the value of relative humidity at the cut-off point (corresponding to 0° C.) will be transmitted.

11212. Data pertaining to the lowest point at which 0° occurs will be transmitted regardless of inversion and isothermal layers that might introduce additional 0° temperature levels aloft.

11213. Icing of the raob balloon (see par. 9238.1) will also be reported in remarks in the first hourly (or 3-hourly) airway observation filed after determination of icing.

11214. The report of icing will be preceded by the phrase contraction "RAICG" (raob icing). The altitude of icing will be expressed in hundreds of feet m. s. l. and will be reported for the point where the first lengthened contact indicates a decrease in ascensional rate; e. g. "RAICG 13 m. s. l." (raob icing at 1,300 feet m. s. l.). If it is believed that snow is contributing to the decreasing ascensional rate of the raob balloon, then the abbreviation "SNW" will follow "RAICG."

11215. When both icing and freezing level data are reported in the same observation, precedence may be given to either; e. g., "RAICG 13 m. s. l. RAFRZ 12 m. s. l. RH 93." A time group will be placed at the end of the report when an hour or more elapses between the time the raob balloon reaches the freezing level and the time the relevant data are included in an airway observation. The time reported will be that at which the balloon reaches the freezing level and will be expressed to the nearest minute in terms of the time used for airway reports.

11220. Determination of the Height of Freezing and Icing Levels.—Table 18 of the WBAN Computation Tables will be used to determine the height above sea level of freezing and icing levels. The curve is based upon the standard atmosphere, and heights of levels determined by means of it will therefore usually differ from heights of the same levels determined by means of the adiabatic chart. Since the altimeters used in most aircraft are calibrated to the standard atmosphere, heights indicated by an altimeter will generally be in much closer agreement with heights determined by the standard atmosphere curve than with those determined by an adiabatic chart.

11221. Determine from an inspection of the recorder record the contact corresponding to the icing or freezing level. In the former case it will be the first lengthened contact; and in the latter, the first contact above the surface (see par. 9238.1) corresponding to a temperature of 0° C.

(1) Find the pressure corresponding to this contact from the pressure-calibration chart furnished with each radiosonde and, from table 18, find the height to the nearest hundred feet corresponding to this pressure.

(2) In the same manner, find the height in hundreds of feet corresponding to the station pressure at the time of release of the radiosonde.

(3) Subtract algebraically the height found in (2) from the height found in (1). Add the station elevation in feet to the remainder. The resultant value will be the required height in feet, m. s. l. Note that this subtraction must be made algebraically, as shown in the following example:

Given:
Station elevation ..... 60 feet.
Station pressure ..... 1025 millibars.
Freezing level occurs at the 25th contact.

1. The calibration chart furnished with the radiosonde indicates that the twenty-fifth contact corresponds to a pressure of 740 mbs.

2. From the standard atmosphere curve it is found that a pressure of 740 mbs. corresponds to an altitude of 8,400 feet mean sea level (to the nearest hundred feet).

3. In a similar manner it is found that the station pressure of 1025 millibars corresponds to an altitude of −300 feet mean sea level (to the nearest hundred feet).

4. Subtract algebraically the value found in 2 from that found in 3:

8,400—(—300)=8,700	
Plus station elevation of 60 feet (to the nearest hundred feet)	100
Required height	8,800

It will be noted that the value found in 3 will always be negative for pressures higher than 1013 mbs.

11222. The required height may also be obtained graphically as follows:

Given:
Station elevation ..... 60 feet.
Station pressure ..... 1025 millibars.
Freezing level occurs at 25th contact on recorder record (corresponding to 740 mbs.).

1. On table 18 find the intersection of the station pressure (1025 millibars) and station elevation (100 feet to nearest hundred feet). This point is four divisions (to the nearest whole division) to the right of the standard atmosphere curve.

2. Find the point on the curve corresponding to 740 millibars and displace this point four divisions (as found in (1) immediately above) to the right and read the required height (8,800 feet) beneath the latter point on the horizontal scale at the bottom of the chart. This point should always be displaced to the same side of the curve and in the same amount as the point found in (1).

INDEX

Radiosonde Observation Computation Tables and Diagrams

(WBAN)

Supplement
S-I

Table I

BAROMETRIC INCHES (MERCURY) INTO MILLIBARS

1 inch = 33.86395 mb.

1 mb. = 0.02952993 inch

Inches	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
	mb.	*mb.*	*mb.*	*mb.*	*mb.*	*mb.*	*mb.*	*mb.*	*mb.*	*mb.*
26.0	880.5	880.8	881.1	881.5	881.8	882.2	882.5	882.8	883.2	883.5
26.1	883.8	884.2	884.5	884.9	885.2	885.5	885.9	886.2	886.6	886.9
26.2	887.2	887.6	887.9	888.3	888.6	888.9	889.3	889.6	889.9	890.3
26.3	890.6	891.0	891.3	891.6	892.0	892.3	892.7	893.0	893.3	893.7
26.4	894.0	894.3	894.7	895.0	895.4	895.7	896.0	896.4	896.7	897.1
26.5	897.4	897.7	898.1	898.4	898.7	899.1	899.4	899.8	900.1	900.4
26.6	900.8	901.1	901.5	901.8	902.1	902.5	902.8	903.2	903.5	903.8
26.7	904.2	904.5	904.8	905.2	905.5	905.9	906.2	906.5	906.9	907.2
26.8	907.6	907.9	908.2	908.6	908.9	909.2	909.6	909.9	910.3	910.6
26.9	910.9	911.3	911.6	912.0	912.3	912.6	913.0	913.3	913.6	914.0
27.0	914.3	914.7	915.0	915.3	915.7	916.0	916.4	916.7	917.0	917.4
27.1	917.7	918.1	918.4	918.7	919.1	919.4	919.7	920.1	920.4	920.8
27.2	921.1	921.4	921.8	922.1	922.5	922.8	923.1	923.5	923.8	924.1
27.3	924.5	924.8	925.2	925.5	925.8	926.2	926.5	926.9	927.2	927.5
27.4	927.9	928.2	928.5	928.9	929.2	929.6	929.9	930.2	930.6	930.9
27.5	931.3	931.6	931.9	932.3	932.6	933.0	933.3	933.6	934.0	934.3
27.6	934.6	935.0	935.3	935.7	936.0	936.3	936.7	937.0	937.4	937.7
27.7	938.0	938.4	938.7	939.0	939.4	939.7	940.1	940.4	940.7	941.1
27.8	941.4	941.8	942.1	942.4	942.8	943.1	943.4	943.8	944.1	944.5
27.9	944.8	945.1	945.5	945.8	946.2	946.5	946.8	947.2	947.5	947.9
28.0	948.2	948.5	948.9	949.2	949.5	949.9	950.2	950.6	950.9	951.2
28.1	951.6	951.9	952.3	952.6	952.9	953.3	953.6	953.9	954.3	954.6
28.2	955.0	955.3	955.6	956.0	956.3	956.7	957.0	957.3	957.7	958.0
28.3	958.3	958.7	959.0	959.4	959.7	960.0	960.4	960.7	961.1	961.4
28.4	961.7	962.1	962.4	962.8	963.1	963.4	963.8	964.1	964.4	964.8
28.5	965.1	965.5	965.8	966.1	966.5	966.8	967.2	967.5	967.8	968.2
28.6	968.5	968.8	969.2	969.5	969.9	970.2	970.5	970.9	971.2	971.6
28.7	971.9	972.2	972.6	972.9	973.2	973.6	973.9	974.3	974.6	974.9
28.8	975.3	975.6	976.0	976.3	976.6	977.0	977.3	977.7	978.0	978.3
28.9	978.7	979.0	979.3	979.7	980.0	980.4	980.7	981.0	981.4	981.7
29.0	982.1	982.4	982.7	983.1	983.4	983.7	984.1	984.4	984.8	985.1
29.1	985.4	985.8	986.1	986.5	986.8	987.1	987.5	987.8	988.2	988.5
29.2	988.8	989.2	989.5	989.8	990.2	990.5	990.9	991.2	991.5	991.9
29.3	992.2	992.6	992.9	993.2	993.6	993.9	994.2	994.6	994.9	995.3
29.4	995.6	995.9	996.3	996.6	997.0	997.3	997.6	998.0	998.3	998.6
29.5	999.0	999.3	999.7	1000.0	1000.3	1000.7	1001.0	1001.4	1001.7	1002.0
29.6	1002.4	1002.7	1003.1	1003.4	1003.7	1004.1	1004.4	1004.7	1005.1	1005.4
29.7	1005.8	1006.1	1006.4	1006.8	1007.1	1007.5	1007.8	1008.1	1008.5	1008.8
29.8	1009.1	1009.5	1009.8	1010.2	1010.5	1010.8	1011.2	1011.5	1011.9	1012.2
29.9	1012.5	1012.9	1013.2	1013.5	1013.9	1014.2	1014.6	1014.9	1015.2	1015.6
30.0	1015.9	1016.3	1016.6	1016.9	1017.3	1017.6	1018.0	1018.3	1018.6	1019.0
30.1	1019.3	1019.6	1020.0	1020.3	1020.7	1021.0	1021.3	1021.7	1022.0	1022.4
30.2	1022.7	1023.0	1023.4	1023.7	1024.0	1024.4	1024.7	1025.1	1025.4	1025.7
30.3	1026.1	1026.4	1026.8	1027.1	1027.4	1027.8	1028.1	1028.4	1028.8	1029.1
30.4	1029.5	1029.8	1030.1	1030.5	1030.8	1031.2	1031.5	1031.8	1032.2	1032.5
30.5	1032.9	1033.2	1033.5	1033.9	1034.2	1034.5	1034.9	1035.2	1035.6	1035.9
30.6	1036.2	1036.6	1036.9	1037.3	1037.6	1037.9	1038.3	1038.6	1038.9	1039.3
30.7	1039.6	1040.0	1040.3	1040.6	1041.0	1041.3	1041.7	1042.0	1042.3	1042.7
30.8	1043.0	1043.3	1043.7	1044.0	1044.4	1044.7	1045.0	1045.4	1045.7	1046.1
30.9	1046.4	1046.7	1047.1	1047.4	1047.8	1048.1	1048.4	1048.8	1049.1	1049.5
31.0	1049.8	1050.1	1050.5	1050.8	1051.1	1051.5	1051.8	1052.2	1052.5	1052.8
31.1	1053.2	1053.5	1053.8	1054.2	1054.5	1054.9	1055.2	1055.5	1055.9	1056.2
31.2	1056.6	1056.9	1057.2	1057.6	1057.9	1058.2	1058.6	1058.9	1059.3	1059.6
31.3	1059.9	1060.3	1060.6	1061.0	1061.3	1061.6	1062.0	1062.3	1062.7	1063.0
31.4	1063.3	1063.7	1064.0	1064.3	1064.7	1065.0	1065.4	1065.7	1066.0	1066.4
31.5	1066.7	1067.1	1067.4	1067.7	1068.1	1068.4	1068.7	1069.1	1069.4	1069.8
31.6	1070.1	1070.4	1070.8	1071.1	1071.5	1071.8	1072.1	1072.5	1072.8	1073.1
31.7	1073.5	1073.8	1074.2	1074.5	1074.8	1075.2	1075.5	1075.9	1076.2	1076.5
31.8	1076.9	1077.2	1077.6	1077.9	1078.2	1078.6	1078.9	1079.2	1079.6	1079.9
31.9	1080.3	1080.6	1080.9	1081.3	1081.6	1082.0	1082.3	1082.6	1083.0	1083.3

Table 2 gives values of relative humidity, or percentage of saturation, for air temperatures from -39° to +44°C. (side argument) and for depressions of the wet-bulb thermometer at 0.1°C. intervals (top argument). Thus, only a single interpolation is necessary. The values have been computed for a barometric pressure of 29.24 inches (990 mb.), this being approximately the average station pressure for many stations in the United States not lying in mountainous or plateau regions. Since theory and observation have shown that the relative humidity can be computed from readings of the dry and wet bulb temperatures and the barometric pressure, errors may result when the table is used for pressures markedly different from the value given above.

The following table, 2a, is illustrative of the corrections which it would be necessary to add to the relative humidities obtained from Table 2 in order to take into account the effect of barometric pressures differing from 29.24 inches. The corrections are given in whole numbers, and hence some of the irregularities which occur in this table are largely due to the dropping of fractional parts of one per cent. It is obvious that errors resulting from the use of Table 2 disregarding the prevailing barometric pressure are greatest at low temperatures, low humidities, and for pressures deviating furthest from the value of 29.24 inches. To take cognizance of these facts, some restrictions in the use of Table 2 should be observed, depending on the allowable error. Errors of one to two percent are within the errors of observation, and generally are considered allowable. Hence, for pressures within the limits 30.50 inches (1,033 mb.) and 28.00 inches (948 mb.) when temperatures are above -10°C., the results obtained from Table 2 may be used with the errors ordinarily falling between zero to two per cent. At lower temperatures for pressures different from 29.24 inches (990 mb.), and at pressures outside the above limits for all temperatures, Table 2a should be consulted to determine the magnitude of the error. If this is too great, recourse must be had to more extended psychrometric tables (Weather Bureau No. 235, Psychrometric Tables, Fahrenheit degrees).

TABLE 2a.—*Additive corrections to values obtained from Table 2 to give true relative humidities for various barometric pressures, temperatures, and depressions of the wet-bulb thermometer*

Air temperature, t		B=31 in.=1049.8 mb.					B=27 in.=914.3 mb.					B=25 in.=846.6 mb.				
°C.	Δt	0.1	0.2				0.1	0.2				0.1	0.2			
-39	r	56	11				56	11				56	11			
	δr	-3	-5				3	7				6	13			
	Δt	0.1	0.2	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0.5
-30	r	83	65	48	30	13	83	65	48	30	13	83	65	48	30	13
	δr	-1	-2	-3	-4	-5	1	3	3	5	6	2	5	7	10	12
	Δt	0.1	0.3	0.5	0.7	1.0	0.1	0.3	0.5	0.7	1.0	0.1	0.3	0.5	0.7	1.0
-20	r	93	79	65	51	30	93	79	65	51	30	93	79	65	51	30
	δr	0	-1	-2	-3	-4	0	1	2	3	4	1	2	4	6	9
	Δt	0.1	0.5	1.0	1.5	2.0	0.1	0.5	1.0	1.5	2.0	0.1	0.5	1.0	1.5	2.0
-10	r	97	84	67	51	35	97	84	67	51	35	97	84	67	51	35
	δr	0	-1	-2	-3	-3	0	0	2	2	3	0	1	3	5	7
	Δt	0.1	1.0	2.0	3.0	4.0	0.1	1.0	2.0	3.0	4.0	0.1	1.0	2.0	3.0	4.0
0	r	98	81	64	46	29	98	81	64	46	29	98	81	64	46	29
	δr	0	0	-2	-2	-2	0	1	1	3	4	0	2	3	5	6
	Δt	0.5	1.0	2.0	4.0	6.0	0.5	1.0	2.0	4.0	6.0	0.5	1.0	2.0	4.0	6.0
10	r	94	88	77	55	34	94	88	77	55	34	94	88	77	55	34
	δr	0	0	-1	-2	-2	0	1	0	1	3	0	1	1	3	5
	Δt	0.5	2.0	4.0	6.0	9.0	0.5	2.0	4.0	6.0	9.0	0.5	2.0	4.0	6.0	9.0
20	r	96	83	66	51	31	96	83	66	51	31	96	83	66	51	31
	δr	-1	-1	0	-1	-2	0	0	1	2	2	0	0	2	3	3
	Δt	0.5	3.0	6.0	9.0	12.0	0.5	3.0	6.0	9.0	12.0	0.5	3.0	6.0	9.0	12.0
30	r	96	79	61	44	30	96	79	61	44	30	96	79	61	44	30
	δr	0	0	-1	0	-1	0	1	1	1	1	0	1	1	2	2
	Δt	0.5	3.0	6.0	10.0	15.0	0.5	3.0	6.0	10.0	15.0	0.5	3.0	6.0	10.0	15.0
40	r	97	82	67	48	29	97	82	67	48	29	97	82	67	48	29
	δr	0	0	-1	0	-1	0	1	0	1	1	0	1	0	2	2

t=dry-bulb (air) temperature.
t'=wet-bulb temperature.
Δt=$t-t'$=depression of wet-bulb thermometer.
B=barometric pressure (station).
r="relative humidity" obtained from Table 2 (for B=29.24 in.), in per cent.
δr=additive corrections (%) to r to give true relative humidity for indicated values of B, t, and Δt.

Table 2

RELATIVE HUMIDITY (%), CENTIGRADE TEMPERATURES

(Pressure 29.24 inches)

Depression of wet bulb thermometer

Air temp.	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5
0	98	96	94	93	91	89	87	85	83	81	80	78	76	74	73	71	69	67	66	64	62	60	59	57	55
1	98	97	95	93	92	90	88	86	85	83	81	80	78	76	75	73	71	70	68	66	64	63	61	59	58
2	98	97	95	93	92	90	89	87	85	84	82	81	79	78	76	74	73	71	70	68	67	65	63	62	60
3	98	97	95	94	92	91	89	88	86	84	83	82	80	78	77	76	74	72	71	70	68	67	65	64	62
4	99	97	96	94	93	91	90	88	87	85	84	82	81	79	78	77	75	74	72	71	69	68	67	65	64
5	99	97	96	94	93	91	90	88	87	86	84	83	82	80	79	77	76	75	73	72	71	69	68	67	65
6	99	97	96	94	93	92	90	89	88	86	85	84	82	81	80	78	77	76	74	73	72	70	69	68	67
7	99	97	96	95	93	92	91	89	88	87	86	84	83	82	80	79	78	77	75	74	73	72	70	69	68
8	99	97	96	95	94	92	91	90	88	87	86	85	84	82	81	80	79	77	76	75	74	73	71	70	69
9	99	98	96	95	94	93	91	90	89	88	87	85	84	83	82	81	79	78	77	76	75	74	72	71	70
10	99	98	96	95	94	93	91	90	89	88	87	86	84	83	82	81	80	79	78	77	76	74	73	72	71
11	99	98	97	95	94	93	92	91	90	89	87	86	85	84	83	82	81	80	79	78	76	75	74	73	72
12	99	98	97	96	94	93	92	91	90	89	88	87	86	85	84	82	81	80	79	78	77	76	75	74	73
13	99	98	97	96	95	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74
14	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	79	79	78	77	76	75
15	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75
16	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	82	81	80	79	78	77	76
17	99	98	97	96	95	94	93	92	91	90	89	89	88	87	86	85	84	83	82	81	80	79	78	78	76
18	99	98	97	96	95	94	93	92	92	91	90	89	88	87	86	85	84	83	83	82	81	80	79	78	77
19	99	98	97	96	95	95	94	93	92	91	90	89	88	87	87	86	85	84	83	82	81	80	80	79	78
20	99	98	97	96	96	95	94	93	92	91	90	89	89	88	87	86	85	84	83	83	82	81	80	79	78
21	99	98	97	97	96	95	94	93	92	91	90	90	89	88	87	86	86	85	84	83	82	81	81	80	79
22	99	98	97	97	96	95	94	93	92	92	91	90	89	88	87	87	86	85	84	83	83	82	81	80	80
23	99	98	97	97	96	95	94	93	93	92	91	90	89	89	88	87	86	85	85	84	83	82	81	81	80
24	99	98	98	97	96	95	94	94	93	92	91	90	90	89	88	87	87	86	85	84	83	83	82	81	80
25	99	98	98	97	96	95	94	94	93	92	91	91	90	89	88	88	87	86	85	84	84	83	82	82	81
26	99	98	98	97	96	95	95	94	93	92	91	91	90	89	88	88	87	86	86	85	84	83	83	82	81
27	99	98	98	97	96	95	95	94	93	92	92	91	90	89	89	88	87	87	86	85	84	84	83	82	82
28	99	99	98	97	96	96	95	94	93	93	92	91	90	90	89	88	88	87	86	85	85	84	83	83	82
29	99	99	98	97	96	96	95	94	93	93	92	91	90	90	89	88	88	87	86	86	85	84	84	83	82
30	99	99	98	97	96	96	95	94	94	93	92	91	91	90	89	89	88	87	87	86	85	85	84	83	83
31	99	99	98	97	96	96	95	94	94	93	92	92	91	90	90	89	88	87	87	86	86	85	84	84	83
32	99	99	98	97	96	96	95	94	94	93	92	92	91	90	90	89	88	88	87	86	86	85	84	84	83
33	99	99	98	97	97	96	95	94	94	93	92	92	91	90	90	89	89	88	87	87	86	85	85	84	83
34	99	99	98	97	97	96	95	95	94	93	93	92	91	91	90	89	89	88	87	87	86	86	85	84	84
35	99	99	98	97	97	96	95	95	94	94	93	92	91	91	90	90	89	88	88	87	86	86	85	85	84
36	99	99	98	97	97	96	95	95	94	94	93	92	92	91	90	90	89	88	88	87	87	86	85	85	84
37	99	99	98	97	97	96	96	95	94	94	93	92	92	91	91	90	89	89	88	87	87	86	86	85	84
38	99	99	98	97	97	96	96	95	94	94	93	92	92	91	91	90	89	89	88	88	87	86	86	85	84
39	99	99	98	98	97	96	96	95	94	94	93	93	92	91	91	90	90	89	88	88	87	87	86	86	85
40	99	99	98	98	97	96	96	95	94	94	93	93	92	91	91	90	90	89	89	88	87	87	86	86	85
41	99	99	98	98	97	96	96	95	95	94	93	93	92	92	91	91	90	89	89	88	88	87	87	86	85
42	99	99	98	98	97	96	96	95	95	94	93	93	92	92	91	91	90	89	89	88	88	87	87	86	86
44	99	99	98	98	97	96	96	95	95	94	94	93	92	92	91	91	90	90	89	88	88	87	87	86	86
44	99	99	98	98	97	97	96	95	95	94	94	93	93	92	91	91	90	90	89	89	88	88	87	86	86

Air temp.	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0
0	53	52	50	48	46	45	43	41	40	38	36	34	33	31	29	28	26	24	23	21	20	18	16	15	13
1	56	54	53	51	49	48	46	45	43	41	40	38	36	35	33	32	30	28	27	25	24	22	21	19	17
2	59	57	55	54	52	51	49	48	46	44	43	41	40	38	37	35	34	32	31	29	28	26	25	23	22
3	61	59	58	56	55	53	52	50	49	47	46	44	43	41	40	39	37	36	34	33	31	30	28	27	26
4	62	61	60	58	57	55	54	53	51	50	48	47	46	44	43	42	40	39	37	36	35	33	32	31	29
5	64	62	61	60	58	57	56	54	53	52	51	49	48	47	45	44	43	42	40	39	38	37	35	34	33
6	65	64	63	61	60	59	58	56	55	54	53	51	50	49	48	46	45	44	43	41	40	39	38	37	35
7	67	65	64	63	62	60	59	58	57	56	54	53	52	51	50	48	47	46	45	44	43	41	40	39	38
8	68	67	65	64	63	62	61	59	58	57	56	55	54	52	51	50	49	48	47	46	45	44	42	41	40
9	69	68	67	66	64	63	62	61	60	59	58	56	55	54	53	52	51	50	49	48	47	46	45	43	42
10	70	69	68	67	66	65	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	47	46	45	44
11	71	70	69	68	67	66	65	64	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46
12	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
13	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	51	50
14	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	58	57	56	55	54	53	52	51
15	74	74	73	72	71	70	69	68	67	66	65	64	63	62	61	61	60	59	58	57	56	55	54	54	53
16	75	74	73	72	71	71	70	69	68	67	66	65	64	63	63	62	61	60	59	58	58	57	56	55	54
17	75	74	73	72	72	71	70	70	69	68	67	66	65	64	64	63	62	61	60	60	59	58	57	56	55
18	76	76	75	74	73	72	71	70	70	69	68	67	66	65	65	64	63	62	61	61	60	59	58	57	57
19	77	76	75	75	74	73	72	71	70	70	69	68	67	66	65	65	64	63	62	62	61	60	59	58	58
20	78	77	76	75	74	74	73	72	71	70	70	69	68	67	66	66	65	64	63	63	62	61	60	59	59
21	78	77	77	76	75	74	73	73	72	71	70	70	69	68	67	66	66	65	64	64	63	62	61	61	60
22	79	78	77	76	76	75	74	73	73	72	71	70	70	69	68	67	67	66	65	64	64	63	62	61	61
23	79	78	78	77	76	75	75	74	73	72	72	71	70	70	69	68	67	67	66	65	64	64	63	62	62
24	80	79	78	77	77	76	75	74	74	73	72	72	71	70	69	69	68	67	67	66	65	65	64	63	62
25	80	79	79	78	77	76	76	75	74	74	73	72	72	71	70	69	69	68	67	67	66	65	65	64	63
26	80	80	79	78	78	77	76	76	75	74	74	73	72	71	71	70	69	69	68	67	67	66	65	65	64
27	81	80	79	79	78	77	77	76	75	75	74	73	73	72	71	71	70	69	69	68	67	67	66	65	65
28	81	81	80	79	78	78	77	77	76	75	75	74	73	73	72	71	71	70	69	69	68	67	67	66	65
29	82	81	80	80	79	78	78	77	76	76	75	74	74	73	72	72	71	71	70	69	69	68	67	67	66
30	82	81	81	80	79	79	78	77	77	76	75	75	74	74	73	72	72	71	70	70	69	69	68	67	67
31	82	82	81	80	80	79	78	78	77	77	76	75	74	74	73	73	72	72	71	70	70	69	69	68	67
32	83	82	81	81	80	79	79	78	78	77	76	76	75	75	74	73	73	72	72	71	70	70	69	68	68
33	83	82	82	81	80	80	79	78	78	77	77	76	76	75	74	74	73	73	72	71	71	70	70	69	68
34	83	82	82	81	81	80	79	79	78	78	77	76	76	75	75	74	74	73	72	72	71	71	70	70	69
35	83	83	82	82	81	80	80	79	79	78	77	77	76	76	75	75	74	73	73	72	72	71	71	70	69
36	84	83	82	82	81	81	80	79	79	78	78	77	77	76	75	75	74	74	73	73	72	72	71	70	70
37	84	83	83	82	82	81	80	80	79	79	78	78	77	76	76	75	75	74	74	73	73	72	72	71	70
38	84	84	83	82	82	81	81	80	80	79	78	78	77	77	76	76	75	75	74	74	73	72	72	71	71
39	84	84	83	83	82	82	81	80	80	79	79	78	77	77	77	76	76	75	74	74	73	73	72	72	71
40	85	84	84	83	82	82	81	81	80	80	79	79	78	77	77	76	76	75	75	74	74	73	73	72	72
41	85	84	84	83	83	82	82	81	80	80	79	79	78	78	77	77	76	76	75	75	74	74	73	73	72
42	85	84	84	83	83	82	82	81	81	80	80	79	79	78	78	77	76	76	75	75	74	74	73	73	72
44	85	85	84	84	83	82	82	81	81	80	80	79	79	78	78	77	77	76	76	75	75	74	74	73	73
44	85	85	84	84	83	83	82	82	81	81	80	80	79	79	78	78	77	77	76	76	75	75	74	74	73

Table 2

RELATIVE HUMIDITY (%), CENTIGRADE TEMPERATURES

(Pressure 29.24 inches)

Air temp.	Depression of wet bulb thermometer																								
	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5
0	11	10	8	7	5																				
1	16	14	13	11	10	8	7	5																	
2	20	19	17	16	14	13	11	10	8	7	6														
3	24	23	21	20	19	17	16	14	13	12	10	9	8	6	5										
4	28	26	25	24	22	21	20	18	17	16	14	13	12	11	9	8	7	5							
5	31	30	29	28	26	25	24	22	21	20	18	17	16	15	13	12	11	10	8	7	6	5			
6	34	33	32	31	29	28	27	26	25	24	22	21	20	19	17	16	15	14	13	11	10	9	8	6	5
7	37	36	34	33	32	31	30	29	28	26	25	24	23	22	21	20	19	18	17	15	14	13	12	11	10
8	39	38	37	36	35	34	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14
9	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
10	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	22	21	20
11	45	44	43	42	41	40	39	38	37	36	35	35	34	33	32	31	30	29	28	27	26	25	24	23	22
12	47	46	45	44	43	42	41	40	40	39	38	37	36	35	34	33	32	31	30	29	29	28	27	26	25
13	49	48	47	46	45	44	43	42	42	41	40	39	38	37	36	35	34	34	33	32	31	30	29	28	28
14	50	50	49	48	47	46	45	44	43	42	42	41	40	39	38	37	36	36	35	34	33	32	31	31	30
15	52	51	50	49	48	48	47	46	45	44	43	43	42	41	40	39	38	38	37	36	35	34	33	32	32
16	53	52	52	51	50	49	48	47	47	46	45	44	43	43	42	41	40	39	39	38	37	36	35	35	34
17	55	54	53	52	51	51	50	49	48	47	47	46	45	44	43	43	42	41	40	40	39	38	37	37	36
18	56	55	54	53	53	52	51	50	49	49	48	47	46	46	45	44	43	43	42	41	40	40	39	38	38
19	57	56	55	55	54	53	52	52	51	50	49	49	48	47	46	46	45	44	44	43	42	41	40	40	39
20	58	57	56	56	55	54	54	53	52	51	51	50	49	48	48	47	46	46	45	44	44	43	42	41	41
21	59	58	58	57	56	55	55	54	53	53	52	51	50	50	49	48	48	47	46	46	45	44	44	43	42
22	60	59	59	58	57	56	56	55	54	54	53	52	52	51	50	50	49	48	48	47	46	46	45	44	44
23	61	60	60	59	58	58	57	56	55	55	54	53	53	52	52	51	50	50	49	48	48	47	46	46	45
24	62	61	60	60	59	58	58	57	56	56	55	54	54	53	53	52	51	51	50	49	49	48	47	47	46
25	63	62	61	61	60	59	59	58	57	57	56	55	55	54	54	53	52	52	51	50	50	49	49	48	47
26	63	63	62	62	61	60	60	59	58	58	57	56	56	55	54	54	53	53	52	51	51	50	50	49	49
27	64	64	63	62	62	61	60	60	59	58	58	57	57	56	56	55	54	54	53	52	52	51	51	50	50
28	65	64	64	63	62	62	61	61	60	59	59	58	58	57	56	56	55	55	54	53	53	52	52	51	51
29	66	65	64	64	63	62	62	61	61	60	60	59	58	58	57	57	56	55	55	54	54	53	53	52	52
30	66	66	65	64	64	63	63	62	61	61	60	60	59	59	58	57	57	56	56	55	55	54	53	53	52
31	67	66	66	65	64	64	63	63	62	61	61	60	60	59	59	58	58	57	57	56	55	55	54	54	53
32	67	67	66	66	65	64	64	63	63	62	62	61	61	60	60	59	58	58	57	57	56	56	55	55	54
33	68	67	67	66	66	65	65	64	63	63	62	62	61	61	60	60	59	59	58	57	57	56	56	55	55
34	68	68	67	67	66	66	65	65	64	63	63	62	62	61	61	60	60	59	59	58	58	57	57	56	56
35	69	68	68	67	67	66	66	65	65	64	64	63	63	62	61	61	60	60	59	59	58	58	57	57	56
36	69	69	68	68	67	66	66	65	65	64	64	63	63	62	62	61	61	60	60	59	59	58	58	57	57
37	70	69	69	68	68	67	67	66	66	65	65	64	64	63	63	62	62	61	61	60	60	59	59	58	58
38	70	70	69	69	68	68	67	67	66	66	65	65	64	64	63	63	62	62	61	61	60	60	59	59	58
39	71	70	70	69	69	68	68	67	67	66	66	65	65	64	64	63	63	62	62	61	61	60	60	59	59
40	71	71	70	70	69	69	68	68	67	67	66	66	65	65	64	64	63	63	62	62	61	61	60	60	59
41	72	71	71	70	70	69	69	68	68	67	67	66	66	65	65	64	64	63	63	62	62	61	61	60	60
42	72	71	71	70	70	69	69	68	68	67	67	67	66	66	65	65	64	64	63	63	62	62	61	61	61
43	72	72	71	71	70	70	69	69	68	68	67	67	66	66	66	65	65	64	64	63	63	62	62	61	61
44	73	72	72	71	71	70	70	69	69	68	68	67	67	66	66	66	65	65	64	64	63	63	62	62	62

Air temp.	Depression of wet bulb thermometer																								
	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10.0
0																									
1																									
2																									
3																									
4																									
5																									
6																									
7	9	8	7	5																					
8	12	11	10	9	8	7	6	5																	
9	16	15	14	13	12	11	10	9	8	7	6	5													
10	19	18	17	16	15	14	13	12	11	10	9	8	7	7	6	5									
11	22	21	20	19	18	17	16	15	14	13	13	12	11	10	9	8	7	6	6	5					
12	24	23	22	22	21	20	19	18	17	16	16	15	14	13	12	11	10	10	9	8	7	6	5	5	
13	27	26	25	24	23	22	22	21	20	19	18	17	17	16	15	14	13	13	12	11	10	9	9	8	7
14	29	28	27	27	26	25	24	23	22	22	21	20	19	18	18	17	16	15	15	14	13	12	11	11	10
15	31	30	29	28	27	27	26	25	24	24	23	22	22	21	20	20	19	18	17	16	16	15	14	13	13
16	33	32	32	31	30	29	29	28	27	26	26	25	24	23	23	22	21	20	20	19	18	17	17	16	15
17	35	34	34	33	32	31	31	30	29	28	28	27	26	26	25	24	23	23	22	21	21	20	19	18	18
18	37	36	35	35	34	33	33	32	31	30	30	29	28	28	27	26	26	25	24	23	23	22	21	21	20
19	39	38	37	36	36	35	34	34	33	32	32	31	30	30	29	28	28	27	26	26	25	24	24	23	22
20	40	39	39	38	37	37	36	35	35	34	33	33	32	31	31	30	29	29	28	28	27	26	26	25	24
21	42	41	40	40	39	38	38	37	36	36	35	34	34	33	32	32	31	31	30	29	29	28	28	27	26
22	43	42	42	41	40	40	39	39	38	37	37	36	35	35	34	34	33	32	32	31	30	30	29	29	28
23	44	44	43	42	42	41	41	40	39	39	38	38	37	36	36	35	34	34	33	33	32	32	31	30	30
24	46	45	44	44	43	43	42	41	41	40	40	39	38	38	37	37	36	35	35	34	34	33	33	32	31
25	47	46	46	45	44	44	43	43	42	41	41	40	40	39	39	38	37	37	36	36	35	35	34	33	33
26	48	47	47	46	46	45	44	44	43	43	42	42	41	40	40	39	39	38	38	37	37	36	35	35	34
27	49	48	48	47	47	46	46	45	44	44	43	43	42	42	41	41	40	39	39	38	38	37	37	36	36
28	50	49	49	48	48	47	47	46	46	45	44	44	43	43	42	42	41	41	40	40	39	39	38	38	37
29	51	50	50	49	49	48	48	47	47	46	46	45	44	44	43	43	42	42	41	41	40	40	39	39	38
30	52	51	51	50	50	49	49	48	48	47	47	46	45	45	44	44	43	43	42	42	41	41	40	40	39
31	53	52	52	51	51	50	50	49	49	48	48	47	47	46	45	45	44	44	43	43	42	42	41	41	40
32	54	53	52	52	51	51	50	50	49	49	48	48	47	47	46	46	45	45	44	44	43	43	42	42	41
33	54	54	53	53	52	52	51	51	50	50	49	49	48	48	47	47	46	46	45	45	44	44	43	43	42
34	55	55	54	54	53	53	52	52	51	51	50	50	49	49	48	48	47	47	46	46	45	45	44	44	43
35	56	55	54	54	54	53	53	52	52	51	51	50	50	49	49	49	48	48	47	47	46	46	45	45	44
36	56	56	55	55	54	54	53	53	53	52	52	51	51	50	50	49	49	48	48	48	47	47	46	46	45
37	57	57	56	56	55	55	54	54	53	53	52	52	51	51	51	50	50	49	49	48	48	47	47	47	46
38	58	57	57	56	56	55	55	55	54	54	53	53	52	52	51	51	50	50	50	49	49	48	48	47	47
39	58	58	57	57	57	56	56	55	55	54	54	53	53	52	52	52	51	51	50	50	49	49	48	48	48
40	59	59	58	58	57	57	56	56	55	54	54	54	54	53	53	52	52	51	51	51	50	50	49	49	48
41	60	59	59	58	58	57	57	56	56	56	55	55	54	54	53	53	52	52	52	51	51	50	50	50	49
42	60	60	59	59	58	58	57	57	57	56	56	55	54	54	54	53	53	53	52	52	51	51	51	50	50
43	61	60	60	59	59	58	58	58	57	57	56	56	55	55	55	54	54	53	53	52	52	52	51	51	50
44	61	61	60	60	59	59	58	58	58	57	57	56	56	56	55	55	54	54	53	53	53	52	52	51	51

Table 2

RELATIVE HUMIDITY (%), CENTIGRADE TEMPERATURES

(Pressure, 29.24 inches)

Depression of wet bulb thermometer

Air temp	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9	11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.9	12.0	12.1	12.2	12.3	12.4	12.5
13	6	6	5																						
14	9	8	8	7	6	6	5																		
15	12	11	11	10	9	8	8	7	6	6	5														
16	15	14	13	13	12	11	10	10	9	8	8	7	6	6	5										
17	17	16	16	15	14	14	13	12	12	11	10	10	9	8	8	7	6	6	5						
18	19	19	18	17	17	16	15	15	14	14	13	12	12	11	10	10	9	8	8	7	7	6	5	5	
19	22	21	20	20	19	18	18	17	17	16	15	15	14	13	13	12	12	11	10	10	9	9	8	7	7
20	24	23	22	22	21	21	20	19	19	18	18	17	16	16	15	15	14	13	13	12	12	11	10	10	9
21	26	25	24	24	23	23	22	22	21	20	20	19	19	18	17	17	16	16	15	14	14	13	13	12	12
22	28	27	26	26	25	25	24	23	23	22	22	21	20	20	19	19	18	18	17	17	16	15	15	14	14
23	29	29	28	27	27	26	26	25	25	24	24	23	22	22	21	21	20	20	19	19	18	17	17	16	16
24	31	30	30	29	29	28	27	27	26	26	25	25	24	24	23	23	22	21	21	20	20	19	19	18	18
25	32	32	31	31	30	30	29	29	28	28	27	26	26	25	25	24	24	23	23	22	22	21	21	20	20
26	34	33	33	32	32	31	31	30	30	29	28	28	27	27	26	26	25	25	24	24	23	23	22	22	21
27	35	35	34	34	33	33	32	32	31	31	30	30	29	29	28	28	27	27	26	26	25	25	24	24	23
28	36	36	35	35	34	34	33	33	32	32	31	31	30	30	29	29	28	28	27	27	27	26	26	25	25
29	38	37	37	36	36	35	35	34	34	33	33	32	32	31	31	30	30	29	29	28	28	28	27	27	26
30	39	38	38	37	37	36	36	35	35	35	34	34	33	33	32	32	31	31	30	30	29	29	28	28	28
31	40	40	39	39	38	38	37	37	36	36	35	35	34	34	33	33	32	32	32	31	31	30	30	29	29
32	41	41	40	40	39	39	38	38	37	37	36	36	36	35	35	34	34	33	33	32	32	31	31	31	30
33	42	42	41	41	40	40	39	39	38	38	37	37	36	36	36	35	35	34	34	33	33	32	32	32	31
34	43	43	42	42	41	41	40	40	39	39	39	38	38	37	37	36	36	35	35	35	34	34	33	33	32
35	44	44	43	43	42	42	41	41	40	40	40	39	39	38	38	37	37	37	36	36	35	35	34	34	34
36	45	44	44	44	43	43	42	42	41	41	40	40	40	39	39	38	38	38	37	37	36	36	35	35	35
37	46	45	45	44	44	44	43	43	42	42	41	41	41	40	40	39	39	38	38	38	37	37	36	36	36
38	46	46	46	45	45	44	44	44	43	43	42	42	41	41	41	40	40	39	39	39	38	38	37	37	37
39	47	47	46	46	46	45	45	44	44	43	43	43	42	42	42	41	41	40	40	39	39	39	38	38	38
40	48	48	47	47	46	46	46	45	45	44	44	44	43	43	42	42	42	41	40	40	40	40	39	39	38
41	49	48	48	47	47	47	46	46	45	45	45	44	44	43	44	43	42	42	41	41	41	40	40	40	39
42	49	49	48	48	48	47	47	46	46	46	45	45	45	44	44	43	43	43	42	42	42	41	41	40	40
43	50	50	49	49	48	48	48	47	47	46	46	46	45	45	44	44	44	43	43	43	42	42	42	41	41
44	51	50	50	49	49	49	48	48	47	47	47	46	46	46	45	45	44	44	44	43	43	43	42	42	42

Air temp	12.6	12.7	12.8	12.9	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9	14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	15.0
13																									
14																									
15																									
16																									
17																									
18																									
19	6	6	5																						
20	9	8	7	7	6	6	5	5																	
21	11	10	10	9	9	8	8	7	7	6	5	5													
22	13	13	12	12	11	10	10	9	9	8	8	7	7	6	6	5	5								
23	15	15	14	14	13	13	12	12	11	11	10	10	9	9	8	8	7	7	6	6	5	5			
24	17	17	16	16	15	15	14	14	13	13	12	12	11	11	10	10	9	9	8	8	7	7	6	6	5
25	19	19	18	18	17	17	16	16	15	15	14	14	13	13	12	12	11	11	10	10	9	9	9	8	8
26	21	20	20	19	19	19	18	18	17	17	16	16	15	15	14	14	13	13	12	12	11	11	11	10	10
27	23	22	22	21	21	20	20	19	19	18	18	17	17	17	16	16	15	15	14	14	13	13	12	12	12
28	24	24	23	23	22	22	21	21	20	20	20	19	19	18	18	17	17	16	16	16	15	15	14	14	13
29	26	25	25	24	24	23	23	22	22	22	21	21	20	20	19	19	19	18	18	17	17	16	16	16	15
30	27	27	26	26	25	25	24	24	24	23	23	22	22	21	21	21	20	20	19	19	18	18	18	17	17
31	28	28	28	27	27	26	26	25	25	25	24	24	23	23	22	22	22	21	21	20	20	20	19	19	18
32	30	29	29	28	28	28	27	27	26	26	25	25	25	24	24	23	23	23	22	22	21	21	21	20	20
33	31	30	30	30	29	29	28	28	28	27	27	26	26	26	25	25	24	24	24	23	23	22	22	22	21
34	32	32	31	31	30	30	30	29	29	28	28	28	27	27	26	26	26	25	25	24	24	24	23	23	23
35	33	33	32	32	32	31	31	30	30	30	29	29	28	28	28	27	27	26	26	26	25	25	25	24	24
36	34	34	33	33	33	32	32	31	31	31	30	30	29	29	29	28	28	28	27	27	26	26	26	25	25
37	35	35	34	34	34	33	33	33	32	32	31	31	31	30	30	30	29	29	28	28	28	27	27	27	26
38	36	36	35	35	35	34	34	33	33	43	32	32	31	31	31	31	30	30	29	29	29	28	28	28	27
39	37	37	36	36	36	35	35	34	34	34	33	33	33	32	32	32	31	31	30	30	30	29	29	29	28
40	38	38	37	37	36	36	36	35	35	35	34	34	34	33	33	32	32	32	31	31	31	30	30	30	29
41	39	39	38	38	37	37	37	36	36	36	35	35	35	34	34	33	33	33	32	32	32	31	31	31	30
42	40	39	39	39	38	38	37	37	37	36	36	36	35	35	35	34	34	34	33	33	33	32	32	32	31
43	40	40	40	39	39	39	38	38	38	37	37	37	36	36	35	35	35	34	34	34	33	33	33	32	32
44	41	41	40	40	40	39	39	39	38	38	38	37	37	37	36	36	36	35	35	35	34	34	34	33	33

Table 2

RELATIVE HUMIDITY (%), CENTIGRADE TEMPERATURES

(Pressure, 29.24 inches)

Depression of wet bulb thermometer

Air temp	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9	11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.9	12.0	12.1	12.2	12.3	12.4	12.5
13	6	6	5																						
14	9	8	8	7	6	6	5																		
15	12	11	11	10	9	8	8	7	6	6	5														
16	15	14	13	13	12	11	10	10	9	8	8	7	6	6	5										
17	17	16	16	15	14	14	13	12	12	11	10	10	9	8	8	7	6	6	5						
18	19	19	18	17	17	16	15	15	14	14	13	12	12	11	10	10	9	8	8	7	7	6	5	5	
19	22	21	20	20	19	18	18	17	17	16	15	15	14	13	13	12	12	11	10	10	9	9	8	7	7
20	24	23	22	22	21	21	20	19	19	18	18	17	16	16	15	15	14	13	13	12	12	11	10	10	9
21	26	25	24	24	23	23	22	22	21	20	20	19	19	18	17	17	16	16	15	14	14	13	13	12	12
22	28	27	26	26	25	25	24	23	23	22	22	21	20	20	19	19	18	18	17	17	16	15	15	14	14
23	29	29	28	27	27	26	26	25	25	24	24	23	22	22	21	21	20	20	19	19	18	17	17	16	16
24	31	30	30	29	29	28	27	27	26	26	25	25	24	24	23	23	22	21	21	20	20	19	19	18	18
25	32	32	31	31	30	30	29	29	28	28	27	26	26	25	25	24	24	23	23	22	22	21	21	20	20
26	34	33	33	32	32	31	31	30	30	29	28	28	27	27	26	26	25	25	24	24	23	23	22	22	21
27	35	35	34	34	33	33	32	32	31	31	30	30	29	29	28	28	27	27	26	26	25	25	24	24	23
28	36	36	35	35	34	34	33	33	32	32	31	31	30	30	29	29	28	28	27	27	27	26	26	25	25
29	38	37	37	36	36	35	35	34	34	33	33	32	32	31	31	30	30	29	29	28	28	28	27	27	26
30	39	38	38	37	37	36	36	35	35	35	34	34	33	33	32	32	31	31	30	30	29	29	28	28	28
31	40	40	39	39	38	38	37	37	36	36	35	35	34	34	33	33	32	32	32	31	31	30	30	29	29
32	41	41	40	40	39	39	38	38	37	37	36	36	36	35	35	34	34	33	33	32	32	31	31	31	30
33	42	42	41	41	40	40	39	39	38	38	37	37	36	36	36	35	35	34	34	33	33	32	32	32	31
34	43	43	42	42	41	41	40	40	39	39	39	38	38	37	37	36	36	35	35	35	34	34	33	33	32
35	44	44	43	43	42	42	41	41	40	40	40	39	39	38	38	37	37	37	36	36	35	35	34	34	34
36	45	44	44	44	43	43	42	42	41	41	40	40	40	39	39	38	38	38	37	37	36	36	35	35	35
37	46	45	45	44	44	44	43	43	42	42	41	41	41	40	40	39	39	38	38	38	37	37	36	36	36
38	46	46	46	45	45	44	44	44	43	43	42	42	41	41	41	40	40	39	39	39	38	38	37	37	37
39	47	47	46	46	46	45	45	44	44	43	43	43	42	42	42	41	41	40	40	39	39	39	38	38	38
40	48	48	47	47	46	46	46	45	45	44	44	44	43	43	42	42	42	41	40	40	40	40	39	39	38
41	49	48	48	47	47	47	46	46	45	45	45	44	44	43	44	43	42	42	41	41	41	40	40	40	39
42	49	49	48	48	48	47	47	46	46	46	45	45	45	44	44	43	43	43	42	42	42	41	41	40	40
43	50	50	49	49	48	48	48	47	47	46	46	46	45	45	44	44	44	43	43	43	42	42	42	41	41
44	51	50	50	49	49	49	48	48	47	47	47	46	46	46	45	45	44	44	44	43	43	43	42	42	42

Air temp	12.6	12.7	12.8	12.9	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9	14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	15.0
13																									
14																									
15																									
16																									
17																									
18																									
19	6	6	5																						
20	9	8	7	7	6	6	5	5																	
21	11	10	10	9	9	8	8	7	7	6	5	5													
22	13	13	12	12	11	10	10	9	9	8	8	7	7	6	6	5	5								
23	15	15	14	14	13	13	12	12	11	11	10	10	9	9	8	8	7	7	6	6	5	5			
24	17	17	16	16	15	15	14	14	13	13	12	12	11	11	10	10	9	9	8	8	7	7	6	6	5
25	19	19	18	18	17	17	16	16	15	15	14	14	13	13	12	12	11	11	10	10	9	9	9	8	8
26	21	20	20	19	19	19	18	18	17	17	16	16	15	15	14	14	13	13	12	12	11	11	11	10	10
27	23	22	22	21	21	20	20	19	19	18	18	17	17	17	16	16	15	15	14	14	13	13	12	12	12
28	24	24	23	23	22	22	21	21	20	20	20	19	19	18	18	17	17	16	16	16	15	15	14	14	13
29	26	25	25	24	24	23	23	22	22	22	21	21	20	20	19	19	19	18	18	17	17	16	16	16	15
30	27	27	26	26	25	25	24	24	24	23	23	22	22	21	21	21	20	20	19	19	18	18	18	17	17
31	28	28	28	27	27	26	26	25	25	25	24	24	23	23	22	22	22	21	21	20	20	20	19	19	18
32	30	29	29	28	28	28	27	27	26	26	25	25	25	24	24	23	23	23	22	22	21	21	21	20	20
33	31	30	30	30	29	29	28	28	28	27	27	26	26	26	25	25	24	24	24	23	23	22	22	22	21
34	32	32	31	31	30	30	30	29	29	28	28	28	27	27	26	26	26	25	25	24	24	24	23	23	23
35	33	33	32	32	32	31	31	30	30	30	29	29	28	28	28	27	27	26	26	26	25	25	25	24	24
36	34	34	33	33	33	32	32	31	31	31	30	30	29	29	29	28	28	28	27	27	26	26	26	25	25
37	35	35	34	34	34	33	33	33	32	32	31	31	31	30	30	30	29	29	28	28	28	27	27	27	26
38	36	36	35	35	35	34	34	33	33	43	32	32	31	31	31	31	30	30	29	29	29	28	28	28	27
39	37	37	36	36	36	35	35	34	34	34	33	33	33	32	32	32	31	31	30	30	30	29	29	29	28
40	38	38	37	37	36	36	35	35	35	35	34	34	34	33	33	32	32	32	31	31	31	30	30	30	29
41	39	39	38	38	37	37	37	36	36	36	35	35	35	34	34	33	33	33	32	32	32	31	31	31	30
42	40	39	39	39	38	38	37	37	37	36	36	36	35	35	35	34	34	34	33	33	33	32	32	32	31
43	40	40	40	39	39	39	38	38	38	37	37	37	36	36	35	35	35	34	34	34	33	33	33	32	32
44	41	41	40	40	40	39	39	39	38	38	38	37	37	37	36	36	36	35	35	35	34	34	34	33	33

Table 2

RELATIVE HUMIDITY (%), CENTIGRADE TEMPERATURES

(Pressure, 29.24 inches)

Depression of wet bulb thermometer

Air temp.	15 1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9	16.0	16.1	16.2	16.3	16.4	16.5	16.6	16.7	16.8	16.9	17.0	17.1	17.2	17.3	17.4	17.5
24	5																								
25	7	7	6	6	5	5																			
26	9	9	8	8	7	7	7	6	6	5	5														
27	11	11	10	10	9	9	9	8	8	7	7	6	6	6	5	5									
28	13	13	12	12	11	11	10	10	10	9	9	8	8	8	7	7	6	6	6	5	5				
29	15	14	14	13	13	13	12	12	11	11	11	10	10	9	9	9	8	8	7	7	7	6	6	5	5
30	16	16	16	15	15	14	14	14	13	13	12	12	12	11	11	10	10	10	9	9	9	8	8	7	7
31	18	18	17	17	16	16	16	15	15	14	14	14	13	13	12	12	12	11	11	11	10	10	9	9	9
32	19	19	19	18	18	17	17	17	16	16	15	15	15	14	14	14	13	13	13	12	12	11	11	11	10
33	21	20	20	20	19	19	19	18	18	17	17	17	16	16	16	15	15	15	14	14	13	13	13	12	12
34	22	22	21	21	21	20	20	20	19	19	18	18	18	17	17	17	16	16	16	15	15	14	14	14	13
35	23	23	23	22	22	22	21	21	21	20	20	19	19	19	18	18	18	17	17	17	16	16	16	15	15
36	25	24	24	23	23	23	22	22	22	21	21	21	20	20	20	19	19	19	18	18	18	17	17	17	16
37	26	25	25	25	24	24	24	23	23	23	22	22	22	21	21	21	20	20	20	19	19	19	18	18	18
38	27	27	26	26	26	25	25	24	24	24	23	23	23	22	22	22	21	21	21	20	20	20	19	19	19
39	28	28	27	27	27	26	26	26	25	25	25	24	24	24	23	23	23	22	22	22	21	21	21	20	20
40	29	29	28	28	28	27	27	27	26	26	26	25	25	25	24	24	24	23	23	23	22	22	22	21	21
41	30	30	29	29	29	28	28	28	27	27	27	26	26	25	25	25	25	24	24	24	23	23	23	23	22
42	31	31	30	30	30	29	29	29	28	28	28	27	27	27	26	26	26	25	25	25	24	24	24	24	23
43	32	31	31	31	30	30	30	29	29	29	28	28	28	28	27	27	27	26	26	26	25	25	25	24	24
44	33	32	32	32	31	31	31	30	30	30	29	29	29	28	28	28	28	27	27	27	26	26	26	25	25

Air temp.	17.6	17.7	17.8	17.9	18.0	18.1	18.2	18.3	18.4	18.5	18.6	18.7	18.8	18.9	19.0	19.1	19.2	19.3	19.4	19.5	19.6	19.7	19.8	19.9	20.0
24																									
25																									
26																									
27																									
28																									
29	5																								
30	7	6	6	5	5	5																			
31	8	8	8	7	7	7	6	6	5	5	5														
32	10	10	9	9	9	8	8	8	7	7	7	6	6	6	5	5	5								
33	12	11	11	11	10	10	10	9	9	9	8	8	7	7	7	6	6	6	5	5	5				
34	13	13	12	12	12	11	11	11	10	10	10	9	9	9	8	8	8	7	7	7	6	6	6	6	5
35	15	14	14	14	13	13	13	12	12	12	11	11	11	10	10	10	9	9	9	8	8	8	7	7	7
36	16	16	15	15	15	14	14	14	13	13	13	12	12	12	11	11	11	10	10	10	10	9	9	9	8
37	17	17	17	16	16	16	15	15	15	14	14	14	13	13	13	12	12	12	12	11	11	11	10	10	10
38	18	18	18	18	17	17	17	16	16	16	15	15	15	14	14	14	14	13	13	13	12	12	12	11	11
39	20	19	19	19	18	18	18	17	17	17	17	16	16	16	15	15	15	14	14	14	14	13	13	13	12
40	21	20	20	20	20	19	19	19	18	18	18	17	17	17	16	16	16	16	15	15	15	14	14	14	14
41	22	22	21	21	21	20	20	20	19	19	19	18	18	18	17	17	17	17	16	16	16	16	15	15	15
42	23	23	22	22	22	21	21	21	21	20	20	20	19	19	19	19	18	18	18	17	17	17	17	16	16
43	24	24	23	23	23	22	22	22	22	21	21	21	20	20	20	20	19	19	19	18	18	18	18	17	17
44	25	24	24	24	24	23	23	23	22	22	22	22	21	21	21	21	20	20	20	19	19	19	19	18	16

Depression of wet bulb thermometer

Air temp.	20.1	20.2	20.3	20.4	20.5	20.6	20.7	20.8	20.9	21.0	21.1	21.2	21.3	21.4	21.5	21.6	21.7	21.8	21.9	22.0	22.1	22.2	22.3	22.4	22.5
34	5	5																							
35	6	6	6	6	5	5	5																		
36	8	8	7	7	7	6	6	6	6	5	5	5													
37	9	9	9	9	8	8	8	7	7	7	7	6	6	6	5	5	5	5							
38	11	11	10	10	10	9	9	9	9	8	8	8	8	7	7	7	6	6	6	5	5	5	5		
39	12	12	12	11	11	11	10	10	10	10	9	9	9	8	8	8	8	7	7	7	7	6	6	6	6
40	13	13	13	12	12	12	12	11	11	11	11	10	10	10	10	9	9	9	8	8	8	8	7	7	7
41	15	14	14	14	13	13	13	13	12	12	12	12	11	11	11	10	10	10	10	9	9	9	9	8	8
42	16	15	15	15	15	14	14	14	14	13	13	13	13	12	12	12	11	11	11	11	10	10	10	10	9
43	17	16	16	16	16	15	15	15	15	14	14	14	14	13	13	13	13	12	12	12	11	11	11	11	11
44	18	18	17	17	17	17	16	16	16	16	15	15	15	15	14	14	14	13	13	13	13	12	12	12	12

Air temp.	22.6	22.7	22.8	22.9	23.0	23 1	23.2	23.3	23.4	23.5	23.6	23.7	23.8	23.9	24.0	24.1	24.2	24.3	24.4	24.5	24.6	24.7	24.8	24.9	25.0
34																									
35																									
36																									
37																									
38																									
39	5	5	5																						
40	7	6	6	6	6	5	5	5	5																
41	8	8	7	7	7	7	6	6	6	6	5	5	5	5											
42	9	9	9	8	8	8	8	7	7	7	7	6	6	6	6	5	5	5	5	5					
43	10	10	10	10	9	9	9	9	8	8	8	8	7	7	7	7	7	6	6	6	6	5	5	5	5
44	11	11	11	11	10	10	10	10	10	9	9	9	9	8	8	8	8	7	7	7	7	7	6	6	6

Table 2

RELATIVE HUMIDITY (%), CENTIGRADE TEMPERATURES

(pressure, 29.24 inches)

Depression of wet bulb thermometer

Air temp.	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5
-39	56	11																							
-38	60	21																							
-37	64	28																							
-36	68	36																							
-35	71	42	13																						
-34	74	48	22																						
-33	77	53	30	6																					
-32	79	57	36	15																					
-31	81	62	42	23																					
-30	83	65	48	30	13																				
-29	84	68	53	37	21	5																			
-28	86	71	57	43	28	14																			
-27	87	74	61	48	35	22	9																		
-26	88	75	64	52	40	29	17	5																	
-25	89	78	67	57	46	35	24	13																	
-24	90	80	70	60	50	40	31	21	11																
-23	91	82	73	64	55	46	37	28	18	9															
-22	92	83	75	67	58	50	42	34	25	17	9														
-21	92	85	77	69	62	54	47	39	31	24	16	9													
-20	93	86	79	72	65	58	51	44	37	30	23	16	9												
-19	94	87	81	74	68	61	55	48	42	35	29	23	16	10											
-18	94	88	82	76	70	64	58	52	46	40	34	29	23	17	11	5									
-17	94	89	83	78	72	67	61	56	50	45	40	34	29	23	18	12	7								
-16	95	90	85	80	75	69	64	59	54	49	44	39	34	29	24	19	14	9							
-15	95	91	86	81	76	72	67	62	58	53	48	44	39	34	30	25	21	16	11	7					
-14	96	91	87	82	78	74	69	65	61	56	52	48	43	39	35	30	26	22	18	13	9	5			
-13	96	92	88	84	80	76	72	67	63	59	55	51	47	43	39	35	31	27	23	20	16	12	8		
-12	96	92	89	85	81	77	73	70	66	62	58	55	51	47	44	40	36	32	29	25	21	18	14	11	7
-11	96	93	89	86	82	79	75	72	68	65	61	58	54	51	47	44	40	37	34	30	27	23	20	17	13
-10	97	93	90	87	84	80	77	74	70	67	64	61	57	54	51	48	44	41	38	35	32	28	25	22	19
-9	97	94	91	88	84	81	78	75	72	69	66	63	60	57	54	51	48	45	42	39	36	33	30	27	24
-8	97	94	91	88	85	83	80	77	74	71	68	65	62	60	57	54	51	48	45	43	40	37	34	32	29
-7	97	95	92	89	86	84	81	78	75	73	70	67	65	62	59	57	54	52	49	46	44	41	38	36	33
-6	97	95	92	90	87	85	82	79	77	74	72	69	67	64	62	59	57	54	52	49	47	45	42	40	37
-5	98	95	93	90	88	86	83	81	78	76	74	71	69	66	64	62	59	57	55	52	50	48	45	43	41
-4	98	95	93	91	89	86	84	82	79	77	75	73	71	68	66	64	62	59	57	55	53	51	49	46	44
-3	98	96	93	91	89	87	85	82	80	78	76	74	72	70	68	66	64	62	59	57	55	53	51	49	47
-2	98	96	94	92	90	88	86	84	81	79	77	75	73	71	70	68	66	64	62	60	58	56	54	52	50
-1	98	96	94	92	90	88	86	84	83	81	79	77	75	73	71	69	68	66	64	62	60	58	56	54	53
0	98	96	94	93	91	89	87	85	83	81	80	78	76	74	73	71	69	67	66	64	62	60	59	57	55

Air temp.	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0
-11	10	6																							
-10	16	13	9	6																					
-9	21	18	15	12	9	6																			
-8	26	23	20	18	15	12	10	7																	
-7	31	28	25	22	20	18	15	13	10	8	5														
-6	35	32	30	27	25	23	20	18	15	13	11	8	6												
-5	39	36	34	32	29	27	25	23	20	18	16	14	11	9	7	5									
-4	42	40	38	36	33	31	29	27	25	23	21	19	17	14	12	10	8	6							
-3	45	43	41	39	37	35	33	31	29	27	25	23	21	19	17	15	13	11	10	8	6				
-2	48	46	44	42	40	39	37	35	33	31	29	27	25	23	22	20	18	16	14	12	11	9	7	5	
-1	51	49	47	45	43	42	40	38	36	34	33	31	29	27	26	24	22	20	19	17	15	14	12	10	8
0	53	52	50	48	46	45	43	41	40	38	36	34	33	31	29	28	26	24	23	21	20	18	16	15	13

Table 3

Distances from a surface of given pressure to a standard isobaric surface, where the mean virtual temperature between the surfaces is 0°C.; the distances being expressed in terms of the unit: 0 98 dynamic meter, thus giving them approximately in geometric meters.

	Pressure (millibars)	0	1	2	3	4	5	6	7	8	9	
800												800
	800	0	10	20	30	40	50	60	70	80	89	
Distance	810	99	109	119	129	139	149	158	168	178	188	
of the	820	197	207	217	227	236	246	256	265	275	285	
800-mb	830	294	304	314	323	333	342	352	362	371	381	
surface	840	390	400	409	419	428	438	447	456	466	475	
above a	850	485	494	504	513	522	532	541	550	560	569	
surface	860	578	588	597	606	615	625	634	643	652	662	
of given	870	671	680	689	698	707	717	726	735	744	753	
pressure	880	762	771	780	789	798	807	816	825	834	843	
	890	852	861	870	879	888	897	906	915	924	933	
900												900
	900	0	9	18	27	35	44	53	62	71	80	
Distance	910	88	97	106	115	123	132	141	150	158	167	
of the	920	176	184	193	202	210	219	228	236	245	254	
900-mb	930	262	271	279	288	297	305	314	322	331	339	
surface	940	348	356	365	373	382	390	399	407	415	424	
above a	950	432	441	449	458	466	474	483	491	499	508	
surface	960	516	524	533	541	549	558	566	574	582	591	
of given	970	599	607	615	624	632	640	648	656	665	673	
pressure	980	681	689	697	705	714	722	730	738	746	754	
	990	762	770	778	786	794	802	810	818	826	834	
1000												1000
	1000	0	8	16	24	32	40	48	56	64	72	
Distance	1010	80	87	95	103	111	119	127	135	143	150	
of the	1020	158	166	174	182	190	197	205	213	221	229	
000-mb	1030	236	244	252	260	267	275	283	291	298	306	
surface	1040	314	321	329	337	344	352	360	367	375	383	
above a	1050	390	398	405	413	421	428	436	443	451	458	
surface	1060	466	473	481	489	496	504	511	519	526	534	
of given	1070	541	548	556	563	571	578	586	593	601	608	
pressure	1080	615	623	630	638	645	652	660	667	674	682	
	1090	689	696	704	711	718	726	733	740	748	755	

Table 4

Distances between standard isobaric surfaces, expressed in terms of the unit:* 0.98 dynamic meter, thus giving distances approximately in geometric meters.

Standard isobaric surface mb.	t' °C.	0	1	2	3	4	5	6	7	8	9	
400												400
	-70	1326	1319	1313	1306	1300	1293	1287	1280	1274	1267	
	-60	1391	1385	1378	1372	1365	1359	1352	1346	1339	1332	
	-50	1457	1450	1444	1437	1431	1424	1418	1411	1404	1398	
	-40	1522	1516	1509	1503	1496	1490	1483	1477	1470	1463	
	-30	1588	1581	1575	1568	1562	1555	1549	1542	1535	1529	
	-20	1653	1647	1640	1634	1627	1621	1614	1607	1601	1594	
	-10	1719	1712	1706	1699	1693	1686	1680	1673	1666	1660	
	- 0	1784	1778	1771	1765	1758	1752	1745	1738	1732	1725	
	+ 0	1784	1791	1797	1804	1811	1817	1824	1830	1837	1843	
500												500
	-60	1137	1132	1126	1121	1115	1110	1105	1099	1094	1089	
	-50	1190	1185	1180	1174	1169	1164	1158	1153	1148	1142	
	-40	1244	1239	1233	1228	1222	1217	1212	1206	1201	1196	
	-30	1297	1292	1287	1281	1276	1271	1265	1260	1255	1249	
	-20	1351	1346	1340	1335	1329	1324	1319	1313	1308	1303	
	-10	1404	1399	1394	1388	1383	1378	1372	1367	1362	1356	
	- 0	1458	1453	1447	1442	1436	1431	1426	1420	1415	1410	
	+ 0	1458	1463	1469	1474	1479	1485	1490	1495	1501	1506	
	+10	1511	1517	1522	1527	1533	1538	1543	1549	1554	1560	
600												600
	-50	1006	1002	997	993	988	984	979	975	970	966	
	-40	1052	1047	1043	1038	1034	1029	1025	1020	1015	1011	
	-30	1097	1092	1088	1083	1079	1074	1070	1065	1061	1056	
	-20	1142	1138	1133	1129	1124	1120	1115	1110	1106	1101	
	-10	1187	1183	1178	1174	1169	1165	1160	1156	1151	1147	
	- 0	1233	1228	1224	1219	1215	1210	1205	1201	1196	1192	
	+ 0	1233	1237	1242	1246	1251	1255	1260	1264	1269	1273	
	+10	1278	1282	1287	1291	1296	1300	1305	1310	1314	1319	
	+20	1323	1328	1332	1337	1341	1346	1350	1355	1359	1364	
700												700
	-40	911	907	903	899	895	891	887	884	880	876	
	-30	950	946	942	938	935	931	927	923	919	915	
	-20	989	985	982	978	974	970	966	962	958	954	
	-10	1029	1025	1021	1017	1013	1009	1005	1001	997	993	
	- 0	1068	1064	1060	1056	1052	1048	1044	1040	1036	1032	
	+ 0	1068	1072	1076	1080	1083	1087	1091	1095	1099	1103	
	+10	1107	1111	1115	1119	1123	1127	1130	1134	1138	1142	
	+20	1146	1150	1154	1158	1162	1166	1170	1174	1177	1181	
800												800
	-40	804	800	797	793	790	786	783	779	776	772	
	-30	838	835	831	828	824	821	817	814	810	807	
	-20	873	869	866	862	859	855	852	849	845	842	
	-10	907	904	900	897	893	890	887	883	880	876	
	- 0	942	938	935	931	928	925	921	918	914	911	
	+ 0	942	945	949	952	956	959	963	966	969	973	
	+10	976	980	983	987	990	994	997	1001	1004	1008	
	+20	1011	1014	1018	1021	1025	1028	1032	1035	1039	1042	
	+30	1046	1049	1052	1056	1059	1063	1066	1070	1073	1077	
900												900
	-40	719	716	713	710	706	703	700	697	694	691	
	-30	750	747	744	740	737	734	731	728	725	722	
	-20	781	778	774	771	768	765	762	759	756	753	
	-10	812	808	805	802	799	796	793	790	787	784	
	- 0	842	839	836	833	830	827	824	821	818	815	
	+ 0	842	846	849	852	855	858	861	864	867	870	
	+10	873	876	880	883	886	889	892	895	898	901	
	+20	904	907	910	914	917	920	923	926	929	932	
	+30	935	938	941	945	948	951	954	957	960	963	
	+40	966	969	972	975	979	982	985	988	991	994	
1000												1000

*Distances expressed in terms of this unit may be converted to distances in terms of dynamic meters by multiplying the former by the factor 0.98, i.e. by subtracting 2% thereof.
t' = mean virtual temperature of stratum between standard isobaric surfaces.

Table 4

Distances between standard isobaric surfaces, expressed in terms of the unit:*
0.98 dynamic meter, thus giving distances approximately in geometric meters.

Standard isobaric surface mb.	t' °C.	0	1	2	3	4	5	6	7	8	9	
100												100
	-80	1260	1254	1247	1241	1234	1228	1221	1215	1208	1201	
	-70	1326	1319	1313	1306	1300	1293	1287	1280	1274	1267	
	-60	1391	1385	1378	1372	1365	1359	1352	1346	1339	1332	
	-50	1457	1450	1444	1437	1431	1424	1418	1411	1404	1398	
	-40	1522	1516	1509	1503	1496	1490	1483	1477	1470	1463	
	-30	1588	1581	1575	1568	1562	1555	1549	1542	1535	1529	
125												125
	-80	1030	1024	1019	1014	1008	1003	998	992	987	982	
	-70	1083	1078	1073	1067	1062	1057	1051	1046	1041	1035	
	-60	1137	1132	1126	1121	1115	1110	1105	1099	1094	1089	
	-50	1190	1185	1180	1174	1169	1164	1158	1153	1148	1142	
	-40	1244	1239	1233	1228	1222	1217	1212	1206	1201	1196	
	-30	1297	1292	1287	1281	1276	1271	1265	1260	1255	1249	
150												150
	-80	871	866	862	857	853	848	844	839	835	830	
	-70	916	911	907	902	898	893	889	884	880	875	
	-60	961	957	952	948	943	939	934	930	925	920	
	-50	1006	1002	997	993	988	984	979	975	970	966	
	-40	1052	1047	1043	1038	1034	1029	1025	1020	1015	1011	
	-30	1097	1092	1088	1083	1079	1074	1070	1065	1061	1056	
175												175
	-80	754	750	746	743	739	735	731	727	723	719	
	-70	793	790	786	782	778	774	770	766	762	758	
	-60	833	829	825	821	817	813	809	805	801	797	
	-50	872	868	864	860	856	852	848	844	840	837	
	-40	911	907	903	899	895	891	887	884	880	876	
	-30	950	946	942	938	935	931	927	923	919	915	
200												200
	-80	1260	1254	1247	1241	1234	1228	1221	1215	1208	1201	
	-70	1326	1319	1313	1306	1300	1293	1287	1280	1274	1267	
	-60	1391	1385	1378	1372	1365	1359	1352	1346	1339	1332	
	-50	1457	1450	1444	1437	1431	1424	1418	1411	1404	1398	
	-40	1522	1516	1509	1503	1496	1490	1483	1477	1470	1463	
	-30	1588	1581	1575	1568	1562	1555	1549	1542	1535	1529	
250												250
	-80	1030	1024	1019	1014	1008	1003	998	992	987	982	
	-70	1083	1078	1073	1067	1062	1057	1051	1046	1041	1035	
	-60	1137	1132	1126	1121	1115	1110	1105	1099	1094	1089	
	-50	1190	1185	1180	1174	1169	1164	1158	1153	1148	1142	
	-40	1244	1239	1233	1228	1222	1217	1212	1206	1201	1196	
	-30	1297	1292	1287	1281	1276	1271	1265	1260	1255	1249	
	-20	1351	1346	1340	1335	1329	1324	1319	1313	1308	1303	
300												300
	-70	916	911	907	902	898	893	889	884	880	875	
	-60	961	957	952	948	943	939	934	930	925	920	
	-50	1006	1002	997	993	988	984	979	975	970	966	
	-40	1052	1047	1043	1038	1034	1029	1025	1020	1015	1011	
	-30	1097	1092	1088	1083	1079	1074	1070	1065	1061	1056	
	-20	1142	1138	1133	1129	1124	1120	1115	1110	1106	1101	
	-10	1187	1183	1178	1174	1169	1165	1160	1156	1151	1147	
350												350
	-60	833	829	825	821	817	813	809	805	801	797	
	-50	872	868	864	860	856	852	848	844	840	837	
	-40	911	907	903	899	895	891	887	884	880	876	
	-30	950	946	942	938	935	931	927	923	919	915	
	-20	989	985	982	978	974	970	966	962	958	954	
	-10	1029	1025	1021	1017	1013	1009	1005	1001	997	993	
	- 0	1068	1064	1060	1056	1052	1048	1044	1040	1036	1032	
400												400

*Distances expressed in terms of this unit may be converted to distances in terms of dynamic meters by multiplying the former by the factor 0.98, i.e. by subtracting 2% thereof.
t' = mean virtual temperature of stratum between standard isobaric surfaces.

Table 4

Distances between standard isobaric surfaces, expressed in terms of the unit:* 0.98 dynamic meter, thus giving distances approximately in geometric meters.

Standard isobaric surface mb.	t' °C.	0	1	2	3	4	5	6	7	8	9	
5												5
	-80	3915	3895	3875	3854	3834	3814	3793	3773	3753	3732	
	-70	4119	4098	4078	4058	4037	4017	3997	3976	3956	3936	
	-60	4322	4302	4281	4261	4241	4220	4200	4180	4159	4139	
	-50	4526	4505	4485	4464	4444	4424	4403	4383	4363	4342	
	-40	4729	4709	4688	4668	4648	4627	4607	4587	4566	4546	
	-30	4932	4912	4892	4871	4851	4831	4810	4790	4770	4749	
10												10
	-80	2290	2278	2266	2255	2243	2231	2219	2207	2195	2183	
	-70	2409	2397	2385	2374	2362	2350	2338	2326	2314	2302	
	-60	2528	2516	2504	2493	2481	2469	2457	2445	2433	2421	
	-50	2647	2635	2623	2612	2600	2588	2576	2564	2552	2540	
	-40	2766	2754	2742	2731	2719	2707	2695	2683	2671	2659	
	-30	2885	2873	2861	2850	2838	2826	2814	2802	2790	2778	
15												15
	-80	1625	1617	1608	1600	1591	1583	1574	1566	1557	1549	
	-70	1709	1701	1693	1684	1676	1667	1659	1650	1642	1633	
	-60	1794	1785	1777	1769	1760	1752	1743	1735	1726	1718	
	-50	1878	1870	1861	1853	1844	1836	1828	1819	1811	1802	
	-40	1963	1954	1946	1937	1929	1920	1912	1904	1895	1887	
	-30	2047	2039	2030	2022	2013	2005	1996	1988	1980	1971	
20												20
	-80	2290	2278	2266	2255	2243	2231	2219	2207	2195	2183	
	-70	2409	2397	2385	2374	2362	2350	2338	2326	2314	2302	
	-60	2528	2516	2504	2493	2481	2469	2457	2445	2433	2421	
	-50	2647	2635	2623	2612	2600	2588	2576	2564	2552	2540	
	-40	2766	2754	2742	2731	2719	2707	2695	2683	2671	2659	
	-30	2885	2873	2861	2850	2838	2826	2814	2802	2790	2778	
30												30
	-80	1625	1617	1608	1600	1591	1583	1574	1566	1557	1549	
	-70	1709	1701	1693	1684	1676	1667	1659	1650	1642	1633	
	-60	1794	1785	1777	1769	1760	1752	1743	1735	1726	1718	
	-50	1878	1870	1861	1853	1844	1836	1828	1819	1811	1802	
	-40	1963	1954	1946	1937	1929	1920	1912	1904	1895	1887	
	-30	2047	2039	2030	2022	2013	2005	1996	1988	1980	1971	
40												40
	-80	1260	1254	1247	1241	1234	1228	1221	1215	1208	1201	
	-70	1326	1319	1313	1306	1300	1293	1287	1280	1274	1267	
	-60	1391	1385	1378	1372	1365	1359	1352	1346	1339	1332	
	-50	1457	1450	1444	1437	1431	1424	1418	1411	1404	1398	
	-40	1522	1516	1509	1503	1496	1490	1483	1477	1470	1463	
	-30	1588	1581	1575	1568	1562	1555	1549	1542	1535	1529	
50												50
	-80	1030	1024	1019	1014	1008	1003	998	992	987	982	
	-70	1083	1078	1073	1067	1062	1057	1051	1046	1041	1035	
	-60	1137	1132	1126	1121	1115	1110	1105	1099	1094	1089	
	-50	1190	1185	1180	1174	1169	1164	1158	1153	1148	1142	
	-40	1244	1239	1233	1228	1222	1217	1212	1206	1201	1196	
	-30	1297	1292	1287	1281	1276	1271	1265	1260	1255	1249	
60												60
	-80	1625	1617	1608	1600	1591	1583	1574	1566	1557	1549	
	-70	1709	1701	1693	1684	1676	1667	1659	1650	1642	1633	
	-60	1794	1785	1777	1769	1760	1752	1743	1735	1726	1718	
	-50	1878	1870	1861	1853	1844	1836	1828	1819	1811	1802	
	-40	1963	1954	1946	1937	1929	1920	1912	1904	1895	1887	
	-30	2047	2039	2030	2022	2013	2005	1996	1988	1980	1971	
80												80
	-80	1260	1254	1247	1241	1234	1228	1221	1215	1208	1201	
	-70	1326	1319	1313	1306	1300	1293	1287	1280	1274	1267	
	-60	1391	1385	1378	1372	1365	1359	1352	1346	1339	1332	
	-50	1457	1450	1444	1437	1431	1424	1418	1411	1404	1398	
	-40	1522	1516	1509	1503	1496	1490	1483	1477	1470	1463	
	-30	1588	1581	1575	1568	1562	1555	1549	1542	1535	1529	
100												100

*Distances expressed in terms of this unit may be converted to distances in terms of dynamic meters by multiplying the former by the factor 0.98, i.e. by subtracting 2% thereof.

t' = mean virtual temperature of stratum between standard isobaric surfaces.

Table 5

Distances from a standard isobaric surface to a surface of given pressure, where the mean virtual temperature between the surfaces is 0° C.; the distances being expressed in terms of the unit:* 0.98 dynamic meter, thus giving them approximately in geometric meters.

	Pressure (millibars)	0	1	2	3	4	5	6	7	8	9	
	400	1784	1764	1744	1725	1705	1685	1665	1646	1626	1606	
	410	1587	1567	1548	1529	1509	1490	1471	1451	1432	1413	
Distances	420	1394	1375	1356	1337	1318	1300	1281	1262	1243	1225	
from the	430	1206	1187	1169	1150	1132	1114	1095	1077	1059	1040	
500-mb.	440	1022	1004	986	968	950	932	914	896	878	860	
surface	450	842	825	807	789	772	754	737	719	702	684	
	460	667	649	632	615	598	580	563	546	529	512	
	470	495	478	461	444	427	410	393	377	360	343	
	480	326	310	293	277	260	244	227	211	194	178	
	490	162	145	129	113	97	80	64	48	32	16	
500												500
	500	1458	1442	1426	1410	1394	1378	1362	1347	1331	1315	
	510	1300	1284	1268	1253	1237	1222	1206	1191	1175	1160	
	520	1144	1129	1114	1098	1083	1068	1053	1037	1022	1007	
Distances	530	992	977	962	947	932	917	902	887	872	857	
from the	540	842	828	813	798	783	769	754	739	725	710	
600-mb.	550	696	681	667	652	638	623	609	595	580	566	
surface	560	552	537	523	509	495	481	466	452	438	424	
	570	410	396	382	368	354	340	326	313	299	285	
	580	271	257	244	230	216	202	189	175	162	148	
	590	134	121	107	94	80	67	53	40	27	13	
600												600
	600	1233	1219	1206	1193	1179	1166	1153	1140	1127	1114	
	610	1100	1087	1074	1061	1048	1035	1022	1009	996	983	
	620	970	958	945	932	919	906	893	881	868	855	
Distances	630	842	830	817	804	792	779	767	754	742	729	
from the	640	717	704	692	679	667	654	642	630	617	605	
700-mb.	650	593	580	568	556	544	531	519	507	495	483	
surface	660	471	458	446	434	422	410	398	386	374	362	
	670	350	338	326	315	303	291	279	267	255	244	
	680	232	220	208	197	185	173	162	150	138	127	
	690	115	103	92	80	69	57	46	34	23	11	
700												700
	700	1068	1056	1045	1034	1022	1011	999	988	977	966	
	710	954	943	932	921	909	898	887	876	865	854	
	720	842	831	820	809	798	787	776	765	754	743	
Distances	730	732	721	710	699	688	678	667	656	645	634	
from the	740	623	613	602	591	580	570	559	548	537	527	
800-mb.	750	516	505	495	484	474	463	452	442	431	421	
surface	760	410	400	389	379	368	358	347	337	326	316	
	770	306	295	285	275	264	254	244	233	223	213	
	780	202	192	182	172	162	151	141	131	121	111	
	790	101	90	80	70	60	50	40	30	20	10	
800												800
	800	942	932	922	912	902	892	882	872	862	852	
	810	842	833	823	813	803	793	783	774	764	754	
	820	744	735	725	715	705	696	686	676	667	657	
Distances	830	647	638	628	619	609	599	590	580	571	561	
from the	840	552	542	533	523	514	504	495	485	476	466	
900-mb.	850	457	448	438	429	420	410	401	391	382	373	
surface	860	364	354	345	336	326	317	308	299	289	280	
	870	271	262	253	244	234	225	216	207	198	189	
	880	180	171	162	152	143	134	125	116	107	98	
	890	89	80	71	62	53	45	36	27	18	9	
900												900
	900	842	834	825	816	807	798	789	781	772	763	
	910	754	745	737	728	719	710	702	693	684	675	
	920	667	658	649	641	632	623	615	606	598	589	
Distances	930	580	572	563	555	546	537	529	520	512	503	
from the	940	495	486	478	469	461	452	444	435	427	419	
1000-mb.	950	410	402	393	385	377	368	360	351	343	335	
surface	960	326	318	310	301	293	285	277	268	260	252	
	970	244	235	227	219	211	202	194	186	178	170	
	980	162	153	145	137	129	121	113	105	97	88	
	990	80	72	64	56	48	40	32	24	16	8	
1000												1000
	1000	0	-8	-16	-24	-32	-40	-48	-56	-64	-72	
	1010	-80	-87	-95	-103	-111	-119	-127	-135	-143	-150	
	1020	-158	-166	-174	-182	-190	-197	-205	-213	-221	-229	
Distances	1030	-236	-244	-252	-260	-267	-275	-283	-291	-298	-306	
from the	1040	-314	-321	-329	-337	-344	-352	-360	-367	-375	-383	
1000-mb.	1050	-390	-398	-405	-413	-421	-428	-436	-443	-451	-458	
surface	1060	-466	-473	-481	-489	-496	-504	-511	-519	-526	-534	
	1070	-541	-548	-556	-563	-571	-578	-586	-593	-601	-608	
	1080	-615	-623	-630	-638	-645	-652	-660	-667	-674	-682	
	1090	-689	-696	-704	-711	-718	-726	-733	-740	-748	-755	

Table 5

Distances from a standard isobaric surface to a surface of given pressure, where the mean virtual temperature between the surfaces is 0° C.; the distances being expressed in terms of the unit:* 0.98 dynamic meter, thus giving them approximately in geometric meters.

Pressure (millibars)	0	1	2	3	4	5	6	7	8	9	
	Distances from the 10-mb. surface										
0						5543	4085	2852	1784	842	
10											10
	Distances from the 15-mb. surface										
10	3242	2480	1784	1144	552						
15											15
	Distances from the 20-mb. surface										
10						2300	1784	1300	842	410	
20											20
	Distances from the 30-mb. surface										
20	3242	2852	2480	2125	1784	1458	1144	842	552	271	
30											30
	Distances from the 40-mb. surface										
30	2300	2038	1784	1538	1300	1068	842	623	410	202	
40											40
	Distances from the 50-mb. surface										
40	1784	1587	1394	1206	1022	842	667	495	326	162	
50											50
	Distances from the 60-mb. surface										
50	1458	1300	1144	992	842	696	552	410	271	134	
60											60
	Distances from the 80-mb. surface										
60	2300	2168	2038	1910	1784	1660	1538	1418	1300	1183	
70	1068	954	842	732	623	516	410	306	202	101	
80											80
	Distances from the 100-mb. surface										
80	1784	1685	1587	1490	1394	1300	1206	1114	1022	932	
90	842	754	667	580	495	410	326	244	162	80	
100											100
	Distances from the 125-mb. surface										
100	1784	1705	1626	1548	1471	1394	1318	1243	1169	1095	
110	1022	950	878	807	737	667	598	529	461	393	
120	326	260	194	129	64						
125											125
	Distances from the 150-mb. surface										
120						1458	1394	1331	1268	1206	
130	1144	1083	1022	962	902	842	783	725	667	609	
140	552	495	438	382	326	271	216	162	107	53	
150											150
	Distances from the 175-mb. surface										
150	1233	1179	1127	1074	1022	970	919	868	817	767	
160	717	667	617	568	519	471	422	374	326	279	
170	232	185	138	92	46						
175											175
	Distances from the 200-mb. surface										
170						1068	1022	977	932	887	
180	842	798	754	710	667	623	580	537	495	452	
190	410	368	326	285	244	202	162	121	80	40	
200											200
Distances from the 250-mb. surface											
200	1784	1744	1705	1665	1626	1587	1548	1509	1471	1432	
210	1394	1356	1318	1281	1243	1206	1169	1132	1095	1059	
220	1022	986	950	914	878	842	807	772	737	702	
230	667	632	598	563	529	495	461	427	393	360	
240	326	293	260	227	194	162	129	97	64	32	
250											250
Distances from the 300-mb. surface											
250	1458	1426	1394	1362	1331	1300	1268	1237	1206	1175	
260	1144	1114	1083	1053	1022	992	962	932	902	872	
270	842	813	783	754	725	696	667	638	609	580	
280	552	523	495	466	438	410	382	354	326	299	
290	271	244	216	189	162	134	107	80	53	27	
300											300
Distances from the 350-mb. surface											
300	1233	1206	1179	1153	1127	1100	1074	1048	1022	996	
310	970	945	919	893	868	842	817	792	767	742	
320	717	692	667	642	617	593	568	544	519	495	
330	471	446	422	398	374	350	326	303	279	255	
340	232	208	185	162	138	115	92	69	46	23	
350											350
Distances from the 400-mb. surface											
350	1068	1045	1022	999	977	954	932	909	887	865	
360	842	820	798	776	754	732	710	688	667	645	
370	623	602	580	559	537	516	495	474	452	431	
380	410	389	368	347	326	306	285	264	244	223	
390	202	182	162	141	121	101	80	60	40	20	
400											400

*Distances expressed in terms of this unit may be converted to distances in terms of dynamic meters by multiplying the former by the factor 0.98, i.e. by subtracting 2% thereof.

Table 6

Determination of heights by the barometer.

Temperature correction = $(H_u - H_1)(0.00367t')$, where t' = mean virtual temperature of stratum.

For temperatures (above 0° C.) / (below 0° C.) the values are to be (added) / (subtracted).

$H_u - H_1$ (meters)	t' °C.																										
	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°	27°	28°	29°	30°
10....	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20....	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
30....	0	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3
40....	0	0	0	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	4
50....	0	0	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6
60....	0	0	1	1	1	1	2	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	6	6	6	6	6	7
70....	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	6	6	6	6	6	7	7	7	7	8
80....	0	1	1	1	1	2	2	2	3	3	3	4	4	4	4	5	5	5	6	6	6	6	7	7	7	8	8	8	9	9
90....	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	7	7	8	8	8	9	9	9	10	10
100....	0	1	1	1	2	2	3	3	3	4	4	4	5	5	6	6	6	7	7	7	8	8	8	9	9	10	10	10	11	11
110....	0	1	1	2	2	2	3	3	4	4	4	5	5	6	6	6	7	7	8	8	8	9	9	10	10	10	11	11	12	12
120....	0	1	1	2	2	3	3	4	4	4	5	5	6	6	7	7	7	8	8	9	9	10	10	11	11	11	12	12	13	13
130....	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10	10	11	11	12	12	13	13	14	14
140....	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15
150....	1	1	2	2	3	3	4	4	5	6	6	7	7	8	8	9	9	10	10	11	12	12	13	13	14	14	15	15	16	17
160....	1	1	2	2	3	4	4	5	5	6	6	7	8	8	9	9	10	11	11	12	12	13	14	14	15	15	16	16	17	18
170....	1	1	2	2	3	4	4	5	6	6	7	7	8	9	9	10	11	11	12	12	13	14	14	15	16	16	17	17	18	19
180....	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11	11	12	13	13	14	15	15	16	17	17	18	18	19	20
190....	1	1	2	3	3	4	5	6	6	7	8	8	9	10	10	11	12	13	13	14	15	15	16	17	17	18	19	20	20	21
200....	1	1	2	3	4	4	5	6	7	7	8	9	10	10	11	12	12	13	14	15	15	16	17	18	18	19	20	21	21	22
210....	1	2	2	3	4	5	5	6	7	8	8	9	10	11	12	12	13	14	15	15	16	17	18	18	19	20	21	22	22	23
220....	1	2	2	3	4	5	6	6	7	8	9	10	10	11	12	13	14	15	15	16	17	18	19	19	20	21	22	23	23	24
230....	1	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	14	15	16	17	18	19	19	20	21	22	23	24	24	25
240....	1	2	3	4	4	5	6	7	8	9	10	11	11	12	13	14	15	16	17	18	18	19	20	21	22	23	24	25	26	26
250....	1	2	3	4	5	6	6	7	8	9	10	11	12	13	14	15	16	17	17	18	19	20	21	22	23	24	25	26	27	28
260....	1	2	3	4	5	6	7	8	9	10	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
270....	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	27	28	29	30
280....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	20	21	22	23	24	25	26	27	28	29	30	31
290....	1	2	3	4	5	6	7	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	26	27	28	29	30	31	32
300....	1	2	3	4	6	7	8	9	10	11	12	13	14	15	17	18	19	20	21	22	23	24	25	26	28	29	30	31	32	33
310....	1	2	3	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	22	23	24	25	26	27	28	30	31	32	33	34
320....	1	2	4	5	6	7	8	9	11	12	13	14	15	16	18	19	20	21	22	23	25	26	27	28	29	31	32	33	34	35
330....	1	2	4	5	6	7	8	10	11	12	13	15	16	17	18	19	21	22	23	24	25	27	28	29	30	31	33	34	35	36
340....	1	2	4	5	6	7	9	10	11	12	14	15	16	17	19	20	21	22	24	25	26	27	29	30	31	32	34	35	36	37
350....	1	3	4	5	6	8	9	10	12	13	14	15	17	18	19	21	22	23	24	26	27	28	30	31	32	33	35	36	37	39
360....	1	3	4	5	7	8	9	11	12	13	15	16	17	18	20	21	22	24	25	26	28	29	30	32	33	34	36	37	38	40
370....	1	3	4	5	7	8	10	11	12	14	15	16	18	19	20	22	23	24	26	27	29	30	31	33	34	35	37	38	39	41
380....	1	3	4	6	7	8	10	11	13	14	15	17	18	20	21	22	24	25	26	28	29	31	32	33	35	36	38	39	40	42
390....	1	3	4	6	7	9	10	11	13	14	16	17	19	20	21	23	24	26	27	29	30	31	33	34	36	37	39	40	42	43
400....	1	3	4	6	7	9	10	12	13	15	16	18	19	21	22	23	25	26	28	29	31	32	34	35	37	38	40	41	43	44
410....	2	3	5	6	8	9	11	12	14	15	17	18	20	21	23	24	26	27	29	30	32	33	35	36	38	39	41	42	44	45
420....	2	3	5	6	8	9	11	12	14	15	17	18	20	22	23	25	26	28	29	31	32	34	35	37	39	40	42	43	45	46
430....	2	3	5	6	8	9	11	13	14	16	17	19	21	22	24	25	27	28	30	32	33	35	36	38	39	41	43	44	46	47
440....	2	3	5	6	8	10	11	13	15	16	18	19	21	23	24	26	27	29	31	32	34	36	37	39	40	42	44	45	47	48
450....	2	3	5	7	8	10	12	13	15	17	18	20	21	23	25	26	28	30	31	33	35	36	38	40	41	43	45	46	48	50
460....	2	3	5	7	8	10	12	14	15	17	19	20	22	24	25	27	29	30	32	34	35	37	39	41	42	44	46	47	49	51
470....	2	3	5	7	9	10	12	14	16	17	19	21	22	24	26	28	29	31	33	34	36	38	40	41	43	45	47	48	50	52
480....	2	4	5	7	9	11	12	14	16	18	19	21	23	25	26	28	30	32	33	35	37	39	41	42	44	46	48	49	51	53
490....	2	4	5	7	9	11	13	14	16	18	20	22	23	25	27	29	31	32	34	36	38	40	41	43	45	47	49	50	52	54
500....	2	4	6	7	9	11	13	15	17	18	20	22	24	26	28	29	31	33	35	37	39	40	42	44	46	48	50	51	53	55
510....	2	4	6	7	9	11	13	15	17	19	21	22	24	26	28	30	32	34	36	37	39	41	43	45	47	49	51	52	54	56
520....	2	4	6	8	10	11	13	15	17	19	21	23	25	27	29	31	32	34	36	38	40	42	44	46	48	50	52	53	55	57
530....	2	4	6	8	10	12	14	16	18	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	54	56	58
540....	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	55	57	59
550....	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	57	59	61
560....	2	4	6	8	10	12	14	16	18	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	58	60	62
570....	2	4	6	8	10	13	15	17	19	21	23	25	27	29	31	33	36	38	40	42	44	46	48	50	52	54	56	59	61	63
580....	2	4	6	9	11	13	15	17	19	21	23	26	28	30	32	34	36	38	40	43	45	47	49	51	53	55	57	60	62	64
590....	2	4	6	9	11	13	15	17	19	22	24	26	28	30	32	35	37	39	41	43	45	48	50	52	54	56	58	61	63	65
600....	2	4	7	9	11	13	15	18	20	22	24	26	29	31	33	35	37	40	42	44	46	48	51	53	55	57	59	62	64	66
610....	2	4	7	9	11	13	16	18	20	22	25	27	29	31	34	36	38	40	43	45	47	49	51	54	56	58	60	63	65	67
620....	2	5	7	9	11	14	16	18	20	23	25	27	30	32	34	36	39	41	43	46	48	50	52	55	57	59	61	64	66	68
630....	2	5	7	9	12	14	16	18	21	23	25	28	30	32	35	37	39	42	44	46	49	51	53	55	58	60	62	65	67	69
640....	2	5	7	9	12	14	16	19	21	23	26	28	31	33	35	38	40	42	45	47	49	52	54	56	59	61	63	66	68	70
650....	2	5	7	10	12	14	17	19	21	24	26	29	31	33	36	38	41	43	45	48	50	52	55	57	60	62	64	67	69	72
660....	2	5	7	10	12	15	17	19	22	24	27	29	31	34	36	39	41	44	46	48	51	53	56	58	61	63	65	68	70	73
670....	2	5	7	10	12	15	17	20	22	25	27	30	32	34	37	39	42	44	47	49	52	54	57	59	61	64	66	69	71	74
680....	2	5	7	10	12	15	17	20	22	25	27	30	32	35	37	40	42	45	47	50	52	55	57	60	62	65	67	70	72	75
690....	3	5	8	10	13	15	18	20	23	25	28	30	33	35	38	41	43	46	48	51	53	56	58	61	63	66	68	71	73	76
700....	3	5	8	10	13	15	18	21	23	26	28	31	33	36	39	41	44	46	49	51	54	57	59	62	64	67	69	72	75	77
710....	3	5	8	10	13	16	18	21	23	26	29	31	34	36	39	42	44	47	50	52	55	57	60	63	65	68	70	73	76	78
720....	3	5	8	11	13	16	18	21	24	26	29	32	34	37	40	42	45	48	50	53	55	58	61	63	66	69	71	74	77	79
730....	3	5	8	11	13	16	19	21	24	27	29	32	35	38	40	43	46	48	51	54	56	59	62	64	67	70	72	75	78	80
740....	3	5	8	11	14	16	19	22	24	27	30	33	35	38	41	43	46	49	52	54	57	60	62	65	68	71	73	76	79	81
750....	3	6	8	11	14	17	19	22	25	28	30	33	36	39	41	44	47	50	52	55	58	61	63	66	69	72	74	77	80	83
760....	3	6	8	11	14	17	20	22	25	28	31	33	36	39	42	45	47	50	53	56	59	61	64	67	70	73	75	78	81	84
770....	3	6	8	11	14	17	20	23	25	28	31	34	37	40	42	45	48	51	54	57	59	62	65	68	71	73	76	79	82	85
780....	3	6	9	11	14	17	20	23	26	29	31	34	37	40	43	46	49	52	54	57	60	63	66	69	72	74	77	80	83	86
790....	3	6	9	12	14	17	20	23	26	29	32	35	38	41	43	46	49	52	55	58	61	64	67	70	72	75	78	81	84	87
800....	3	6	9	12	15	18	21	23	26	29	32	35	38	41	44	47	50	53	56	59	62	65	68	70	73	76	79	82	85	88

Table 6

Determination of heights by the barometer.

Temperature correction = $(H_u - H_1)(0.00367t')$, where t' = mean virtual temperature of stratum.

For temperatures (above 0° C.) / (below 0° C.) the values are to be (added / subtracted).

$H_u - H_1$ (meters)	t' °C.																														
	31°	32°	33°	34°	35°	36°	37°	38°	39°	40°	41°	42°	43°	44°	45°	46°	47°	48°	49°	50°	51°	52°	53°	54°	55°	56°	57°	58°	59°	60°
10.....	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
20.....	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4
30.....	3	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	7
40.....	5	5	5	5	5	5	5	6	6	6	6	6	6	6	7	7	7	7	7	7	7	8	8	8	8	8	8	8	9	9
50.....	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	10	11	11	11
60.....	7	7	7	7	8	8	8	8	9	9	9	9	9	10	10	10	10	11	11	11	11	11	12	12	12	12	13	13	13	13
70.....	8	8	8	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15
80.....	9	9	10	10	10	11	11	11	11	12	12	12	13	13	13	14	14	14	14	15	15	15	16	16	16	16	17	17	17	18
90.....	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16	16	16	17	17	17	18	18	18	18	19	19	19	20
100.....	11	12	12	12	13	13	14	14	14	15	15	15	16	16	17	17	17	18	18	18	19	19	19	20	20	21	21	21	22	22
110.....	13	13	13	14	14	15	15	15	16	16	17	17	17	18	18	19	19	19	20	20	21	21	21	22	22	23	23	23	24	24
120.....	14	14	15	15	15	16	16	17	17	18	18	18	19	19	20	20	21	21	22	22	22	23	23	24	24	25	25	26	26	26
130.....	15	15	16	16	17	17	18	18	19	19	20	20	21	21	21	22	22	23	23	24	24	25	25	26	26	27	27	28	28	29
140.....	16	16	17	17	18	18	19	20	20	21	21	22	22	23	23	24	24	25	25	26	26	27	27	28	28	29	29	30	30	31
150.....	17	18	18	19	19	20	20	21	21	22	23	23	24	24	25	25	26	26	27	28	28	29	29	30	30	31	31	32	32	33
160.....	18	19	19	20	21	21	22	22	23	23	24	25	25	26	26	27	28	28	29	29	30	31	31	32	32	33	33	34	35	35
170.....	19	20	21	21	22	22	23	24	24	25	26	26	27	27	28	29	29	30	31	31	32	32	33	34	34	35	36	36	37	37
180.....	20	21	22	22	23	24	24	25	26	26	27	28	28	29	30	30	31	32	32	33	34	34	35	36	36	37	38	38	39	40
190.....	22	22	23	24	25	25	26	26	27	28	29	29	30	31	31	32	33	33	34	35	36	36	37	38	38	39	40	40	41	42
200.....	23	23	24	25	26	26	27	28	29	29	30	31	32	32	33	34	34	35	36	37	37	38	39	40	40	41	42	43	43	44
210.....	24	25	25	26	27	28	29	29	30	31	32	32	33	34	35	35	36	37	38	39	39	40	41	42	42	43	44	45	45	46
220.....	25	26	27	27	28	29	30	31	31	32	33	34	35	36	36	37	38	39	40	40	41	42	43	44	44	45	46	47	48	48
230.....	26	27	28	29	30	30	31	32	33	34	35	35	36	37	38	39	40	41	41	42	43	44	45	46	46	47	48	49	50	51
240.....	27	28	29	30	31	32	33	33	34	35	36	37	38	39	40	41	41	42	43	44	45	46	47	48	48	49	50	51	52	53
250.....	28	29	30	31	32	33	34	35	36	37	38	39	39	40	41	42	43	44	45	46	47	48	49	50	50	51	52	53	54	55
260.....	30	31	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	52	53	54	55	56	57
270.....	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	54	55	56	57	58	59
280.....	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	57	58	59	60	61	62
290.....	33	34	35	36	37	38	39	40	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	59	60	61	62	63	64
300.....	34	35	36	37	39	40	41	42	43	44	45	46	47	48	50	51	52	53	54	55	56	57	58	59	61	62	63	64	65	66
310.....	35	36	38	39	40	41	42	43	44	46	47	48	49	50	51	52	53	55	56	57	58	59	60	61	63	64	65	66	67	68
320.....	36	38	39	40	41	42	43	45	46	47	48	49	50	52	53	54	55	56	58	59	60	61	62	63	65	66	67	68	69	70
330.....	38	39	40	41	42	44	45	46	47	48	50	51	52	53	54	56	57	58	59	61	62	63	64	65	67	68	69	70	71	73
340.....	39	40	41	42	44	45	46	47	49	50	51	52	54	55	56	57	59	60	61	62	64	65	66	67	69	70	71	72	74	75
350.....	40	41	42	44	45	46	48	49	50	51	53	54	55	57	58	59	60	62	63	64	66	67	68	69	71	72	73	75	76	77
360.....	41	42	44	45	46	48	49	50	52	53	54	55	57	58	59	61	62	63	65	66	67	69	70	71	73	74	75	77	78	79
370.....	42	43	45	46	48	49	50	52	53	54	56	57	58	60	61	62	64	65	67	68	69	71	72	73	75	76	77	79	80	81
380.....	43	45	46	47	49	50	52	53	54	56	57	59	60	61	63	64	66	67	68	70	71	73	74	76	77	78	79	81	82	84
390.....	44	46	47	49	50	52	53	54	56	57	59	60	62	63	64	66	67	69	70	72	73	74	76	77	79	80	82	83	84	86
400.....	46	47	48	50	51	53	54	56	57	59	60	62	63	65	66	68	69	70	72	73	75	76	78	79	81	82	84	85	87	88
410.....	47	48	50	51	53	54	56	57	59	60	62	63	65	66	68	69	71	72	74	75	77	78	80	81	83	84	86	87	89	90
420.....	48	49	51	52	54	55	57	59	60	62	63	65	66	68	69	71	72	74	76	77	79	80	82	83	85	86	88	89	91	92
430.....	49	50	52	54	55	57	58	60	62	63	65	66	68	69	71	73	74	76	77	79	80	82	84	85	87	88	90	92	93	95
440.....	50	52	53	55	57	58	60	61	63	65	66	68	69	71	73	74	76	78	79	81	82	84	86	87	89	90	92	94	95	97
450.....	51	53	54	56	58	59	61	63	64	66	68	69	71	73	74	76	78	79	81	83	84	86	88	89	91	92	94	96	97	99
460.....	52	54	56	57	59	61	62	64	66	68	69	71	73	74	76	78	79	81	83	84	86	88	89	91	93	95	96	98	100	101
470.....	53	55	57	59	60	62	64	66	67	69	71	72	74	76	78	79	81	83	85	86	88	90	91	93	95	97	98	100	102	103
480.....	55	56	58	60	62	63	65	67	69	70	72	74	76	78	79	81	83	85	86	88	90	92	93	95	97	99	100	102	104	106
490.....	56	58	59	61	63	65	67	68	70	72	74	76	77	79	81	83	85	86	88	90	92	94	95	97	99	101	103	104	106	108
500.....	57	59	61	62	64	66	68	70	72	73	75	77	79	81	83	84	86	88	90	92	94	95	97	99	101	103	105	106	108	110
510.....	58	60	62	64	66	67	69	71	73	75	77	79	80	82	84	86	88	90	92	94	95	97	99	101	103	105	107	109	110	112
520.....	59	61	63	65	67	69	71	73	74	76	78	80	82	84	86	88	90	92	94	95	97	99	101	103	105	107	109	111	113	115
530.....	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117
540.....	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117	119
550.....	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107	109	111	113	115	117	119	121
560.....	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	95	97	99	101	103	105	107	109	111	113	115	117	119	121	123
570.....	65	67	69	71	73	75	77	79	82	84	86	88	90	92	94	96	98	100	103	105	107	109	111	113	115	117	119	121	123	126
580.....	66	68	70	72	75	77	79	81	83	85	87	89	92	94	96	98	100	102	104	106	109	111	113	115	117	119	121	123	126	128
590.....	67	69	71	74	76	78	80	82	84	87	89	91	93	95	97	100	102	104	106	108	110	113	115	117	119	121	123	126	128	130
600.....	68	70	73	75	77	79	81	84	86	88	90	92	95	97	99	101	103	106	108	110	112	115	117	119	121	123	126	128	130	132
610.....	69	72	74	76	78	81	83	85	87	90	92	94	96	99	101	103	105	107	110	112	114	116	119	121	123	125	128	130	132	134
620.....	71	73	75	77	80	82	84	86	89	91	93	96	98	100	102	105	107	109	111	114	116	118	121	123	125	127	130	132	134	137
630.....	72	74	76	79	81	83	86	88	90	92	95	97	99	102	104	106	109	111	113	116	118	120	123	125	127	129	132	134	136	139
640.....	73	75	78	80	82	85	87	89	92	94	96	99	101	103	106	108	110	113	115	117	120	122	124	127	129	132	134	136	139	141
650.....	74	76	79	81	83	86	88	91	93	95	98	100	103	105	107	110	112	115	117	119	122	124	126	129	131	134	136	138	141	143
660.....	75	78	80	82	85	87	90	92	94	97	99	102	104	107	109	111	114	116	119	121	124	126	128	131	133	136	138	140	143	145
670.....	76	79	81	84	86	89	91	93	96	98	101	103	106	108	111	113	116	118	120	123	125	128	130	133	135	138	140	143	145	148
680.....	77	80	82	85	87	90	92	95	97	100	102	105	107	110	112	115	117	120	122	125	127	130	132	135	137	140	142	145	147	150
690.....	79	81	84	86	89	91	94	96	99	101	104	106	109	111	114	116	119	122	124	127	129	132	134	137	139	142	144	147	149	152
700.....	80	82	85	87	90	92	95	98	100	103	105	108	110	113	116	118	121	123	126	128	131	134	136	139	141	144	146	149	152	154
710.....	81	83	86	89	91	94	96	99	102	104	107	109	112	115	117	120	122	125	128	130	133	135	138	141	143	146	149	151	154	156
720.....	82	85	87	90	92	95	98	100	103	106	108	111	114	116	119	122	124	127	129	132	135	137	140	143	145	148	151	153	156	159
730.....	83	86	88	91	94	96	99	102	104	107	110	113	115	118	121	123	126	129	131	134	137	139	142	145	147	150	153	155	158	161
740.....	84	87	90	92	95	98	100	103	106	109	111	114	117	119	122	125	128	130	133	136	139	141	144	147	149	152	155	158	160	163
750.....	85	88	91	94	96	99	102	105	107	110	113	116	118	121	124	127	129	132	135	138	140	143	146	149	151	154	157	160	162	165
760.....	86	89	92	95	98	100	103	106	109	112	114	117	120	123	126	128	131	134	137	139	143	145	148	151	153	156	159	162	165	167
770.....	88	90	93	96	99	102	105	107	110	113	116	119	122	124	127	130	133	136	138	141	144	147	150	153	155	158	161	164	167	170
780.....	89	92	94	97	100	103	106	109	112	115	117	120	123	126	129	132	135	137	140	143	146	149	152	155	157	160	163	166	169	172
790.....	90	93	96	99	101	104	107	110	113	116	119	122	125	128	130	133	136	139	142	145	148	151	154	157	159	162	165	168	171	174
800.....	91	94	97	100	103	106	109	112	115	117	120	123	126	129	132	135	138	141	144	147	150	153	156	159	161	164	167	170	173	176

Table 6

Determination of heights by the barometer.

Temperature correction $= (H_U - H_1)(0.00367t')$, where $t' =$ mean virtual temperature of stratum.

For temperatures (above 0° C.) / (below 0° C.) the values are to be (added) / (subtracted).

$H_U - H_1$ (meters)	t' °C.																			
	61°	62°	63°	64°	65°	66°	67°	68°	69°	70°	71°	72°	73°	74°	75°	76°	77°	78°	79°	80°
10....	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3
20....	4	5	5	5	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6
30....	7	7	7	7	7	7	7	7	8	8	8	8	8	8	8	8	8	9	9	9
40....	9	9	9	9	10	10	10	10	10	10	10	11	11	11	11	11	11	11	12	12
50....	11	11	12	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	14	15
60....	13	14	14	14	14	15	15	15	15	15	16	16	16	16	17	17	17	17	17	18
70....	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	20	20	20	20	21
80....	18	18	18	19	19	19	20	20	20	21	21	21	21	22	22	22	23	23	23	23
90....	20	20	21	21	21	22	22	22	23	23	23	24	24	24	25	25	25	26	26	26
100....	22	23	23	23	24	24	25	25	25	26	26	26	27	27	28	28	28	29	29	29
110....	25	25	25	26	26	27	27	27	28	28	29	29	29	30	30	31	31	31	32	32
120....	27	27	28	28	29	29	30	30	30	31	31	32	32	33	33	33	34	34	35	35
130....	29	30	30	31	31	31	32	32	33	33	34	34	35	35	36	36	37	37	38	38
140....	31	32	32	33	33	34	34	35	35	36	36	37	38	38	39	39	40	40	41	41
150....	34	34	35	35	36	36	37	37	38	39	39	40	40	41	41	42	42	43	43	44
160....	36	36	37	38	38	39	39	40	41	41	42	42	43	43	44	45	45	46	46	47
170....	38	39	39	40	41	41	42	42	43	44	44	45	46	46	47	47	48	49	49	50
180....	40	41	42	42	43	44	44	45	46	46	47	48	48	49	50	50	51	52	52	53
190....	43	43	44	45	45	46	47	47	48	49	50	50	51	52	52	53	54	54	55	56
200....	45	46	46	47	48	48	49	50	51	51	52	53	54	54	55	56	57	57	58	59
210....	47	48	49	49	50	51	52	52	53	54	55	55	56	57	58	59	59	60	61	62
220....	49	50	51	52	52	53	54	55	56	57	57	58	59	60	61	61	62	63	64	65
230....	51	52	53	54	55	56	57	57	58	59	60	61	62	62	63	64	65	66	67	68
240....	54	55	55	56	57	58	59	60	61	62	63	63	64	65	66	67	68	69	70	70
250....	56	57	58	59	60	61	61	62	63	64	65	66	67	68	69	70	71	72	72	73
260....	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	73	74	75	76
270....	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
280....	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82
290....	65	66	67	68	69	70	71	72	73	75	76	77	78	79	80	81	82	83	84	85
300....	67	68	69	70	72	73	74	75	76	77	78	79	80	81	83	84	85	86	87	88
310....	69	71	72	73	74	75	76	77	79	80	81	82	83	84	85	86	88	89	90	91
320....	72	73	74	75	76	78	79	80	81	82	83	85	86	87	88	89	90	92	93	94
330....	74	75	76	78	79	80	81	82	84	85	86	87	88	90	91	92	93	94	96	97
340....	76	77	79	80	81	82	84	85	86	87	89	90	91	92	94	95	96	97	99	100
350....	78	80	81	82	83	85	86	87	89	90	91	92	94	95	96	98	99	100	101	103
360....	81	82	83	85	86	87	89	90	91	92	94	95	96	98	99	100	102	103	104	106
370....	83	84	86	87	88	90	91	92	94	95	96	98	99	100	102	103	105	106	107	109
380....	85	86	88	89	91	92	93	95	96	98	99	100	102	103	105	106	107	109	110	112
390....	87	89	90	92	93	94	96	97	99	100	102	103	104	106	107	109	110	112	113	115
400....	90	91	92	94	95	97	98	100	101	103	104	106	107	109	110	112	113	115	116	117
410....	92	93	95	96	98	99	101	102	104	105	107	108	110	111	113	114	116	117	119	120
420....	94	96	97	99	100	102	103	105	106	108	109	111	113	114	116	117	119	120	122	123
430....	96	98	99	101	103	104	106	107	109	110	112	114	115	117	118	120	122	123	125	126
440....	99	100	102	103	105	107	108	110	111	113	115	116	118	119	121	123	124	126	128	129
450....	101	102	104	106	107	109	111	112	114	116	117	119	121	122	124	126	127	129	130	132
460....	103	105	106	108	110	111	113	115	116	118	120	122	123	125	127	128	130	132	133	135
470....	105	107	109	110	112	114	116	117	119	121	122	124	126	128	129	131	133	135	136	138
480....	107	109	111	113	115	116	118	120	122	123	125	127	129	130	132	134	136	137	139	141
490....	110	111	113	115	117	119	120	122	124	126	128	129	131	133	135	137	138	140	142	144
500....	112	114	116	117	119	121	123	125	127	128	130	132	134	136	138	139	141	143	145	147
510....	114	116	118	120	122	124	125	127	129	131	133	135	137	139	140	142	144	146	148	150
520....	116	118	120	122	124	126	128	130	132	134	135	137	139	141	143	145	147	149	151	153
530....	119	121	123	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156
540....	121	123	125	127	129	131	133	135	137	139	141	143	145	147	149	151	153	155	157	159
550....	123	125	127	129	131	133	135	137	139	141	143	145	147	149	151	153	155	157	159	161
560....	125	127	129	132	134	136	138	140	142	144	146	148	150	152	154	156	158	160	162	164
570....	128	130	132	134	136	138	140	142	144	146	149	151	153	155	157	159	161	163	165	167
580....	130	132	134	136	138	140	143	145	147	149	151	153	155	158	160	162	164	166	168	170
590....	132	134	136	139	141	143	145	147	149	152	154	156	158	160	162	165	167	169	171	173
600....	134	137	139	141	143	145	148	150	152	154	156	159	161	163	165	167	170	172	174	176
610....	137	139	141	143	146	148	150	152	154	157	159	161	163	166	168	170	172	175	177	179
620....	139	141	143	146	148	150	152	155	157	159	162	164	166	168	171	173	175	177	180	182
630....	141	143	146	148	150	153	155	157	160	162	164	166	169	171	173	176	178	180	183	185
640....	143	146	148	150	153	155	157	160	162	164	167	169	171	174	176	179	181	183	186	188
650....	146	148	150	153	155	157	160	162	165	167	169	172	174	177	179	181	184	186	188	191
660....	148	150	153	155	157	160	162	165	167	170	172	174	177	179	182	184	187	189	191	194
670....	150	152	155	157	160	162	165	167	170	172	175	177	179	182	184	187	189	192	194	197
680....	152	155	157	160	162	165	167	170	172	175	177	180	182	185	187	190	192	195	197	200
690....	154	157	160	162	165	167	170	172	175	177	180	182	185	187	190	192	195	198	200	203
700....	157	159	162	164	167	170	172	175	177	180	182	185	188	190	193	195	198	200	203	206
710....	159	162	164	167	169	172	175	177	180	182	185	188	190	193	195	198	201	203	206	208
720....	161	164	166	169	172	174	177	180	182	185	188	190	193	196	198	201	203	206	209	211
730....	163	166	169	171	174	177	179	182	185	188	190	193	196	198	201	204	206	209	212	214
740....	166	168	171	174	177	179	182	185	187	190	193	196	198	201	204	206	209	212	215	217
750....	168	171	173	176	179	182	184	187	190	193	195	198	201	204	206	209	212	215	217	220
760....	170	173	176	179	181	184	187	190	192	195	198	201	204	206	209	212	215	218	220	223
770....	172	175	178	181	184	187	189	192	195	198	201	203	206	209	212	215	218	220	223	226
780....	175	177	180	183	186	189	192	195	198	200	203	206	209	212	215	218	220	223	226	229
790....	177	180	183	186	188	191	194	197	200	203	206	209	212	215	217	220	223	226	229	232
800....	179	182	185	188	191	194	197	200	203	206	208	211	214	217	220	223	226	229	232	235

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Table 6

Determination of heights by the barometer.

Temperature correction = $(H_u-H_l)\ (0.00367t')$, where t' = mean virtual temperature of stratum.

For temperatures (above 0° C. / below 0° C.) the values are to be (added / subtracted).

H_u-H_l (meters)	t' °C.																										
	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°	27°	28°	29°	30°
810.....	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	56	59	62	65	68	71	74	77	80	83	86	89
820.....	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84	87	90
830.....	3	6	9	12	15	18	21	24	27	30	34	37	40	43	46	49	52	55	58	61	64	67	70	73	76	79	82	85	88	91
840.....	3	6	9	12	15	18	22	25	28	31	34	37	40	43	46	49	52	55	59	62	65	68	71	74	77	80	83	86	89	92
850.....	3	6	9	12	16	19	22	25	28	31	34	37	41	44	47	50	53	56	59	62	66	69	72	75	78	81	84	87	90	94
860.....	3	6	9	13	16	19	22	25	28	32	35	38	41	44	47	50	54	57	60	63	66	69	73	76	79	82	85	88	92	95
870.....	3	6	10	13	16	19	22	26	29	32	35	38	42	45	48	51	54	57	61	64	67	70	73	77	80	83	86	89	93	96
880.....	3	6	10	13	16	19	23	26	29	32	36	39	42	45	48	52	55	58	61	65	68	71	74	78	81	84	87	90	94	97
890.....	3	7	10	13	16	20	23	26	29	33	36	39	42	46	49	52	56	59	62	65	69	72	75	78	82	85	88	91	95	98
900.....	3	7	10	13	17	20	23	26	30	33	36	40	43	46	50	53	56	59	63	66	69	73	76	79	83	86	89	92	96	99
910.....	3	7	10	13	17	20	23	27	30	33	37	40	43	47	50	53	57	60	63	67	70	73	77	80	83	87	90	94	97	100
920.....	3	7	10	14	17	20	24	27	30	34	37	41	44	47	51	54	57	61	64	68	71	74	78	81	84	88	91	95	98	101
930.....	3	7	10	14	17	20	24	27	31	34	38	41	44	48	51	55	58	61	65	68	72	75	79	82	85	89	92	96	99	102
940.....	3	7	10	14	17	21	24	28	31	34	38	41	45	48	52	55	59	62	66	69	72	76	79	83	86	90	93	97	100	103
950.....	3	7	10	14	17	21	24	28	31	35	38	42	45	49	52	56	59	63	66	70	73	77	80	84	87	91	94	98	101	105
960.....	4	7	11	14	18	21	25	28	32	35	39	42	46	49	53	56	60	63	67	70	74	78	81	85	88	92	95	99	102	106
970.....	4	7	11	14	18	21	25	28	32	36	39	43	46	50	53	57	61	64	68	71	75	78	82	85	89	93	96	100	103	107
980.....	4	7	11	14	18	22	25	29	32	36	40	43	47	50	54	58	61	65	68	72	76	79	83	86	90	94	97	101	104	108
990.....	4	7	11	15	18	22	25	29	33	36	40	44	47	51	54	58	62	65	69	73	76	80	84	87	91	94	98	102	105	109
1000.....	4	7	11	15	18	22	26	29	33	37	40	44	48	51	55	59	62	66	70	73	77	81	84	88	92	95	99	103	106	110
1010.....	4	7	11	15	19	22	26	30	33	37	41	44	48	52	56	59	63	67	70	74	78	82	85	89	93	96	100	104	107	111
1020.....	4	7	11	15	19	22	26	30	34	37	41	45	49	52	56	60	64	67	71	75	79	82	86	90	94	97	101	105	109	112
1030.....	4	8	11	15	19	23	26	30	34	38	42	45	49	53	57	60	64	68	72	76	79	83	87	91	95	98	102	106	110	113
1040.....	4	8	11	15	19	23	27	31	34	38	42	46	50	53	57	61	65	69	73	76	80	84	88	92	96	99	103	107	111	115
1050.....	4	8	12	15	19	23	27	31	35	39	42	46	50	54	58	62	66	69	73	77	81	85	89	92	96	100	104	108	112	116
1060.....	4	8	12	16	19	23	27	31	35	39	43	47	51	54	58	62	66	70	74	78	82	86	89	93	97	101	105	109	113	117
1070.....	4	8	12	16	20	24	27	31	35	39	43	47	51	55	59	63	67	71	75	79	82	86	90	94	98	102	106	110	114	118
1080.....	4	8	12	16	20	24	28	32	36	40	44	48	52	55	59	63	67	71	75	79	83	87	91	95	99	103	107	111	115	119
1090.....	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100	104	108	112	116	120
1100.....	4	8	12	16	20	24	28	32	36	40	44	48	52	57	61	65	69	73	77	81	85	89	93	97	101	105	109	113	117	121
1110.....	4	8	12	16	20	24	29	33	37	41	45	49	53	57	61	65	69	73	77	81	86	90	94	98	102	106	110	114	118	122
1120.....	4	8	12	16	21	25	29	33	37	41	45	49	53	58	62	66	70	74	78	82	86	90	95	99	103	107	111	115	119	123
1130.....	4	8	12	17	21	25	29	33	37	41	46	50	54	58	62	66	71	75	79	83	87	91	95	100	104	108	112	116	120	124
1140.....	4	8	13	17	21	25	29	33	38	42	46	50	54	59	63	67	71	75	79	84	88	92	96	100	105	109	113	117	121	126
1150.....	4	8	13	17	21	26	30	34	38	42	46	51	55	59	63	68	72	76	80	84	89	93	97	101	106	110	114	118	122	127
1160.....	4	9	13	17	21	26	30	34	38	43	47	51	55	60	64	68	72	77	81	85	89	94	98	102	106	111	115	119	123	128
1170.....	4	9	13	17	21	26	30	34	39	43	47	52	56	60	64	69	73	77	82	86	90	94	99	103	107	112	116	120	125	129
1180.....	4	9	13	17	22	26	30	35	39	43	48	52	56	61	65	69	74	78	82	87	91	95	100	104	108	113	117	121	126	130
1190.....	4	9	13	17	22	26	31	35	39	44	48	52	57	61	66	70	74	79	83	87	92	96	100	105	109	114	118	122	127	131
1200.....	4	9	13	18	22	26	31	35	40	44	48	53	57	62	66	70	75	79	84	88	92	97	101	106	110	115	119	123	128	132
1210.....	4	9	13	18	22	27	31	36	40	44	49	53	58	62	67	71	75	80	84	89	93	98	102	107	111	115	120	124	129	133
1220.....	4	9	13	18	22	27	31	36	40	45	49	54	58	63	67	72	76	81	85	90	94	99	103	107	112	116	121	125	130	134
1230.....	5	9	14	18	23	27	32	36	41	45	50	54	59	63	68	72	77	81	86	90	95	99	104	108	113	117	122	126	131	135
1240.....	5	9	14	18	23	27	32	36	41	46	50	55	59	64	68	73	77	82	86	91	96	100	105	109	114	118	123	127	132	137
1250.....	5	9	14	18	23	28	32	37	41	46	50	55	60	64	69	73	78	83	87	92	96	101	106	110	115	119	124	128	133	138
1260.....	5	9	14	18	23	28	32	37	42	46	51	55	60	65	69	74	79	83	88	92	97	102	106	111	116	120	125	129	134	139
1270.....	5	9	14	19	23	28	33	37	42	47	51	56	61	65	70	75	79	84	89	93	98	103	107	112	117	121	126	131	135	140
1280.....	5	9	14	19	23	28	33	38	42	47	52	56	61	66	70	75	80	85	89	94	99	103	108	113	117	122	127	132	136	141
1290.....	5	9	14	19	24	28	33	38	43	47	52	57	62	66	71	76	80	85	90	95	99	104	109	114	118	123	128	133	137	142
1300.....	5	10	14	19	24	29	33	38	43	48	52	57	62	67	72	76	81	86	91	95	100	105	110	115	119	124	129	134	138	143
1310.....	5	10	14	19	24	29	34	38	43	48	53	58	63	67	72	77	82	87	91	96	101	106	111	115	120	125	130	135	139	144
1320.....	5	10	15	19	24	29	34	39	44	48	53	58	63	68	73	78	82	87	92	97	102	107	111	116	121	126	131	136	140	145
1330.....	5	10	15	20	24	29	34	39	44	49	54	59	63	68	73	78	83	88	93	98	103	107	112	117	122	127	132	137	142	146
1340.....	5	10	15	20	25	30	34	39	44	49	54	59	64	69	74	79	84	89	93	98	103	108	113	118	123	128	133	138	143	148
1350.....	5	10	15	20	25	30	35	40	45	50	54	59	64	69	74	79	84	89	94	99	104	109	114	119	124	129	134	139	144	149
1360.....	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145	150
1370.....	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	91	96	101	106	111	116	121	126	131	136	141	146	151
1380.....	5	10	15	20	25	30	35	41	46	51	56	61	66	71	76	81	86	91	96	101	106	111	116	122	127	132	137	142	147	152
1390.....	5	10	15	20	26	31	36	41	46	51	56	61	66	71	77	82	87	92	97	102	107	112	117	122	128	133	138	143	148	153
1400.....	5	10	15	21	26	31	36	41	46	51	57	62	67	72	77	82	87	92	98	103	108	113	118	123	128	134	139	144	149	154
1410.....	5	10	16	21	26	31	36	41	47	52	57	62	67	72	78	83	88	93	98	103	109	114	119	124	129	135	140	145	150	155
1420.....	5	10	16	21	26	31	36	42	47	52	57	63	68	73	78	83	89	94	99	104	109	115	120	125	130	135	141	146	151	156
1430.....	5	10	16	21	26	31	37	42	47	52	58	63	68	73	79	84	89	94	100	105	110	115	121	126	131	136	142	147	152	157
1440.....	5	11	16	21	26	32	37	42	48	53	58	63	69	74	79	85	90	95	100	106	111	116	122	127	132	137	143	148	153	159
1450.....	5	11	16	21	27	32	37	43	48	53	59	64	69	75	80	85	90	96	101	106	112	117	122	128	133	138	144	149	154	160
1460.....	5	11	16	21	27	32	38	43	48	54	59	64	70	75	80	86	91	96	102	107	113	118	123	129	134	139	145	150	155	161
1470.....	5	11	16	22	27	32	38	43	49	54	59	65	70	76	81	86	92	97	103	108	113	119	124	129	135	140	146	151	156	162
1480.....	5	11	16	22	27	33	38	43	49	54	60	65	71	76	81	87	92	98	103	109	114	119	125	130	136	141	147	152	158	163
1490.....	5	11	16	22	27	33	38	44	49	55	60	66	71	77	82	87	93	98	104	109	115	120	126	131	137	142	148	153	159	164
1500.....	6	11	17	22	28	33	39	44	50	55	61	66	72	77	83	88	94	99	105	110	116	121	127	132	138	143	149	154	160	165
1510.....	6	11	17	22	28	33	39	44	50	55	61	67	72	78	83	89	94	100	105	111	116	122	127	133	139	144	150	155	161	166
1520.....	6	11	17	22	28	33	39	45	50	56	61	67	73	78	84	89	95	100	106	112	117	123	128	134	139	145	151	156	162	167
1530.....	6	11	17	22	28	34	39	45	51	56	62	67	73	79	84	90	95	101	107	112	118	124	129	135	140	146	152	157	163	168
1540.....	6	11	17	23	28	34	40	45	51	57	62	68	73	79	85	90	96	102	107	113	119	124	130	136	141	147	153	158	164	170
1550.....	6	11	17	23	28	34	40	46	51	57	63	68	74	80	85	91	97	102	108	114	119	125	131	137	142	148	154	159	165	171
1560.....	6	11	17	23	29	34	40	46	52	57	63	69	74	80	86	92	97	103	109	115	120	126	132	137	143	149	155	160	166	172
1570.....	6	12	17	23	29	35	40	46	52	58	63	69	75	81	86	92	98	104	109	115	121	127	133	138	144	150	156	161	167	173
1580.....	6	12	17	23	29	35	41	46	52	58	64	70	75	81	87	93	99	104	110	116	122	128	133	139	145	151	157	162	168	174
1590.....	6	12	18	23	29	35	41	47	53	58	64	70	76	82	88	93	99	105	111	117	123	128	134	140	146	152	158	163	169	175
1600.....	6	12	18	23	29	35	41	47	53	59	65	70	76	82	88	94	100	106	112	117	123	129	135	141	147	153	159	164	170	176

Table 6

Determination of heights by the barometer.

Temperature correction = $(H_u - H_l)$ (0.00367t'), where t' = mean virtual temperature of stratum.

For temperatures (above 0° C.) (below 0° C.) the values are to be (added) (subtracted).

$H_u - H_l$ (meters)	t' °C.																									
	31°	32°	33°	34°	35°	36°	37°	38°	39°	40°	41°	42°	43°	44°	45°	46°	47°	48°	49°	50°	51°	52°	53°	54°	55°	56°	57°	58°	59°	60°
810.....	92	95	98	101	104	107	110	113	116	119	122	125	128	131	134	137	140	143	146	149	152	155	158	161	163	166	169	172	175	178
820.....	93	96	99	102	105	108	111	114	117	120	123	126	129	132	135	138	141	144	147	150	153	156	159	163	166	169	172	175	178	181
830.....	94	97	101	104	107	110	113	116	119	122	125	128	131	134	137	140	143	146	149	152	155	158	161	164	168	171	174	177	180	183
840.....	96	99	102	105	108	111	114	117	120	123	126	129	133	136	139	142	145	148	151	154	157	160	163	166	170	173	176	179	182	185
850.....	97	100	103	106	109	112	115	119	122	125	128	131	134	137	140	143	147	150	153	156	159	162	165	168	172	175	178	181	184	187
860.....	98	101	104	107	110	114	117	120	123	126	129	133	136	139	142	145	148	151	155	158	161	164	167	170	174	177	180	183	186	189
870.....	99	102	105	109	112	115	118	121	125	128	131	134	137	140	144	147	150	153	156	160	163	166	169	172	176	179	182	185	188	192
880.....	100	103	107	110	113	116	119	123	126	129	132	136	139	142	145	149	152	155	158	161	165	168	171	174	178	181	184	187	191	194
890.....	101	105	108	111	114	118	121	124	127	131	134	137	140	144	147	150	154	157	160	163	167	170	173	176	180	183	186	189	193	196
900.....	102	106	109	112	116	119	122	126	129	132	135	139	142	145	149	152	155	159	162	165	168	172	175	178	182	185	188	192	195	198
910.....	104	107	110	114	117	120	124	127	130	134	137	140	144	147	150	154	157	160	164	167	170	174	177	180	184	187	190	194	197	200
920.....	105	108	111	115	118	122	125	128	132	135	138	142	145	149	152	155	159	162	165	169	172	176	179	182	186	189	192	196	199	203
930.....	106	109	113	116	119	123	126	130	133	137	140	143	147	150	154	157	160	164	167	171	174	177	181	184	188	191	195	198	201	205
940.....	107	110	114	117	121	124	128	131	135	138	141	145	148	152	155	159	162	166	169	172	176	179	183	186	190	193	197	200	204	207
950.....	108	112	115	119	122	126	129	132	136	139	143	146	150	153	157	160	164	167	171	174	178	181	185	188	192	195	199	202	206	209
960.....	109	113	116	120	123	127	130	134	137	141	144	148	151	155	159	162	166	169	173	176	180	183	187	190	194	197	201	204	208	211
970.....	110	114	117	121	125	128	132	135	139	142	146	150	153	157	160	164	167	171	174	178	182	185	189	192	196	199	203	206	210	214
980.....	111	115	119	122	126	129	133	137	140	144	147	151	155	158	162	165	169	173	176	180	183	187	191	194	198	201	205	209	212	216
990.....	113	116	120	124	127	131	134	138	142	145	149	153	156	160	163	167	171	174	178	182	185	189	193	196	200	203	207	211	214	218
1000.....	114	117	121	125	128	132	136	139	143	147	150	154	158	161	165	169	172	176	180	184	187	191	195	198	202	206	209	213	217	220
1010.....	115	119	122	126	130	133	137	141	145	148	152	156	159	163	167	171	174	178	182	185	189	193	196	200	204	208	211	215	219	222
1020.....	116	120	124	127	131	135	139	142	146	150	153	157	161	165	168	172	176	180	183	187	191	195	198	202	206	210	213	217	221	225
1030.....	117	121	125	129	132	136	140	144	147	151	155	159	163	166	170	174	178	181	185	189	193	197	200	204	208	212	215	219	223	227
1040.....	118	122	126	130	134	137	141	145	149	153	156	160	164	168	172	176	179	183	187	191	195	198	202	206	210	214	218	221	225	229
1050.....	119	123	127	131	135	139	143	146	150	154	158	162	166	170	173	177	181	185	189	193	197	200	204	208	212	216	220	224	227	231
1060.....	121	124	128	132	136	140	144	148	152	156	159	163	167	171	175	179	183	187	191	195	198	202	206	210	214	218	222	226	230	233
1070.....	122	126	130	134	137	141	145	149	153	157	161	165	169	173	177	181	185	188	192	196	200	204	208	212	216	220	224	228	232	236
1080.....	123	127	131	135	139	143	147	151	155	159	163	166	170	174	178	182	186	190	194	198	202	206	210	214	218	222	226	230	234	238
1090.....	124	128	132	136	140	144	148	152	156	160	164	168	172	176	180	184	188	192	196	200	204	208	212	216	220	224	228	232	236	240
1100.....	125	129	133	137	141	145	149	153	157	161	166	170	174	178	182	186	190	194	198	202	206	210	214	218	222	226	230	234	238	242
1110.....	126	130	134	139	143	147	151	155	159	163	167	171	175	179	183	187	191	196	200	204	208	212	216	220	224	228	232	236	240	244
1120.....	127	132	136	140	144	148	152	156	160	164	169	173	177	181	185	189	193	197	201	206	210	214	218	222	226	230	234	238	243	247
1130.....	129	133	137	141	145	149	153	158	162	166	170	174	178	182	187	191	195	199	203	207	212	216	220	224	228	232	236	241	245	249
1140.....	130	134	138	142	146	151	155	159	163	167	172	176	180	184	188	192	197	201	205	209	213	218	222	226	230	234	238	243	247	251
1150.....	131	135	139	143	148	152	156	160	165	169	173	177	181	186	190	194	198	203	207	211	215	219	224	228	232	236	241	245	249	253
1160.....	132	136	140	145	149	153	158	162	166	170	175	179	183	187	192	196	200	204	209	213	217	221	226	230	234	238	243	247	251	255
1170.....	133	137	142	146	150	155	159	163	167	172	176	180	185	189	193	198	202	206	210	215	219	223	228	232	236	240	245	249	253	258
1180.....	134	139	143	147	152	156	160	165	169	173	178	182	186	191	195	199	204	208	212	217	221	225	230	234	238	243	247	251	256	260
1190.....	135	140	144	148	153	157	162	166	170	175	179	183	188	192	197	201	205	210	214	218	223	227	231	236	240	245	249	253	258	262
1200.....	137	141	145	150	154	159	163	167	172	176	181	185	189	194	198	203	207	211	216	220	225	229	233	238	242	247	251	255	260	264
1210.....	138	142	147	151	155	160	164	169	173	178	182	187	191	195	200	204	209	213	218	222	226	231	235	240	244	249	253	258	262	266
1220.....	139	143	148	152	157	161	166	170	175	179	184	188	193	197	201	206	210	215	219	224	228	233	237	242	246	251	255	260	264	269
1230.....	140	144	149	153	158	163	167	172	176	181	185	190	194	199	203	208	212	217	221	226	230	235	239	244	248	253	257	262	266	271
1240.....	141	146	150	155	159	164	168	173	177	182	187	191	196	200	205	209	214	218	223	228	232	237	241	246	250	255	259	264	268	273
1250.....	142	147	151	156	161	165	170	174	179	184	188	193	197	202	206	211	216	220	225	229	234	239	243	248	252	257	261	266	271	275
1260.....	143	148	153	157	162	166	171	176	180	185	190	194	199	203	208	213	217	222	227	231	236	240	245	250	254	259	264	268	273	277
1270.....	144	149	154	158	163	168	172	177	182	186	191	196	200	205	210	214	219	224	228	233	238	242	247	252	256	261	266	270	275	280
1280.....	146	150	155	160	164	169	174	179	183	188	193	197	202	207	211	216	221	225	230	235	240	244	249	254	258	263	268	272	277	282
1290.....	147	151	156	161	166	170	175	180	185	189	194	199	204	208	213	218	223	227	232	237	241	246	251	256	260	265	270	275	279	284
1300.....	148	153	157	162	167	172	177	181	186	191	196	200	205	210	215	219	224	229	234	239	243	248	253	258	262	267	272	277	281	286
1310.....	149	154	159	163	168	173	178	183	188	192	197	202	207	212	216	221	226	231	236	240	245	250	255	260	264	269	274	279	284	288
1320.....	150	155	160	165	170	174	179	184	189	194	199	203	208	213	218	223	228	233	237	242	247	252	257	262	266	271	276	281	286	291
1330.....	151	156	161	166	171	176	181	185	190	195	200	205	210	215	220	225	229	234	239	244	249	254	259	264	268	273	278	283	288	293
1340.....	152	157	162	167	172	177	182	187	192	197	202	207	211	216	221	226	231	236	241	246	251	256	261	266	270	275	280	285	290	295
1350.....	154	159	163	168	173	178	183	188	193	198	203	208	213	218	223	228	233	238	243	248	253	258	263	268	272	277	282	287	292	297
1360.....	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	284	289	294	299
1370.....	156	161	166	171	176	181	186	191	196	201	206	211	216	221	226	231	236	241	246	251	256	261	266	272	277	282	287	292	297	302
1380.....	157	162	167	172	177	182	187	192	198	203	208	213	218	223	228	233	238	243	248	253	258	263	268	273	279	284	289	294	299	304
1390.....	158	163	168	173	179	184	189	194	199	204	209	214	219	224	230	235	240	245	250	255	260	265	270	275	281	286	291	296	301	306
1400.....	159	164	170	175	180	185	190	195	200	206	211	216	221	226	231	236	241	247	252	257	262	267	272	277	283	288	293	298	303	308
1410.....	160	166	171	176	181	186	191	197	202	207	212	217	223	228	233	238	243	248	254	259	264	269	274	279	285	290	295	300	305	310
1420.....	162	167	172	177	182	188	193	198	203	208	214	219	224	229	235	240	245	250	255	261	266	271	276	281	287	292	297	302	307	313
1430.....	163	168	173	178	184	189	194	199	205	210	215	220	226	231	236	241	247	252	257	262	268	273	278	283	289	294	299	304	310	315
1440.....	164	169	174	180	185	190	196	201	206	211	217	222	227	233	238	243	248	254	259	264	270	275	280	285	291	296	301	307	312	317
1450.....	165	170	176	181	186	192	197	202	208	213	218	224	229	234	239	245	250	255	261	266	271	277	282	287	293	298	303	309	314	319
1460.....	166	171	177	182	188	193	198	204	209	214	220	225	230	236	241	246	252	257	263	268	273	279	284	289	295	300	305	311	316	321
1470.....	167	173	178	183	189	194	200	205	210	216	221	227	232	237	243	248	254	259	264	270	275	281	286	291	297	302	308	313	318	324
1480.....	168	174	179	185	190	196	201	206	212	217	223	228	234	239	244	250	255	261	266	272	277	282	288	293	299	304	310	315	320	326
1490.....	170	175	180	186	191	197	202	208	213	219	224	230	235	241	246	252	257	262	268	273	279	284	290	295	301	306	312	317	323	328
1500.....	171	176	182	187	193	198	204	209	215	220	226	231	237	242	248	253	259	264	270	275	281	286	292	297	303	308	314	319	325	330
1510.....	172	177	183	188	194	200	205	211	216	222	227	233	238	244	249	255	260	266	272	277	283	288	294	299	305	310	316	321	327	333
1520.....	173	179	184	190	195	201	206	212	218	223	229	234	240	245	251	257	262	268	273	279	284	290	296	301	307	312	318	324	329	335
1530.....	174	180	185	191	197	202	208	213	219	225	230	236	241	247	253	258	264	270	275	281	286	292	298	303	309	314	320	326	331	337
1540.....	175	181	187	192	198	203	209	215	220	226	232	237	243	249	254	260	266	271	277	283	288	294	300	305	311	317	322	328	333	339
1550.....	176	182	188	193	199	205	210	216	222	228	233	239	245	250	256	262	267	273	279	284	290	296	301	307	313	319	324	330	336	341
1560.....	177	183	189	195	200	206	212	218	223	229	235	240	246	252	258	263	269	275	281	286	292	298	303	309	315	321	326	332	338	344
1570.....	179	184	190	196	202	207	213	219	225	230	236	242	248	254	259	265	271	277	282	288	294	300	305	311	317	323	328	334	340	346
1580.....	180	186	191	197	203	209	215	220	226	232	238	244	249	255	261	267	273	278	284	290	296	302	307	313	319	325	331	336	342	348
1590.....	181	187	193	198	204	210	216	222	228	233	239	245	251	257	263	268	274	280	286	292	298	303	309	315	321	327	333	338	344	350
1600.....	182	188	194	200	206	211	217	223	229	235	241	247	252	258	264	270	276	282	288	294	299	305	311	317	323	329	335	341	346	352

Table 6

Determination of heights by the barometer.

Temperature correction = $(H_u - H_l)$ (0.00367t'), where t' = mean virtual temperature of stratum.

For temperatures (above 0° C.) / (below 0° C.) the values are to be (added) / (subtracted).

$H_u - H_l$ (meters)	t' °C.																			
	61°	62°	63°	64°	65°	66°	67°	68°	69°	70°	71°	72°	73°	74°	75°	76°	77°	78°	79°	80°
810.....	181	184	187	190	193	196	199	202	205	208	211	214	217	220	223	226	229	232	235	238
820.....	184	187	190	193	196	199	202	205	208	211	214	217	220	223	226	229	232	235	238	241
830.....	186	189	192	195	198	201	204	207	210	213	216	219	222	225	228	232	235	238	241	244
840.....	188	191	194	197	200	203	207	210	213	216	219	222	225	228	231	234	237	240	244	247
850.....	190	193	197	200	203	206	209	212	215	218	221	225	228	231	234	237	240	243	246	250
860.....	193	196	199	202	205	208	211	215	218	221	224	227	230	234	237	240	243	246	249	252
870.....	195	198	201	204	208	211	214	217	220	224	227	230	233	236	239	243	246	249	252	255
880.....	197	200	203	207	210	213	216	220	223	226	229	233	236	239	242	245	249	252	255	258
890.....	199	203	206	209	212	216	219	222	225	229	232	235	238	242	245	248	252	255	258	261
900.....	201	205	208	211	215	218	221	225	228	231	235	238	241	244	248	251	254	258	261	264
910.....	204	207	210	214	217	220	224	227	230	234	237	240	244	247	250	254	257	260	264	267
920.....	206	209	213	216	219	223	226	230	233	236	240	243	246	250	253	257	260	263	267	270
930.....	208	212	215	218	222	225	229	232	236	239	242	246	249	253	256	259	263	266	270	273
940.....	210	214	217	221	224	228	231	235	238	241	245	248	252	255	259	262	266	269	273	276
950.....	213	216	220	223	227	230	234	237	241	244	248	251	255	258	261	265	268	272	275	279
960.....	215	218	222	225	229	233	236	240	243	247	250	254	257	261	264	268	271	275	278	282
970.....	217	221	224	228	231	235	239	242	246	249	253	256	260	263	267	271	274	278	281	285
980.....	219	223	227	230	234	237	241	245	248	252	255	259	263	266	270	273	277	281	284	288
990.....	222	225	229	233	236	240	243	247	251	254	258	262	265	269	272	276	280	283	287	291
1000.....	224	228	231	235	239	242	246	250	253	257	261	264	268	272	275	279	283	286	290	294
1010.....	226	230	234	237	241	245	248	252	256	259	263	267	271	274	278	282	285	289	293	297
1020.....	228	232	236	240	243	247	251	255	258	262	266	270	273	277	281	284	288	292	296	299
1030.....	231	234	238	242	246	249	253	257	261	265	268	272	276	280	284	287	291	295	299	302
1040.....	233	237	240	244	248	252	256	260	263	267	271	275	279	282	286	290	294	298	302	305
1050.....	235	239	243	247	250	254	258	262	266	270	274	277	281	285	289	293	297	301	304	308
1060.....	237	241	245	249	253	257	261	265	268	272	276	280	284	288	292	296	300	303	307	311
1070.....	240	243	247	251	255	259	263	267	271	275	279	283	287	291	295	298	302	306	310	314
1080.....	242	246	250	254	258	262	266	270	273	277	281	285	289	293	297	301	305	309	313	317
1090.....	244	248	252	256	260	264	268	272	276	280	284	288	292	296	300	304	308	312	316	320
1100.....	246	250	254	258	262	266	270	275	279	283	287	291	295	299	303	307	311	315	319	323
1110.....	248	253	257	261	265	269	273	277	281	285	289	293	297	301	306	310	314	318	322	326
1120.....	251	255	259	263	267	271	275	280	284	288	292	296	300	304	308	312	317	321	325	329
1130.....	253	257	261	265	270	274	278	282	286	290	294	299	303	307	311	315	319	323	328	332
1140.....	255	259	264	268	272	276	280	284	289	293	297	301	305	310	314	318	322	326	331	335
1150.....	257	262	266	270	274	279	283	287	291	295	300	304	308	312	317	321	325	329	333	338
1160.....	260	264	268	272	277	281	285	289	294	298	302	307	311	315	319	324	328	332	336	341
1170.....	262	266	271	275	279	283	288	292	296	301	305	309	313	318	322	326	331	335	339	344
1180.....	264	268	273	277	281	286	290	294	299	303	307	312	316	320	325	329	333	338	342	346
1190.....	266	271	275	280	284	288	293	297	301	306	310	314	319	323	328	332	336	341	345	349
1200.....	269	273	277	282	286	291	295	299	304	308	313	317	321	326	330	335	339	344	348	352
1210.....	271	275	280	284	289	293	298	302	306	311	315	320	324	329	333	337	342	346	351	355
1220.....	273	278	282	287	291	296	300	304	309	313	318	322	327	331	336	340	345	349	354	358
1230.....	275	280	284	289	293	298	302	307	311	316	321	325	330	334	339	343	348	352	357	361
1240.....	278	282	287	291	296	300	305	309	314	319	323	328	332	337	341	346	350	355	360	364
1250.....	280	284	289	294	298	303	307	312	317	321	326	330	335	339	344	349	353	358	362	367
1260.....	282	287	291	296	301	305	310	314	319	324	328	333	338	342	347	351	356	361	365	370
1270.....	284	289	294	298	303	308	312	317	322	326	331	336	340	345	350	354	359	364	368	373
1280.....	287	291	296	301	305	310	315	319	324	329	334	338	343	348	352	357	362	366	371	376
1290.....	289	294	298	303	308	312	317	322	327	331	336	341	346	350	355	360	365	369	374	379
1300.....	291	296	301	305	310	315	320	324	329	334	339	344	348	353	358	363	367	372	377	382
1310.....	293	298	303	308	313	317	322	327	332	337	341	346	351	356	361	365	370	375	380	385
1320.....	296	300	305	310	315	320	325	329	334	339	344	349	354	358	363	368	373	378	383	388
1330.....	298	303	308	312	317	322	327	332	337	342	347	351	356	361	366	371	376	381	386	390
1340.....	300	305	310	315	320	325	329	334	339	344	349	354	359	364	369	374	379	384	389	393
1350.....	302	307	312	317	322	327	332	337	342	347	352	357	362	367	372	377	381	386	391	396
1360.....	304	309	314	319	324	329	334	339	344	349	354	359	364	369	374	379	384	389	394	399
1370.....	307	312	317	322	327	332	337	342	347	352	357	362	367	372	377	382	387	392	397	402
1380.....	309	314	319	324	329	334	339	344	349	355	360	365	370	375	380	385	390	395	400	405
1390.....	311	316	321	326	332	337	342	347	352	357	362	367	372	377	383	388	393	398	403	408
1400.....	313	319	324	329	334	339	344	349	355	360	365	370	375	380	385	390	396	401	406	411
1410.....	316	321	326	331	336	342	347	352	357	362	367	373	378	383	388	393	398	404	409	414
1420.....	318	323	328	334	339	344	349	354	360	365	370	375	380	386	391	396	401	406	412	417
1430.....	320	325	331	336	341	346	352	357	362	367	373	378	383	388	394	399	404	409	415	420
1440.....	322	328	333	338	344	349	354	359	365	370	375	381	386	391	396	402	407	412	417	423
1450.....	325	330	335	341	346	351	357	362	367	373	378	383	388	394	399	404	410	415	420	426
1460.....	327	332	338	343	348	354	359	364	370	375	380	386	391	397	402	407	413	418	423	429
1470.....	329	334	340	345	351	356	361	367	372	378	383	388	394	399	405	410	415	421	426	432
1480.....	331	337	342	348	353	358	364	369	375	380	386	391	397	402	407	413	418	424	429	435
1490.....	334	339	345	350	355	361	366	372	377	383	388	394	399	405	410	416	421	427	432	437
1500.....	336	341	347	352	358	363	369	374	380	385	391	396	402	407	413	418	424	429	435	440
1510.....	338	344	349	355	360	366	371	377	382	388	393	399	405	410	416	421	427	432	438	443
1520.....	340	346	351	357	363	368	374	379	385	390	396	402	407	413	418	424	430	435	441	446
1530.....	343	348	354	359	365	371	376	382	387	393	399	404	410	416	421	427	432	438	444	449
1540.....	345	350	356	362	367	373	379	384	390	396	401	407	413	418	424	430	435	441	446	452
1550.....	347	353	358	364	370	375	381	387	393	398	404	410	415	421	427	432	438	444	449	455
1560.....	349	355	361	366	372	378	384	389	395	401	406	412	418	424	429	435	441	447	452	458
1570.....	351	357	363	369	375	380	386	392	398	403	409	415	421	426	432	438	444	449	455	461
1580.....	354	360	365	371	377	383	389	394	400	406	412	417	423	429	435	441	446	452	458	464
1590.....	356	362	368	373	379	385	391	397	403	408	414	420	426	432	438	443	449	455	461	467
1600.....	358	364	370	376	382	388	393	399	405	411	417	423	429	435	440	446	452	458	464	470

Table 6

Determination of heights by the barometer.

Temperature correction = $(H_u - H_l)(0.00367t')$, where t' = mean virtual temperature of stratum.

For temperatures (above 0° C. / below 0° C.) the values are to be (added / subtracted).

$H_u - H_l$ (meters)	t' °C.																									
	31°	32°	33°	34°	35°	36°	37°	38°	39°	40°	41°	42°	43°	44°	45°	46°	47°	48°	49°	50°	51°	52°	53°	54°	55°	56°	57°	58°	59°	60°
1610.....	183	189	195	201	207	213	219	225	230	236	242	248	254	260	266	272	278	284	290	295	301	307	313	319	325	331	337	343	349	355
1620.....	184	190	196	202	208	214	220	226	232	238	244	250	256	262	268	273	279	285	291	297	303	309	315	321	327	333	339	345	351	357
1630.....	185	191	197	203	209	215	221	227	233	239	245	251	257	263	269	275	281	287	293	299	305	311	317	323	329	335	341	347	353	359
1640.....	187	193	199	205	211	217	223	229	235	241	247	253	259	265	271	277	283	289	295	301	307	313	319	325	331	337	343	349	355	361
1650.....	188	194	200	206	212	218	224	230	236	242	248	254	260	266	272	279	285	291	297	303	309	315	321	327	333	339	345	351	357	363
1660.....	189	195	201	207	213	219	225	232	238	244	250	256	262	268	274	280	286	292	299	305	311	317	323	329	335	341	347	353	359	366
1670.....	190	196	202	208	215	221	227	233	239	245	251	257	264	270	276	282	288	294	300	306	313	319	325	331	337	343	349	355	362	368
1680.....	191	197	203	210	216	222	228	234	240	247	253	259	265	271	277	284	290	296	302	308	314	321	327	333	339	345	351	358	364	370
1690.....	192	198	205	211	217	223	229	236	242	248	254	260	267	273	279	285	292	298	304	310	316	323	329	335	341	347	354	360	366	372
1700.....	193	200	206	212	218	225	231	237	243	250	256	262	268	275	281	287	293	299	306	312	318	324	331	337	343	349	356	362	368	374
1710.....	195	201	207	213	220	226	232	238	245	251	257	264	270	276	282	289	295	301	308	314	320	326	333	339	345	351	358	364	370	377
1720.....	196	202	208	215	221	227	234	240	246	252	259	265	271	278	284	290	297	303	309	316	322	328	335	341	347	353	360	366	372	379
1730.....	197	203	210	216	222	229	235	241	248	254	260	267	273	279	286	292	298	305	311	317	324	330	337	343	349	356	362	368	375	381
1740.....	198	204	211	217	224	230	236	243	249	255	262	268	275	281	287	294	300	307	313	319	326	332	338	345	351	358	364	370	377	383
1750.....	199	206	212	218	225	231	238	244	250	257	263	270	276	283	289	295	302	308	315	321	328	334	340	347	353	360	366	373	379	385
1760.....	200	207	213	220	226	233	239	245	252	258	265	271	278	284	291	297	304	310	317	323	329	336	342	349	355	362	368	375	381	388
1770.....	201	208	214	221	227	234	240	247	253	260	266	273	279	286	292	299	305	312	318	325	331	338	344	351	357	364	370	377	383	390
1780.....	203	209	216	222	229	235	242	248	255	261	268	274	281	287	294	300	307	314	320	327	333	340	346	353	359	366	372	379	385	392
1790.....	204	210	217	223	230	236	243	250	256	263	269	276	282	289	296	302	309	315	322	328	335	342	348	355	361	368	374	381	388	394
1800.....	205	211	218	225	231	238	244	251	258	264	271	277	284	291	297	304	310	317	324	330	337	344	350	357	363	370	377	383	390	396
1810.....	206	213	219	226	232	239	246	252	259	266	272	279	286	292	299	306	312	319	325	332	339	345	352	359	365	372	379	385	392	399
1820.....	207	214	220	227	234	240	247	254	260	267	274	281	287	294	301	307	314	321	327	334	341	347	354	361	367	374	381	387	394	401
1830.....	208	215	222	228	235	242	248	255	262	269	275	282	289	296	302	309	316	322	329	336	343	349	356	363	369	376	383	390	396	403
1840.....	209	216	223	230	236	243	250	257	263	270	277	284	290	297	304	311	317	324	331	338	344	351	358	365	371	378	385	392	398	405
1850.....	210	217	224	231	238	244	251	258	265	272	278	285	292	299	306	312	319	326	333	339	346	353	360	367	373	380	387	394	401	407
1860.....	212	218	225	232	239	246	253	259	266	273	280	287	294	300	307	314	321	328	334	341	348	355	362	369	375	382	389	396	403	410
1870.....	213	220	226	233	240	247	254	261	268	275	281	288	295	302	309	316	323	329	336	343	350	357	364	371	377	384	391	398	405	412
1880.....	214	221	228	235	241	248	255	262	269	276	283	290	297	304	310	317	324	331	338	345	352	359	366	373	379	386	393	400	407	414
1890.....	215	222	229	236	243	250	257	264	271	277	284	291	298	305	312	319	326	333	340	347	354	361	368	375	381	388	395	402	409	416
1900.....	216	223	230	237	244	251	258	265	272	279	286	293	300	307	314	321	328	335	342	349	356	363	370	377	384	390	397	404	411	418
1910.....	217	224	231	238	245	252	259	266	273	280	287	294	301	308	315	322	329	336	343	350	357	365	372	379	386	393	400	407	414	421
1920.....	218	225	233	240	247	254	261	268	275	282	289	296	303	310	317	324	331	338	345	352	359	366	373	381	388	395	402	409	416	423
1930.....	220	227	234	241	248	255	262	269	276	283	290	297	305	312	319	326	333	340	347	354	361	368	375	382	390	397	404	411	418	425
1940.....	221	228	235	242	249	256	263	271	278	285	292	299	306	313	320	328	335	342	349	356	363	370	377	384	392	399	406	413	420	427
1950.....	222	229	236	243	250	258	265	272	279	286	293	301	308	315	322	329	336	344	351	358	365	372	379	386	394	401	408	415	422	429
1960.....	223	230	237	245	252	259	266	273	281	288	295	302	309	317	324	331	338	345	352	360	367	374	381	388	396	403	410	417	424	432
1970.....	224	231	239	246	253	260	268	275	282	289	296	304	311	318	325	333	340	347	354	361	369	376	383	390	398	405	412	419	427	434
1980.....	225	233	240	247	254	262	269	276	283	291	298	305	312	320	327	334	342	349	356	363	371	378	385	392	400	407	414	421	429	436
1990.....	226	234	241	248	256	263	270	278	285	292	299	307	314	321	329	336	343	351	358	365	372	380	387	394	402	409	416	424	431	438
2000.....	228	235	242	250	257	264	272	279	286	294	301	308	316	323	330	338	345	352	360	367	374	382	389	396	404	411	418	426	433	440
2010.....	229	236	243	251	258	266	273	280	288	295	302	310	317	325	332	339	347	354	361	369	376	384	391	398	406	413	420	428	435	443
2020.....	230	237	245	252	259	267	274	282	289	297	304	311	319	326	334	341	348	356	363	371	378	385	393	400	408	415	423	430	437	445
2030.....	231	238	246	253	261	268	276	283	291	298	305	313	320	328	335	343	350	358	365	373	380	387	395	402	410	417	425	432	440	447
2040.....	232	240	247	255	262	270	277	284	292	299	307	314	322	329	337	344	352	359	367	374	382	389	397	404	412	419	427	434	442	449
2050.....	233	241	248	256	263	271	278	286	293	301	308	316	324	331	339	346	354	361	369	376	384	391	399	406	414	421	429	436	444	451
2060.....	234	242	249	257	265	272	280	287	295	302	310	318	325	333	340	348	355	363	370	378	386	393	401	408	416	423	431	438	446	454
2070.....	236	243	251	258	266	273	281	289	296	304	311	319	327	334	342	349	357	365	372	380	387	395	403	410	418	425	433	441	448	456
2080.....	237	244	252	260	267	275	282	290	298	305	313	321	328	336	344	351	359	366	374	382	389	397	405	412	420	427	435	443	450	458
2090.....	238	245	253	261	268	276	284	291	299	307	314	322	330	337	345	353	361	368	376	384	391	399	407	414	422	430	437	445	453	460
2100.....	239	247	254	262	270	277	285	293	301	308	316	324	331	339	347	355	362	370	378	385	393	401	408	416	424	432	439	447	455	462
2110.....	240	248	256	263	271	279	287	294	302	310	317	325	333	341	348	356	364	372	379	387	395	403	410	418	426	434	441	449	457	465
2120.....	241	249	257	265	272	280	288	296	303	311	319	327	335	342	350	358	366	373	381	389	397	405	412	420	428	436	443	451	459	467
2130.....	242	250	258	266	274	281	289	297	305	313	321	328	336	344	352	360	367	375	383	391	399	406	414	422	430	438	446	453	461	469
2140.....	243	251	259	267	275	283	291	298	306	314	322	330	338	346	353	361	369	377	385	393	401	408	416	424	432	440	448	456	463	471
2150.....	245	252	260	268	276	284	292	300	308	316	324	331	339	347	355	363	371	379	387	395	402	410	418	426	434	442	450	458	466	473
2160.....	246	254	262	270	277	285	293	301	309	317	325	333	341	349	357	365	373	381	388	396	404	412	420	428	436	444	452	460	468	476
2170.....	247	255	263	271	279	287	295	303	311	319	327	334	342	350	358	366	374	382	390	398	406	414	422	430	438	446	454	462	470	478
2180.....	248	256	264	272	280	288	296	304	312	320	328	336	344	352	360	368	376	384	392	400	408	416	424	432	440	448	456	464	472	480
2190.....	249	257	265	273	281	289	297	305	313	321	330	338	346	354	362	370	378	386	394	402	410	418	426	434	442	450	458	466	474	482
2200.....	250	258	266	275	283	291	299	307	315	323	331	339	347	355	363	371	379	388	396	404	412	420	428	436	444	452	460	468	476	484
2210.....	251	260	268	276	284	292	300	308	316	324	333	341	349	357	365	373	381	389	397	405	414	422	430	438	446	454	462	470	479	487
2220.....	253	261	269	277	285	293	301	310	318	326	334	342	350	358	367	375	383	391	399	407	416	424	432	440	448	456	464	473	481	489
2230.....	254	262	270	278	286	295	303	311	319	327	336	344	352	360	368	376	385	393	401	409	417	426	434	442	450	458	466	475	483	491
2240.....	255	263	271	280	288	296	304	312	321	329	337	345	353	362	370	378	386	395	403	411	419	427	436	444	452	460	469	477	485	493
2250.....	256	264	272	281	289	297	306	314	322	330	339	347	355	363	372	380	388	396	405	413	421	429	438	446	454	462	471	479	487	495
2260.....	257	265	274	282	290	299	307	315	323	332	340	348	357	365	373	382	390	398	406	415	423	431	440	448	456	464	473	481	489	498
2270.....	258	267	275	283	292	300	308	317	325	333	342	350	358	367	375	383	392	400	408	417	425	433	442	450	458	467	475	483	492	500
2280.....	259	268	276	284	293	301	310	318	326	335	343	351	360	368	377	385	393	402	410	418	427	435	443	452	460	469	477	485	494	502
2290.....	261	269	277	286	294	303	311	319	328	336	345	353	361	370	378	387	395	403	412	420	429	437	445	454	462	471	479	487	496	504
2300.....	262	270	279	287	295	304	312	321	329	338	346	355	363	371	380	388	397	405	414	422	430	439	447	456	464	473	481	490	498	506
2310.....	263	271	280	288	297	305	314	322	331	339	348	356	365	373	381	390	398	407	415	424	432	441	449	458	466	475	483	492	500	509
2320.....	264	272	281	289	298	307	315	324	332	341	349	358	366	375	383	392	400	409	417	426	434	443	451	460	468	477	485	494	502	511
2330.....	265	274	282	291	299	308	316	325	333	342	351	359	368	376	385	393	402	410	419	428	435	445	453	462	470	479	487	496	505	513
2340.....	266	275	283	292	301	309	318	326	335	344	352	361	369	378	386	395	404	412	421	429	438	447	455	464	472	481	490	498	507	515
2350.....	267	276	285	293	302	310	319	328	336	345	354	362	371	379	388	397	405	414	423	431	440	448	457	466	474	483	492	500	509	517
2360.....	268	277	286	294	303	312	320	329	338	346	355	364	372	381	390	398	407	416	424	433	442	450	459	468	476	485	494	502	511	520
2370.....	270	278	287	296	304	313	322	331	339	348	357	365	374	383	391	400	409	417	426	435	444	452	461	470	478	487	496	504	513	522
2380.....	271	280	288	297	306	314	323	332	341	349	358	367	376	384	393	402	411	419	428	437	445	454	463	472	480	489	498	507	515	524
2390.....	272	281	289	298	307	316	325	333	342	351	360	368	377	386	395	403	412	421	430	439	447	456	465	474	482	491	500	509	518	526
2400.....	273	282	291	299	308	317	326	335	344	352	361	370	379	388	396	405	414	423	432	440	449	458	467	476	484	493	502	511	520	528

Table 6

Determination of heights by the barometer.

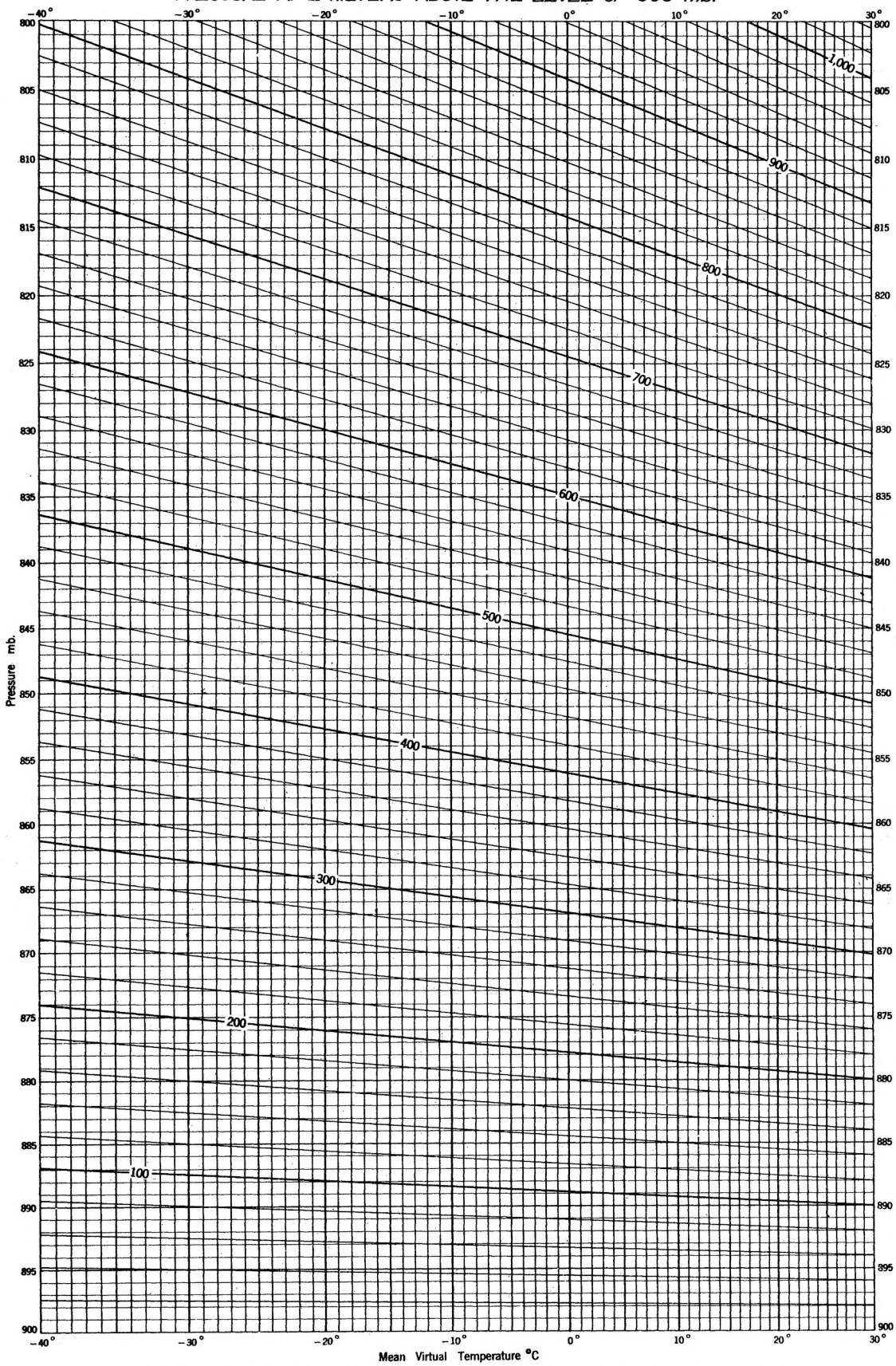
Temperature correction = $(H_u - H_l)(0.00367t')$, where t' = mean virtual temperature of stratum.

For temperatures (above 0° C.) / (below 0° C.) the values are to be (added) / (subtracted).

$H_u - H_l$ (meters)	t' °C.																			
	61°	62°	63°	64°	65°	66°	67°	68°	69°	70°	71°	72°	73°	74°	75°	76°	77°	78°	79°	80°
1610.....	360	366	372	378	384	390	396	402	408	414	420	425	431	437	443	449	455	461	467	473
1620.....	363	369	375	381	386	392	398	404	410	416	422	428	434	440	446	452	458	464	470	476
1630.....	365	371	377	383	389	395	401	407	413	419	425	431	437	443	449	455	461	467	473	479
1640.....	367	373	379	385	391	397	403	409	415	421	427	433	439	445	451	457	463	469	475	482
1650.....	369	375	381	388	394	400	406	412	418	424	430	436	442	448	454	460	466	472	478	484
1660.....	372	378	384	390	396	402	408	414	420	426	433	439	445	451	457	463	469	475	481	487
1670.....	374	380	386	392	398	405	411	417	423	429	435	441	447	454	460	466	472	478	484	490
1680.....	376	382	388	395	401	407	413	419	425	432	438	444	450	456	462	469	475	481	487	493
1690.....	378	385	391	397	403	409	416	422	428	434	440	447	453	459	465	471	478	484	490	496
1700.....	381	387	393	399	406	412	418	424	430	437	443	449	455	462	468	474	480	487	493	499
1710.....	383	389	395	402	408	414	420	427	433	439	446	452	458	464	471	477	483	490	496	502
1720.....	385	391	398	404	410	417	423	429	436	442	448	454	461	467	473	480	486	492	499	505
1730.....	387	394	400	406	413	419	425	432	438	444	451	457	463	470	476	483	489	495	502	508
1740.....	390	396	402	409	415	421	428	434	441	447	453	460	466	473	479	485	492	498	504	511
1750.....	392	398	405	411	417	424	430	437	443	450	456	462	469	475	482	488	495	501	507	514
1760.....	394	400	407	413	420	426	433	439	446	452	459	465	472	478	484	491	497	504	510	517
1770.....	396	403	409	416	422	429	435	442	448	455	461	468	474	481	487	494	500	507	513	520
1780.....	398	405	412	418	425	431	438	444	451	457	464	470	477	483	490	496	503	510	516	523
1790.....	401	407	414	420	427	434	440	447	453	460	466	473	480	486	493	499	506	512	519	526
1800.....	403	410	416	423	429	436	443	449	456	462	469	476	482	489	495	502	509	515	522	528
1810.....	405	412	418	425	432	438	445	452	458	465	472	478	485	492	498	505	511	518	525	531
1820.....	407	414	421	427	434	441	448	454	461	468	474	481	488	494	501	508	514	521	528	534
1830.....	410	416	423	430	437	443	450	457	463	470	477	484	490	497	504	510	517	524	531	537
1840.....	412	419	425	432	439	446	452	459	466	473	479	486	493	500	506	513	520	527	533	540
1850.....	414	421	428	435	441	448	455	462	468	475	482	489	496	502	509	516	523	530	536	543
1860.....	416	423	430	437	444	451	457	464	471	478	485	491	498	505	512	519	526	532	539	546
1870.....	419	425	432	439	446	453	460	467	474	480	487	494	501	508	515	522	528	535	542	549
1880.....	421	428	435	442	448	455	462	469	476	483	490	497	504	511	517	524	531	538	545	552
1890.....	423	430	437	444	451	458	465	472	479	486	492	499	506	513	520	527	534	541	548	555
1900.....	425	432	439	446	453	460	467	474	481	488	495	502	509	516	523	530	537	544	551	558
1910.....	428	435	442	449	456	463	470	477	484	491	498	505	512	519	526	533	540	547	554	561
1920.....	430	437	444	451	458	465	472	479	486	493	500	507	514	521	528	536	543	550	557	564
1930.....	432	439	446	453	460	467	475	482	489	496	503	510	517	524	531	538	545	552	560	567
1940.....	434	441	449	456	463	470	477	484	491	498	506	513	520	527	534	541	548	555	562	570
1950.....	437	444	451	458	465	472	479	487	494	501	508	515	522	530	537	544	551	558	565	573
1960.....	439	446	453	460	468	475	482	489	496	504	511	518	525	532	539	547	554	561	568	575
1970.....	441	448	455	463	470	477	484	492	499	506	513	521	528	535	542	549	557	564	571	578
1980.....	443	451	458	465	472	480	487	494	501	509	516	523	530	538	545	552	560	567	574	581
1990.....	446	453	460	467	475	482	489	497	504	511	519	526	533	540	548	555	562	570	577	584
2000.....	448	455	462	470	477	484	492	499	506	514	521	528	536	543	550	558	565	573	580	587
2010.....	450	457	465	472	479	487	494	502	509	516	524	531	538	546	553	561	568	575	583	590
2020.....	452	460	467	474	482	489	497	504	512	519	526	534	541	549	556	563	571	578	586	593
2030.....	454	462	469	477	484	492	499	507	514	522	529	536	544	551	559	566	574	581	589	596
2040.....	457	464	472	479	487	494	502	509	517	524	532	539	547	554	562	569	576	584	591	599
2050.....	459	466	474	482	489	497	504	512	519	527	534	542	549	557	564	572	579	587	594	602
2060.....	461	469	476	484	491	499	507	514	522	529	537	544	552	559	567	575	582	590	597	605
2070.....	463	471	479	486	494	501	509	517	524	532	539	547	555	562	570	577	585	593	600	608
2080.....	466	473	481	489	496	504	511	519	527	534	542	550	557	565	573	580	588	595	603	611
2090.....	468	476	483	491	499	506	514	522	529	537	545	552	560	568	575	583	591	598	606	614
2100.....	470	478	486	493	501	509	516	524	532	539	547	555	563	570	578	586	593	601	609	617
2110.....	472	480	488	496	503	511	519	527	534	542	550	558	565	573	581	589	596	604	612	619
2120.....	475	482	490	498	506	514	521	529	537	545	552	560	568	576	584	591	599	607	615	622
2130.....	477	485	492	500	508	516	524	532	539	547	555	563	571	578	586	594	602	610	618	625
2140.....	479	487	495	503	510	518	526	534	542	550	558	565	573	581	589	597	605	613	620	628
2150.....	481	489	497	505	513	521	529	537	544	552	560	568	576	584	592	600	608	615	623	631
2160.....	484	491	499	507	515	523	531	539	547	555	563	571	579	587	595	602	610	618	626	634
2170.....	486	494	502	510	518	526	534	542	550	557	565	573	581	589	597	605	613	621	629	637
2180.....	488	496	504	512	520	528	536	544	552	560	568	576	584	592	600	608	616	624	632	640
2190.....	490	498	506	514	522	530	538	547	555	563	571	579	587	595	603	611	619	627	635	643
2200.....	493	501	509	517	525	533	541	549	557	565	573	581	589	597	606	614	622	630	638	646
2210.....	495	503	511	519	527	535	543	552	560	568	576	584	592	600	608	616	625	633	641	649
2220.....	497	505	513	521	530	538	546	554	562	570	578	587	595	603	611	619	627	635	644	652
2230.....	499	507	516	524	532	540	548	557	565	573	581	589	597	606	614	622	630	638	647	655
2240.....	501	510	518	526	534	543	551	559	567	575	584	592	600	608	617	625	633	641	649	658
2250.....	504	512	520	528	537	545	553	562	570	578	586	595	603	611	619	628	636	644	652	661
2260.....	506	514	523	531	539	547	556	564	572	581	589	597	605	614	622	630	639	647	655	664
2270.....	508	517	525	533	542	550	558	567	575	583	591	600	608	616	625	633	641	650	658	666
2280.....	510	519	527	536	544	552	561	569	577	586	594	602	611	619	628	636	644	653	661	669
2290.....	513	521	529	538	546	555	563	571	580	588	597	605	614	622	630	639	647	656	664	672
2300.....	515	523	532	540	549	557	566	574	582	591	599	608	616	625	633	642	650	658	667	675
2310.....	517	526	534	543	551	560	568	576	585	593	602	610	619	627	636	644	653	661	670	678
2320.....	519	528	536	545	553	562	570	579	587	596	605	613	622	630	639	647	656	664	673	681
2330.....	522	530	539	547	556	564	573	581	590	599	607	616	624	633	641	650	658	667	676	684
2340.....	524	532	541	550	558	567	575	584	593	601	610	618	627	635	644	653	661	670	678	687
2350.....	526	535	543	552	561	569	578	586	595	604	612	621	630	638	647	655	664	673	681	690
2360.....	528	537	546	554	563	572	580	589	598	606	615	624	632	641	650	658	667	676	684	693
2370.....	531	539	548	557	565	574	583	591	600	609	618	626	635	644	652	661	670	678	687	696
2380.....	533	542	550	559	568	576	585	594	603	611	620	629	638	646	655	664	673	681	690	699
2390.....	535	544	553	561	570	579	588	596	605	614	623	632	640	649	658	667	675	684	693	702
2400.....	537	546	555	564	573	581	590	599	608	617	625	634	643	652	661	669	678	687	696	705

Table 7

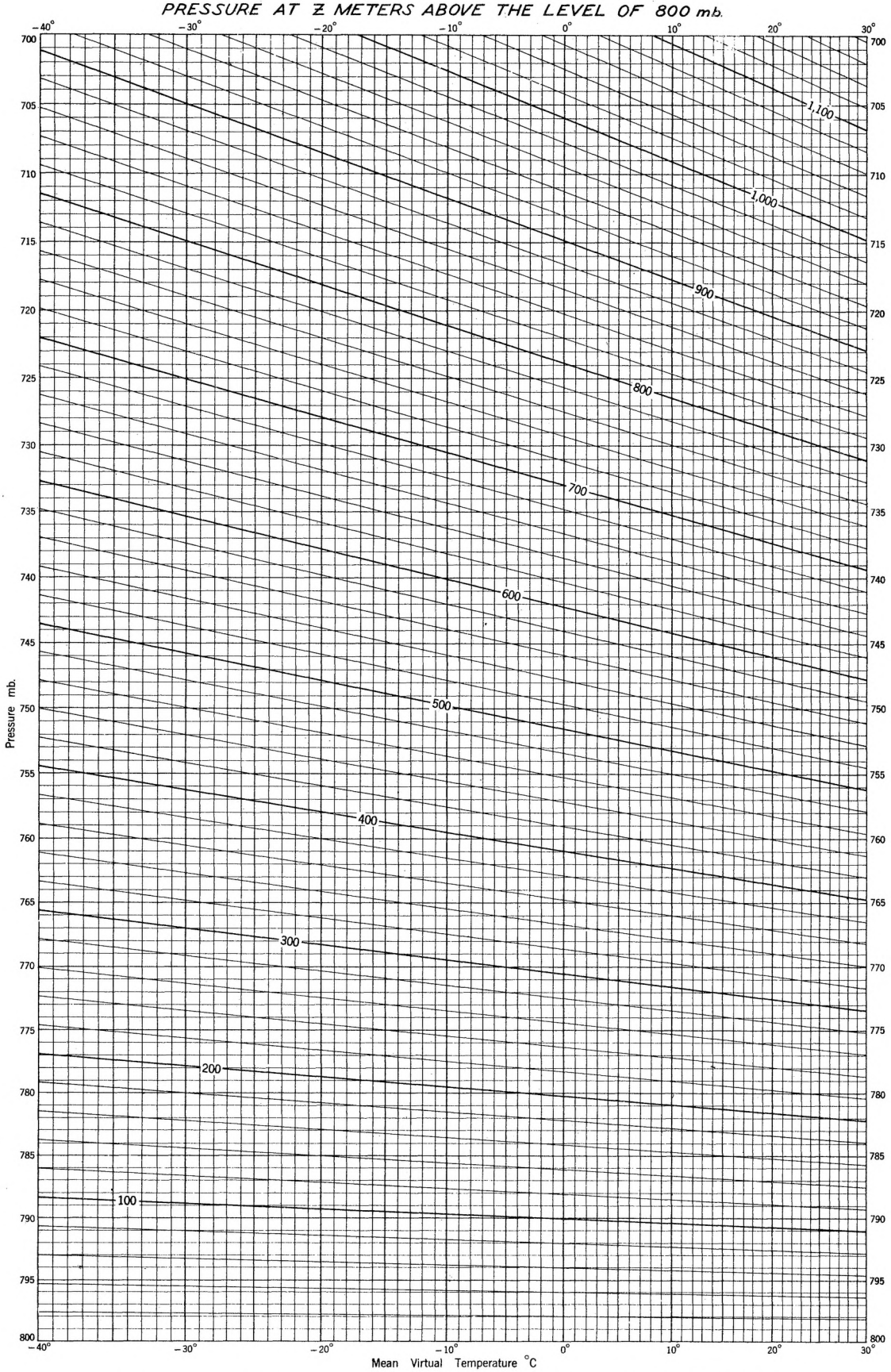
PRESSURE AT Z METERS ABOVE THE LEVEL OF 900 mb.



Slanting lines represent elevations of Z meters (0.98 dynamic meters) above the level of the 900 mb surface

Table 8

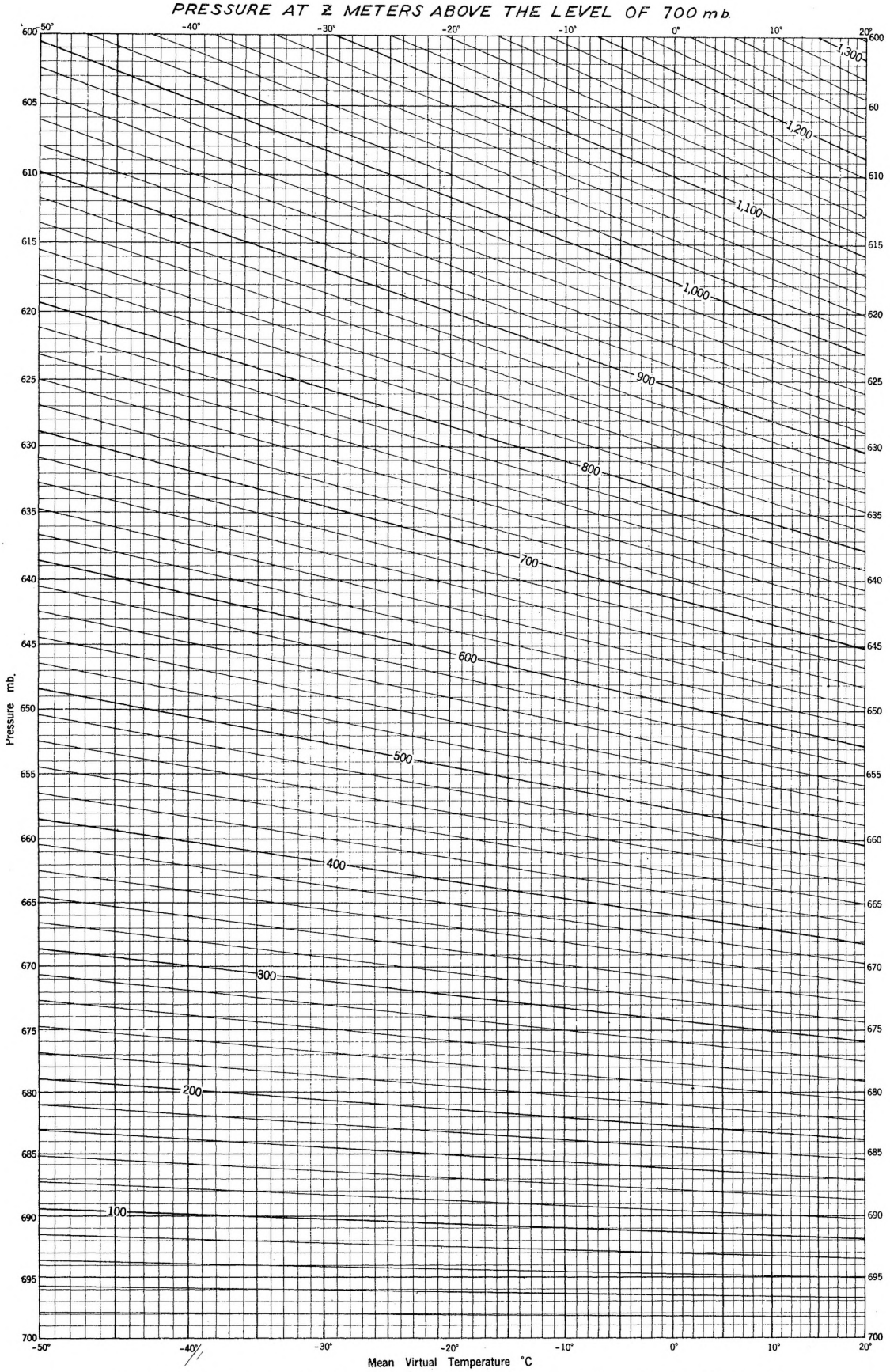
PRESSURE AT Z METERS ABOVE THE LEVEL OF 800 mb.



Slanting lines represent elevations of Z meters (0.98 dynamic meters) above the level of the 800mb. surface.

Table 9

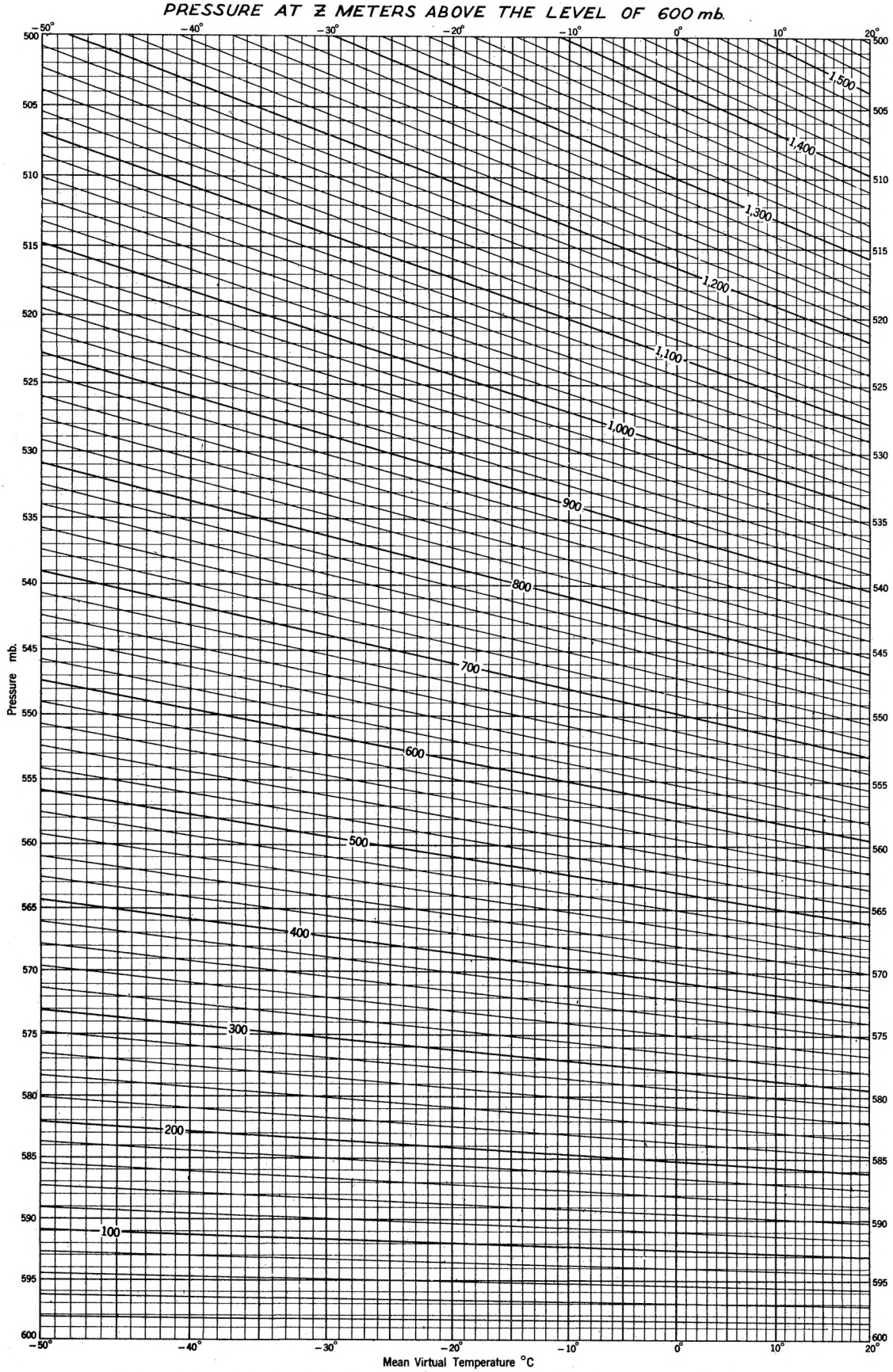
PRESSURE AT Z METERS ABOVE THE LEVEL OF 700 mb.



Slanting lines represent elevations of Z meters (0.98 dynamic meters) above the level of the 700mb surface

Table 10

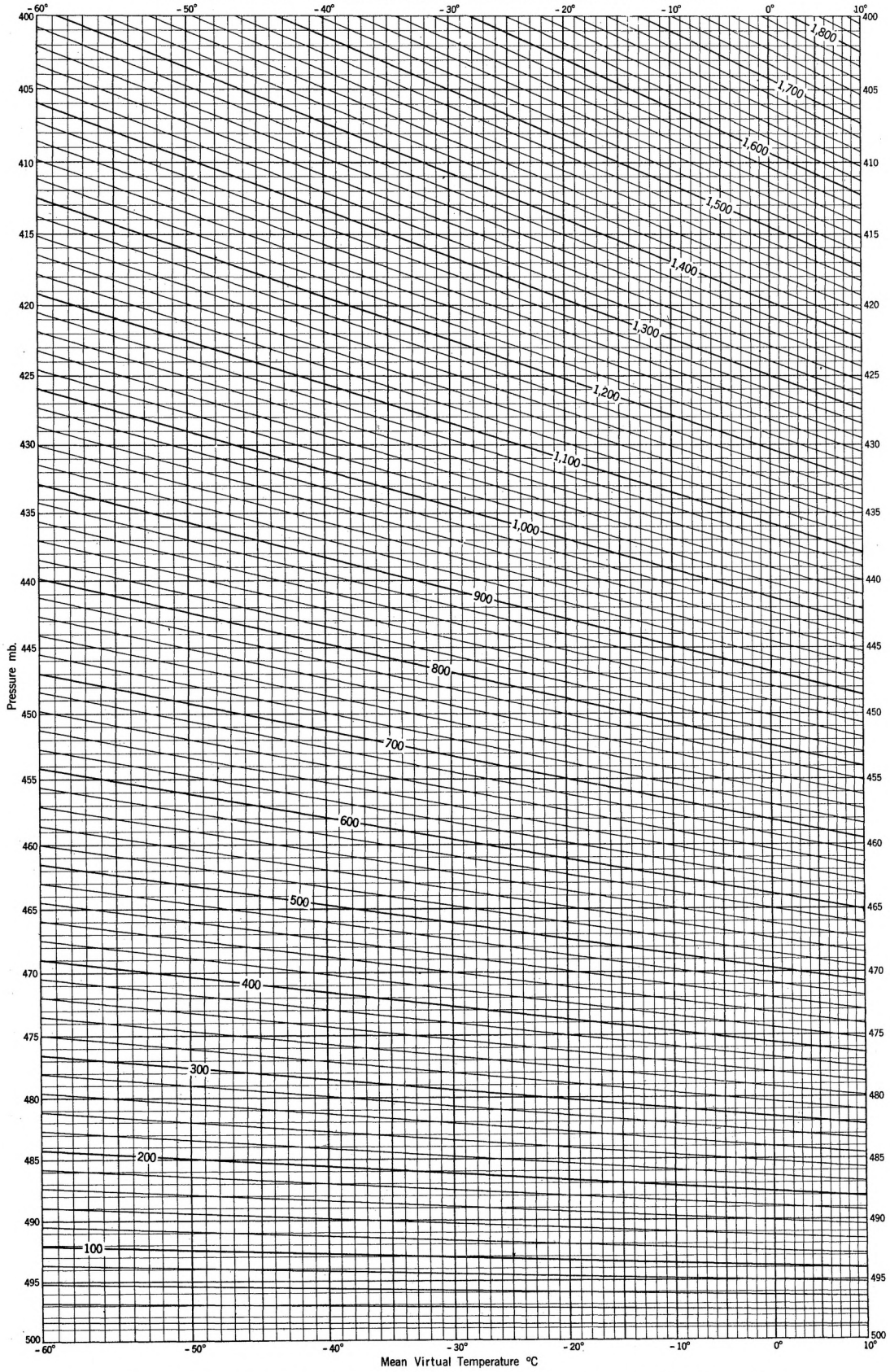
PRESSURE AT Z METERS ABOVE THE LEVEL OF 600 mb.



Slanting lines represent elevations of Z meters (0.98 dynamic meters) above the level of the 600mb surface

Table II

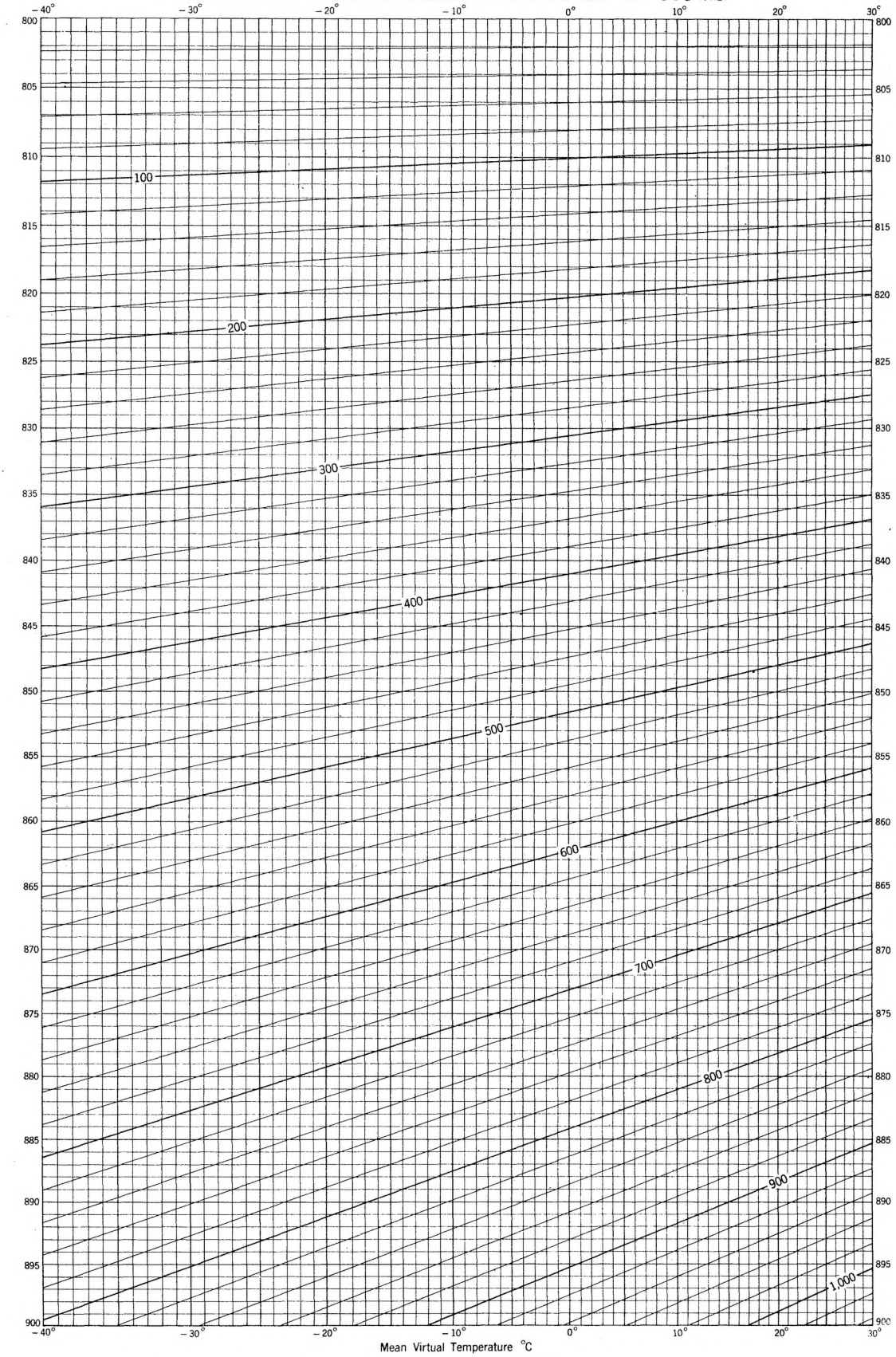
PRESSURE AT Z METERS ABOVE THE LEVEL OF 500 mb.



Slanting lines represent elevations of Z meters (0.98 dynamic meters) above the level of the 500 mb surface

Table 12

PRESSURE AT Z METERS BELOW THE LEVEL OF 800 mb.



Slanting lines represent elevations of Z meters (0.98 dynamic meters) below the level of the 800 mb. surface

Table 13

Stream Function Computation Tables

10.05T, for Various Temperatures, t, in °C.

Temperature, t°C.	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
-59	2151	2150	2149	2148	2147	2146	2145	2144	2143	2142
-58	2161	2160	2159	2158	2157	2156	2155	2154	2153	2152
-57	2171	2170	2169	2168	2167	2166	2165	2164	2163	2162
-56	2181	2180	2179	2178	2177	2176	2175	2174	2173	2172
-55	2191	2190	2189	2188	2187	2186	2185	2184	2183	2182
-54	2201	2200	2199	2198	2197	2196	2195	2194	2193	2192
-53	2211	2210	2209	2208	2207	2206	2205	2204	2203	2202
-52	2221	2220	2219	2218	2217	2216	2215	2214	2213	2212
-51	2231	2230	2229	2228	2227	2226	2225	2224	2223	2222
-50	2241	2240	2239	2238	2237	2236	2235	2234	2233	2232
-49	2251	2250	2249	2248	2247	2246	2245	2244	2243	2242
-48	2261	2260	2259	2258	2257	2256	2255	2254	2253	2252
-47	2271	2270	2269	2268	2267	2266	2265	2264	2263	2262
-46	2281	2280	2279	2278	2277	2276	2275	2274	2273	2272
-45	2291	2290	2289	2288	2287	2286	2285	2284	2283	2282
-44	2301	2300	2299	2298	2297	2296	2295	2294	2293	2292
-43	2312	2310	2309	2308	2307	2306	2305	2304	2303	2302
-42	2322	2321	2320	2319	2318	2317	2316	2315	2314	2313
-41	2332	2331	2330	2329	2328	2327	2326	2325	2324	2323
-40	2342	2341	2340	2339	2338	2337	2336	2335	2334	2333
-39	2352	2351	2350	2349	2348	2347	2346	2345	2344	2343
-38	2362	2361	2360	2359	2358	2357	2356	2355	2354	2353
-37	2372	2371	2370	2369	2368	2367	2366	2365	2364	2363
-36	2382	2381	2380	2379	2378	2377	2376	2375	2374	2373
-35	2392	2391	2390	2389	2388	2387	2386	2385	2384	2383
-34	2402	2401	2400	2399	2398	2397	2396	2395	2394	2393
-33	2412	2411	2410	2409	2408	2407	2406	2405	2404	2403
-32	2422	2421	2420	2419	2418	2417	2416	2415	2414	2413
-31	2432	2431	2430	2429	2428	2427	2426	2425	2424	2423
-30	2442	2441	2440	2439	2438	2437	2436	2435	2434	2433
-29	2452	2451	2450	2449	2448	2447	2446	2445	2444	2443
-28	2462	2461	2460	2459	2458	2457	2456	2455	2454	2453
-27	2472	2471	2470	2469	2468	2467	2466	2465	2464	2463
-26	2482	2481	2480	2479	2478	2477	2476	2475	2474	2473
-25	2492	2491	2490	2489	2488	2487	2486	2485	2484	2483
-24	2502	2501	2500	2499	2498	2497	2496	2495	2494	2493
-23	2512	2511	2510	2509	2508	2507	2506	2505	2504	2503
-22	2523	2522	2521	2520	2519	2518	2517	2516	2515	2514
-21	2533	2532	2531	2530	2529	2528	2527	2526	2525	2524
-20	2543	2542	2541	2540	2539	2538	2537	2536	2535	2534
-19	2553	2552	2551	2550	2549	2548	2547	2546	2545	2544
-18	2563	2562	2561	2560	2559	2558	2557	2556	2555	2554
-17	2573	2572	2571	2570	2569	2568	2567	2566	2565	2564
-16	2583	2582	2581	2580	2579	2578	2577	2576	2575	2574
-15	2593	2592	2591	2590	2589	2588	2587	2586	2585	2584
-14	2603	2602	2601	2600	2599	2598	2597	2596	2595	2594
-13	2613	2612	2611	2610	2609	2608	2607	2606	2605	2604
-12	2623	2622	2621	2620	2619	2618	2617	2616	2615	2614
-11	2633	2632	2631	2630	2629	2628	2627	2626	2625	2624
-10	2643	2642	2641	2640	2639	2638	2637	2636	2635	2634

T = (273 + t°C.) = absolute temperature (°A.)

10.05T, for Various Temperatures, t, in °C.

Temperature, t°C.	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
-9	2653	2652	2651	2650	2649	2648	2647	2646	2645	2644
-8	2663	2662	2661	2660	2659	2658	2657	2656	2655	2654
-7	2673	2672	2671	2670	2669	2668	2667	2666	2665	2664
-6	2683	2682	2681	2680	2679	2678	2677	2676	2675	2674
-5	2693	2692	2691	2690	2689	2688	2687	2686	2685	2684
-4	2703	2702	2701	2700	2699	2698	2697	2696	2695	2694
-3	2714	2712	2711	2710	2709	2708	2707	2706	2705	2704
-2	2724	2723	2722	2721	2720	2719	2718	2717	2716	2715
-1	2734	2733	2732	2731	2730	2729	2728	2727	2726	2725
-0	2744	2743	2742	2741	2740	2739	2738	2737	2736	2735
+0	2744	2745	2746	2747	2748	2749	2750	2751	2752	2753
+1	2754	2755	2756	2757	2758	2759	2760	2761	2762	2763
2	2764	2765	2766	2767	2768	2769	2770	2771	2772	2773
3	2774	2775	2776	2777	2778	2779	2780	2781	2782	2783
4	2784	2785	2786	2787	2788	2789	2790	2791	2792	2793
5	2794	2795	2796	2797	2798	2799	2800	2801	2802	2803
6	2804	2805	2806	2807	2808	2809	2810	2811	2812	2813
7	2814	2815	2816	2817	2818	2819	2820	2821	2822	2823
8	2824	2825	2826	2827	2828	2829	2830	2831	2832	2833
9	2834	2835	2836	2837	2838	2839	2840	2841	2842	2843
10	2844	2845	2846	2847	2848	2849	2850	2851	2852	2853
11	2854	2855	2856	2857	2858	2859	2860	2861	2862	2863
12	2864	2865	2866	2867	2868	2869	2870	2871	2872	2873
13	2874	2875	2876	2877	2878	2879	2880	2881	2882	2883
14	2884	2885	2886	2887	2888	2889	2890	2891	2892	2893
15	2894	2895	2896	2897	2898	2899	2900	2901	2902	2903
16	2904	2905	2906	2907	2908	2909	2910	2911	2912	2913
17	2914	2916	2917	2918	2919	2920	2921	2922	2923	2924
18	2925	2926	2927	2928	2929	2930	2931	2932	2933	2934
19	2935	2936	2937	2938	2939	2940	2941	2942	2943	2944
20	2945	2946	2947	2948	2949	2950	2951	2952	2953	2954
21	2955	2956	2957	2958	2959	2960	2961	2962	2963	2964
22	2965	2966	2967	2968	2969	2970	2971	2972	2973	2974
23	2975	2976	2977	2978	2979	2980	2981	2982	2983	2984
24	2985	2986	2987	2988	2989	2990	2991	2992	2993	2994
25	2995	2996	2997	2998	2999	3000	3001	3002	3003	3004
26	3005	3006	3007	3008	3009	3010	3011	3012	3013	3014
27	3015	3016	3017	3018	3019	3020	3021	3022	3023	3024
28	3025	3026	3027	3028	3029	3030	3031	3032	3033	3034
29	3035	3036	3037	3038	3039	3040	3041	3042	3043	3044
30	3045	3046	3047	3048	3049	3050	3051	3052	3053	3054
31	3055	3056	3057	3058	3059	3060	3061	3062	3063	3064
32	3065	3066	3067	3068	3069	3070	3071	3072	3073	3074
33	3075	3076	3077	3078	3079	3080	3081	3082	3083	3084
34	3085	3086	3087	3088	3089	3090	3091	3092	3093	3094
35	3095	3096	3097	3098	3099	3100	3101	3102	3103	3104
36	3105	3106	3107	3108	3109	3110	3111	3112	3113	3114
37	3116	3117	3118	3119	3120	3121	3122	3123	3124	3125
38	3126	3127	3128	3129	3130	3131	3132	3133	3134	3135
39	3136	3137	3138	3139	3140	3141	3142	3143	3144	3145

Table 14

Stream Function Computation Tables

$\left(\frac{\phi \text{ gdm.}}{10}\right)$ for Various Heights (Above Sea Level) Expressed in Terms of Unit 0.98 Dynamic Meter

Height above sea level in unit: 0.98 dynamic meter	00	10	20	30	40	50	60	70	80	90
0	0	1	2	3	4	5	6	7	8	9
100	10	11	12	13	14	15	16	17	18	19
200	20	21	22	23	24	24	25	26	27	28
300	29	30	31	32	33	34	35	36	37	38
400	39	40	41	42	43	44	45	46	47	48
500	49	50	51	52	53	54	55	56	57	58
600	59	60	61	62	63	64	65	66	67	68
700	69	70	71	72	73	74	74	75	76	77
800	78	79	80	81	82	83	84	85	86	87
900	88	89	90	91	92	93	94	95	96	97
1000	98	99	100	101	102	103	104	105	106	107
1100	108	109	110	111	112	113	114	115	116	117
1200	118	119	120	121	122	122	123	124	125	126
1300	127	128	129	130	131	132	133	134	135	136
1400	137	138	139	140	141	142	143	144	145	146
1500	147	148	149	150	151	152	153	154	155	156
1600	157	158	159	160	161	162	163	164	165	166
1700	167	168	169	170	171	172	172	173	174	175
1800	176	177	178	179	180	181	182	183	184	185
1900	186	187	188	189	190	191	192	193	194	195
2000	196	197	198	199	200	201	202	203	204	205
2100	206	207	208	209	210	211	212	213	214	215
2200	216	217	218	219	220	220	221	222	223	224
2300	225	226	227	228	229	230	231	232	233	234
2400	235	236	237	238	239	240	241	242	243	244
2500	245	246	247	248	249	250	251	252	253	254
2600	255	256	257	258	259	260	261	262	263	264
2700	265	266	267	268	269	270	270	271	272	273
2800	274	275	276	277	278	279	280	281	282	283
2900	284	285	286	287	288	289	290	291	292	293
3000	294	295	296	297	298	299	300	301	302	303
3100	304	305	306	307	308	309	310	311	312	313
3200	314	315	316	317	318	318	319	320	321	322
3300	323	324	325	326	327	328	329	330	331	332
3400	333	334	335	336	337	338	339	340	341	342
3500	343	344	345	346	347	348	349	350	351	352
3600	353	354	355	356	357	358	359	360	361	362
3700	363	364	365	366	367	368	368	369	370	371
3800	372	373	374	375	376	377	378	379	380	381
3900	382	383	384	385	386	387	388	389	390	391
4000	392	393	394	395	396	397	398	399	400	401
4100	402	403	404	405	406	407	408	409	410	411
4200	412	413	414	415	416	416	417	418	419	420
4300	421	422	423	424	425	426	427	428	429	430
4400	431	432	433	434	435	436	437	438	439	440
4500	441	442	443	444	445	446	447	448	449	450
4600	451	452	453	454	455	456	457	458	459	460
4700	461	462	463	464	465	466	466	467	468	469
4800	470	471	472	473	474	475	476	477	478	479
4900	480	481	482	483	484	485	486	487	488	489

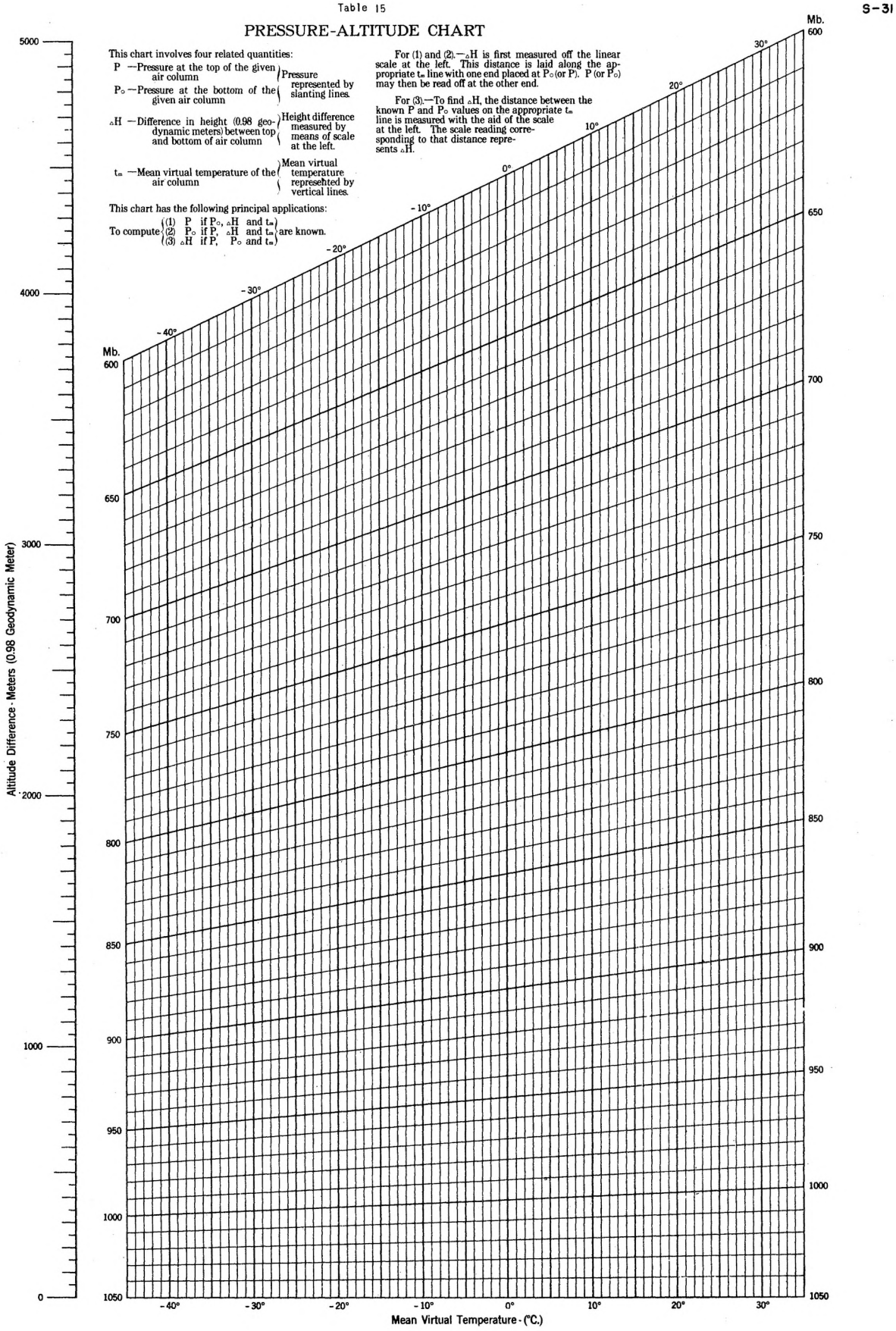
ϕ gdm = height (geodynamic) in dynamic meters, referred to sea level.

$\left(\frac{\phi \text{ gdm.}}{10}\right)$ for Various Heights (Above Sea Level) Expressed in Terms of Unit 0.98 Dynamic Meter

Height above sea level in unit: 0.98 dynamic meter	00	10	20	30	40	50	60	70	80	90
5000	490	491	492	493	494	495	496	497	498	499
5100	500	501	502	503	504	505	506	507	508	509
5200	510	511	512	513	514	514	515	516	517	518
5300	519	520	521	522	523	524	525	526	527	528
5400	529	530	531	532	533	534	535	536	537	538
5500	539	540	541	542	543	544	545	546	547	548
5600	549	550	551	552	553	554	555	556	557	558
5700	559	560	561	562	563	564	564	565	566	567
5800	568	569	570	571	572	573	574	575	576	577
5900	578	579	580	581	582	583	584	585	586	587
6000	588	589	590	591	592	593	594	595	596	597
6100	598	599	600	601	602	603	604	605	606	607
6200	608	609	610	611	612	612	613	614	615	616
6300	617	618	619	620	621	622	623	624	625	626
6400	627	628	629	630	631	632	633	634	635	636
6500	637	638	639	640	641	642	643	644	645	646
6600	647	648	649	650	651	652	653	654	655	656
6700	657	658	659	660	661	662	662	663	664	665
6800	666	667	668	669	670	671	672	673	674	675
6900	676	677	678	679	680	681	682	683	684	685
7000	686	687	688	689	690	691	692	693	694	695
7100	696	697	698	699	700	701	702	703	704	705
7200	706	707	708	709	710	710	711	712	713	714
7300	715	716	717	718	719	720	721	722	723	724
7400	725	726	727	728	729	730	731	732	733	734
7500	735	736	737	738	739	740	741	742	743	744
7600	745	746	747	748	749	750	751	752	753	754
7700	755	756	757	758	759	760	760	761	762	763
7800	764	765	766	767	768	769	770	771	772	773
7900	774	775	776	777	778	779	780	781	782	783
8000	784	785	786	787	788	789	790	791	792	793
8100	794	795	796	797	798	799	800	801	802	803
8200	804	805	806	807	808	808	809	810	811	812
8300	813	814	815	816	817	818	819	820	821	822
8400	823	824	825	826	827	828	829	830	831	832
8500	833	834	835	836	837	838	839	840	841	842
8600	843	844	845	846	847	848	849	850	851	852
8700	853	854	855	856	857	858	858	859	860	861
8800	862	863	864	865	866	867	868	869	870	871
8900	872	873	874	875	876	877	878	879	880	881
9000	882	883	884	885	886	887	888	889	890	891
9100	892	893	894	895	896	897	898	899	900	901
9200	902	903	904	905	906	906	907	908	909	910
9300	911	912	913	914	915	916	917	918	919	920
9400	921	922	923	924	925	926	927	928	929	930
9500	931	932	933	934	935	936	937	938	939	940
9600	941	942	943	944	945	946	947	948	949	950
9700	951	952	953	954	955	956	956	957	958	959
9800	960	961	962	963	964	965	966	967	968	969
9900	970	971	972	973	974	975	976	977	978	979

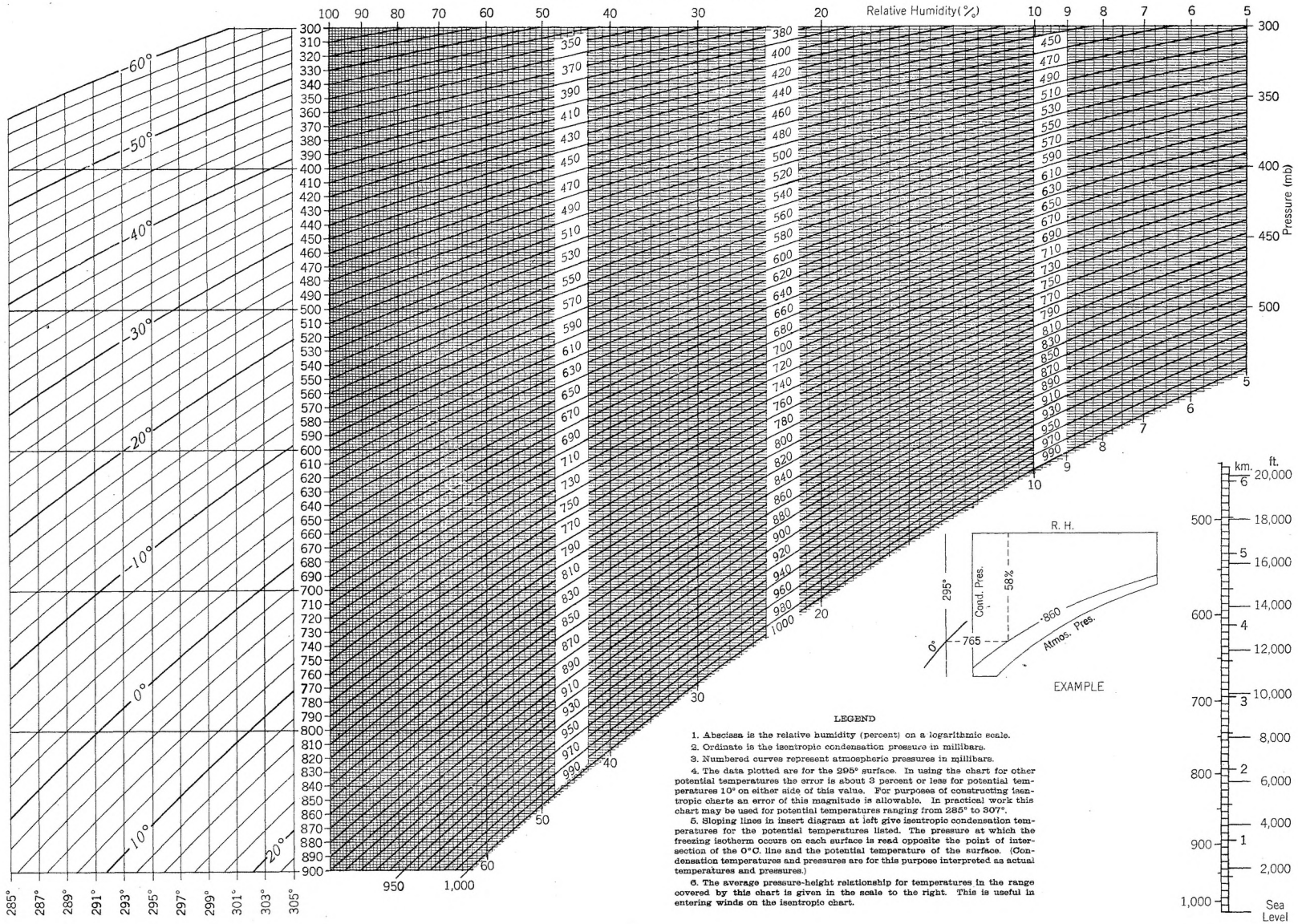
Table 15

PRESSURE-ALTITUDE CHART



ISENTROPIC COMPUTATION CHART $\Theta = 295°$

U. S. DEPARTMENT OF COMMERCE, WEATHER BUREAU



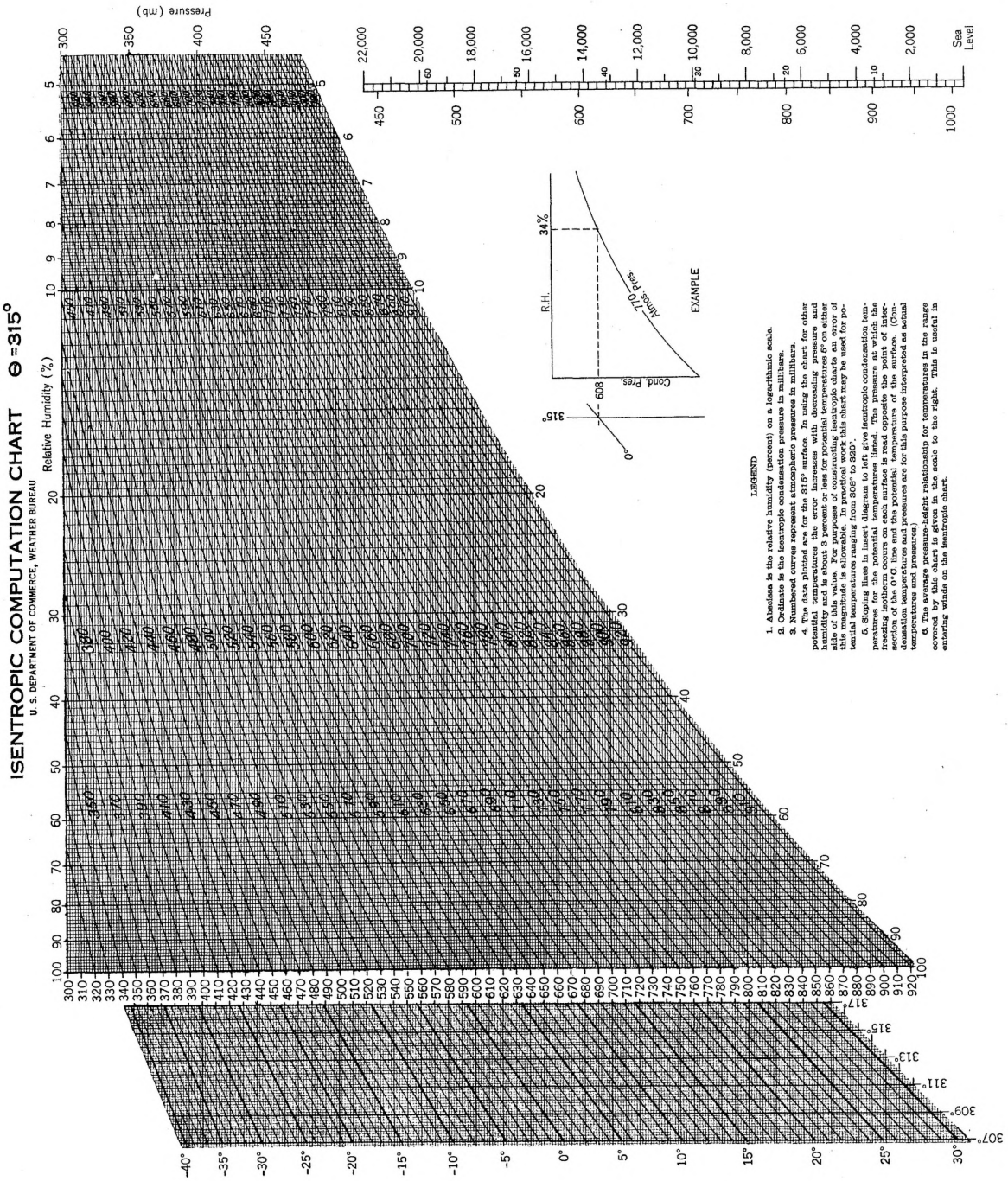
LEGEND

1. Abscissa is the relative humidity (percent) on a logarithmic scale.
2. Ordinate is the isentropic condensation pressure in millibars.
3. Numbered curves represent atmospheric pressures in millibars.
4. The data plotted are for the 295° surface. In using the chart for other potential temperatures the error is about 3 percent or less for potential temperatures 10° on either side of this value. For purposes of constructing isentropic charts an error of this magnitude is allowable. In practical work this chart may be used for potential temperatures ranging from 285° to 307°.
5. Sloping lines in insert diagram at left give isentropic condensation temperatures for the potential temperatures listed. The pressure at which the freezing isotherm occurs on each surface is read opposite the point of intersection of the 0°C. line and the potential temperature of the surface. (Condensation temperatures and pressures are for this purpose interpreted as actual temperatures and pressures.)
6. The average pressure-height relationship for temperatures in the range covered by this chart is given in the scale to the right. This is useful in entering winds on the isentropic chart.

Table 17

ISENTROPIC COMPUTATION CHART θ=315°

U. S. DEPARTMENT OF COMMERCE, WEATHER BUREAU



LEGEND

1. Abcissa is the relative humidity (percent) on a logarithmic scale.
2. Ordinate is the isentropic condensation pressure in millibars.
3. Numbered curves represent atmospheric pressures in millibars.
4. The data plotted are for the 315° surface. In using this chart for other potential temperatures, the error introduced with decreasing pressure and humidity and is about 3 percent or less for potential temperatures 6° on either side of this value. For purposes of constructing isentropic charts an error of this magnitude is allowable. In practice, work this chart may be used for potential temperatures ranging from 309° to 320°.
5. Sloping lines in inset diagram to left give isentropic condensation temperatures for the potential temperature used. The pressure at which the first freezing isotherm occurs on each surface is read opposite the point of intersection of the 0°C. line and the potential temperature of the surface. (Condensation temperatures and pressures are for this purpose interpreted as actual temperatures and pressures.)
6. The average pressure-height relationship for temperatures in the range covered by this chart is given in the scale to the right. This is useful in entering winds on the isentropic chart.

613388 O - 45 - 9

Table 18

STANDARD ATMOSPHERE CURVE

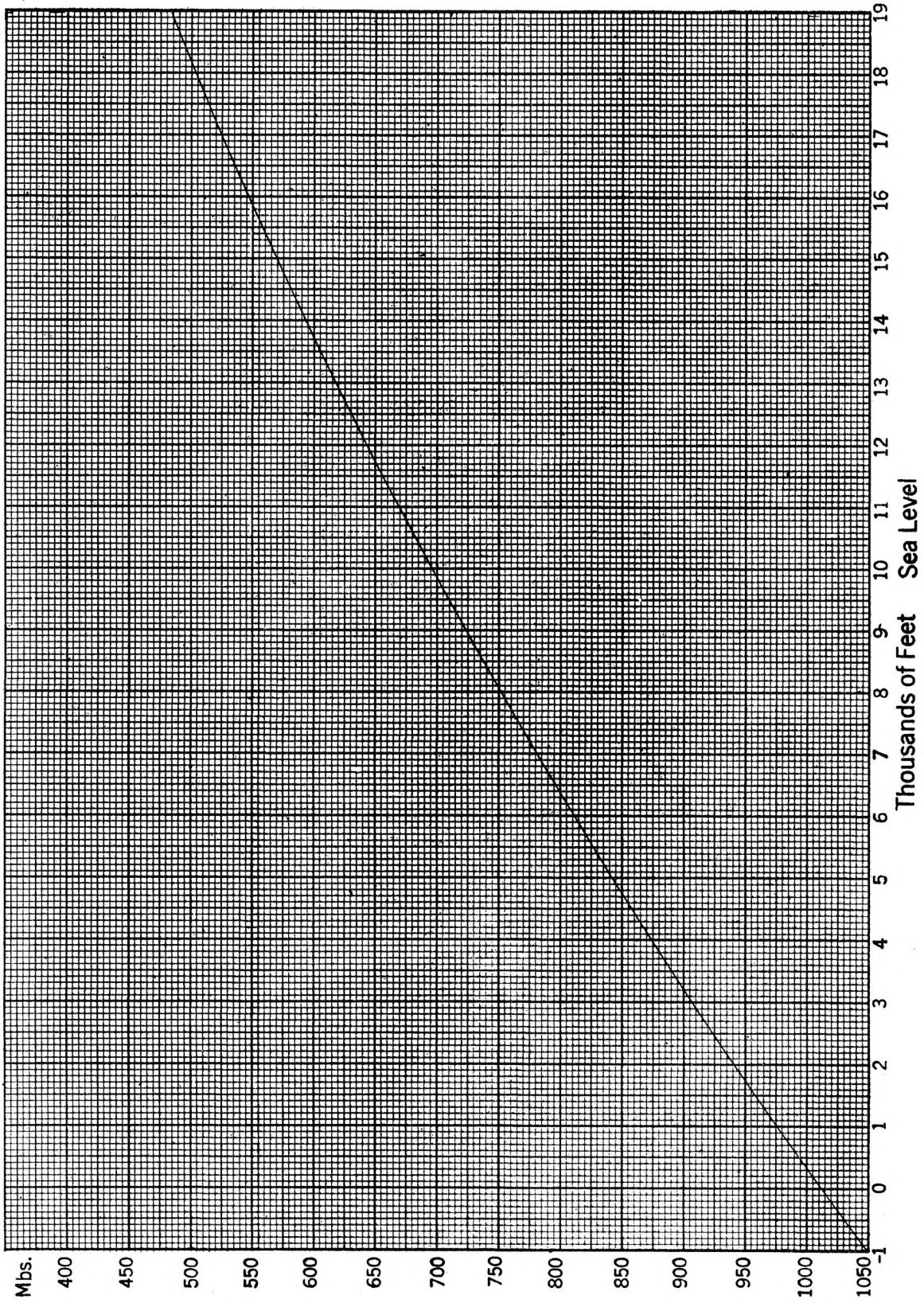


Table 19

MEAN VALUES OF RELATIVE HUMIDITY, WHICH EXIST AT VARIOUS TEMPERATURES, WHEN ELECTRIC HYGROMETER IS BELOW ITS OPERATING RANGE.

(For Radiosonde of 300,000 & 335,000 Series)

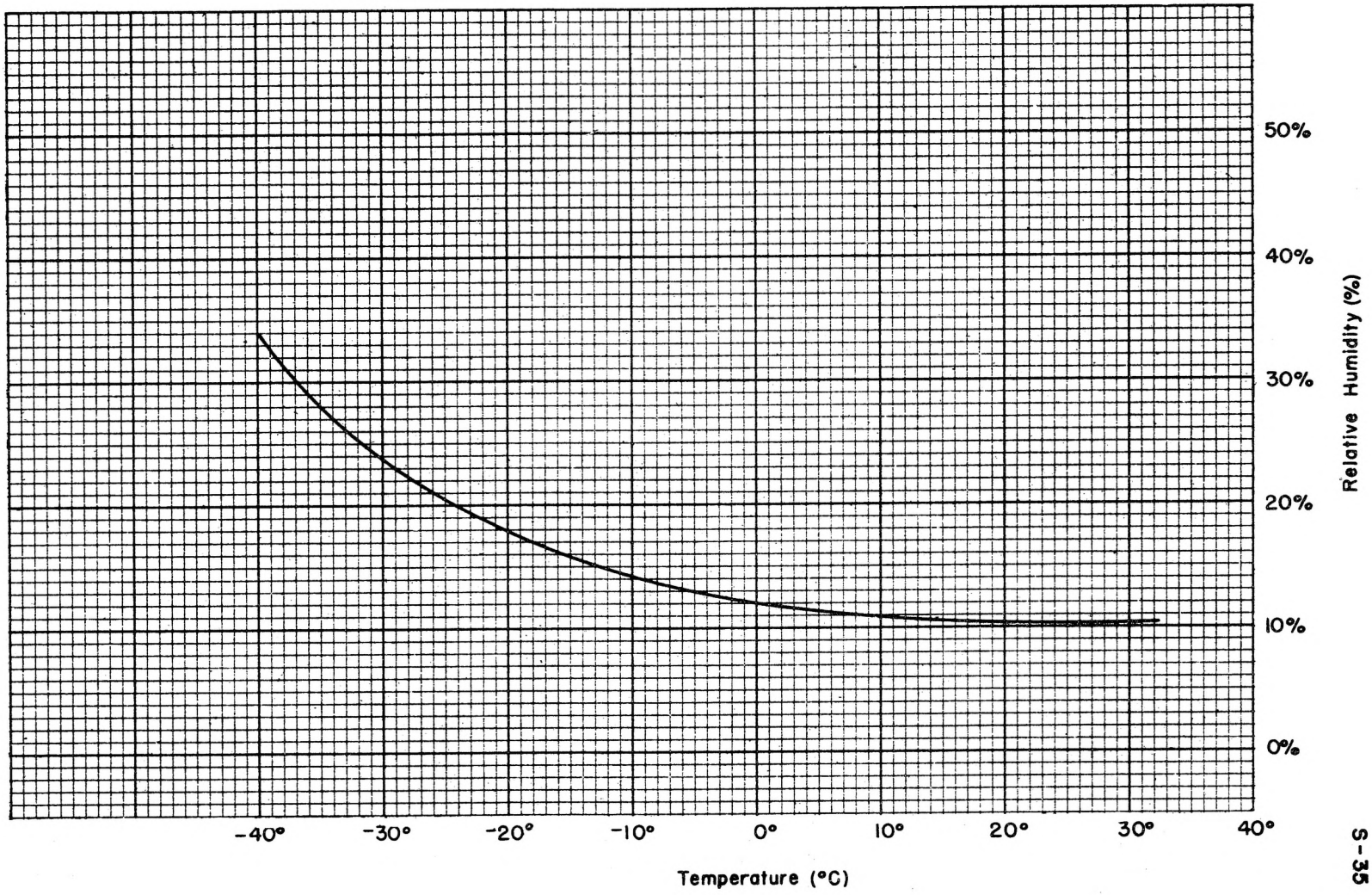


Table 20

MEAN VALUES OF RELATIVE HUMIDITY, WHICH EXIST AT VARIOUS TEMPERATURES, WHEN ELECTRIC HYGROMETER IS BELOW ITS OPERATING RANGE.

For radiosondes of the following series:
340,000 - 349,000
350,000 - 355,000
400,000 - 435,000
500,000 - 550,000

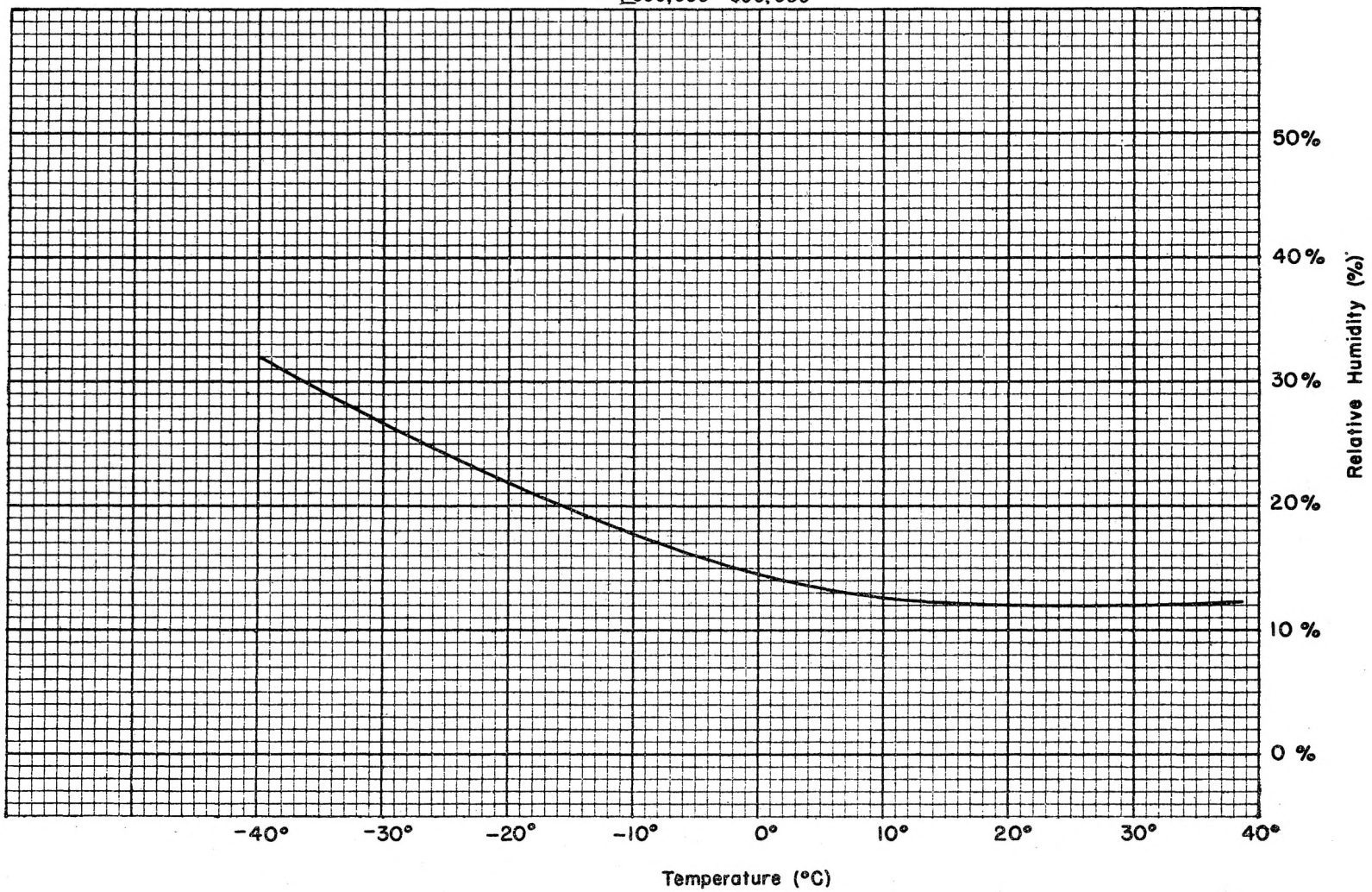


Table 21

FAHRENHEIT TO CENTIGRADE TEMPERATURES

°F.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
+120	+48.89	+48.94	+49.00	+49.06	+49.11	+49.17	+49.22	+49.28	+49.33	+49.39
119	48.33	48.39	48.44	48.50	48.56	48.61	48.67	48.72	48.78	48.83
118	47.78	47.83	47.89	47.94	48.00	48.06	48.11	48.17	48.22	48.28
117	47.22	47.28	47.33	47.39	47.44	47.50	47.56	47.61	47.67	47.72
116	46.67	46.72	46.78	46.83	46.89	46.94	47.00	47.06	47.11	47.17
+115	+46.11	+46.17	+46.22	+46.28	+46.33	+46.39	+46.44	+46.50	+46.56	+46.61
114	45.56	45.61	45.67	45.72	45.78	45.83	45.89	45.94	46.00	46.06
113	45.00	45.06	45.11	45.17	45.22	45.28	45.33	45.39	45.44	45.50
112	44.44	44.50	44.56	44.61	44.67	44.72	44.78	44.83	44.89	44.94
111	43.89	43.94	44.00	44.06	44.11	44.17	44.22	44.28	44.33	44.39
+110	+43.33	+43.39	+43.44	+43.50	+43.56	+43.61	+43.67	+43.72	+43.78	+43.83
109	42.78	42.83	42.89	42.94	43.00	43.06	43.11	43.17	43.22	43.28
108	42.22	42.28	42.33	42.39	42.44	42.50	42.56	42.61	42.67	42.72
107	41.67	41.72	41.78	41.83	41.89	41.94	42.00	42.06	42.11	42.17
106	41.11	41.17	41.22	41.28	41.33	41.39	41.44	41.50	41.56	41.61
+105	+40.56	+40.61	+40.67	+40.72	+40.78	+40.83	+40.89	+40.94	+41.00	+41.06
104	40.00	40.06	40.11	40.17	40.22	40.28	40.33	−40.39	40.44	40.50
103	39.44	39.50	39.56	39.61	39.67	39.72	39.78	39.83	39.89	39.94
102	38.89	38.94	39.00	39.06	39.11	39.17	39.22	39.28	39.33	39.39
101	38.33	38.39	38.44	38.50	38.56	38.61	38.67	38.72	38.78	38.83
+100	+37.78	+37.83	+37.89	+37.94	+38.00	+38.06	+38.11	+38.17	+38.22	+38.28
99	37.22	37.28	37.33	37.39	37.44	37.50	37.56	37.61	37.67	37.72
98	36.67	36.72	36.78	36.83	36.89	36.94	37.00	37.06	37.11	37.17
97	36.11	36.17	36.22	36.28	36.33	36.39	36.44	36.50	36.56	36.61
96	35.56	35.61	35.67	35.72	35.78	35.83	35.89	35.94	36.00	36.06
+ 95	+35.00	+35.06	+35.11	+35.17	+35.22	+35.28	+35.33	+35.39	+35.44	+35.50
94	34.44	34.50	34.56	34.61	34.67	34.72	34.78	34.83	34.89	34.94
93	33.89	33.94	34.00	34.06	34.11	34.17	34.22	34.28	34.33	34.39
92	33.33	33.39	33.44	33.50	33.56	33.61	33.67	33.72	33.78	33.83
91	32.78	32.83	32.89	32.94	33.00	33.06	33.11	33.17	33.22	33.28
+ 90	+32.22	+32.28	+32.33	+32.39	+32.44	+32.50	+32.56	+32.61	+32.67	+32.72
89	31.67	31.72	31.78	31.83	31.89	31.94	32.00	32.06	32.11	32.17
88	31.11	31.17	31.22	31.28	31.33	31.39	31.44	31.50	31.56	31.61
87	30.56	30.61	30.67	30.72	30.78	30.83	30.89	30.94	31.00	31.06
86	30.00	30.06	30.11	30.17	30.22	30.28	30.33	30.39	30.44	30.50
+ 85	+29.44	+29.50	+29.56	+29.61	+29.67	+29.72	+29.78	+29.83	+29.89	+29.94
84	28.89	28.94	29.00	29.06	29.11	29.17	29.22	29.28	29.33	29.39
83	28.33	28.39	28.44	28.50	28.56	28.61	28.67	28.72	28.78	28.83
82	27.78	27.83	27.89	27.94	28.00	28.06	28.11	28.17	28.22	28.28
81	27.22	27.28	27.33	27.39	27.44	27.50	27.56	27.61	27.67	27.72
+ 80	+26.67	+26.72	+26.78	+26.83	+26.89	+26.94	+27.00	+27.06	+27.11	+27.17
79	26.11	26.17	26.22	26.28	26.33	26.39	26.44	26.50	26.56	26.61
78	25.56	25.61	25.67	25.72	25.78	25.83	25.89	25.94	26.00	26.06
77	25.00	25.06	25.11	25.17	25.22	25.28	25.33	25.39	25.44	25.50
76	24.44	24.50	24.56	24.61	24.67	24.72	24.78	24.83	24.89	24.94
+ 75	+23.89	+23.94	+24.00	+24.06	+24.11	+24.17	+24.22	+24.28	+24.33	+24.39
74	23.33	23.39	23.44	23.50	23.56	23.61	23.67	23.72	23.78	23.83
73	22.78	22.83	22.89	22.94	23.00	23.06	23.11	23.17	23.22	23.28
72	22.22	22.28	22.33	22.39	22.44	22.50	22.56	22.61	22.67	22.72
71	21.67	21.72	21.78	21.83	21.89	21.94	22.00	22.06	22.11	22.17
+ 70	+21.11	+21.17	+21.22	+21.28	+21.33	+21.39	+21.44	+21.50	+21.56	+21.61
69	20.56	20.61	20.67	20.72	20.78	20.83	20.89	20.94	21.00	21.06
68	20.00	20.06	20.11	20.17	20.22	20.28	20.33	20.39	20.44	20.50
67	19.44	19.50	19.56	19.61	19.67	19.72	19.78	19.83	19.89	19.94
66	18.89	18.94	19.00	19.06	19.11	19.17	19.22	19.28	19.33	19.39
+ 65	+18.33	+18.39	+18.44	+18.50	+18.56	+18.61	+18.67	+18.72	+18.78	+18.83
64	17.78	17.83	17.89	17.94	18.00	18.06	18.11	18.17	18.22	18.28
63	17.22	17.28	17.33	17.39	17.44	17.50	17.56	17.61	17.67	17.72
62	16.67	16.72	16.78	16.83	16.89	16.94	17.00	17.06	17.11	17.17
61	16.11	16.17	16.22	16.28	16.33	16.39	16.44	16.50	16.56	16.61

Table 21

FAHRENHEIT TO CENTIGRADE TEMPERATURES

°F.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
+60	+15.56	+15.61	+15.67	+15.72	+15.78	+15.83	+15.89	+15.94	+16.00	+16.06
59	15.00	15.06	15.11	15.17	15.22	15.28	15.33	15.39	15.44	15.50
58	14.44	14.50	14.56	14.61	14.67	14.72	14.78	14.83	14.89	14.94
57	13.89	13.94	14.00	14.06	14.11	14.17	14.22	14.28	14.33	14.39
56	13.33	13.39	13.44	13.50	13.56	13.61	13.67	13.72	13.78	13.83
+55	+12.78	+12.83	+12.89	+12.94	+13.00	+13.06	+13.11	+13.17	+13.22	+13.28
54	12.22	12.28	12.33	12.39	12.44	12.50	12.56	12.61	12.67	12.72
53	11.67	11.72	11.78	11.83	11.89	11.94	12.00	12.06	12.11	12.17
52	11.11	11.17	11.22	11.28	11.33	11.39	11.44	11.50	11.56	11.61
51	10.56	10.61	10.67	10.72	10.78	10.83	10.89	10.94	11.00	11.06
+50	+10.00	+10.06	+10.11	+10.17	+10.22	+10.28	+10.33	+10.39	+10.44	+10.50
49	9.44	9.50	9.56	9.61	9.67	9.72	9.78	9.83	9.89	9.94
48	8.89	8.94	9.00	9.06	9.11	9.17	9.22	9.28	9.33	9.39
47	8.33	8.39	8.44	8.50	8.56	8.61	8.67	8.72	8.78	8.83
46	7.78	7.83	7.89	7.94	8.00	8.06	8.11	8.17	8.22	8.28
+45	+ 7.22	+ 7.28	+ 7.33	+ 7.39	+ 7.44	+ 7.50	+ 7.56	+ 7.61	+ 7.67	+ 7.72
44	6.67	6.72	6.78	6.83	6.89	6.94	7.00	7.06	7.11	7.17
43	6.11	6.17	6.22	6.28	6.33	6.39	6.44	6.50	6.56	6.61
42	5.56	5.61	5.67	5.72	5.78	5.83	5.89	5.94	6.00	6.06
41	5.00	5.06	5.11	5.17	5.22	5.28	5.33	5.39	5.44	5.50
+40	+ 4.44	+ 4.50	+ 4.56	+ 4.61	+ 4.67	+ 4.72	+ 4.78	+ 4.83	+ 4.89	+ 4.94
39	3.89	3.94	4.00	4.06	4.11	4.17	4.22	4.28	4.33	4.39
38	3.33	3.39	3.44	3.50	3.56	3.61	3.67	3.72	3.78	3.83
37	2.78	2.83	2.89	2.94	3.00	3.06	3.11	3.17	3.22	3.28
36	2.22	2.28	2.33	2.39	2.44	2.50	2.56	2.61	2.67	2.72
+35	+ 1.67	+ 1.72	+ 1.78	+ 1.83	+ 1.89	+ 1.94	+ 2.00	+ 2.06	+ 2.11	+ 2.17
34	+ 1.11	+ 1.17	+ 1.22	+ 1.28	+ 1.33	+ 1.39	+ 1.44	+ 1.50	+ 1.56	+ 1.61
33	+ 0.56	+ 0.61	+ 0.67	+ 0.72	+ 0.78	+ 0.83	+ 0.89	+ 0.94	+ 1.00	+ 1.06
32	0.00	+ 0.06	+ 0.11	+ 0.17	+ 0.22	+ 0.28	+ 0.33	+ 0.39	+ 0.44	+ 0.50
31	- 0.56	- 0.50	- 0.44	- 0.39	- 0.33	- 0.28	- 0.22	- 0.17	- 0.11	- 0.06
+30	- 1.11	- 1.06	- 1.00	- 0.94	- 0.89	- 0.83	- 0.78	- 0.72	- 0.67	- 0.61
29	1.67	1.61	1.56	1.50	1.44	1.39	1.33	1.28	1.22	1.17
28	2.22	2.17	2.11	2.06	2.00	1.94	1.89	1.83	1.78	1.72
27	2.78	2.72	2.67	2.61	2.56	2.50	2.44	2.39	2.33	2.28
26	3.33	3.28	3.22	3.17	3.11	3.06	3.00	2.94	2.89	2.83
+25	- 3.89	- 3.83	- 3.78	- 3.72	- 3.67	- 3.61	- 3.56	- 3.50	- 3.44	- 3.39
24	4.44	4.39	4.33	4.28	4.22	4.17	4.11	4.06	4.00	3.94
23	5.00	4.94	4.89	4.83	4.78	4.72	4.67	4.61	4.56	4.50
22	5.56	5.50	5.44	5.39	5.33	5.28	5.22	5.17	5.11	5.06
21	6.11	6.06	6.00	5.94	5.89	5.83	5.78	5.72	5.67	5.61
+20	- 6.67	- 6.61	- 6.56	- 6.50	- 6.44	- 6.39	- 6.33	- 6.28	- 6.22	- 6.17
19	7.22	7.17	7.11	7.06	7.00	6.94	6.89	6.83	6.78	6.72
18	7.78	7.72	7.67	7.61	7.56	7.50	7.44	7.39	7.33	7.28
17	8.33	8.28	8.22	8.17	8.11	8.06	8.00	7.94	7.89	7.83
16	8.89	8.83	8.78	8.72	8.67	8.61	8.56	8.50	8.44	8.39
+15	- 9.44	- 9.39	- 9.33	- 9.28	- 9.22	- 9.17	- 9.11	- 9.06	- 9.00	- 8.94
14	10.00	9.94	9.89	9.83	9.78	9.72	9.67	9.61	9.56	9.50
13	10.56	10.50	10.44	10.39	10.33	10.28	10.22	10.17	10.11	10.06
12	11.11	11.06	11.00	10.94	10.89	10.83	10.78	10.72	10.67	10.61
11	11.67	11.61	11.56	11.50	11.44	11.39	11.33	11.28	11.22	11.17
+10	-12.22	-12.17	-12.11	-12.06	-12.00	-11.94	-11.89	-11.83	-11.78	-11.72
9	12.78	12.72	12.67	12.61	12.56	12.50	12.44	12.39	12.33	12.28
8	13.33	13.28	13.22	13.17	13.11	13.06	13.00	12.94	12.89	12.83
7	13.89	13.83	13.78	13.72	13.67	13.61	13.56	13.50	13.44	13.39
6	14.44	14.39	14.33	14.28	14.22	14.17	14.11	14.06	14.00	13.94
+ 5	-15.00	-14.94	-14.89	-14.83	-14.78	-14.72	-14.67	-14.61	-14.56	-14.50
4	15.56	15.50	15.44	15.39	15.33	15.28	15.22	15.17	15.11	15.06
3	16.11	16.06	16.00	15.94	15.89	15.83	15.78	15.72	15.67	15.61
2	16.67	16.61	16.56	16.50	16.44	16.39	16.33	16.28	16.22	16.17
1	17.22	17.17	17.11	17.06	17.00	16.94	16.89	16.83	16.78	16.72
+ 0	17.78	17.72	17.67	17.61	17.56	17.50	17.44	17.39	17.33	17.28

Table 21

FAHRENHEIT TO CENTIGRADE TEMPERATURES

°F.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
- 0	-17.78	-17.83	-17.89	-17.94	-18.00	-18.06	-18.11	-18.17	-18.22	-18.28
1	18.33	18.39	18.44	18.50	18.56	18.61	18.67	18.72	18.78	18.88
2	18.89	18.94	19.00	19.06	19.11	19.17	19.22	19.28	19.33	19.39
3	19.44	19.50	19.56	19.61	19.67	19.72	19.78	19.83	19.89	19.94
4	20.00	20.06	20.11	20.17	20.22	20.28	20.33	20.39	20.44	20.50
- 5	-20.56	-20.61	-20.67	-20.72	-20.78	-20.83	-20.89	-20.94	-21.00	-21.06
6	21.11	21.17	21.22	21.28	21.33	21.39	21.44	21.50	21.56	21.61
7	21.67	21.72	21.78	21.83	21.89	21.94	22.00	22.06	22.11	22.17
8	22.22	22.28	22.33	22.39	22.44	22.50	22.56	22.61	22.67	22.72
9	22.78	22.83	22.89	22.94	23.00	23.06	23.11	23.17	23.22	23.28
-10	-23.33	-23.39	-23.44	-23.50	-23.56	-23.61	-23.67	-23.72	-23.78	-23.83
11	23.89	23.94	24.00	24.06	24.11	24.17	24.22	24.28	24.33	24.39
12	24.44	24.50	24.56	24.61	24.67	24.72	24.78	24.83	24.89	24.94
13	25.00	25.06	25.11	25.17	25.22	25.28	25.33	25.39	25.44	25.50
14	25.56	25.61	25.67	25.72	25.78	25.83	25.89	25.94	26.00	26.06
-15	-26.11	-26.17	-26.22	-26.28	-26.33	-26.39	-26.44	-26.50	-26.56	-26.61
16	26.67	26.72	26.78	26.83	26.89	26.94	27.00	27.06	27.11	27.17
17	27.22	27.28	27.33	27.39	27.44	27.50	27.56	27.61	27.67	27.72
18	27.78	27.83	27.89	27.94	28.00	28.06	28.11	28.17	28.22	28.28
19	28.33	28.39	28.44	28.50	28.56	28.61	28.67	28.72	28.78	28.83
-20	-28.89	-28.94	-29.00	-29.06	-29.11	-29.17	-29.22	-29.28	-29.33	-29.39
21	29.44	29.50	29.56	29.61	29.67	29.72	29.78	29.83	29.89	29.94
22	30.00	30.06	30.11	30.17	30.22	30.28	30.33	30.39	30.44	30.50
23	30.56	30.61	30.67	30.72	30.78	30.83	30.89	30.94	31.00	31.06
24	31.11	31.17	31.22	31.28	31.33	31.39	31.44	31.50	31.56	31.61
-25	-31.67	-31.72	-31.78	-31.83	-31.89	-31.94	-32.00	-32.06	-32.11	-32.17
26	32.22	32.28	32.33	32.39	32.44	32.50	32.56	32.61	32.67	32.72
27	32.78	32.83	32.89	32.94	33.00	33.06	33.11	33.17	33.22	33.28
28	33.33	33.39	33.44	33.50	33.56	33.61	33.67	33.72	33.78	33.83
29	33.89	33.94	34.00	34.06	34.11	34.17	34.22	34.28	34.33	34.39
-30	-34.44	-34.50	-34.56	-34.61	-34.67	-34.72	-34.78	-34.83	-34.89	-34.94
31	35.00	35.06	35.11	35.17	35.22	35.28	35.33	35.39	35.44	35.50
32	35.56	35.61	35.67	35.72	35.78	35.83	35.89	35.94	36.00	36.06
33	36.11	36.17	36.22	36.28	36.33	36.39	36.44	36.50	36.56	36.61
34	36.67	36.72	36.78	36.83	36.89	36.94	37.00	37.06	37.11	37.17
-35	-37.22	-37.28	-37.33	-37.39	-37.44	-37.50	-37.56	-37.61	-37.67	-37.72
36	37.78	37.83	37.89	37.94	38.00	38.06	38.11	38.17	38.22	38.28
37	38.33	38.39	38.44	38.50	38.56	38.61	38.67	38.72	38.78	38.83
38	38.89	38.94	39.00	39.06	39.11	39.17	39.22	39.28	39.33	39.39
39	39.44	39.50	39.56	39.61	39.67	39.72	39.78	39.83	39.89	39.94
-40	-40.00	-40.06	-40.11	-40.17	-40.22	-40.28	-40.33	-40.39	-40.44	-40.50
41	40.56	40.61	40.67	40.72	40.78	40.83	40.89	40.94	41.00	41.06
42	41.11	41.17	41.22	41.28	41.33	41.39	41.44	41.50	41.56	41.61
43	41.67	41.72	41.78	41.83	41.89	41.94	42.00	42.06	42.11	42.17
44	42.22	42.28	42.33	42.39	42.44	42.50	42.56	42.61	42.67	42.72
-45	-42.78	-42.83	-42.89	-42.94	-43.00	-43.06	-43.11	-43.17	-43.22	-43.28
46	43.33	43.39	43.44	43.50	43.56	43.61	43.67	43.72	43.78	43.83
47	43.89	43.94	44.00	44.06	44.11	44.17	44.22	44.28	44.33	44.39
48	44.44	44.50	44.56	44.61	44.67	44.72	44.78	44.83	44.89	44.94
49	45.00	45.06	45.11	45.17	45.22	45.28	45.33	45.39	45.44	45.50
-50	-45.56	-45.61	-45.67	-45.72	-45.78	-45.83	-45.89	-45.94	-46.00	-46.06
51	46.11	46.17	46.22	46.28	46.33	46.39	46.44	46.50	46.56	46.61
52	46.67	46.72	46.78	46.83	46.89	46.94	47.00	47.06	47.11	47.17
53	47.22	47.28	47.33	47.39	47.44	47.50	47.56	47.61	47.67	47.72
54	47.78	47.83	47.89	47.94	48.00	48.06	48.11	48.17	48.22	48.28
-55	-48.33	-48.39	-48.44	-48.50	-48.56	-48.61	-48.67	-48.72	-48.78	-48.83
56	48.89	48.94	49.00	49.06	49.11	49.17	49.22	49.28	49.33	49.39
57	49.44	49.50	49.56	49.61	49.67	49.72	49.78	49.83	49.89	49.94
58	50.00	50.06	50.11	50.17	50.22	50.28	50.33	50.39	50.44	50.50
59	50.56	50.61	50.67	50.72	50.78	50.83	50.89	50.94	51.00	51.06

Table 21

FAHRENHEIT TO CENTIGRADE TEMPERATURES

°F.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.	°C.
- 60	-51.11	-51.17	-51.22	-51.28	-51.33	-51.39	-51.44	-51.50	-51.56	-51.61
61	51.67	51.72	51.78	51.83	51.89	51.94	52.00	52.06	52.11	52.17
62	52.22	52.28	52.33	52.39	52.44	52.50	52.56	52.61	52.67	52.72
63	52.78	52.83	52.89	52.94	53.00	53.06	53.11	53.17	53.22	53.28
64	53.33	53.39	53.44	53.50	53.56	53.61	53.67	53.72	53.78	53.83
- 65	-53.89	-53.94	-54.00	-54.06	-54.11	-54.17	-54.22	-54.28	-54.33	-54.39
66	54.44	54.50	54.56	54.61	54.67	54.72	54.78	54.83	54.89	54.94
67	55.00	55.06	55.11	55.17	55.22	55.28	55.33	55.39	55.44	55.50
68	55.56	55.61	55.67	55.72	55.78	55.83	55.89	55.94	56.00	56.06
69	56.11	56.17	56.22	56.28	56.33	56.39	56.44	56.50	56.56	56.61
- 70	-56.67	-56.72	-56.78	-56.83	-56.89	-56.94	-57.00	-57.06	-57.11	-57.17
71	57.22	57.28	57.33	57.39	57.44	57.50	57.56	57.61	57.67	57.72
72	57.78	57.83	57.89	57.94	58.00	58.06	58.11	58.17	58.22	58.28
73	58.33	58.39	58.44	58.50	58.56	58.61	58.67	58.72	58.78	58.83
74	58.89	58.94	59.00	59.06	59.11	59.17	59.22	59.28	59.33	59.39
- 75	-59.44	-59.50	-59.56	-59.61	-59.67	-59.72	-59.78	-59.83	-59.89	-59.94
76	60.00	60.06	60.11	60.17	60.22	60.28	60.33	60.39	60.44	60.50
77	60.56	60.61	60.67	60.72	60.78	60.83	60.89	60.94	61.00	61.06
78	61.11	61.17	61.22	61.28	61.33	61.39	61.44	61.50	61.56	61.61
79	61.67	61.72	61.78	61.83	61.89	61.94	62.00	62.06	62.11	62.17
- 80	-62.22	-62.28	-62.33	-62.39	-62.44	-62.50	-62.56	-62.61	-62.67	-62.72
81	62.78	62.83	62.89	62.94	63.00	63.06	63.11	63.17	63.22	63.28
82	63.33	63.39	63.44	63.50	63.56	63.61	63.67	63.72	63.78	63.83
83	63.89	63.94	64.00	64.06	64.11	64.17	64.22	64.28	64.33	64.39
84	64.44	64.50	64.56	64.61	64.67	64.72	64.78	64.83	64.89	64.94
- 85	-65.00	-65.06	-65.11	-65.17	-65.22	-65.28	-65.33	-65.39	-65.44	-65.50
86	65.56	65.61	65.67	65.72	65.78	65.83	65.89	65.94	66.00	66.06
87	66.11	66.17	66.22	66.28	66.33	66.39	66.44	66.50	66.56	66.61
88	66.67	66.72	66.78	66.83	66.89	66.94	67.00	67.06	67.11	67.17
89	67.22	67.28	67.33	67.39	67.44	67.50	67.56	67.61	67.67	67.72
- 90	-67.78	-67.83	-67.89	-67.94	-68.00	-68.06	-68.11	-68.17	-68.22	-68.28
91	68.33	68.39	68.44	68.50	68.56	68.61	68.67	68.72	68.78	68.83
92	68.89	68.94	69.00	69.06	69.11	69.17	69.22	69.28	69.33	69.39
93	69.44	69.50	69.56	69.61	69.67	69.72	69.78	69.83	69.89	69.94
94	70.00	70.06	70.11	70.17	70.22	70.28	70.33	70.39	70.44	70.50
- 95	-70.56	-70.61	-70.67	-70.72	-70.78	-70.83	-70.89	-70.94	-71.00	-71.06
96	71.11	71.17	71.22	71.28	71.33	71.39	71.44	71.50	71.56	71.61
97	71.67	71.72	71.78	71.83	71.89	71.94	72.00	72.06	72.11	72.17
98	72.22	72.28	72.33	72.39	72.44	72.50	72.56	72.61	72.67	72.72
99	72.78	72.83	72.89	72.94	73.00	73.06	73.11	73.17	73.22	73.28
-100	-73.33	-73.39	-73.44	-73.50	-73.56	-73.61	-73.67	-73.72	-73.78	-73.83
101	73.89	73.94	74.00	74.06	74.11	74.17	74.22	74.28	74.33	74.39
102	74.44	74.50	74.56	74.61	74.67	74.72	74.78	74.83	74.89	74.94
103	75.00	75.06	75.11	75.17	75.22	75.28	75.33	75.39	75.44	75.50
104	75.56	75.61	75.67	75.72	75.78	75.83	75.89	75.94	76.00	76.06
-105	-76.11	-76.17	-76.22	-76.28	-76.33	-76.39	-76.44	-76.50	-76.56	-76.61
106	76.67	76.72	76.78	76.83	76.89	76.94	77.00	77.06	77.11	77.17
107	77.22	77.28	77.33	77.39	77.44	77.50	77.56	77.61	77.67	77.72
108	77.78	77.83	77.89	77.94	78.00	78.06	78.11	78.17	78.22	78.28
109	78.33	78.39	78.44	78.50	78.56	78.61	78.67	78.72	78.78	78.83
-110	-78.89	-78.94	-79.00	-79.06	-79.11	-79.17	-79.22	-79.28	-79.33	-79.39
111	79.44	79.50	79.56	79.61	79.67	79.72	79.78	79.83	79.89	79.94
112	80.00	80.06	80.11	80.17	80.22	80.28	80.33	80.39	80.44	80.50
113	80.56	80.61	80.67	80.72	80.78	80.83	80.89	80.94	81.00	81.06
114	81.11	81.17	81.22	81.28	81.33	81.39	81.44	81.50	81.56	81.61
-115	-81.67	-81.72	-81.78	-81.83	-81.89	-81.94	-82.00	-82.06	-82.11	-82.17
116	82.22	82.28	82.33	82.39	82.44	82.50	82.56	82.61	82.67	82.72
117	82.78	82.83	82.89	82.94	83.00	83.06	83.11	83.17	83.22	83.28
118	83.33	83.39	83.44	83.50	83.56	83.61	83.67	83.72	83.78	83.83
119	83.89	83.94	84.00	84.06	84.11	84.17	84.22	84.28	84.33	84.39

Table 22

CENTIGRADE TO FAHRENHEIT TEMPERATURES

°C.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
+60	+140.00	+140.18	+140.36	+140.54	+140.72	+140.90	+141.08	+141.26	+141.44	+141.62
59	138.20	138.38	138.56	138.74	138.92	139.10	139.28	139.46	139.64	139.82
58	136.40	136.58	136.76	136.94	137.12	137.30	137.48	137.66	137.84	138.02
57	134.60	134.78	134.96	135.14	135.32	135.50	135.68	135.86	136.04	136.22
56	132.80	132.98	133.16	133.34	133.52	133.70	133.88	134.06	134.24	134.42
+55	+131.00	+131.18	+131.36	+131.54	+131.72	+131.90	+132.08	+132.26	+132.44	+132.62
54	129.20	129.38	129.56	129.74	129.92	130.10	130.28	130.46	130.64	130.82
53	127.40	127.58	127.76	127.94	128.12	128.30	128.48	128.66	128.84	129.02
52	125.60	125.78	125.96	126.14	126.32	126.50	126.68	126.86	127.04	127.22
51	123.80	123.98	124.16	124.34	124.52	124.70	124.88	125.06	125.24	125.42
+50	+122.00	+122.18	+122.36	+122.54	+122.72	+122.90	+123.08	+123.26	+123.44	+123.62
49	120.20	120.38	120.56	120.74	120.92	121.10	121.28	121.46	121.64	121.82
48	118.40	118.58	118.76	118.94	119.12	119.30	119.48	119.66	119.84	120.02
47	116.60	116.78	116.96	117.14	117.32	117.50	117.68	117.86	118.04	118.22
46	114.80	114.98	115.16	115.34	115.52	115.70	115.88	116.06	116.24	116.42
+45	+113.00	+113.18	+113.36	+113.54	+113.72	+113.90	+114.08	+114.26	+114.44	+114.62
44	111.20	111.38	111.56	111.74	111.92	112.10	112.28	112.46	112.64	112.82
43	109.40	109.58	109.76	109.94	110.12	110.30	110.48	110.66	110.84	111.02
42	107.60	107.78	107.96	108.14	108.32	108.50	108.68	108.86	109.04	109.22
41	105.80	105.98	106.16	106.34	106.52	106.70	106.88	107.06	107.24	107.42
+40	+104.00	+104.18	+104.36	+104.54	+104.72	+104.90	+105.08	+105.26	+105.44	+105.62
39	102.20	102.38	102.56	102.74	102.92	103.10	103.28	103.46	103.64	103.82
38	100.40	100.58	00.76	100.94	101.12	101.30	101.48	101.66	101.84	102.02
37	98.60	98.78	98.96	99.14	99.32	99.50	99.68	99.86	100.04	100.22
36	96.80	96.98	97.16	97.34	97.52	97.70	97.88	98.06	98.24	98.42
+35	+ 95.00	+ 95.18	+ 95.36	+ 95.54	+ 95.72	+ 95.90	+ 96.08	+ 96.26	+ 96.44	+ 96.62
34	93.20	93.38	93.56	93.74	93.92	94.10	94.28	94.46	94.64	94.82
33	91.40	91.58	91.76	91.94	92.12	92.30	92.48	92.66	92.84	93.02
32	89.60	89.78	89.96	90.14	90.32	90.50	90.68	90.86	91.04	91.22
31	87.80	87.98	88.16	88.34	88.52	88.70	88.88	89.06	89.24	89.42
+30	+ 86.00	+ 86.18	+ 86.36	+ 86.54	+ 86.72	+ 86.90	+ 87.08	+ 87.26	+ 87.44	+ 87.62
29	84.20	84.38	84.56	84.74	84.92	85.10	85.28	85.46	85.64	85.82
28	82.40	82.58	82.76	82.94	83.12	83.30	83.48	83.66	83.84	84.02
27	80.60	80.78	80.96	81.14	81.32	81.50	81.68	81.86	82.04	82.22
26	78.80	78.98	79.16	79.34	79.52	79.70	79.88	80.06	80.24	80.42
+25	+ 77.00	+ 77.18	+ 77.36	+ 77.54	+ 77.72	+ 77.90	+ 78.08	+ 78.26	+ 78.44	+ 78.62
24	75.20	75.38	75.56	75.74	75.92	76.10	76.28	76.46	76.64	76.82
23	73.40	73.58	73.76	73.94	74.12	74.30	74.48	74.66	74.84	75.02
22	71.60	71.78	71.96	72.14	72.32	72.50	72.68	72.86	73.04	73.22
21	69.80	69.98	70.16	70.34	70.52	70.70	70.88	71.06	71.24	71.42
+20	+ 68.00	+ 68.18	+ 68.36	+ 68.54	+ 68.72	+ 68.90	+ 69.08	+ 69.26	+ 69.44	+ 69.62
19	66.20	66.38	66.56	66.74	66.92	67.10	67.28	67.46	67.64	67.82
18	64.40	64.58	64.76	64.94	65.12	65.30	65.48	65.66	65.84	66.02
17	62.60	62.78	62.96	63.14	63.32	63.50	63.68	63.86	64.04	64.22
16	60.80	60.98	61.16	61.34	61.52	61.70	61.88	62.06	62.24	62.42
+15	+ 59.00	+ 59.18	+ 59.36	+ 59.54	+ 59.72	+ 59.90	+ 60.08	+ 60.26	+ 60.44	+ 60.62
14	57.20	57.38	57.56	57.74	57.92	58.10	58.28	58.46	58.64	58.82
13	55.40	55.58	55.76	55.94	56.12	56.30	56.48	56.66	56.84	57.02
12	53.60	53.78	53.96	54.14	54.32	54.50	54.68	54.86	55.04	55.22
11	51.80	51.98	52.16	52.34	52.52	52.70	52.88	53.06	53.24	53.42

Table 22

CENTIGRADE TO FAHRENHEIT TEMPERATURES

°C.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
+10	+50.00	+50.18	+50.36	+50.54	+50.72	+50.90	+51.08	+51.26	+51.44	+51.62
+ 9	+48.20	+48.38	+48.56	+48.74	+48.92	+49.10	+49.28	+49.46	+49.64	+49.82
8	46.40	46.58	46.76	46.94	47.12	47.30	47.48	47.66	47.84	48.02
7	44.60	44.78	44.96	45.14	45.32	45.50	45.68	45.86	46.04	46.22
6	42.80	42.98	43.16	43.34	43.52	43.70	43.88	44.06	44.24	44.42
5	41.00	41.18	41.36	41.54	41.72	41.90	42.08	42.26	42.44	42.62
+ 4	+39.20	+39.38	+39.56	+39.74	+39.92	+40.10	+40.28	+40.46	+40.64	+40.82
3	37.40	37.58	37.76	37.94	38.12	38.30	38.48	38.66	38.84	39.02
2	35.60	35.78	35.96	36.14	36.32	36.50	36.68	36.86	37.04	37.22
1	33.80	33.98	34.16	34.34	34.52	34.70	34.88	35.06	35.24	35.42
+ 0	32.00	32.18	32.36	32.54	32.72	32.90	33.08	33.26	33.44	33.62
− 0	+32.00	+31.82	+31.64	+31.46	+31.28	+31.10	+30.92	+30.74	+30.56	+30.38
1	30.20	30.02	29.84	29.66	29.48	29.30	29.12	28.94	28.76	28.58
2	28.40	28.22	28.04	27.86	27.68	27.50	27.32	27.14	26.96	26.78
3	26.60	26.42	26.24	26.06	25.88	25.70	25.52	25.34	25.16	24.98
4	24.80	24.62	24.44	24.26	24.08	23.90	23.72	23.54	23.36	23.18
− 5	+23.00	+22.82	+22.64	+22.46	+22.28	+22.10	+21.92	+21.74	+21.56	+21.38
6	21.20	21.02	20.84	20.66	20.48	20.30	20.12	19.94	19.76	19.58
7	19.40	19.22	19.04	18.86	18.68	18.50	18.32	18.14	17.96	17.78
8	17.60	17.42	17.24	17.06	16.88	16.70	16.52	16.34	16.16	15.98
9	15.80	15.62	15.44	15.26	15.08	14.90	14.72	14.54	14.36	14.18
−10	+14.00	+13.82	+13.64	+13.46	+13.28	+13.10	+12.92	+12.74	+12.56	+12.38
11	12.20	12.02	11.84	11.66	11.48	11.30	11.12	10.94	10.76	10.58
12	10.40	10.22	10.04	9.86	9.68	9.50	9.32	9.14	8.96	8.78
13	8.60	8.42	8.24	8.06	7.88	7.70	7.52	7.34	7.16	6.98
14	6.80	6.62	6.44	6.26	6.08	5.90	5.72	5.54	5.36	5.18
−15	+ 5.00	+ 4.82	+ 4.64	+ 4.46	+ 4.28	+ 4.10	+ 3.92	+ 3.74	+ 3.56	+ 3.38
16	+ 3.20	+ 3.02	+ 2.84	+ 2.66	+ 2.48	+ 2.30	+ 2.12	+ 1.94	+ 1.76	+ 1.58
17	+ 1.40	+ 1.22	+ 1.04	+ 0.86	+ 0.68	+ 0.50	+ 0.32	+ 0.14	− 0.04	− 0.22
18	− 0.40	− 0.58	− 0.76	− 0.94	− 1.12	− 1.30	− 1.48	− 1.66	− 1.84	− 2.02
19	− 2.20	− 2.38	− 2.56	− 2.74	− 2.92	− 3.10	− 3.28	− 3.46	− 3.64	− 3.82
−20	− 4.00	− 4.18	− 4.36	− 4.54	− 4.72	− 4.90	− 5.08	− 5.26	− 5.44	− 5.62
21	5.80	5.98	6.16	6.34	6.52	6.70	6.88	7.06	7.24	7.42
22	7.60	7.78	7.96	8.14	8.32	8.50	8.68	8.86	9.04	9.22
23	9.40	9.58	9.76	9.94	10.12	10.30	10.48	10.66	10.84	11.02
24	11.20	11.38	11.56	11.74	11.92	12.10	12.28	12.46	12.64	12.82
−25	−13.00	−13.18	−13.36	−13.54	−13.72	−13.90	−14.08	−14.26	−14.44	−14.62
26	14.80	14.98	15.16	15.34	15.52	15.70	15.88	16.06	16.24	16.42
27	16.60	16.78	16.96	17.14	17.32	17.50	17.68	17.86	18.04	18.22
28	18.40	18.58	18.76	18.94	19.12	19.30	19.48	19.66	19.84	20.02
29	20.20	20.38	20.56	20.74	20.92	21.10	21.28	21.46	21.64	21.82
−30	−22.00	−22.18	−22.36	−22.54	−22.72	−22.90	−23.08	−23.26	−23.44	−23.62
31	23.80	23.98	24.16	24.34	24.52	24.70	24.88	25.06	25.24	25.42
32	25.60	25.78	25.96	26.14	26.32	26.50	26.68	26.86	27.04	27.22
33	27.40	27.58	27.76	27.94	28.12	28.30	28.48	28.66	28.84	29.02
34	29.20	29.38	29.56	29.74	29.92	30.10	30.28	30.46	30.64	30.82
−35	−31.00	−31.18	−31.36	−31.54	−31.72	−31.90	−32.08	−32.26	−32.44	−32.62
36	32.80	32.98	33.16	33.34	33.52	33.70	33.88	34.06	34.24	34.42
37	34.60	34.78	34.96	35.14	35.32	35.50	35.68	35.86	36.04	36.22
38	36.40	36.58	36.76	36.94	37.12	37.30	37.48	37.66	37.84	38.02
39	38.20	38.38	38.56	38.74	38.92	39.10	39.28	39.46	39.64	39.82

Table 22

CENTIGRADE TO FAHRENHEIT TEMPERATURES

°C.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
-40	- 40.00	- 40.18	- 40.36	- 40.54	- 40.72	- 40.90	- 41.08	- 41.26	- 41.44	- 41.62
41	41.80	41.98	42.16	42.34	42.52	42.70	42.88	43.06	43.24	43.42
42	43.60	43.78	43.96	44.14	44.32	44.50	44.68	44.86	45.04	45.22
43	45.40	45.58	45.76	45.94	46.12	46.30	46.48	46.66	46.84	47.02
44	47.20	47.38	47.56	47.74	47.92	48.10	48.28	48.46	48.64	48.82
-45	- 49.00	- 49.18	- 49.36	- 49.54	- 49.72	- 49.90	- 50.08	- 50.26	- 50.44	- 50.62
46	50.80	50.98	51.16	51.34	51.52	51.70	51.88	52.06	52.24	52.42
47	52.60	52.78	52.96	53.14	53.32	53.50	53.68	53.86	54.04	54.22
48	54.40	54.58	54.76	54.94	55.12	55.30	55.48	55.66	55.84	56.02
49	56.20	56.38	56.56	56.74	56.92	57.10	57.28	57.46	57.64	57.82
-50	- 58.00	- 58.18	- 58.36	- 58.54	- 58.72	- 58.90	- 59.08	- 59.26	- 59.44	- 59.62
51	59.80	59.98	60.16	60.34	60.52	60.70	60.88	61.06	61.24	61.42
52	61.60	61.78	61.96	62.14	62.32	62.50	62.68	62.86	63.04	63.22
53	63.40	63.58	63.76	63.94	64.12	64.30	64.48	64.66	64.84	65.02
54	65.20	65.38	65.56	65.74	65.92	66.10	66.28	66.46	66.64	66.82
-55	- 67.00	- 67.18	- 67.36	- 67.54	- 67.72	- 67.90	- 68.08	- 68.26	- 68.44	- 68.62
56	68.80	68.98	69.16	69.34	69.52	69.70	69.88	70.06	70.24	70.42
57	70.60	70.78	70.96	71.14	71.32	71.50	71.68	71.86	72.04	72.22
58	72.40	72.58	72.76	72.94	73.12	73.30	73.48	73.66	73.84	74.02
59	74.20	74.38	74.56	74.74	74.92	75.10	75.28	75.46	75.64	75.82
-60	- 76.00	- 76.18	- 76.36	- 76.54	- 76.72	- 76.90	- 77.08	- 77.26	- 77.44	- 77.62
61	77.80	77.98	78.16	78.34	78.52	78.70	78.88	79.06	79.24	79.42
62	79.60	79.78	79.96	80.14	80.32	80.50	80.68	80.86	81.04	81.22
63	81.40	81.58	81.76	81.94	82.12	82.30	82.48	82.66	82.84	83.02
64	83.20	83.38	83.56	83.74	83.92	84.10	84.28	84.46	84.64	84.82
-65	- 85.00	- 85.18	- 85.36	- 85.54	- 85.72	- 85.90	- 86.08	- 86.26	- 86.44	- 86.62
66	86.80	86.98	87.16	87.34	87.52	87.70	87.88	88.06	88.24	88.42
67	88.60	88.78	88.96	89.14	89.32	89.50	89.68	89.86	90.04	90.22
68	90.40	90.58	90.76	90.94	91.12	91.30	91.48	91.66	91.84	92.02
69	92.20	92.38	92.56	92.74	92.92	93.10	93.28	93.46	93.64	93.82
-70	- 94.00	- 94.18	- 94.36	- 94.54	- 94.72	- 94.90	- 95.08	- 95.26	- 95.44	- 95.62
71	95.80	95.98	96.16	96.34	96.52	96.70	96.88	97.06	97.24	97.42
72	97.60	97.78	97.96	98.14	98.32	98.50	98.68	98.86	99.04	99.22
73	99.40	99.58	99.76	99.94	100.12	100.30	100.48	100.66	100.84	101.02
74	101.20	101.38	101.56	101.74	101.92	102.10	102.28	102.46	102.64	102.82
-75	-103.00	-103.18	-103.36	-103.54	-103.72	-103.90	-104.08	-104.26	-104.44	-104.62
76	104.80	104.98	105.16	105.34	105.52	105.70	105.88	106.06	106.24	106.42
77	106.60	106.78	106.96	107.14	107.32	107.50	107.68	107.86	108.04	108.22
78	108.40	108.58	108.76	108.94	109.12	109.30	109.48	109.66	109.84	110.02
79	110.20	110.38	110.56	110.74	110.92	111.10	111.28	111.46	111.64	111.82
-80	-112.00	-112.18	-112.36	-112.54	-112.72	-112.90	-113.08	-113.26	-113.44	-113.62
81	113.80	113.98	114.16	114.34	114.52	114.70	114.88	115.06	115.24	115.42
82	115.60	115.78	115.96	116.14	116.32	116.50	116.68	116.86	117.04	117.22
83	117.40	117.58	117.76	117.94	118.12	118.30	118.48	118.66	118.84	119.02
84	119.20	119.38	119.56	119.74	119.92	120.10	120.28	120.46	120.64	120.82
-85	-121.00	-121.18	-121.36	-121.54	-121.72	-121.90	-122.08	-122.26	-122.44	-122.62
86	122.80	122.98	123.16	123.34	123.52	123.70	123.88	124.06	124.24	124.42
87	124.60	124.78	124.96	125.14	125.32	125.50	125.68	125.86	126.04	126.22
88	126.40	126.58	126.76	126.94	127.12	127.30	127.48	127.66	127.84	128.02
89	128.20	128.38	128.56	128.74	128.92	129.10	129.28	129.46	129.64	129.82

Table 23

METERS INTO FEET

1 meter = 39.3700 inches = 3.280833 feet

Meters	0	1	2	3	4	5	6	7	8	9
	Feet	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*
0	0.00	3.28	6.56	9.84	13.12	16.40	19.68	22.97	26.25	29.53
10	32.81	36.09	39.37	42.65	45.93	49.21	52.49	55.77	59.05	62.34
20	65.62	68.90	72.18	75.46	78.74	82.02	85.30	88.58	91.86	95.14
30	98.42	101.71	104.99	108.27	111.55	114.83	118.11	121.39	124.67	127.95
40	131.23	134.51	137.79	141.08	144.36	147.64	150.92	154.20	157.48	160.76
50	164.04	167.32	170.60	173.88	177.16	180.45	183.73	187.01	190.29	193.57
60	196.85	200.13	203.41	206.69	209.97	213.25	216.53	219.82	223.10	226.38
70	229.66	232.94	236.22	239.50	242.78	246.06	249.34	252.62	255.90	259.19
80	262.37	265.75	269.03	272.31	275.59	278.87	282.15	285.43	288.71	291.99
90	295.27	298.56	301.84	305.12	308.40	311.68	314.96	318.24	321.52	324.80
100	328.08	331.36	334.64	337.93	341.21	344.49	347.77	351.05	354.33	357.61
110	360.89	364.17	367.45	370.73	374.01	377.30	380.58	383.86	387.14	390.42
120	393.70	396.98	400.26	403.54	406.82	410.10	413.38	416.67	419.95	423.23
130	426.51	429.79	433.07	436.35	439.63	442.91	446.19	449.47	452.75	456.04
140	459.32	462.60	465.88	469.16	472.44	475.72	479.00	482.28	485.56	488.84
150	492.12	495.41	498.69	501.97	505.25	508.53	511.81	515.09	518.37	521.65
160	524.93	528.21	531.49	534.78	538.06	541.34	544.62	547.90	551.18	554.46
170	557.74	561.02	564.30	567.58	570.86	574.15	577.43	580.71	583.99	587.27
180	590.55	593.83	597.11	600.39	603.67	606.95	610.23	613.52	616.80	620.08
190	623.36	626.64	629.92	633.20	636.48	639.76	643.04	646.32	649.60	652.89
200	656.17	659.45	662.73	666.01	669.29	672.57	675.85	679.13	682.41	685.69
210	688.97	692.26	695.54	698.82	702.10	705.38	708.66	711.94	715.22	718.50
220	721.78	725.06	728.34	731.63	734.91	738.19	741.47	744.75	748.03	751.31
230	754.59	757.87	761.15	764.43	767.71	771.00	774.28	777.56	780.84	784.12
240	787.40	790.68	793.96	797.24	800.52	803.80	807.09	810.37	813.65	816.93
250	820.21	823.49	826.77	830.05	833.33	836.61	839.89	843.17	846.45	849.74
260	853.02	856.30	859.58	862.86	866.14	869.42	872.70	875.98	879.26	882.54
270	885.82	889.11	892.39	895.67	898.95	902.23	905.51	908.79	912.07	915.35
280	918.63	921.91	925.19	928.48	931.76	935.04	938.32	941.60	944.88	948.16
290	951.44	954.72	958.00	961.28	964.56	967.85	971.13	974.41	977.69	980.97
300	984.25	987.53	990.81	994.09	997.37	1000.65	1003.93	1007.22	1010.50	1013.78
310	1017.06	1020.34	1023.62	1026.90	1030.18	1033.46	1036.74	1040.02	1043.30	1046.59
320	1049.87	1053.15	1056.43	1059.71	1062.99	1066.27	1069.55	1072.83	1076.11	1079.39
330	1082.67	1085.96	1089.24	1092.52	1095.80	1099.08	1102.36	1105.64	1109.92	1112.20
340	1115.48	1118.76	1122.04	1125.33	1128.61	1131.89	1135.17	1138.45	1141.73	1145.01
350	1148.29	1151.57	1154.85	1158.13	1161.41	1164.70	1167.98	1171.26	1174.54	1177.82
360	1181.10	1184.38	1187.66	1190.94	1194.22	1197.50	1200.78	1204.07	1207.35	1210.63
370	1213.91	1217.19	1220.47	1223.75	1227.03	1230.31	1233.59	1236.87	1240.15	1243.44
380	1246.72	1250.00	1253.28	1256.56	1259.84	1263.12	1266.40	1269.68	1272.96	1276.24
390	1279.52	1282.81	1286.09	1289.37	1292.65	1295.93	1299.21	1302.49	1305.77	1309.05
400	1312.33	1315.61	1318.89	1322.18	1325.46	1328.74	1332.02	1335.30	1338.58	1341.86
410	1345.14	1348.42	1351.70	1354.98	1358.26	1361.55	1364.83	1368.11	1371.39	1374.67
420	1377.95	1381.23	1384.51	1387.79	1391.07	1394.35	1397.63	1400.92	1404.20	1407.48
430	1410.76	1414.04	1417.32	1420.60	1423.88	1427.16	1430.44	1433.72	1437.00	1440.29
440	1443.57	1446.85	1450.13	1453.41	1456.69	1459.97	1463.25	1466.53	1469.81	1473.09
450	1476.37	1479.66	1482.94	1486.22	1489.50	1492.78	1496.06	1499.34	1502.62	1505.90
460	1509.18	1512.46	1515.74	1519.03	1522.31	1525.59	1528.87	1532.15	1535.43	1538.71
470	1541.99	1545.27	1548.55	1551.83	1555.11	1558.40	1561.68	1564.96	1568.24	1571.52
480	1574.80	1578.08	1581.36	1584.64	1587.92	1591.20	1594.48	1597.77	1601.05	1604.33
490	1607.61	1610.89	1614.17	1617.45	1620.73	1624.01	1627.29	1630.57	1633.85	1637.14

Table 23

METERS INTO FEET

1 meter = 39.3700 inches = 3.280833 feet

Meters	0	10	20	30	40	50	60	70	80	90
	Feet	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*
500	1640.4	1673.2	1706.0	1738.8	1771.6	1804.5	1837.3	1870.1	1902.9	1935.7
600	1968.5	2001.3	2034.1	2066.9	2099.7	2132.5	2165.3	2198.2	2231.0	2263.8
700	2296.6	2329.4	2362.2	2395.0	2427.8	2460.6	2493.4	2526.2	2559.0	2591.9
800	2624.7	2657.5	2690.3	2723.1	2755.9	2788.7	2821.5	2854.3	2887.1	2919.9
900	2952.7	2985.6	3018.4	3051.2	3084.0	3116.8	3149.6	3182.4	3215.2	3248.0
1000	3280.8	3313.6	3346.4	3379.3	3412.1	3444.9	3477.7	3510.5	3543.3	3576.1
1100	3608.9	3641.7	3674.5	3707.3	3740.1	3773.0	3805.8	3838.6	3871.4	3904.2
1200	3937.0	3969.8	4002.6	4035.4	4068.2	4101.0	4133.8	4166.7	4199.5	4232.3
1300	4265.1	4297.9	4330.7	4363.5	4396.3	4429.1	4461.9	4494.7	4527.5	4560.4
1400	4593.2	4626.0	4658.8	4691.6	4724.4	4757.2	4790.0	4822.8	4855.6	4888.4
1500	4921.2	4954.1	4986.9	5019.7	5052.5	5085.3	5118.1	5150.9	5183.7	5216.5
1600	5249.3	5282.1	5314.9	5347.8	5380.6	5413.4	5446.2	5479.0	5511.8	5544.6
1700	5577.4	5610.2	5643.0	5675.8	5708.6	5741.5	5774.3	5807.1	5839.9	5872.7
1800	5905.5	5938.3	5971.1	6003.9	6036.7	6069.5	6102.3	6135.2	6168.0	6200.8
1900	6233.6	6266.4	6299.2	6332.0	6364.8	6397.6	6430.4	6463.2	6496.0	6528.9
2000	6561.7	6594.5	6627.3	6660.1	6692.9	6725.7	6758.5	6791.3	6824.1	6856.9
2100	6889.7	6922.6	6955.4	6988.2	7021.0	7053.8	7086.6	7119.4	7152.2	7185.0
2200	7217.8	7250.6	7283.4	7316.3	7349.1	7381.9	7414.7	7447.5	7480.3	7513.1
2300	7545.9	7578.7	7611.5	7644.3	7677.1	7710.0	7742.8	7775.6	7808.4	7841.2
2400	7874.0	7906.8	7939.6	7972.4	8005.2	8038.0	8070.8	8103.7	8136.5	8169.3
2500	8202.1	8234.9	8267.7	8300.5	8333.3	8366.1	8398.9	8431.7	8464.5	8497.4
2600	8530.2	8563.0	8595.8	8628.6	8661.4	8694.2	8727.0	8759.8	8792.6	8825.4
2700	8858.2	8891.1	8923.9	8956.7	8989.5	9022.3	9055.1	9087.9	9120.7	9153.5
2800	9186.3	9219.1	9251.9	9284.8	9317.6	9350.4	9383.2	9416.0	9448.8	9481.6
2900	9514.4	9547.2	9580.0	9612.8	9645.6	9678.5	9711.3	9744.1	9776.9	9809.7
3000	9842.5	9875.3	9908.1	9940.9	9973.7	10006.5	10039.3	10072.2	10105.0	10137.8
3100	10170.6	10203.4	10236.2	10269.0	10301.8	10334.6	10367.4	10400.2	10433.0	10465.9
3200	10498.7	10531.5	10564.3	10597.1	10629.9	10662.7	10695.5	10728.3	10761.1	10793.9
3300	10826.7	10859.6	10892.4	10925.2	10958.0	10990.8	11023.6	11056.4	11089.2	11122.0
3400	11154.8	11187.6	11220.4	11253.3	11286.1	11318.9	11351.7	11384.5	11417.3	11450.1
3500	11482.9	11515.7	11548.5	11581.3	11614.1	11647.0	11679.8	11712.6	11745.4	11778.2
3600	11811.0	11843.8	11876.6	11909.4	11942.2	11975.0	12007.8	12040.7	12073.5	12106.3
3700	12139.1	12171.9	12204.7	12237.5	12270.3	12303.1	12335.9	12368.7	12401.5	12434.4
3800	12467.2	12500.0	12532.8	12565.6	12598.4	12631.2	12664.0	12696.8	12729.6	12762.4
3900	12795.2	12828.1	12860.9	12893.7	12926.5	12959.3	12992.1	13024.9	13057.7	13090.5
4000	13123.3	13156.1	13188.9	13221.8	13254.6	13287.4	13320.2	13353.0	13385.8	13418.6
4100	13451.4	13484.2	13517.0	13549.8	13582.6	13615.5	13648.3	13681.1	13713.9	13746.7
4200	13779.5	13812.3	13845.1	13877.9	13910.7	13943.5	13976.3	14009.2	14042.0	14074.8
4300	14107.6	14140.4	14173.2	14206.0	14238.8	14271.6	14304.4	14337.2	14370.0	14402.9
4400	14435.7	14468.5	14501.3	14534.1	14566.9	14599.7	14632.5	14665.3	14698.1	14730.9
4500	14763.7	14796.6	14829.4	14862.2	14895.0	14927.8	14960.6	14993.4	15026.2	15059.0
4600	15091.8	15124.6	15157.4	15190.3	15223.1	15255.9	15288.7	15321.5	15354.3	15387.1
4700	15419.9	15452.7	15485.5	15518.3	15551.1	15584.0	15616.8	15649.6	15682.4	15715.2
4800	15748.0	15780.8	15813.6	15846.4	15879.2	15912.0	15944.8	15977.7	16010.5	16043.3
4900	16076.1	16108.9	16141.7	16174.5	16207.3	16240.1	16272.9	16305.7	16338.5	16371.4

Table 23

METERS INTO FEET

1 meter = 3.280833 feet

Meters	0	1	2	3	4	5	6	7	8	9
	Feet	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*
5000	16404	16407	16411	16414	16417	16421	16424	16427	16430	16434
5010	16437	16440	16444	16447	16450	16453	16457	16460	16463	16467
5020	16470	16473	16476	16480	16483	16486	16489	16493	16496	16499
5030	16503	16506	16509	16512	16516	16519	16522	16526	16529	16532
5040	16535	16539	16542	16545	16549	16552	16555	16558	16562	16565
5050	16568	16571	16575	16578	16581	16585	16588	16591	16594	16598
5060	16601	16604	16608	16611	16614	16617	16621	16624	16627	16631
5070	16634	16637	16640	16644	16647	16650	16654	16657	16660	16663
5080	16667	16670	16673	16676	16680	16683	16686	16690	16693	16696
5090	16699	16703	16706	16709	16713	16716	16719	16722	16726	16729
5100	16732	16736	16739	16742	16745	16749	16752	16755	16758	16762
5110	16765	16768	16772	16775	16778	16781	16785	16788	16791	16795
5120	16798	16801	16804	16808	16811	16814	16818	16821	16824	16827
5130	16831	16834	16837	16841	16844	16847	16850	16854	16857	16860
5140	16863	16867	16870	16873	16877	16880	16883	16886	16890	16893
5150	16896	16900	16903	16906	16909	16913	16916	16919	16923	16926
5160	16929	16932	16936	16939	16942	16946	16949	16952	16955	16959
5170	16962	16965	16968	16972	16975	16978	16982	16985	16988	16991
5180	16995	16998	17001	17005	17008	17011	17014	17018	17021	17024
5190	17028	17031	17034	17037	17041	17044	17047	17050	17054	17057
5200	17060	17064	17067	17070	17073	17077	17080	17083	17087	17090
5210	17093	17096	17100	17103	17106	17110	17113	17116	17119	17123
5220	17126	17129	17133	17136	17139	17142	17146	17149	17152	17155
5230	17159	17162	17165	17169	17172	17175	17178	17182	17185	17188
5240	17192	17195	17198	17201	17205	17208	17211	17215	17218	17221
5250	17224	17228	17231	17234	17237	17241	17244	17247	17251	17254
5260	17257	17260	17264	17267	17270	17274	17277	17280	17283	17287
5270	17290	17293	17297	17300	17303	17306	17310	17313	17316	17320
5280	17323	17326	17329	17333	17336	17339	17342	17346	17349	17352
5290	17356	17359	17362	17365	17369	17372	17375	17379	17382	17385
5300	17388	17392	17395	17398	17402	17405	17408	17411	17415	17418
5310	17421	17425	17428	17431	17434	17438	17441	17444	17447	17451
5320	17454	17457	17461	17464	17467	17470	17474	17477	17480	17484
5330	17487	17490	17493	17497	17500	17503	17507	17510	17513	17516
5340	17520	17523	17526	17529	17533	17536	17539	17543	17546	17549
5350	17552	17556	17559	17562	17566	17569	17572	17575	17579	17582
5360	17585	17589	17592	17595	17598	17602	17605	17608	17612	17615
5370	17618	17621	17625	17628	17631	17634	17638	17641	17644	17648
5380	17651	17654	17657	17661	17664	17667	17671	17674	17677	17680
5390	17684	17687	17690	17694	17697	17700	17703	17707	17710	17713
5400	17716	17720	17723	17726	17730	17733	17736	17739	17743	17746
5410	17749	17753	17756	17759	17762	17766	17769	17772	17776	17779
5420	17782	17785	17789	17792	17795	17799	17802	17805	17808	17812
5430	17815	17818	17821	17825	17828	17831	17835	17838	17841	17844
5440	17848	17851	17854	17858	17861	17864	17867	17871	17874	17877
5450	17880	17884	17887	17890	17894	17897	17900	17904	17907	17910
5460	17913	17917	17920	17923	17926	17930	17933	17936	17940	17943
5470	17946	17949	17953	17956	17959	17963	17966	17969	17972	17976
5480	17979	17982	17986	17989	17992	17995	17999	18002	18005	18008
5490	18012	18015	18018	18022	18025	18028	18031	18035	18038	18041
5500	18045	18048	18051	18054	18058	18061	18064	18068	18071	18074
5510	18077	18081	18084	18087	18091	18094	18097	18100	18104	18107
5520	18110	18113	18117	18120	18123	18127	18130	18133	18136	18140
5530	18143	18146	18150	18153	18156	18159	18163	18166	18169	18173
5540	18176	18179	18182	18186	18189	18192	18195	18199	18202	18205
5550	18209	18212	18215	18218	18222	18225	18228	18232	18235	18238
5560	18241	18245	18248	18251	18255	18258	18261	18264	18268	18271
5570	18274	18278	18281	18284	18287	18291	18294	18297	18300	18304
5580	18307	18310	18314	18317	18320	18323	18327	18330	18333	18337
5590	18340	18343	18346	18350	18353	18356	18360	18363	18366	18369

Table 23

METERS INTO FEET

1 meter = 3.280833 feet

Meters	0	1	2	3	4	5	6	7	8	9
	Feet	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*
5600	18373	18376	18379	18383	18386	18389	18392	18396	18399	18402
5610	18405	18409	18412	18415	18419	18422	18425	18428	18432	18435
5620	18438	18442	18445	18448	18451	18455	18458	18461	18465	18468
5630	18471	18474	18478	18481	18484	18487	18491	18494	18497	18501
5640	18504	18507	18510	18514	18517	18520	18524	18527	18530	18533
5650	18537	18540	18543	18547	18550	18553	18556	18560	18563	18566
5660	18570	18573	18576	18579	18583	18586	18589	18592	18596	18599
5670	18602	18606	18609	18612	18615	18619	18622	18625	18629	18632
5680	18635	18638	18642	18645	18648	18652	18655	18658	18661	18665
5690	18668	18671	18675	18678	18681	18684	18688	18691	18694	18697
5700	18701	18704	18707	18711	18714	18717	18720	18724	18727	18730
5710	18734	18737	18740	18743	18747	18750	18753	18757	18760	18763
5720	18766	18770	18773	18776	18779	18783	18786	18789	18793	18796
5730	18799	18802	18806	18809	18812	18816	18819	18822	18825	18829
5740	18832	18835	18839	18842	18845	18848	18852	18855	18858	18862
5750	18865	18868	18871	18875	18878	18881	18884	18888	18891	18894
5760	18898	18901	18904	18907	18911	18914	18917	18921	18924	18927
5770	18930	18934	18937	18940	18944	18947	18950	18953	18957	18960
5780	18963	18966	18970	18973	18976	18980	18983	18986	18989	18993
5790	18996	18999	19003	19006	19009	19012	19016	19019	19022	19026
5800	19029	19032	19035	19039	19042	19045	19049	19052	19055	19058
5810	19062	19065	19068	19071	19075	19078	19081	19085	19088	19091
5820	19094	19098	19101	19104	19108	19111	19114	19117	19121	19124
5830	19127	19131	19134	19137	19140	19144	19147	19150	19154	19157
5840	19160	19163	19167	19170	19173	19176	19180	19183	19186	19190
5850	19193	19196	19199	19203	19206	19209	19213	19216	19219	19222
5860	19226	19229	19232	19236	19239	19242	19245	19249	19252	19255
5870	19258	19262	19265	19268	19272	19275	19278	19281	19285	19288
5880	19291	19295	19298	19301	19304	19308	19311	19314	19318	19321
5890	19324	19327	19331	19334	19337	19341	19344	19347	19350	19354
5900	19357	19360	19363	19367	19370	19373	19377	19380	19383	19386
5910	19390	19393	19396	19400	19403	19406	19409	19413	19416	19419
5920	19423	19426	19429	19432	19436	19439	19442	19445	19449	19452
5930	19455	19459	19462	19465	19468	19472	19475	19478	19482	19485
5940	19488	19491	19495	19498	19501	19505	19508	19511	19514	19518
5950	19521	19524	19528	19531	19534	19537	19541	19544	19547	19550
5960	19554	19557	19560	19564	19567	19570	19573	19577	19580	19583
5970	19587	19590	19593	19596	19600	19603	19606	19610	19613	19616
5980	19619	19623	19626	19629	19633	19636	19639	19642	19646	19649
5990	19652	19655	19659	19662	19665	19669	19672	19675	19678	19682
6000	19685	19688	19692	19695	19698	19701	19705	19708	19711	19715
6010	19718	19721	19724	19728	19731	19734	19737	19741	19744	19747
6020	19751	19754	19757	19760	19764	19767	19770	19774	19777	19780
6030	19783	19787	19790	19793	19797	19800	19803	19806	19810	19813
6040	19816	19820	19823	19826	19829	19833	19836	19839	19842	19846
6050	19849	19852	19856	19859	19862	19865	19869	19872	19875	19879
6060	19882	19885	19888	19892	19895	19898	19902	19905	19908	19911
6070	19915	19918	19921	19924	19928	19931	19934	19938	19941	19944
6080	19947	19951	19954	19957	19961	19964	19967	19970	19974	19977
6090	19980	19984	19987	19990	19993	19997	20000	20003	20007	20010
6100	20013	20016	20020	20023	20026	20029	20033	20036	20039	20043
6110	20046	20049	20052	20056	20059	20062	20066	20069	20072	20075
6120	20079	20082	20085	20089	20092	20095	20098	20102	20105	20108
6130	20112	20115	20118	20121	20125	20128	20131	20134	20138	20141
6140	20144	20148	20151	20154	20157	20161	20164	20167	20171	20174
6150	20177	20180	20184	20187	20190	20194	20197	20200	20203	20207
6160	20210	20213	20216	20220	20223	20226	20230	20233	20236	20239
6170	20243	20246	20249	20253	20256	20259	20262	20266	20269	20272
6180	20276	20279	20282	20285	20289	20292	20295	20299	20302	20305
6190	20308	20312	20315	20318	20321	20325	20328	20331	20335	20338

Table 24

FEET INTO METERS

1 foot = 0.3048006 meter

Feet	0	1	2	3	4	5	6	7	8	9
	m.	*m.*	*m.*	*m.*	*m.*	*m.*	*m.*	*m.*	*m.*	*m.*
0	0.000	0.305	0.610	0.914	1.219	1.524	1.829	2.134	2.438	2.743
10	3.048	3.353	3.658	3.962	4.267	4.572	4.877	5.182	5.486	5.791
20	6.096	6.401	6.706	7.010	7.315	7.620	7.925	8.230	8.534	8.839
30	9.144	9.449	9.754	10.058	10.363	10.668	10.973	11.278	11.582	11.887
40	12.192	12.497	12.802	13.106	13.411	13.716	14.021	14.326	14.630	14.935
50	15.240	15.545	15.850	16.154	16.459	16.764	17.069	17.374	17.678	17.983
60	18.288	18.593	18.898	19.202	19.507	19.812	20.117	20.422	20.726	21.031
70	21.336	21.641	21.946	22.250	22.555	22.860	23.165	23.470	23.774	24.079
80	24.384	24.689	24.994	25.298	25.603	25.908	26.213	26.518	26.822	27.127
90	27.432	27.737	28.042	28.346	28.651	28.956	29.261	29.566	29.870	30.175

	0	10	20	30	40	50	60	70	80	90
100	30.48	33.53	36.58	39.62	42.67	45.72	48.77	51.82	54.86	57.91
200	60.96	64.01	67.06	70.10	73.15	76.20	79.25	82.30	85.34	88.39
300	91.44	94.49	97.54	100.58	103.63	106.68	109.73	112.78	115.82	118.87
400	121.92	124.97	128.02	131.06	134.11	137.16	140.21	143.26	146.30	149.35
500	152.40	155.45	158.50	161.54	164.59	167.64	170.69	173.74	176.78	179.83
600	182.88	185.93	188.98	192.02	195.07	198.12	201.17	204.22	207.26	210.31
700	213.36	216.41	219.46	222.50	225.55	228.60	231.65	234.70	237.74	240.79
800	243.84	246.89	249.94	252.98	256.03	259.08	262.13	265.18	268.22	271.27
900	274.32	277.37	280.42	283.46	286.51	289.56	292.61	295.66	298.70	301.75
1000	304.80	307.85	310.90	313.94	316.99	320.04	323.09	326.14	329.18	332.23
1100	335.28	338.33	341.38	344.42	347.47	350.52	353.57	356.62	359.67	362.71
1200	365.76	368.81	371.86	374.90	377.95	381.00	384.05	387.10	390.14	393.19
1300	396.24	399.29	402.34	405.38	408.43	411.48	414.53	417.58	420.62	423.67
1400	426.72	429.77	432.82	435.86	438.91	441.96	445.01	448.06	451.10	454.15
1500	457.20	460.25	463.30	466.34	469.39	472.44	475.49	478.54	481.58	484.63
1600	487.68	490.73	493.78	496.82	499.87	502.92	505.97	509.02	512.07	515.11
1700	518.16	521.21	524.26	527.31	530.35	533.40	536.45	539.50	542.55	545.59
1800	548.64	551.69	554.74	557.79	560.83	563.88	566.93	569.98	573.03	576.07
1900	579.12	582.17	585.22	588.27	591.31	594.36	597.41	600.46	603.51	606.55
2000	609.60	612.65	615.70	618.75	621.79	624.84	627.89	630.94	633.99	637.03
2100	640.08	643.13	646.18	649.23	652.27	655.32	658.37	661.42	664.47	667.51
2200	670.56	673.61	676.66	679.71	682.75	685.80	688.85	691.90	694.95	697.99
2300	701.04	704.09	707.14	710.19	713.23	716.28	719.33	722.38	725.43	728.47
2400	731.52	734.57	737.62	740.67	743.71	746.76	749.81	752.86	755.91	758.95
2500	762.00	765.05	768.10	771.15	774.19	777.24	780.29	783.34	786.39	789.43
2600	792.48	795.53	798.58	801.63	804.67	807.72	810.77	813.82	816.87	819.91
2700	822.96	826.01	829.06	832.11	835.15	838.20	841.25	844.30	847.35	850.39
2800	853.44	856.49	859.54	862.59	865.63	868.68	871.73	874.78	877.83	880.87
2900	883.92	886.97	890.02	893.07	896.11	899.16	902.21	905.26	908.31	911.35
3000	914.40	917.45	920.50	923.55	926.59	929.64	932.69	935.74	938.79	941.83
3100	944.88	947.93	950.98	954.03	957.06	960.12	963.17	966.22	969.27	972.31
3200	975.36	978.41	981.46	984.51	987.55	990.60	993.65	996.70	999.75	1002.79
3300	1005.84	1008.89	1011.94	1014.99	1018.03	1021.08	1024.13	1027.18	1030.23	1033.27
3400	1036.32	1039.37	1042.42	1045.47	1048.51	1051.56	1054.61	1057.66	1060.71	1063.75
3500	1066.80	1069.85	1072.90	1075.95	1078.99	1082.04	1085.09	1088.14	1091.19	1094.23
3600	1097.28	1100.33	1103.38	1106.43	1109.47	1112.52	1115.57	1118.62	1121.67	1124.71
3700	1127.76	1130.81	1133.86	1136.91	1139.95	1143.00	1146.05	1149.10	1152.15	1155.19
3800	1158.24	1161.29	1161.34	1167.39	1170.43	1173.48	1176.53	1179.58	1182.63	1185.67
3900	1188.72	1191.77	1194.82	1197.87	1200.91	1203.96	1207.01	1210.06	1213.11	1216.15

Table 24

FEET INTO METERS

1 foot = 0.3048006 meter

Feet	0	10	20	30	40	50	60	70	80	90
	m.	*m.*	*m.*	*m.*	*m.*	*m.*	*m.*	*m.*	*m.*	*m.*
4000	1219.2	1222.3	1225.3	1228.3	1231.4	1234.4	1237.5	1240.5	1243.6	1246.6
4100	1249.7	1252.7	1255.8	1258.8	1261.9	1264.9	1268.0	1271.0	1274.1	1277.1
4200	1280.2	1283.2	1286.3	1289.3	1292.4	1295.4	1298.5	1301.5	1304.5	1307.6
4300	1310.6	1313.7	1316.7	1319.8	1322.8	1325.9	1328.9	1332.0	1335.0	1338.1
4400	1341.1	1344.2	1347.2	1350.3	1353.3	1356.4	1359.4	1362.5	1365.5	1368.6
4500	1371.6	1374.7	1377.7	1380.7	1383.8	1386.8	1389.9	1392.9	1396.0	1399.0
4600	1402.1	1405.1	1408.2	1411.2	1414.3	1417.3	1420.4	1423.4	1426.5	1429.5
4700	1432.6	1435.6	1438.7	1441.7	1444.8	1447.8	1450.9	1453.9	1456.9	1460.0
4800	1463.0	1466.1	1469.1	1472.2	1475.2	1478.3	1481.3	1484.4	1487.4	1490.5
4900	1493.5	1496.6	1499.6	1502.7	1505.7	1508.8	1511.8	1514.9	1517.9	1521.0
5000	1524.0	1527.1	1530.1	1533.1	1536.2	1539.2	1542.3	1545.3	1548.4	1551.4
5100	1554.5	1557.5	1560.6	1563.6	1566.7	1569.7	1572.8	1575.8	1578.9	1581.9
5200	1585.0	1588.0	1591.1	1594.1	1597.2	1600.2	1603.3	1606.3	1609.3	1612.4
5300	1615.4	1618.5	1621.5	1624.6	1627.6	1630.7	1633.7	1636.8	1639.8	1642.9
5400	1645.9	1649.0	1652.0	1655.1	1658.1	1661.2	1664.2	1667.3	1670.3	1673.4
5500	1676.4	1679.5	1682.5	1685.5	1688.6	1691.6	1694.7	1697.7	1700.8	1703.8
5600	1706.9	1709.9	1713.0	1716.0	1719.1	1722.1	1725.2	1728.2	1731.3	1734.3
5700	1737.4	1740.4	1743.5	1746.5	1749.6	1752.6	1755.7	1758.7	1761.7	1764.8
5800	1767.8	1770.9	1773.9	1777.0	1780.0	1783.1	1786.1	1789.2	1792.2	1795.3
5900	1798.3	1801.4	1804.4	1807.5	1810.5	1813.6	1816.6	1819.7	1822.7	1825.8
6000	1828.8	1831.9	1834.9	1837.9	1841.0	1844.0	1847.1	1850.1	1853.2	1856.2
6100	1859.3	1862.3	1865.4	1868.4	1871.5	1874.5	1877.6	1880.6	1883.7	1886.7
6200	1889.8	1892.8	1895.9	1898.9	1902.0	1905.0	1908.1	1911.1	1914.1	1917.2
6300	1920.2	1923.3	1926.3	1929.4	1932.4	1935.5	1938.5	1941.6	1944.6	1947.7
6400	1950.7	1953.8	1956.8	1959.9	1962.9	1966.0	1969.0	1972.1	1975.1	1978.2
6500	1981.2	1984.3	1987.3	1990.3	1993.4	1996.4	1999.5	2002.5	2005.6	2008.6
6600	2011.7	2014.7	2017.8	2020.8	2023.9	2026.9	2030.0	2033.0	2036.1	2039.1
6700	2042.2	2045.2	2048.3	2051.3	2054.4	2057.4	2060.5	2063.5	2066.5	2069.6
6800	2072.6	2075.7	2078.7	2081.8	2084.8	2087.9	2090.9	2094.0	2097.0	2100.1
6900	2103.1	2106.2	2109.2	2112.3	2115.3	2118.4	2121.4	2124.5	2127.5	2130.6
7000	2133.6	2136.7	2139.7	2142.7	2145.8	2148.8	2151.9	2154.9	2158.0	2161.0
7100	2164.1	2167.1	2170.2	2173.2	2176.3	2179.3	2182.4	2185.4	2188.5	2191.5
7200	2194.6	2197.6	2200.7	2203.7	2206.8	2209.8	2212.9	2215.9	2218.9	2222.0
7300	2225.0	2228.1	2231.1	2234.2	2237.2	2240.3	2243.3	2246.4	2249.4	2252.5
7400	2255.5	2258.6	2261.6	2264.7	2267.7	2270.8	2273.8	2276.9	2279.9	2283.0
7500	2286.0	2289.1	2292.1	2295.1	2298.2	2301.2	2304.3	2307.3	2310.4	2313.4
7600	2316.5	2319.5	2322.6	2325.6	2328.7	2331.7	2334.8	2337.8	2340.9	2343.9
7700	2347.0	2350.0	2353.1	2356.1	2359.2	2362.2	2365.3	2368.3	2371.3	2374.4
7800	2377.4	2380.5	2383.5	2386.6	2389.6	2392.7	2395.7	2398.8	2401.8	2404.9
7900	2407.9	2411.0	2414.0	2417.1	2420.1	2423.2	2426.2	2429.3	2432.3	2435.4
8000	2438.4	2441.5	2444.5	2447.5	2450.6	2453.6	2456.7	2459.7	2462.8	2465.8
8100	2468.9	2471.9	2475.0	2478.0	2481.1	2484.1	2487.2	2490.2	2493.3	2496.3
8200	2499.4	2502.4	2505.5	2508.5	2511.6	2514.6	2517.7	2520.7	2523.7	2526.8
8300	2529.8	2532.9	2535.9	2539.0	2542.0	2545.1	2548.1	2551.2	2554.2	2557.3
8400	2560.3	2563.4	2566.4	2569.5	2572.5	2575.6	2578.6	2581.7	2584.7	2587.8
8500	2590.8	2593.9	2596.9	2599.9	2603.0	2606.0	2609.1	2612.1	2615.2	2618.2
8600	2621.3	2624.3	2627.4	2630.4	2633.5	2636.5	2639.6	2642.6	2645.7	2648.7
8700	2651.8	2654.8	2657.9	2660.9	2664.0	2667.0	2670.1	2673.1	2676.1	2679.2
8800	2682.2	2685.3	2688.3	2691.4	2694.4	2697.5	2700.5	2703.6	2706.6	2709.7
8900	2712.7	2715.8	2718.8	2721.9	2724.9	2728.0	2731.0	2734.1	2737.1	2740.2

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Table 25

PRESSURE (mb.) OF AQUEOUS VAPOR OVER WATER FOR VARIOUS TEMPERATURES (°C.)

°C.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
0	6.10	6.15	6.20	6.24	6.29	6.33	6.38	6.42	6.47	6.52
1	6.56	6.61	6.66	6.71	6.76	6.81	6.86	6.90	6.95	7.00
2	7.05	7.10	7.16	7.21	7.26	7.31	7.36	7.42	7.47	7.52
3	7.58	7.63	7.68	7.74	7.79	7.85	7.90	7.96	8.02	8.07
4	8.13	8.19	8.25	8.30	8.36	8.42	8.48	8.54	8.60	8.66
5	8.72	8.78	8.84	8.91	8.97	9.03	9.09	9.16	9.22	9.28
6	9.35	9.41	9.48	9.54	9.61	9.68	9.74	9.81	9.88	9.95
7	10.02	10.09	10.15	10.22	10.30	10.37	10.44	10.51	10.58	10.65
8	10.73	10.80	10.87	10.95	11.02	11.10	11.17	11.25	11.32	11.40
9	11.48	11.56	11.64	11.71	11.79	11.87	11.95	12.03	12.12	12.20
10	12.28	12.36	12.44	12.53	12.61	12.70	12.78	12.87	12.95	13.04
11	13.13	13.21	13.30	13.39	13.48	13.57	13.66	13.75	13.84	13.93
12	14.03	14.12	14.21	14.31	14.40	14.50	14.59	14.69	14.78	14.88
13	14.98	15.08	15.18	15.28	15.38	15.48	15.58	15.68	15.78	15.89
14	15.99	16.09	16.20	16.30	16.41	16.51	16.62	16.73	16.84	16.95
15	17.06	17.17	17.28	17.39	17.50	17.61	17.73	17.84	17.96	18.07
16	18.19	18.30	18.42	18.54	18.66	18.78	18.90	19.02	19.14	19.26
17	19.38	19.51	19.63	19.76	19.88	20.01	20.13	20.26	20.39	20.52
18	20.65	20.78	20.91	21.04	21.17	21.31	21.44	21.58	21.71	21.85
19	21.98	22.12	22.26	22.40	22.54	22.68	22.82	22.96	23.11	23.25
20	23.40	23.54	23.69	23.83	23.98	24.13	24.28	24.43	24.58	24.73
21	24.88	25.04	25.19	25.35	25.50	25.66	25.82	25.98	26.14	26.30
22	26.46	26.62	26.78	26.94	27.11	27.27	27.44	27.61	27.78	27.94
23	28.11	28.28	28.46	28.63	28.80	28.98	29.15	29.33	29.51	29.68
24	29.86	30.04	30.22	30.40	30.59	30.77	30.96	31.14	31.33	31.51
25	31.70	31.89	32.08	32.28	32.47	32.66	32.86	33.05	33.25	33.45
26	33.64	33.84	34.04	34.25	34.45	34.65	34.86	35.06	35.27	35.48
27	35.69	35.90	36.11	36.32	36.53	36.75	36.96	37.18	37.40	37.62
28	37.84	38.06	38.28	38.50	38.73	38.95	39.18	39.41	39.64	39.87
29	40.10	40.33	40.56	40.80	41.04	41.27	41.51	41.75	41.99	42.23
30	42.48	42.72	42.97	43.21	43.46	43.71	43.96	44.21	44.47	44.72
31	44.98	45.23	45.49	45.75	46.01	46.27	46.54	46.80	47.07	47.33
32	47.60	47.87	48.14	48.42	48.69	48.97	49.24	49.52	49.80	50.08
33	50.36	50.65	50.93	51.22	51.50	51.79	52.08	52.37	52.67	52.96
34	53.26	53.56	53.85	54.15	54.46	54.76	55.06	55.37	55.68	55.99
35	56.30	56.61	56.92	57.24	57.56	57.87	58.19	58.51	58.84	59.16
36	59.49	59.81	60.14	60.47	60.81	61.14	61.47	61.81	62.15	62.49
37	62.83	63.17	63.52	63.86	64.21	64.56	64.91	65.27	65.62	65.98
38	66.34	66.69	67.06	67.42	67.78	68.15	68.52	68.89	69.26	69.63
39	70.01	70.38	70.76	71.14	71.53	71.91	72.30	72.68	73.07	73.46
40	73.86	74.25	74.65	75.04	75.44	75.85	76.25	76.66	77.06	77.47
41	77.88	78.30	78.71	79.13	79.55	79.97	80.39	80.81	81.24	81.67
42	82.10	82.53	82.97	83.40	83.84	84.28	84.72	85.17	85.61	86.06
43	86.51	86.96	87.42	87.87	88.33	88.79	89.26	89.72	90.19	90.66
44	91.13	91.60	92.07	92.55	93.03	93.51	93.99	94.48	94.97	95.46

Table 25

PRESSURE (mb.) OF AQUEOUS VAPOR OVER WATER FOR VARIOUS TEMPERATURES (°C.)

°C.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
- 0	6.10	6.06	6.02	5.97	5.93	5.89	5.84	5.80	5.76	5.72
- 1	5.68	5.64	5.59	5.55	5.51	5.47	5.43	5.39	5.35	5.31
- 2	5.28	5.24	5.20	5.16	5.12	5.08	5.05	5.01	4.97	4.94
- 3	4.90	4.86	4.83	4.79	4.75	4.72	4.68	4.65	4.61	4.58
- 4	4.55	4.51	4.48	4.44	4.41	4.38	4.35	4.31	4.28	4.25
- 5	4.22	4.18	4.15	4.12	4.09	4.06	4.03	4.00	3.97	3.94
- 6	3.91	3.88	3.85	3.82	3.79	3.76	3.73	3.70	3.68	3.65
- 7	3.62	3.59	3.56	3.54	3.51	3.48	3.46	3.43	3.40	3.38
- 8	3.35	3.33	3.30	3.27	3.25	3.22	3.20	3.17	3.15	3.12
- 9	3.10	3.08	3.05	3.03	3.00	2.98	2.96	2.94	2.91	2.89
-10	2.87	2.84	2.82	2.80	2.78	2.76	2.73	2.71	2.69	2.67
-11	2.65	2.63	2.61	2.58	2.56	2.54	2.52	2.50	2.48	2.46
-12	2.44	2.42	2.40	2.39	2.37	2.35	2.33	2.31	2.29	2.27
-13	2.26	2.24	2.22	2.20	2.18	2.16	2.15	2.13	2.11	2.10
-14	2.08	2.06	2.04	2.03	2.01	2.00	1.98	1.96	1.95	1.93
-15	1.92	1.90	1.88	1.87	1.85	1.84	1.82	1.81	1.79	1.78
-16	1.76	1.75	1.73	1.72	1.71	1.69	1.68	1.66	1.65	1.64
-17	1.62	1.61	1.59	1.58	1.57	1.56	1.54	1.53	1.52	1.50
-18	1.49	1.48	1.46	1.45	1.44	1.43	1.42	1.40	1.39	1.38
-19	1.37	1.36	1.35	1.34	1.32	1.31	1.30	1.29	1.28	1.27
-20	1.26	1.25	1.24	1.22	1.21	1.20	1.19	1.18	1.17	1.16
-21	1.16	1.14	1.13	1.12	1.11	1.10	1.09	1.08	1.07	1.06
-22	1.06	1.05	1.04	1.03	1.02	1.01	1.00	.993	.985	.976
-23	.967	.958	.949	.941	.933	.925	.917	.909	.901	.893
-24	.885	.877	.869	.861	.854	.846	.838	.830	.823	.816
-25	.809	.802	.795	.788	.781	.774	.767	.760	.753	.746
-26	.739	.732	.726	.720	.713	.706	.699	.693	.687	.681
-27	.674	.668	.662	.656	.650	.644	.638	.632	.627	.621
-28	.615	.609	.603	.598	.592	.587	.581	.576	.571	.565
-29	.560	.554	.549	.544	.539	.534	.529	.524	.520	.515
-30	.510	.505	.501	.496	.491	.486	.482	.477	.473	.468
-31	.464	.460	.455	.451	.447	.442	.438	.434	.430	.426
-32	.421	.418	.414	.410	.406	.402	.398	.394	.390	.386
-33	.383	.379	.375	.372	.368	.364	.361	.357	.354	.350
-34	.347	.344	.340	.337	.334	.330	.327	.324	.321	.318
-35	.314	.311	.308	.305	.302	.299	.296	.293	.290	.288
-36	.285	.282	.279	.276	.273	.271	.268	.265	.263	.260
-37	.257	.255	.252	.250	.247	.245	.242	.240	.237	.235
-38	.233	.230	.228	.226	.223	.221	.219	.217	.214	.212
-39	.210	.208	.206	.204	.201	.199	.197	.195	.193	.191
-40	.189	.187	.185	.183	.182	.180	.178	.176	.174	.172
-41	.170	.169	.167	.165	.163	.162	.160	.158	.157	.155
-42	.153	.152	.150	.149	.147	.145	.144	.142	.141	.139
-43	.138	.136	.135	.134	.132	.131	.129	.128	.127	.125
-44	.124	.122	.121	.120	.119	.117	.116	.115	.113	.112
-45	.111	.110	.109	.107	.106	.105	.104	.103	.102	.101
-46	.099	.098	.097	.096	.095	.094	.093	.092	.091	.090
-47	.089	.088	.087	.086	.085	.084	.083	.082	.081	.080
-48	.080	.079	.078	.077	.076	.075	.074	.074	.073	.072
-49	.071	.070	.069	.069	.068	.067	.066	.066	.065	.064