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APPENDIX 1. ABRIDGED OBSERVATIONAL INSTRUCTIONS FOR MANUAL FIRE-WEATHER STATIONS

A1.1 Temperature and Humidity

READING THERMOMETERS

1. Avoid parallax error when reading liquid-in-glass thermometers. A straight line from the observer's eye to the meniscus or index should form a right angle with the thermometer stem and scale.

2. When rounding off temperatures to the nearest degree, an actual thermometer reading with a 0.5 decimal is raised to the next integer; a reading of 67.5, thus, becomes 68.

MAXIMUM AND MINIMUM THERMOMETERS

Standard Liquid-in-Glass Thermometers—The procedure for reading and setting the standard maximum and minimum thermometers, mounted in a Townsend Support, is given in the following steps (refer to fig. 23.2). Record all temperatures to the nearest degree Fahrenheit.

1. Read the minimum thermometer first, while in its set position (bulb end slightly below the horizontal).

   a. Read minimum temperature from the upper end (right end) of the index.

   b. Read current temperature from the top of the alcohol column.

   c. Do not reset at this time.

2. Read the maximum thermometer.

   a. Unlock the spinning shaft and slowly lower the maximum thermometer to a *vertical position* so that the mercury column is resting on the constriction in the bore.

   b. Read maximum temperature from the top of the mercury column.

3. Set the maximum thermometer *first*.

   a. Spin the thermometer in its clamp (several times if necessary, with moderate force) until its reading, in the vertical position, will not go lower. Always start the spin from this position. Record the final reading as the "set maximum" reading.

   b. Lock the maximum thermometer in its set position (bulb slightly above the horizontal).

4. Set the minimum thermometer *last*.

   a. Invert the thermometer in its clamp until the index rod slides to the end of the alcohol column.

   b. Return thermometer to its nearly horizontal position.

Again, *always read the minimum thermometer first and reset it last,* because the index rod can be easily jarred during steps 2 and 3 and slide away from its correct position. *Always start the spin in step 3 from the vertical position,* to avoid a possible break in the mercury column or damage to the constriction in the bore.

The minimum thermometer index rod may slide downward due to vibration during windy conditions if the instrument shelter and its door are not rigidly secured. Check suspiciously low minimum temperatures against a hygrothermograph trace if this is available.

The set maximum and current (or set minimum) thermometer readings should almost always agree within ±1.0 °F. Exceptions may occur during rapidly changing conditions or when body heat or reflected radiation has affected the instruments. If a discrepancy persists, the thermometers should be examined for defects. In particular, the minimum thermometer may have developed a bubble in its alcohol column.

Recording of Maximum and Minimum Temperatures—When taking observations at the basic 24-hour observation time, remember that the maximum temperature recorded for today cannot be *lower* than the minimum temperature read yesterday. Nor can it be lower than the set maximum thermometer reading of either yesterday or today. Likewise, the minimum recorded for today cannot be *higher* than the maximum read yesterday; nor can it be higher than the set maximum of either yesterday or today.

PSYCHROMETER READINGS

For fire-weather observations, the psychrometer (dry bulb and wet bulb thermometer) readings are usually recorded to the nearest degree. Be sure to use the correct psychrometric tables, as designated for the station elevation.

STANDARD ELECTRIC FAN PSYCHROMETER

Basic Operating Procedures—The basic operating procedure for the electric (battery-operated) fan psychrometer, mounted in an instrument shelter, is as follows:

1. *Check the wet bulb wick*—It must be clean and should cover the bulb snugly.

2. *Wet the wick*—Saturate with clean, distilled or other mineral-free water near air temperature just prior to an observation. After wetting, replace cap on the water container.

3. *Ventilate the thermometers*—Turn on the fan switch. To maintain proper ventilation (at least 13 ft/s, or 9 mi/h), replace battery at the first sign of weakness. Be sure that the fan-motor wires are properly connected to the battery, so that the fan will rotate correctly and blow air toward the thermometers.

4. *Read the wet bulb*—Read the wet bulb first, after a wait of 1 or 2 minutes, when its falling temperature should begin to stabilize. Continue to watch the mercury column and record the wet-bulb reading when the mercury column reaches its lowest level (and the wick is still moist). During conditions of variable wind or sunshine, however, an average or fairly steady wet-bulb reading, rather than the lowest reading, may be more representative of the observation time.

5. *Read the dry bulb*—Read the dry bulb immediately after each wet-bulb reading. The recorded dry-bulb temperature will be the one concurrent with the recorded (lowest or most representative) wet-bulb temperature.

Observations in Freezing Weather—During freezing weather, the water on the wet bulb wick should be completely frozen with a thin coating of ice before an observation is begun. To allow this ice coating to form, when the wick is initially dry, wet the wick about 15 minutes prior to the observation time.

Ventilate the thermometers until the wet bulb reaches a steady temperature below 32 °F; read first the wet bulb and then the dry bulb.

HYGROTHERMOGRAPHS

Expose the hygrothermograph in an instrument shelter, on the floor (or supporting blocks) on the left side, so that the sensing elements are near the center of the shelter. Always be sure that the hygrothermograph is far enough forward to allow clearance for the maximum thermometer when it is set by spinning.

Changing the Chart—Before installing a new chart, write the station name (and number) and the "on" date in the spaces provided at the left or right end of the chart.

To remove the old chart:

1. Lift pens off the chart, using shifting lever.
2. Unlatch and raise the instrument cover to a stable open position.
3. Lift drum from spindle, being careful not to hit the pens.
4. Pull retaining clip and remove chart from the drum. Avoid smearing undried ink remaining on recent portion of trace.
5. Record "off" time and date on chart near end of the temperature trace.
6. Wind the clock (where this is required). If the chart drive is battery operated, check to make sure that the chart drive (clock or motor) is running. Listen for an audible sound. Replace batteries if chart motion has stopped since the previous visit or if a replacement is due. If, however, the chart motion has stopped but the chart drive is running, check to see if the gears are binding or meshing too tightly.

To install a new chart:

1. Place chart snugly against the flange at bottom edge of drum, and wrap it tightly around the drum with right edge of chart overlapping the left edge. If chart is of tapered-edge type, first fold the tab on right edge. Align the right edge with the notch on upper edge of drum and the slot in bottom flange.
2. Insert the retaining clip through the slot in flange of drum, covering both ends of the chart if chart is square-end type. Insert clip underneath the right edge, along crease of foldover tab, if chart is tapered-edge type. Push head of clip securely into the notch on drum. Adjust the chart if necessary to obtain snug fit.
3. Reset the drum on spindle. Position drum so that chart time is slightly faster than the correct time.
4. Add ink to pens, if necessary (see instructions below).
5. Bring the pens into contact with the chart, using shifting lever. Check ink flow by rotating drum slightly back and forth.
6. Turn the drum to position the pens at the correct chart time by rotating drum *counterclockwise* (against its normal direction of movement). This will take up any slack in the gears.
7. Lower and latch the instrument cover.

Inking the Pens—

1. Use purple glycerine-base ink made specially for hygrothermographs and other outdoor recording instruments.
2. Fill pen (of barrel type) by touching applicator to the open end of barrel

   Do not overfill so that ink bulges beyond sides of barrel. With pens of the V-point type, fill the ink reservoir to slightly below the top.
3. In damp weather the ink, being hygroscopic, may increase in volume and overflow from the pens; less ink should be used. The ink may also become so diluted as to produce a weak trace. In such a case, remove the ink from the pens, with lint-free paper, and replace with fresh ink.
4. To start the flow of ink and remove loose residue, draw a piece of chart paper through the pen nibs. To avoid catching fibers in the nibs, do not use paper with a torn edge.

Checking the Calibration—If daily readings are taken, check the calibration at the basic observation time. If the station is not visited daily, check at least when the chart is changed. Because of the timelag of the hygrothermograph sensors, calibration checks of current values will be the most reliable when the temperature and humidity are steady. Generally, this will occur around dawn and midafternoon, particularly during cloudy, breezy weather. For temperature, a comparison of the average maximum and minimum values may provide the best calibration check. Make necessary adjustments (refer to sections 23.5 and 30.5).

Make a time-check mark on the traces, lightly deflecting each pen *downward*; a 1/8-inch vertical line is generally sufficient. Do not deflect the humidity pen arm upward, as this may apply damaging force on the hairs. Write the actual time near the pen mark or on the observation form. Make any necessary adjustment of pen position.

A1.2 Wind

AVERAGE WINDSPEED

Windspeed at an observation time ordinarily refers to the average speed over a period of a few minutes or longer, which tends to smooth out gusts and lulls. A standard period of 10 minutes is used for fire-weather observations. Record the average to the nearest whole number (miles per hour); a 0.5 decimal is raised to the next integer. Wherever possible, correct the observed windspeeds as specified in the instruction manual furnished by the anemometer's manufacturer.

Procedures for obtaining average windspeed with several types of anemometers and their counter devices follow:

ONE-SIXTIETH-MILE CONTACTING ANEMOMETER

Readout by Reset Counter Equipped With Timer—

1. Reset the counter to zero, if not done previously.
2. Set the timer for exactly 10 minutes (in the case of fire-weather observations).
3. When the timer stops, read dial.
4. Obtain the 10-minute average windspeed in mi/h by placing a decimal point in front of the final digit read on the counter.
5. Reset the counter to zero.
6. If the average windspeed for a period other than 10 minutes is desired, simply set timer for the desired number of minutes and divide the final count by that number.

Readout by Reset Counter Without Timer—

1. Reset the counter to zero, if not done previously.
2. Start both the counter, using the "on-off" switch, and a stopwatch. Alternatively, a regular analog or digital watch may be used; start the counter when the digital watch reads 00 seconds or when the analog watch's second hand passes 12.
3. After exactly 10 minutes (in the case of fire-weather observations), stop the counter.
4. Obtain the 10-minute average windspeed in mi/h by placing a decimal point in front of the final digit read on the counter.
5. Reset the counter to zero.
6. If the average windspeed for a period other than 10 minutes is desired, let the counter run for the desired number of minutes and divide final count by that number.

HAND-HELD ANEMOMETERS

Observations with hand-held instruments, most typically used in the field, often require only a few minutes' windspeed average, together with notation of gusts. Hold the anemometer in an open, representative location. When using instruments that show instantaneous windspeed, obtain an average speed by mental estimate or by recording the speeds at fixed intervals during the observation.

Dwyer Hand-Held Wind Meter—

1. *Face the wind* and hold the meter at arm's length about head high, with the scale side in view. Hold the instrument about midway from either end, taking care not to block the two holes at the bottom or the pinhole on the top stem.
2. Observe motion of the white ball in relation to the left (low) scale. If ball remains within the range between 2 and 9 mi/h, read from the left scale. If ball is rising to near 10 mi/h, cover the opening at top of stem with index finger and read windspeed from the right (high) scale.
3. To obtain a reading, observe the height attained by the ball in relation to the appropriate scale. Often the height (windspeed) will vary noticeably during the observation period. Average speeds, usually taken over a few minutes' period, may be estimated mentally or by reading and recording at fixed intervals. The highest gust speeds may also be noted.

A1.3 Precipitation

NONRECORDING GAUGES

Timely Measurement of Precipitation—To prevent possible loss by evaporation, measure and record rainfall as soon as possible after its ending when using nonstandard, small-orifice gauges. A supplemental early-morning measurement should be adequate for standard 8-inch gauges at stations with an afternoon basic observation time, provided the top section (the funnel) is on the gauge.

At the basic observation time, record the total 24-hour precipitation obtained from all measurements.

STANDARD 8-INCH GAUGE

The following operating instructions apply to both the large-capacity and smaller-capacity (Forest Service) standard 8-inch-diameter rain gauges.

Measuring Rainfall Within Measuring Tube—

1. Remove the funnel from top of rain gauge.
2. Slowly insert a clean, dry measuring stick vertically into the measuring tube, with the zero end resting on the bottom.
3. Remove the stick after 2 or 3 seconds.
4. Read the depth of precipitation, to the nearest 0.01 inch, as indicated by the waterline. Remember, each scale mark on the stick represents an increment of 0.01 inch. Precipitation amounting to less than 0.01 inch is recorded as a trace (T). A trace is also recorded when the gauge is dry but raindrops or snowflakes have been visually observed since the previous observation time.
5. Remove and empty the measuring tube, allowing it to drain for at least several seconds; then replace it inside the overflow can.
6. Replace the funnel, making sure it is seated squarely on top of the overflow can and over the measuring tube.

Measuring Rainfall When Measuring Tube Has Overflowed—

1. Record 0.50 inch precipitation, initially, for a completely filled measuring tube in the Forest Service gauge; 2.00 inches for a completely filled tube in the large capacity gauge.
2. Carefully remove the measuring tube and dump the water; allow the tube to drain for at least several seconds.
3. Carefully pour water from the overflow can into the measuring tube; stop if water reaches the brim (this is more likely to occur with the smaller capacity Forest Service gauge).
4. If measuring tube is filled to the brim in step 3, add another 0.50 inch or 2.00 inches to the initially recorded amount. Otherwise, insert stick and read the waterline as described in the preceding instructions (steps 2 through 4).
5. Repeat if necessary until all the water in the overflow can has been measured.
6. Record the total of all the increments.

Measuring Water Content of Snowfall—The gauge's funnel and measuring tube should be removed in advance of possible snowfall and freezing temperatures. Only the outer (overflow) can is exposed. When snow (or rain) then occurs, measure the precipitation as soon as possible after it has ended; refer to section 25.1 for details.

RECORDING GAUGES: UNIVERSAL WEIGHING GAUGE

Daily Precipitation Measurements—Precipitation amounts between successive observations are obtained directly from the recording chart, subtracting the previous reading of the pen trace from the current reading. First, tap the floor of the gauge to free the pen arm and its linkage from possible frictional constraint.

Changing Charts—Charts having a weekly time scale are usually changed at that interval, on a Monday, unless accumulated precipitation is exceptionally heavy and approaches or exceeds chart capacity. Charts having a 24-hour time scale may be left on for periods of 1 or 2 weeks, if precipitation is absent or well below chart capacity. In this case, advance the pen slightly upward to a new line each day, noting date and time.

To change a chart, for ordinary warm-season (fire-season) operation:

1. Open any locks used on gauge. Slide the inspection (access) door upward and, using the pen arm shifter, lift pen from the chart.
2. Lift the chart drum clear of spindle and then tilt to remove through access door. Remove chart, noting the date and "time off." Prepare a new chart, noting station name, date, and "time on."
3. Remove the collector and bucket. If there is water in the bucket, check to verify that precipitation has been recorded on the chart just removed. Empty the bucket and replace both bucket and collector.
4. Install the new chart. Make sure that it fits snugly and rests squarely against the lower flange of the drum. (See hygrothermograph instructions, section A1.1.)
5. Wind the clock (where this is required), but do not overwind. (See hygrothermograph instructions, section A1.1.)
6. Replace the chart drum and turn it counterclockwise (backward in time) until the pen is lined up with the correct time position on the new chart.
7. Add ink to the pen, if necessary, filling the V-point reservoir to slighty below the top. Remove and replace ink if it has diluted and overflowed during damp weather conditions.
8. Bring pen into contact with chart, using pen arm shifter, and make final time adjustment if necessary.
9. Check the pen setting. The pen should rest on the bottom horizontal line of the chart when the empty bucket is in place. Use the fine adjustment thumbscrew if necessary.
10. Be sure that ink is flowing from pen to chart. Pressing lightly upon the pen should be sufficient to start this flow. If necessary, remove pen from chart and draw a piece of lint-free paper through the nibs before returning and pressing again.
11. Close the access door of gauge, sliding it downward into groove, and secure locks.

Operation During Freezing Weather—For operation during the snow season (and freezing weather), remove (by rotation) the funnel attached at the bottom of the collector; store in a convenient place. Place an antifreeze solution in the bucket (see section 25.2).

MEASUREMENT OF SNOWFALL AND SNOW DEPTH

Snowfall—Snowfall, the depth of newly fallen snow or ice pellets (sleet), should be measured concurrently with the snowfall water content—measure as soon as possible after the snow has ended, to avoid errors from possible melting, settling, or wind action. Snowfall can be measured on a previously bare or cleared grass surface, on an already existing snow surface (with identifiable crust), or on a snow board or other suitable surface that retains the snow.

Use the rain gauge measuring stick, or a sturdier ruler if necessary; record to the nearest tenth of an inch, reading the actual linear distance on the stick, taking an average from several measurement spots. When a grass surface is used, be sure that the stick is pushed only to the bottom of the snow layer—not lower into the grass blades. Refer to section 25.4 for further details.

Snow Depth—Total depth of snow lying on the ground can be measured with the rain gauge measuring stick or a longer, sturdier stick; several spots are sampled. Snow stakes may be required in areas with heavy snow cover. Record to the nearest inch.

A1.4 Fuel Moisture

USE OF FUEL MOISTURE SCALES

The fuel moisture scale measurements, described below, may have to be corrected for aging changes in the fuel sticks (section 10.1).

FORESTER (APPALACHIAN) SCALE

To measure moisture content of the ½-inch ponderosa pine fuel moisture stick:

1. *Check the scale*—Be sure that the sliding weight on the balance arm is set and locked at 100 grams. The weight is locked by tightening the setscrew on top of the weight. Check calibration by hanging the 100-gram weight on the hook and tapping the pivot block lightly; the pointer should indicate zero. If adjustment is necessary, loosen the wing nuts and carefully move the scale until the pointer indicates zero.
2. *Remove the stick from rack*—Use a clean glove, piece of cloth, or paper and remove the stick from its wire exposure rack. If stick is dry, lightly brush off any dust, using a clean, soft-bristle paintbrush; if wet, shake off any free moisture.
3. *Weigh the stick*—Using its hook, hang the stick on the scale arm. Steady the stick and let the pointer come to rest; then tap the pivot block to overcome any binding due to friction. Close the shelter door, if necessary, to prevent wind interference. Read the moisture percentage

shown on the scale by the pointer, and record to the nearest whole number (see fig. 26.3).

4. *Replace the stick*—Remove the stick from the scale and return it to the wire rack. Be sure that the correct side faces up (side with brads should face down) and that the end with the screw hook points north.

FORESTER (CHISHOLM) PORTABLE SCALE

This scale can be hand-held but is much easier to use if it is hung on a post, tree, etc. To operate:

1. *Check the scale*—Make sure that the scale is plumb and that the pointer moves freely. Check calibration with the 100-gram test weight.
2. *Remove the stick from rack*—Remove the stick from wire rack and remove dust or free moisture, as described in the Forester (Appalachian) scale instructions.
3. *Weigh the stick*—Carefully hang the stick on the scale hook. Gently tap the pointer and read the moisture percentage that it shows on the scale. Record to the nearest whole number (see fig. 26.5).
4. *Replace the stick*—Replace as described in the Forester (Appalachian) scale instructions.

WILLIAMS POCKET SCALE

1. Remove locking screw and scale cover.
2. Insert the locking screw as a handle for the scale.
3. *Check the scale*—Calibrate the scale by hanging i' cover (100 grams) on hook; any deviation from 100 gra must be included as an adjustment in the final moisture calculation (step 6).
4. *Remove the stick from rack*—(See Forester scale instructions.)
5. *Weigh the stick*—After removing scale cover (used in step 3), hang stick on the scale hook. Turn the circular weight until beam balances; at this point be sure that the scale body is horizontal and the handle vertical.
6. *Calculate the moisture value*—Read the graduations on both the rotating weight and the scale body. Add the two readings, adjusting for any deviation found in step 3. Recheck to make certain that the numbers are read in the proper direction on the rotating scale. From the result, subtract 100 grams (the standard fuel stick weight) to obtain the recorded moisture percentage (see fig. 26.7).
7. *Replace the stick*—(See Forester scale instructions.)

APPENDIX 2. PSYCHROMETRIC TABLES

TA No. 454-0-1E
10-63

U. S. DEPARTMENT OF COMMERCE
WEATHER BUREAU

RELATIVE HUMIDITY
and
DEW POINT TABLE

Pressure 30 Inches of Mercury

For use at elevations between 0 and 500 feet above sea level
(In Alaska use at elevations between 0 and 300 feet above sea level)

Values in the body of the table are relative humidities (in percent) and dew points (in deg. Fahr.), with respect to water, for indicated values of wet and dry bulb temperatures in degrees Fahrenheit.

HOW TO USE THE TABLE

Locate at the top of the column the reading corresponding to the wet bulb temperature. Locate at the left side of the table the reading corresponding to the dry bulb temperature. Follow down the column under the wet bulb temperature, and across from the dry bulb temperature; at the intersection of these two columns will be found the relative humidity (%) in black and the dew point (°F.) in red.

USCOMM-WB-DC

WET BULB TEMPERATURES

DRY BULB TEMPERATURES

	21	22	23	24	25	26	27	28	29	30					
30	-31 6	-12 15	-1 25	48 35	11 45	19 56	20 66	24 77	27 88	30 99	31	32	33	34	35
31		-21 8	-8 18	1 27	8 37	13 47	18 57	22 68	25 78	28 89	31 99				
32		-45 2	-10 11	-4 20	4 30	10 39	15 49	19 59	23 69	26 79	29 89	32 100			
33			-31 5	-12 14	-1 23	6 32	12 41	17 51	21 60	24 70	28 80	30 90	33 100		
34				-22 8	-7 16	2 25	9 34	14 43	18 52	22 62	26 71	29 81	32 90	36 100	
35				-47 2	-16 10	-4 19	5 27	11 36	16 45	20 54	24 63	27 72	30 81	33 91	35 100

	36	37	38	39	40	41	42	43	44	45
36	-30 5	-11 13	0 21	7 29	13 38	18 47	22 55	25 64	28 73	31 82	34 91	36 100				
37		-21 7	-6 15	3 23	9 31	15 40	19 48	23 57	26 65	29 74	32 82	35 91	37 100			
38		-42 2	-14 10	-2 18	6 25	12 33	17 42	21 50	25 58	28 66	31 74	33 83	36 91	38 100		
39			-27 5	-9 12	1 20	8 28	14 35	19 43	22 51	26 59	29 67	32 75	34 83	37 92	39 100	
40				-18 7	-4 15	4 22	11 30	16 37	20 45	24 52	27 60	30 68	33 76	35 84	38 92	40 100

	41	42	43	44	45	46	47	48	49	50
41	-36 3	-12 10	-1 17	7 24	13 32	18 39	22 46	25 53	29 61	31 68	34 76	37 84	39 92	41 100					
42		-23 5	-7 12	3 19	10 26	15 33	20 40	23 47	27 54	30 62	33 69	35 77	38 84	40 92	42 100				
43		-49 1	-15 8	-2 14	6 21	12 28	17 35	21 41	25 48	28 55	31 62	34 70	36 77	39 85	41 92	43 100			
44			-29 4	-9 10	2 17	9 23	14 29	19 36	23 43	26 49	29 56	32 63	35 70	37 78	40 85	42 92	44 100		
45				-18 6	-4 12	5 19	11 25	16 31	21 37	24 44	28 51	31 57	34 64	36 71	39 78	41 85	43 93	45 100	

	46	47	48	49	50	51	52	53	54	55
46	-35 2	-11 8	0 14	7 20	13 26	18 32	22 39	26 45	29 52	32 58	35 65	37 72	40 79	42 86	44 93	46 100					
47		-22 5	-6 10	3 16	10 22	16 28	20 34	24 40	27 46	31 53	33 59	36 66	39 72	41 79	43 86	45 93	47 100				
48		-45 1	-14 7	-2 12	6 18	13 24	18 29	22 35	26 41	29 47	32 54	35 60	37 66	40 73	42 79	44 86	46 93	48 100			
49			-27 3	-8 9	2 14	9 20	15 25	20 31	24 37	27 42	30 48	33 54	36 61	39 67	41 73	43 80	45 86	47 93	49 100		
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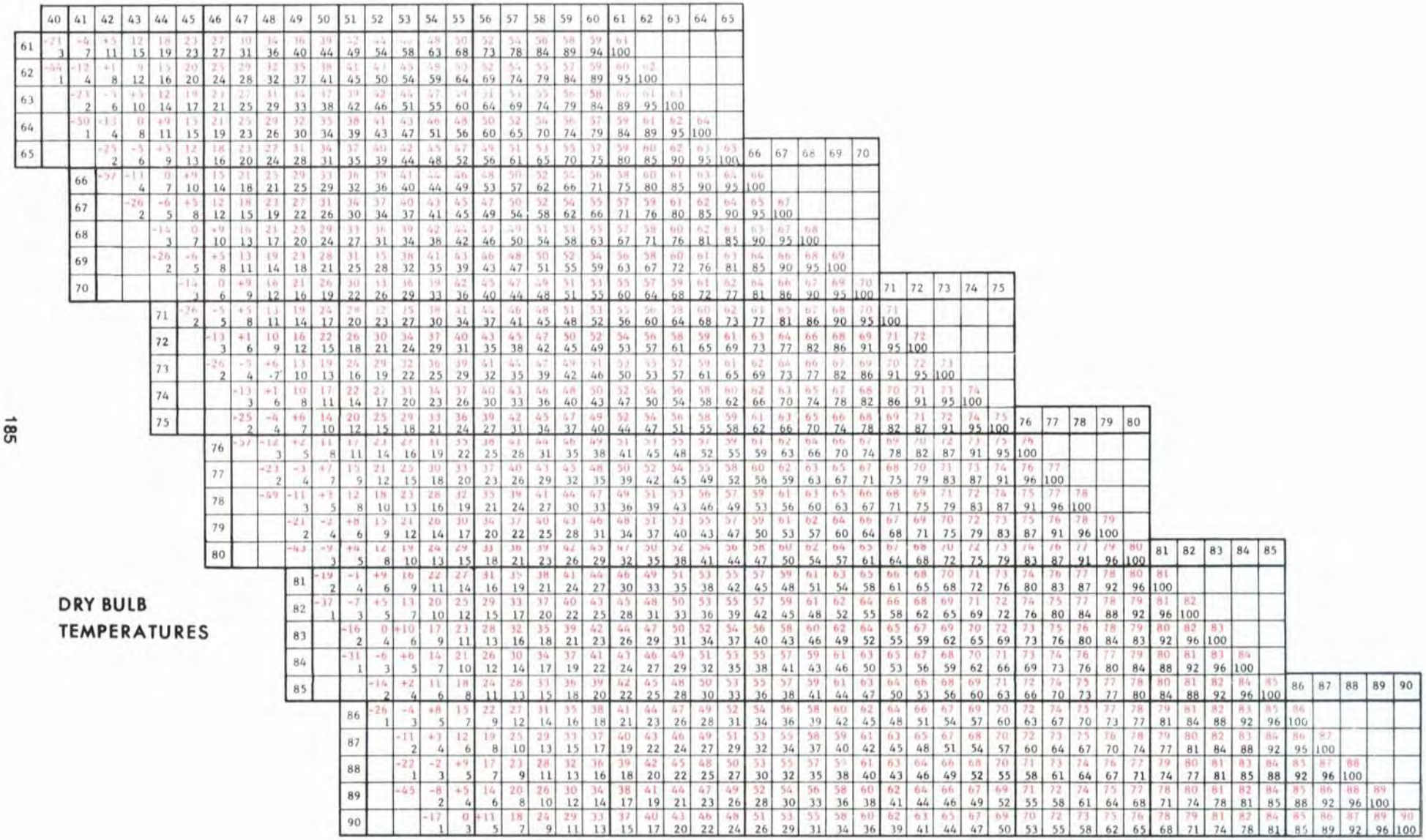
	51	52	53	54	55	56	57	58	59	60
51	-33 2	-11 7	1 12	8 17	14 23	19 28	23 34	27 39	30 45	33 50	36 56	39 62	41 68	43 74	45 81	47 87	49 93	51 100					
52		-21 4	-5 9	4 14	11 19	17 24	21 29	25 35	29 40	32 46	35 51	37 57	40 63	42 69	44 75	46 81	48 87	50 94	52 100				
53		-42 1	-13 6	-1 11	8 16	14 21	19 26	23 31	27 36	30 41	33 47	36 52	39 58	41 64	43 69	45 75	47 81	49 87	51 94	53 100			
54			-25 3	-7 8	3 12	11 17	16 22	21 27	25 32	28 37	32 42	35 48	37 53	40 59	42 64	44 70	47 76	49 82	50 88	52 94	54 100		
55			-57	-15 5	-2 9	7 14	13 19	18 24	23 28	27 33	30 38	33 43	36 49	39 54	41 59	43 65	46 70	48 76	50 82	51 88	53 94	55 100	

	56	57	58	59	60
56	-29 2	-8 7	3 11	10 16	16 20	21 25	25 30	28 35	32 39	35 44	37 50	40 55	42 60	45 65	47 71	49 77	51 82	53 88	54 94	56 100				
57		-17 4	-3 8	6 13	13 17	18 22	23 26	27 31	30 36	33 41	36 45	39 50	41 56	44 61	46 66	48 71	50 77	52 83	54 88	55 94	57 100		
58		-33 2	-10 6	2 10	10 14	16 19	21 23	25 28	28 32	32 37	35 42	38 46	40 51	43 56	45 61	47 67	49 72	51 77	53 83	55 88	56 94	58 100	
59			-19 3	-4 7	8 12	13 16	18 20	23 24	27 29	30 33	33 38	36 43	39 47	41 52	44 57	46 62	48 67	50 72	52 78	54 83	56 89	57 94	59 100	
60			-		1	9	13	17	20 21	25 26	29 30	32 34	35 39	38 44	40 48	43 53	45 58	47 63	49 68	51 73	53 78	55 83		60 100

WET BULB TEMPERATURES



DRY BULB TEMPERATURES

WET BULB TEMPERATURES

DRY BULB TEMPERATURES	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	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
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92		-13 2	+3 3	12 5	19 7	25 9	30 11	34 13	37 15	41 17	44 19	47 21	49 23	52 26	54 28	56 30	58 33	60 35	62 37	64 40	66 43	68 45	69 48	71 51	73 53	74 56	76 59	77 62	79 65	80 68	82 72	83 75	84 78	86 82	87 85	88 89	89 92	91 96	92 100				
93		-26 1	-3 3	+9 4	17 6	23 8	28 10	32 12	36 14	40 16	43 18	46 20	48 22	51 24	53 26	56 28	58 31	60 33	62 36	64 38	65 41	67 43	69 46	71 48	72 51	74 54	75 57	77 60	78 63	80 66	81 69	83 72	84 75	85 78	87 82	88 85	89 89	91 93	92 96	93 100			
94			-10 2	+5 3	14 5	21 7	26 9	31 11	35 13	38 14	42 16	45 18	48 21	50 23	53 25	55 27	57 29	59 31	61 34	63 36	65 39	67 41	68 44	70 46	72 49	73 52	75 54	76 57	78 60	79 63	81 66	82 69	84 72	85 75	86 79	88 82	89 85	90 89	92 93	93 96	94 100		
95			-20 1	0 3	+11 4	18 6	24 8	29 10	33 11	37 13	41 15	44 17	47 19	49 21	52 23	54 25	56 28	59 30	61 32	63 34	64 37	66 39	68 42	70 44	71 47	73 49	75 52	76 55	78 57	79 60	81 63	82 66	83 69	85 72	86 76	87 79	89 82	90 86	91 89	93 93	94 96	95 100	
96			-39	-6 2	+7 4	15 5	22 7	27 9	32 10	36 12	39 14	43 16	46 18	48 20	51 22	53 24	56 26	58 28	60 30	62 33	64 35	66 37	68 40	69 42	71 45	73 47	74 50	76 52	77 55	79 58	80 61	82 64	83 67	84 70	86 73	87 76	88 79	90 82	91 86	92 89	94 93	95 96	
97				-14 1	+2 3	12 4	20 6	25 8	30 10	35 11	38 13	42 15	45 17	48 19	50 21	53 23	55 25	57 27	59 29	61 31	63 33	65 36	67 38	69 40	71 43	72 45	74 48	75 50	77 53	78 55	80 58	81 61	83 64	84 67	85 70	87 73	88 76	89 79	91 83	92 86	93 89	95 93	
98				-28 1	-3 2	+9 4	17 5	23 7	29 9	33 10	37 12	40 14	44 16	47 18	49 19	52 21	54 23	57 25	59 27	61 30	63 32	65 34	67 36	68 38	70 41	72 43	73 46	75 48	77 51	78 53	80 56	81 59	82 61	84 64	85 67	87 70	88 73	89 76	91 79	92 83	93 86	94 89	
99					-10 1	+5 3	14 5	21 6	27 8	32 9	36 11	39 13	43 15	46 16	48 18	51 20	54 22	56 24	58 26	60 28	62 30	64 32	66 34	68 37	70 39	71 41	73 44	75 46	76 48	78 51	79 54	81 56	82 59	84 62	85 65	86 67	88 70	89 73	90 76	92 80	93 83	94 86	
100					-20 1	0 2	+11 4	19 5	25 7	30 9	34 10	48 12	42 14	45 15	48 17	50 19	53 21	55 23	57 25	60 27	62 29	64 31	66 33	67 35	69 37	71 39	73 42	74 44	76 46	77 49	79 51	80 54	82 57	83 59	85 62	86 65	87 68	89 71	90 74	91 77	93 80	94 83	
101					-40	-6 2	+8 3	16 5	23 6	28 8	33 9	37 11	40 13	44 14	47 16	49 18	52 20	54 21	57 23	59 25	61 27	63 29	65 31	67 33	69 36	70 38	72 40	74 42	75 45	77 47	79 49	80 52	81 54	83 57	84 60	86 62	87 65	88 68	90 71	91 74	92 77	94 80
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104							-8 1	+6 3	15 4	22 6	28 7	33 9	37 10	40 12	44 13	47 15	50 16	52 18	55 20	57 22	59 23	61 25	63 27	65 29	67 31	69 33	71 35	73 37	74 39	76 41	77 44	79 46	80 48	82 51	83 53	85 55	86 58	88 61	89 63	90 66	92 69	93 72
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106								-34	-4 2	+9 3	18 4	24 6	29 7	34 8	38 10	42 11	45 13	48 14	51 16	53 18	56 19	58 21	60 23	62 25	64 26	66 28	68 30	70 32	72 34	73 36	75 38	77 40	78 42	80 44	81 47	83 49	84 51	86 54	87 56	88 59	90 61	91 64	92 66
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108									-22 1	0 2	+12 3	20 4	26 6	31 7	35 8	39 10	43 11	46 13	49 14	52 16	54 17	57 19	59 21	61 22	63 24	65 26	67 27	69 29	71 31	73 33	74 35	76 37	78 39	79 41	81 43	82 45	84 47	85 50	87 52	88 54	89 57	91 59	92 62
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113										-16 1	+3 2	14 3	22 4	28 5	33 7	37 8	41 9	44 10	48 12	50 13	53 14	56 16	58 17	60 19	63 20	65 22	67 23	69 25	70 27	72 28	74 30	76 32	77 33	79 35	81 37	82 39	84 41	85 43	87 45	88 47	89 49	91 51
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115											-9 1	+7 2	17 3	24 4	29 5	34 7	39 8	42 9	46 10	49 12	52 13	54 14	57 16	59 17	61 18	64 20	66 21	68 23	70 24	71 26	73 28	75 29	77 31	78 33	80 34	81 36	83 38	85 40	86 42	87 44	89 46	90 48
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117											-35	-3 1	+11 2	19 3	26 4	31 6	36 7	40 8	44 9	47 10	50 11	53 13	55 14	58 15	60 17	61 18	63 19	67 21	69 22	71 24	72 25	74 27	76 28	78 30	79 32	81 33	82 35	84 37	85 39	87 41	88 43	90 44
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119												-19 1	+2 1	14 2	22 4	28 5	33 6	38 7	42 8	45 9	48 10	51 11	54 13	57 14	59 15	61 16	64 18	66 19	68 20	70 22	72 23	73 25	75 26	77 28	79 29	80 31	82 33	83 34	85 36	86 38	88 40	89 41

TA No. 454-0-1D
10-63

U. S. DEPARTMENT OF COMMERCE
WEATHER BUREAU

RELATIVE HUMIDITY and DEW POINT TABLE

Pressure 29 Inches of Mercury

For use at elevations between 501 and 1900 feet above sea level
(In Alaska use at elevations between 301 and 1700 feet above sea level)

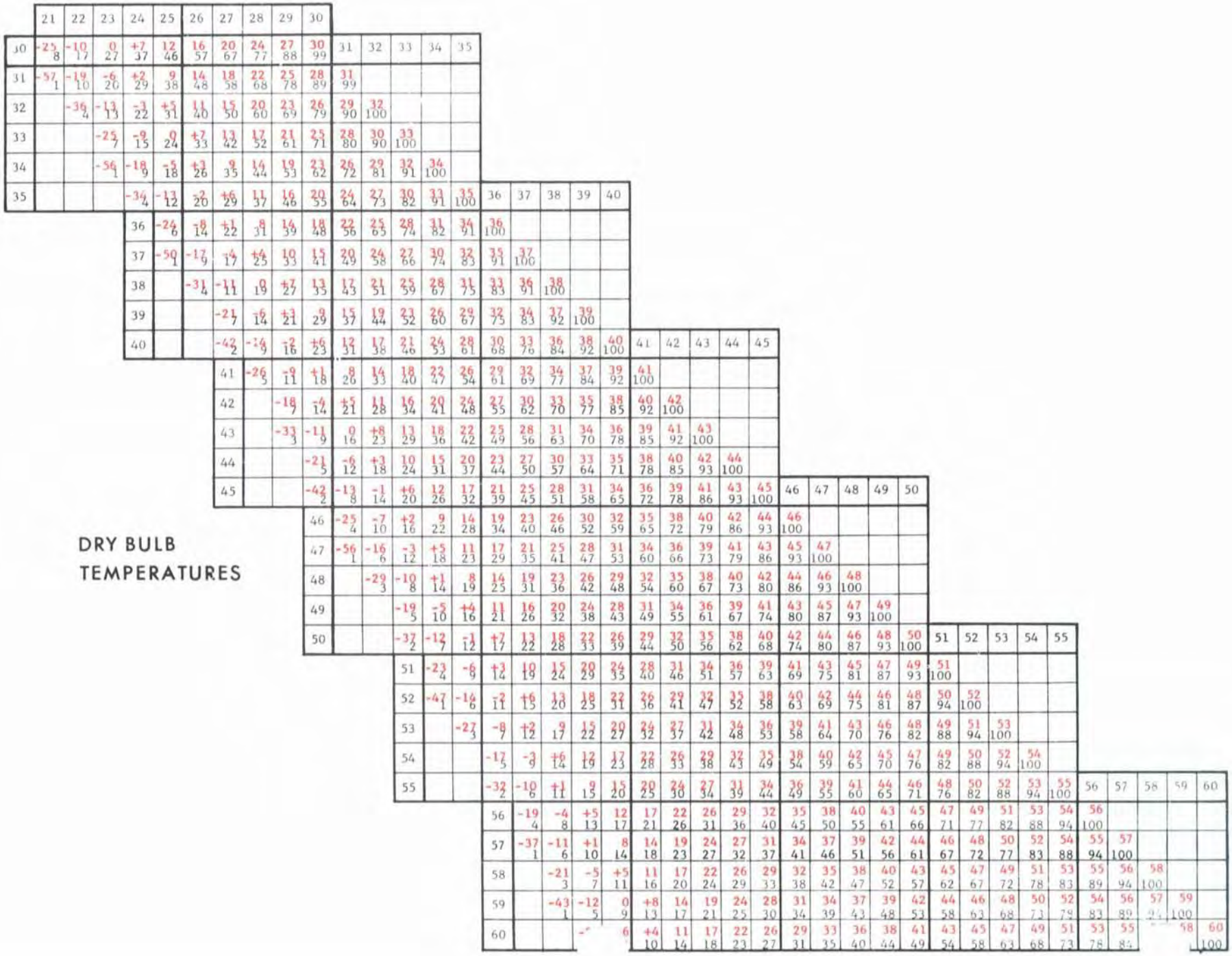
Values in the body of the table are relative humidities (in percent) and dew points (in deg. Fahr.), with respect to water, for indicated values of wet and dry bulb temperatures in degrees Fahrenheit.

HOW TO USE THE TABLE

Locate at the top of the column the reading corresponding to the wet bulb temperature. Locate at the left side of the table the reading corresponding to the dry bulb temperature. Follow down the column under the wet bulb temperature, and across from the dry bulb temperature; at the intersection of these two columns will be found the relative humidity (%) in black and the dew point (°F.) in red.

USCOMM-WB-DC

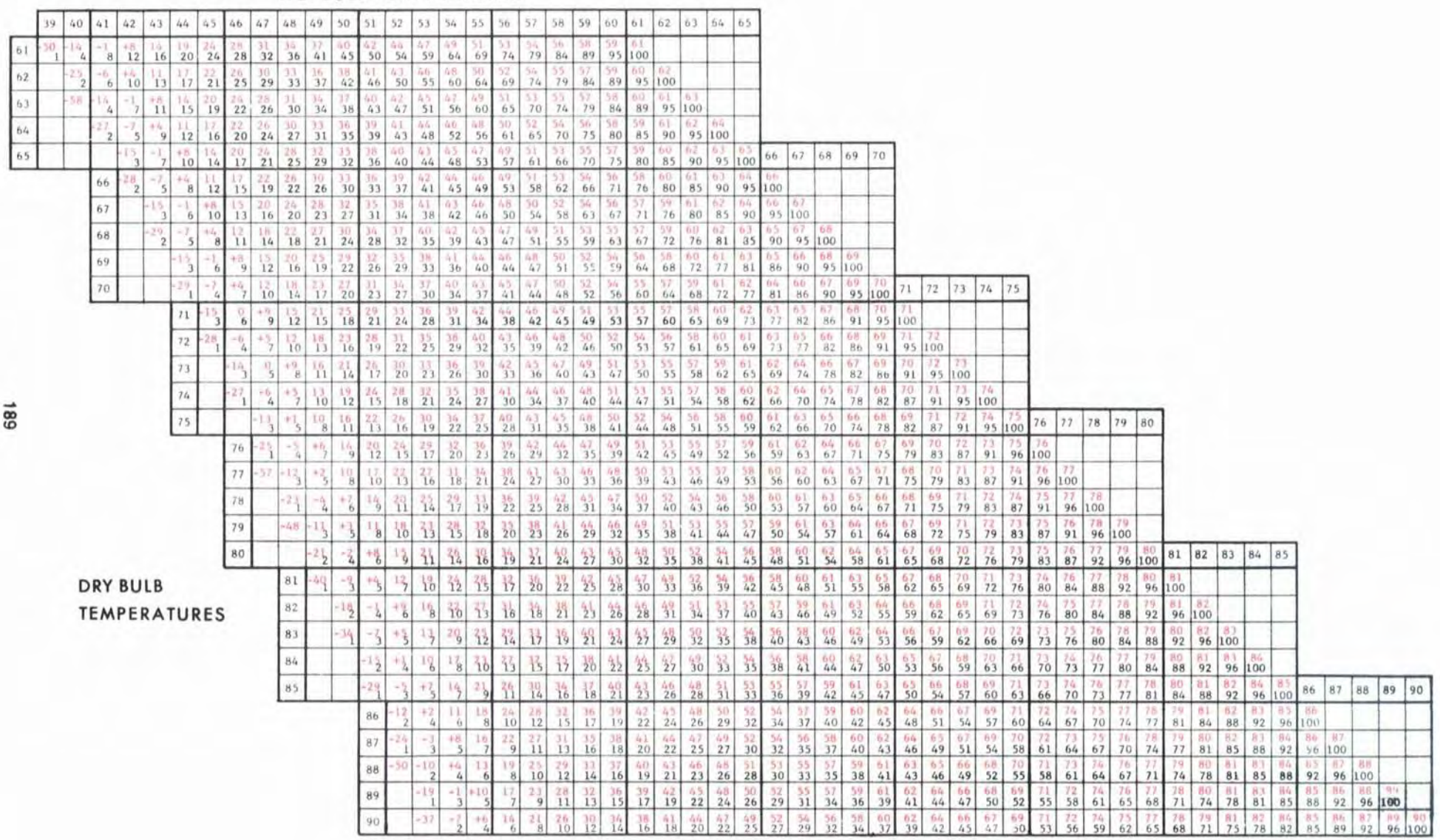
WET BULB TEMPERATURES



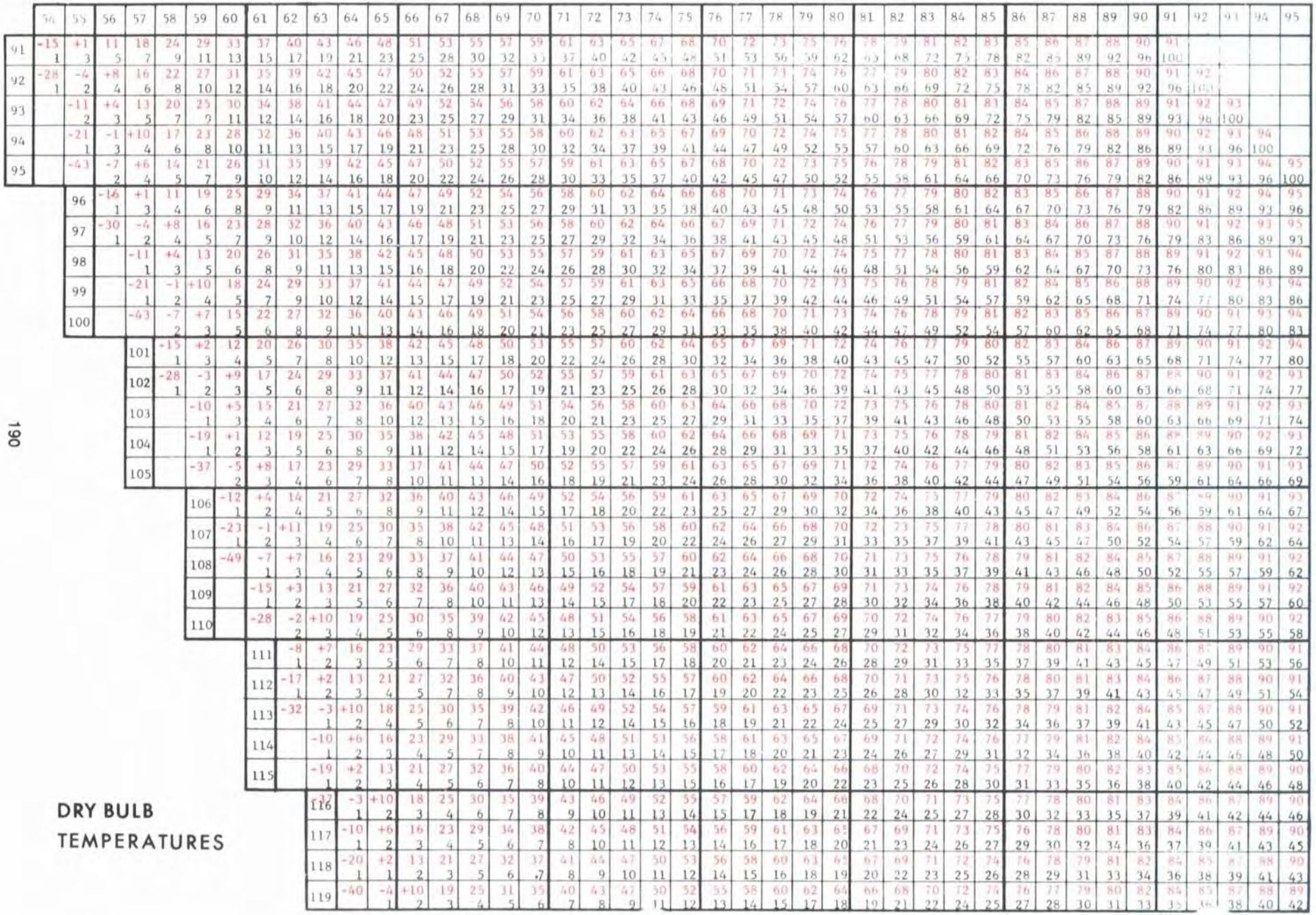
DRY BULB TEMPERATURES

WET BULB TEMPERATURES

DRY BULB TEMPERATURES



WET BULB TEMPERATURES



DRY BULB TEMPERATURES

TA No. 454-0-1C

U. S. DEPARTMENT OF COMMERCE

WEATHER BUREAU

RELATIVE HUMIDITY and DEW POINT TABLE

Pressure 27 Inches of Mercury

For use at elevations between 1,900 and 3,900 feet above sea level
(In Alaska use at elevations between 1,700 and 3,600 feet above sea level)

Values in the body of the table are relative humidities (in percent) and dew points (in deg. Fahr.), with respect to water, for indicated values of wet and dry bulb temperatures in degrees Fahrenheit.

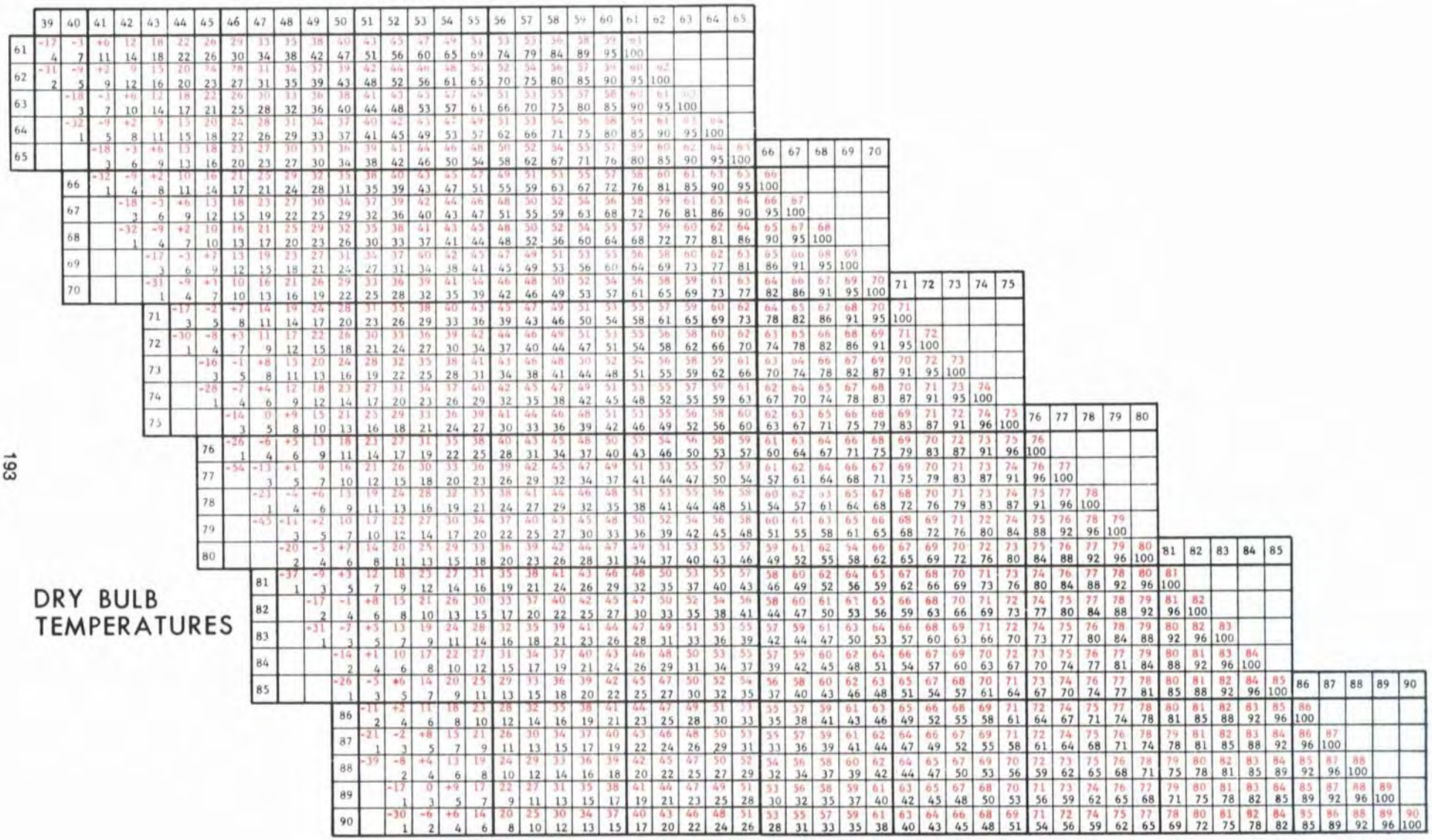
HOW TO USE THE TABLE

Locate at the top of the column the reading corresponding to the wet bulb temperature. Locate at the left side of the table the reading corresponding to the dry bulb temperature. Follow down the column under the wet bulb temperature, and across from the dry bulb temperature; at the intersection of these two columns will be found the relative humidity (%) in black and the dew point (°F.) in red.

WET BULB TEMPERATURES

DRY BULB TEMPERATURES	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
30	-45 3	-17 12	-6 21	+2 30	8 39	13 49	17 58	21 68	24 78	27 89	30 99																														
31		-31 5	-13 14	-3 23	+5 32	10 41	15 50	19 60	22 69	23 79	28 89	31 99																													
32			-23 8	-8 17	0 25	+7 34	12 43	16 52	20 61	24 71	27 80	29 90	32 100																												
33			-43 2	-16 11	-5 19	+3 27	9 36	14 45	18 54	22 63	25 72	28 81	31 91	33 100																											
34				-29 5	-12 13	-2 21	+5 29	11 38	16 46	20 55	23 64	26 73	29 82	32 91	34 100																										
35					-21 8	-7 16	+1 23	8 31	13 40	17 48	21 57	25 65	28 74	30 83	33 91	35 100																										
36				-39 3	-15 10	-4 18	+4 26	10 33	15 42	19 50	23 58	26 66	29 75	31 83	34 91	36 100																									
37					-27 5	-10 13	0 20	+7 28	12 35	17 43	21 51	24 59	27 67	30 75	32 83	35 92	37 100																								
38					-57 1	-18 8	-6 15	+3 22	9 30	14 37	19 45	22 53	26 60	28 68	31 76	34 84	36 92	38 100																							
39						-33 3	-12 10	-2 17	+6 24	11 32	16 39	20 47	24 54	27 61	30 69	32 76	35 84	37 92	39 100																						
40							-23 6	-7 13	+2 19	8 26	14 34	18 41	22 48	25 55	28 62	31 69	33 77	36 84	38 92	40 100																					
41							-43 2	-15 8	-3 15	+5 22	11 28	16 35	20 42	23 49	26 56	29 63	32 70	34 77	37 85	39 92	41 100																			
42								-27 4	-9 11	0 17	+8 24	13 30	18 37	21 43	25 50	28 57	31 64	33 71	36 78	38 85	40 92	42 100																	
43									-18 7	-5 13	+4 19	10 26	15 32	19 38	23 45	26 51	29 58	32 64	34 71	37 78	39 85	41 93	43 100															
44									-32 3	-11 9	-1 15	+7 21	12 27	17 33	21 39	24 46	28 52	30 59	33 65	36 72	38 79	40 86	42 93	44 100													
45										-21 5	-6 11	+3 17	9 23	14 29	19 35	23 41	26 47	29 53	32 59	34 66	37 72	39 79	41 86	43 93	45 100												
46											-38 2	-13 8	-2 13	+6 19	12 25	16 30	21 36	24 42	27 48	30 54	33 60	36 67	38 73	40 80	42 86	44 93	46 100										
47												-24 4	-7 10	+2 15	9 21	14 26	18 32	22 37	26 43	29 49	32 55	34 61	37 67	39 74	41 80	43 87	45 93	47 100								
48												-46 1	-15 6	-3 12	+5 17	11 22	16 28	20 33	24 39	27 44	30 50	33 56	36 62	38 68	40 74	42 80	44 87	46 93	48 100						
49													-26 3	-9 8	+1 13	8 18	13 24	18 29	22 34	26 40	29 45	32 51	34 57	37 63	39 68	41 75	43 81	45 87	47 93	49 100					
50													-57 1	-17 5	-4 10	+4 15	11 20	16 25	20 30	24 36	27 41	30 46	33 52	36 57	38 63	40 69	42 75	44 81	46 87	48 94	50 100					
51														-31 2	-11 7	0 12	+7 17	13 22	18 27	22 32	26 37	29 42	32 47	34 53	37 58	39 64	41 70	44 75	46 81	47 88	49 94	51 100				
52															-20 4	-5 9	+4 14	10 18	15 23	20 28	24 33	27 38	30 43	33 48	36 54	38 59	40 65	43 70	45 76	47 82	48 88	50 94	52 100			
53															-36 2	-12 6	-1 11	+7 15	13 20	18 24	22 29	25 34	29 39	32 44	34 49	37 54	39 60	42 65	44 71	46 76	48 82	50 88	51 94	53 100		
54																-22 4	-6 8	+3 12	10 17	15 21	20 26	24 30	27 35	30 40	33 45	36 50	38 55	41 60	43 66	45 71	47 77	49 82	51 88	52 94	54 100	
55																-42 1	-14 5	-2 9	+6 14	12 18	17 23	22 27	25 32	29 36	32 41	35 46	37 51	40 56	42 61	44 66	46 72	48 77	50 83	52 88	53 94	55 100	
56																	-25 3	-7 7	+2 11	9 15	15 20	20 24	24 28	27 33	30 37	33 42	36 47	39 52	41 57	43 62	45 67	47 72	49 78	51 83	53 89	54 94	56 100	
57																	-50 1	-15 5	-2 9	+6 13	12 17	17 21	22 25	26 30	29 34	32 39	35 43	37 48	40 53	42 57	44 62	46 67	48 73	50 78	52 83	54 89	55 94	57 100	
58																		-27 2	-8 6	+2 10	9 14	15 18	20 22	24 26	27 31	31 35	34 40	36 44	39 49	41 53	43 58	46 63	48 68	49 73	51 78	53 84	55 89	56 94	58 100	
59																			-16 4	-3 8	+6 12	12 16	17 20	22 24	26 28	29 32	32 36	35 41	38 45	40 50	42 54	45 59	47 64	49 69	51 73	52 79	54 84	56 89	57 94	59 100	
60																			-29		+2 9	9 13	15 17	20 21	24 25	28 29	31 33	34 37	37 41	39 46	41 50	44 55	46 59	48 64	50 69	52 74	53 79	55 84		58 95	60 100

WET BULB TEMPERATURES



DRY BULB TEMPERATURES

WET BULB TEMPERATURES

DRY BULB TEMPERATURES	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	81	82	83	84	85	86	87	88	89	90
91	-13 2	+2 3	11 5	18 7	23 9	28 11	32 12	36 14	39 16	42 18	45 20	47 22	50 25	52 27	54 29	56 31	58 34	60 36	62 38	64 41	66 43	67 46	69 49	71 51	72 54	74 57	75 60	77 63	78 66	79 69	81 72	82 75	83 79	85 82	86 85	87 89	89 93	90 96
92	-21 1	-3 3	+8 4	16 6	22 8	27 10	31 11	33 13	38 15	41 17	44 19	47 21	49 23	51 25	54 27	56 30	58 32	60 34	62 36	63 39	65 41	67 44	69 46	70 49	72 52	73 54	75 57	76 60	78 63	79 66	80 69	82 72	83 75	84 79	86 82	87 86	88 89	90 93
93	-45	-9 2	+4 3	13 5	19 7	25 9	29 10	33 12	37 14	40 16	43 18	46 20	48 22	51 24	53 26	55 28	57 30	59 32	61 35	63 37	65 39	66 42	68 44	70 47	71 50	73 52	74 55	76 58	77 60	79 63	80 66	81 69	83 73	84 76	85 79	87 82	88 86	89 89
94		-17 1	0 3	+10 4	17 6	23 8	28 9	32 11	36 13	39 15	42 17	45 19	47 20	50 22	52 24	54 27	57 29	59 31	61 33	62 35	64 38	66 40	68 42	69 45	71 47	72 50	74 53	76 55	77 58	78 61	80 64	81 67	83 70	84 73	85 76	87 79	88 82	89 86
95		-31 1	-5 2	+6 4	15 5	21 7	26 9	30 10	34 12	38 14	41 16	44 17	47 19	49 21	52 23	54 25	56 27	58 29	60 31	62 34	64 36	66 38	67 40	69 43	71 45	72 48	74 50	75 53	77 56	78 58	80 61	81 64	82 67	84 70	85 73	86 76	88 79	89 83
96	-12 1	+1 3	12 4	19 6	24 8	29 9	33 11	37 13	40 14	43 16	46 18	48 20	51 22	53 24	55 26	57 28	59 30	61 32	63 34	65 36	67 39	68 41	70 43	72 46	73 48	75 51	76 53	78 56	79 59	81 61	82 64	83 67	85 70	86 73	87 76	89 79
97	-23 1	-2 2	+9 4	16 5	22 7	27 8	32 10	36 12	39 13	42 15	45 17	48 19	50 21	52 23	55 24	57 26	59 28	61 30	63 33	65 35	66 37	68 39	70 41	71 44	73 46	74 49	76 51	77 54	79 56	80 59	82 62	83 65	84 67	86 70	87 73	88 76
98	-44	-8 2	+5 3	14 5	20 6	26 8	30 9	34 11	38 13	41 14	44 16	47 18	49 19	52 21	54 23	56 25	58 27	60 29	62 31	64 33	66 35	68 37	69 40	71 42	73 44	74 47	76 49	77 52	79 54	80 57	81 59	83 62	84 65	85 68	87 71	88 74
99		-16 1	+1 2	11 4	18 5	24 7	29 8	33 10	37 12	40 13	43 15	46 17	49 18	51 20	53 22	56 24	58 26	60 28	62 30	64 32	65 34	67 36	69 38	71 40	72 42	74 45	75 47	77 50	78 52	80 55	81 57	83 60	84 62	85 65	87 68	88 71
100		-29 1	-4 2	+8 3	16 5	22 6	27 8	32 9	35 11	39 12	42 14	45 16	48 17	50 19	53 21	55 23	57 24	59 26	61 28	63 30	65 32	67 34	68 36	70 38	72 41	73 43	75 45	76 48	78 50	79 52	81 55	82 57	84 60	85 63	86 65	88 68
101	-11 1	+4 3	13 4	20 5	25 7	30 8	34 10	38 11	41 13	44 15	47 16	50 18	52 20	54 21	57 23	59 25	61 27	63 29	65 31	66 33	68 35	70 37	71 39	73 41	75 43	76 46	78 48	79 50	81 53	82 55	83 58	85 60	86 63	87 66		
102	-20 1	-1 2	+10 3	18 5	24 6	29 8	33 9	37 11	40 12	43 14	46 15	49 17	51 19	54 20	56 22	58 24	60 26	62 27	64 29	66 31	68 33	69 35	71 37	73 39	74 42	76 44	77 46	79 48	80 51	82 53	83 56	84 58	86 61	87 63		
103	-37	-6 2	+7 3	15 4	22 6	27 7	32 8	36 10	39 11	42 13	45 14	48 16	51 18	53 19	55 21	58 23	60 24	62 26	64 28	65 30	67 32	69 34	71 36	72 38	74 40	75 42	77 44	78 46	80 49	81 51	83 53	84 56	86 58	87 61		
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106	-48	-8 1	+6 3	15 4	22 5	27 6	32 8	36 9	39 10	43 12	46 13	48 15	51 16	53 18	56 19	58 21	60 23	62 24	64 26	66 28	68 30	69 31	71 33	73 35	74 37	76 39	78 41	79 43	80 45	82 48	83 50	85 52	86 54			
107		-16 1	+2 2	12 3	19 4	25 6	30 7	34 8	38 10	42 11	45 12	48 14	50 15	53 17	55 18	57 20	59 22	62 23	64 25	65 27	67 28	69 30	71 32	72 34	74 36	76 38	77 40	79 42	80 44	82 46	83 48	84 50	86 52			
108		-28	-3 2	+9 3	17 4	23 5	29 6	33 8	37 9	41 10	44 12	47 13	49 14	52 16	54 17	57 19	59 20	61 22	63 24	65 25	67 27	69 29	70 31	72 32	74 34	75 36	77 38	78 40	80 42	81 44	83 46	84 48	86 51			
109			-9 1	+5 2	15 3	21 5	27 6	32 7	36 8	40 10	43 11	46 12	49 14	51 15	54 17	56 18	58 19	60 21	63 23	64 24	66 26	68 28	70 29	72 31	73 33	75 35	77 36	78 38	80 40	81 42	83 44	84 47	85 49				
110			-18 1	+1 2	12 3	19 4	25 5	30 6	35 8	38 9	42 10	45 12	48 13	51 14	53 16	56 17	58 19	60 20	62 22	64 23	66 25	68 26	70 28	71 30	73 31	75 33	76 35	78 37	79 39	81 41	82 43	84 45	85 47				
111	-32	-4 1	+9 2	17 4	24 5	29 6	33 7	37 8	41 10	44 11	47 12	50 13	52 15	55 16	57 18	59 19	61 21	64 22	65 24	67 25	69 27	71 28	73 30	74 32	76 34	77 35	79 37	80 39	82 41	83 43	85 45					
112		-10 1	+5 2	15 3	22 4	27 5	32 7	36 8	40 9	43 10	46 11	49 13	52 14	54 15	57 17	59 18	61 20	63 21	65 23	67 24	69 26	70 27	72 29	74 31	76 32	77 34	79 36	80 38	82 40	83 42	85 44					
113		-19 1	+1 2	12 3	19 4	25 5	31 6	35 7	39 8	42 10	45 11	48 12	51 13	54 15	56 16	58 17	60 19	63 20	65 22	66 23	68 25	70 26	72 28	74 29	75 31	77 33	78 35	80 36	81 38	83 40	84 42					
114		-35	-4 1	+9 2	17 3	24 4	29 5	34 7	38 8	41 9	44 10	47 11	50 13	53 14	55 15	58 16	60 18	62 19	64 21	66 22	68 24	70 25	71 27	73 28	75 30	76 32	78 33	80 35	81 37	83 39	84 40					
115			-11 1	+5 2	15 3	22 4	27 5	32 6	36 7	40 8	44 9	47 11	50 12	52 13	55 14	57 16	59 17	61 18	64 20	66 21	67 23	69 24	71 26	73 27	74 29	76 30	78 32	79 34	81 35	82 37	84 39						
116	-20 1	+1 2	12 2	20 4	26 5	31 6	35 7	39 8	43 9	46 10	49 11	51 12	54 14	56 15	59 16	61 18	63 19	65 20	67 22	69 23	71 25	72 26	74 28	76 29	77 31	79 32	81 34	82 36	84 38							
117	-38	-4 1	+9 2	17 3	24 4	29 5	34 6	38 7	42 8	45 9	48 11	51 12	53 13	56 14	58 15	60 17	63 18	65 19	67 21	68 22	70 24	72 25	74 26	75 28	77 30	79 31	80 33	82 34	83 36							
118		-11 1	+5 2	15 3	22 4	28 5	33 6	37 7	41 8	44 9	47 10	50 11	53 12	55 13	58 15	60 16	62 17	64 18	66 20	68 21	70 23	72 24	73 25	75 27	77 28	78 30	80 32	81 33	83 35							
119		-21	+1 1	12 2	20 3	26 4	31 5	36 6	40 7	43 8	46 9	49 11	52 12	55 13	57 14	59 15	62 16	64 18	66 19	68 20	69 22	71 23	73 24	75 26	76 27	78 29	80 30	81 32	83 34							

TA No. 454-0-1B
10-63

U. S. DEPARTMENT OF COMMERCE
WEATHER BUREAU

RELATIVE HUMIDITY and DEW POINT TABLE

Pressure 25 Inches of Mercury

For use at elevations between 3901 and 6100 feet above sea level
(In Alaska use at elevations between 3601 and 5700 feet above sea level)

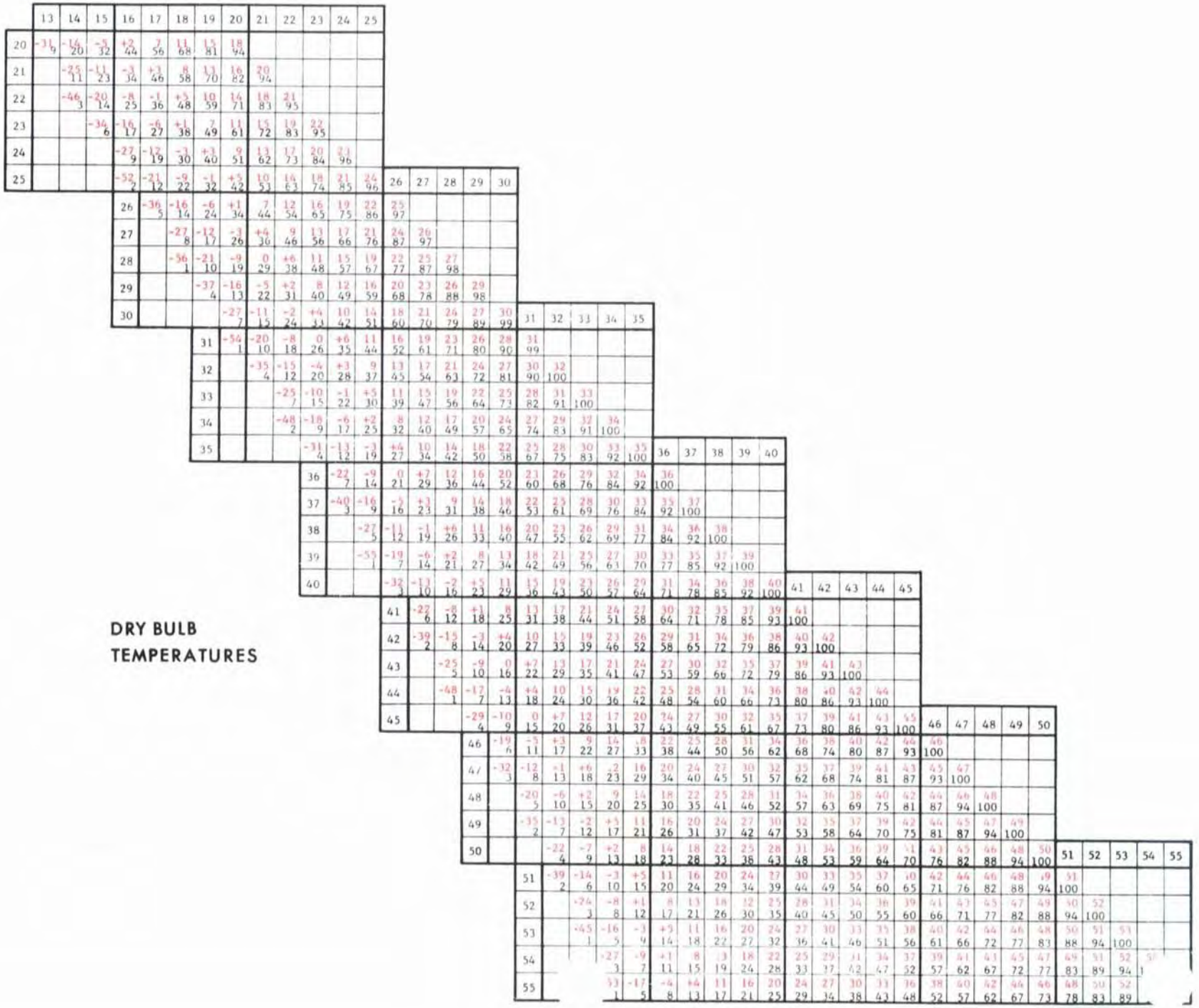
Values in the body of the table are relative humidities (in percent) and dew points (in deg. Fahr.), with respect to water, for indicated values of wet and dry bulb temperatures in degrees Fahrenheit.

HOW TO USE THE TABLE

Locate at the top of the column the reading corresponding to the wet bulb temperature. Locate at the left side of the table the reading corresponding to the dry bulb temperature. Follow down the column under the wet bulb temperature, and across from the dry bulb temperature; at the intersection of these two columns will be found the relative humidity (%) in black and the dew point (°F.) in red.

USCOMM-WB-DC

WET BULB TEMPERATURES



WET BULB TEMPERATURES

DRY BULB TEMPERATURES

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56	-29 2	-10 6	0 10	+8 14	13 18	18 22	22 26	26 31	29 35	32 39	34 44	37 49	39 53	41 58	44 63	46 68	47 73	49 78	51 83	53 89	54 94	56 100				
57		-18 4	-4 8	+4 12	11 15	16 19	20 23	24 28	27 32	30 36	33 40	36 45	38 49	41 54	43 59	45 64	47 68	49 73	50 79	52 84	54 89	55 94	57 100			
58		-31 2	-10 6	0 9	+7 13	13 17	18 21	22 25	26 29	29 33	32 37	35 41	37 46	40 50	42 55	44 59	46 64	48 69	50 74	51 79	53 84	55 89	56 95	58 100		
59			-19 4	-5 7	+4 11	11 14	16 18	20 22	24 26	28 30	31 34	34 38	36 42	39 47	41 51	43 55	45 60	47 65	49 69	51 74	53 79	54 84	56 89	57 95	59 100	
60			-32 2	-11 5	0 9	+8 12	13 16	18 19	22 23	26 27	29 31	32 35	35 39	38 43	40 47	42 52	44 56	46 61	48 65	50 70	52 75	54 79	55 84	57 90	58 95	60 100
61				+19 3	-5 7	+4 10	11 14	16 17	21 21	24 24	28 28	31 32	34 36	37 40	39 44	41 48	43 52	46 57	48 61	49 66	51 70	53 75	55 80	56 85	58 90	59 95
62				-33 1	-11 5	0 8	+8 11	14 15	19 18	23 22	26 26	30 29	33 33	35 37	38 41	40 45	43 49	45 53	47 57	49 62	51 66	52 71	54 75	56 80	57 85	59 90
63					-19 3	-5 6	+4 9	11 13	16 16	21 20	25 23	28 27	31 30	34 34	37 38	39 42	42 46	44 50	46 54	48 58	50 62	52 67	54 71	55 76	57 80	58 85
64					-34 1	-11 4	0 8	+8 11	14 14	19 17	23 21	27 24	30 28	33 31	36 35	38 39	41 43	43 46	45 50	47 54	49 59	51 63	53 67	55 72	56 76	58 81
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66						-33 1	-10 4	+1 7	8 10	14 13	19 16	23 20	27 23	31 26	34 30	36 33	39 37	41 40	44 44	46 48	48 52	50 56	52 60	53 64	55 68	57 72
67							-19 3	-4 6	+5 8	12 11	17 15	22 18	26 21	29 24	32 27	35 31	38 34	40 38	43 41	45 45	47 49	49 52	51 56	53 60	55 64	56 68
68							-32 1	-10 4	+1 7	9 10	15 13	20 16	24 19	28 22	31 25	34 28	37 32	39 35	42 39	44 42	46 46	48 49	50 53	52 57	54 61	56 65
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70								-31 1	-9 4	+2 7	10 9	15 12	20 15	25 18	28 21	32 24	35 27	37 30	40 33	42 37	45 40	47 44	49 47	51 51	53 54	55 58
71									+17 3	-3 5	+6 8	13 11	18 13	23 16	27 19	30 22	33 25	36 28	39 31	41 34	44 38	46 41	48 44	50 48	52 51	54 55
72									-29 1	-8 4	+3 6	10 9	16 12	21 14	25 17	29 20	32 23	35 26	38 29	41 32	43 35	45 38	47 42	49 45	51 48	53 52
73										-15 3	-2 5	+7 8	14 10	19 13	23 16	27 18	31 21	34 24	37 27	40 30	42 33	44 36	47 39	49 42	51 46	53 49
74										-26 1	-7 4	+4 6	11 9	17 11	22 14	26 17	30 19	33 22	36 25	39 28	41 31	44 34	46 37	48 40	50 43	52 46
75										-52	-14 3	0 5	+8 7	15 10	20 12	24 15	28 18	32 20	35 23	38 26	40 29	43 31	45 34	47 37	49 41	51 44
76											-24 2	-5 4	+5 6	12 9	18 11	22 13	27 16	30 19	33 21	36 24	39 27	42 29	44 32	47 35	49 38
77											-43	-12 3	+1 5	9 7	15 10	21 12	25 14	29 17	32 19	35 22	38 25	41 27	43 30	46 33	48 36
78												-21 2	-4 4	+6 6	13 8	19 11	23 13	27 15	31 18	34 20	37 23	40 26	43 28	45 31	47 34
79												-36 1	-10 3	+2 5	10 7	16 9	21 12	26 14	30 16	33 19	36 21	39 24	42 26	44 29	46 32
80													-18 2	-2 4	+7 6	14 8	20 10	24 13	28 15	32 17	35 20	38 22	41 25	43 27	46 30
81													-31 1	-8 3	+4 5	11 7	17 9	22 11	27 14	30 16	34 18	37 21	40 23	42 25	45 28
82													-57	-15 2	-1 4	+8 6	15 8	21 10	25 12	29 15	33 17	36 19	39 21	41 24	44 26
83														-26 1	-6 3	+5 5	13 7	19 9	23 11	28 13	31 15	35 18	38 20	41 22	43 25
84														-49	-12 2	+1 4	10 6	16 8	22 10	26 12	30 14	34 16	37 18	40 21	42 23
85															-21 1	-3 3	+7 5	14 7	20 9	24 11	29 13	32 15	36 17	39 19	41 22

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57																									
58																									
59																									
60																									
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62	61 95	62 100																							
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70	56 62	58 66	60 70	61 74	63 78	64 82	66 86	67 91	69 95	70 100															
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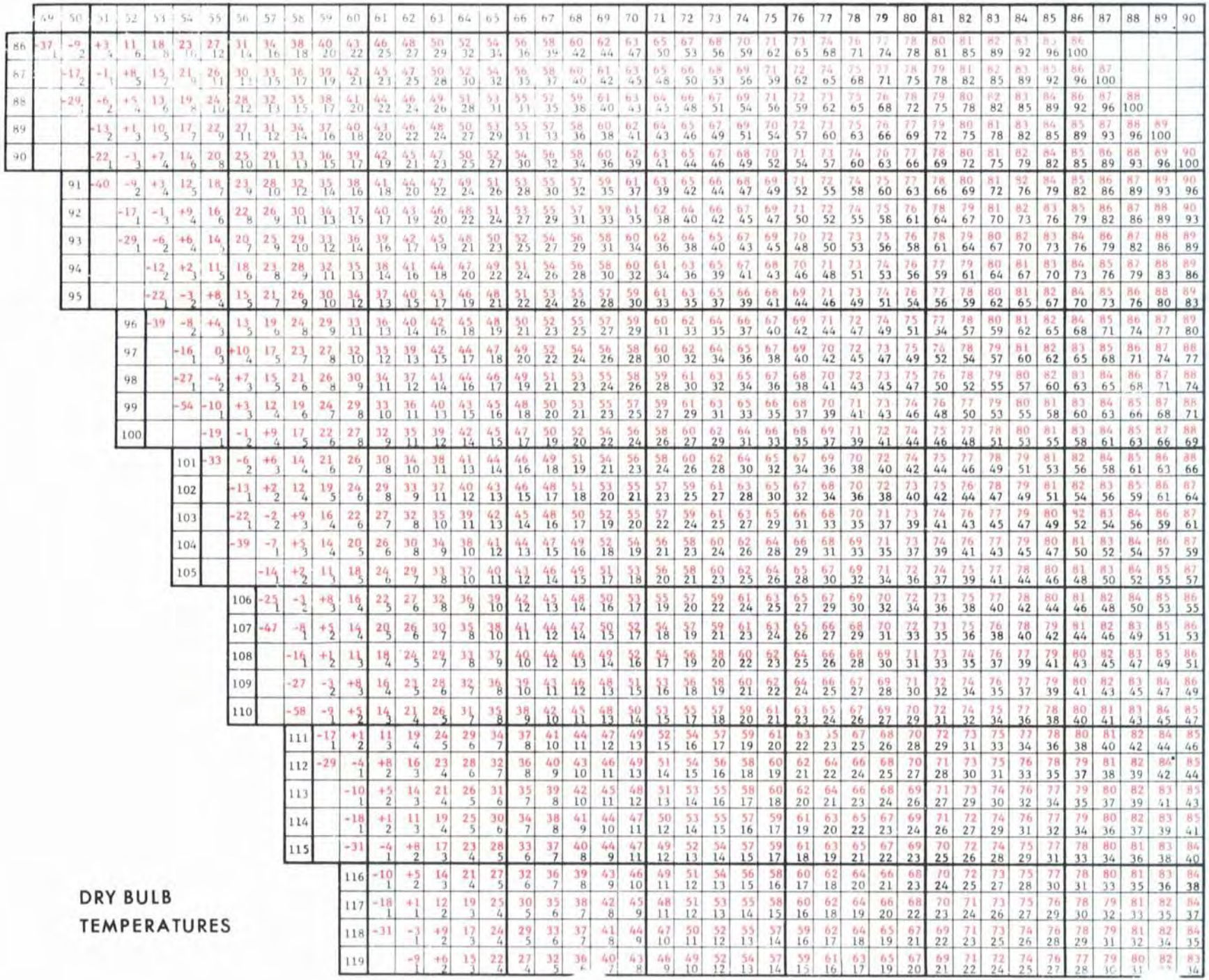
72	55 55	57 59	59 63	60 66	62 70	63 74	65 78	66 83	68 87	69 91	71 95	72 100													
73	55 52	56 56	58 59	60 63	61 67	63 71	64 75	66 79	67 83	69 87	70 91	72 96	73 100												
74	54 50	56 53	58 56	59 60	61 64	62 67	64 71	66 75	67 79	68 83	70 87	71 91	73 96	74 100											
75	53 47	55 50	57 53	59 57	60 60	62 64	64 68	65 71	67 75	68 79	70 83	71 87	72 91	74 96	75 100										
76	53 44	55 47	56 51	58 54	60 57	62 61	63 64	65 68	66 72	68 75	69 79	71 83	72 87	73 91	75 96	76 100									
77	52 42	54 45	56 48	58 51	59 55	61 58	63 61	64 65	66 68	67 72	69 76	70 80	72 83	73 87	74 92	76 96	77 100								
78	51 40	53 42	55 46	57 49	59 52	61 55	62 58	64 62	65 65	67 69	68 72	70 76	71 80	73 84	74 88	75 92	77 96	78 100							
79	51 37	53 40	55 43	57 46	58 49	60 52	62 56	63 59	65 62	66 66	68 69	69 73	71 76	72 80	74 84	75 88	76 92	78 96	79 100						
80	50 35	52 38	54 41	56 44	58 47	60 50	61 53	63 56	65 59	66 63	68 66	69 69	71 73	72 77	73 80	75 84	76 88	78 92	79 96	80 100					
81	49 33	51 36	53 39	55 41	57 44	59 47	61 50	62 53	64 56	66 60	67 63	69 66	70 70	72 73	73 77	74 80	76 84	77 88	78 92	80 96	81 100				
82	49 31	51 34	53 37	55 39	57 42	59 45	60 48	62 51	64 54	65 57	67 60	68 63	70 67	71 70	73 73	74 77	75 80	77 84	78 88	80 92	81 96	82 100			
83	48 29	50 32	52 35	54 37	56 40	58 43	60 45	61 48	63 51	65 54	66 57	68 60	69 64	71 67	72 70	74 74	75 77	76 81	78 84	79 88	80 92	82 96	83 100		
84	47 28	49 30	52 33	54 35	56 38	57 41	59 43	61 46	63 49	64 52	66 55	68 58	69 61	71 64	72 67	73 71	75 74	76 77	78 81	79 85	80 88	81 92	83 96	84 100	
85	46 26	49 28	51 31	53 33	55 36	57 38	59 41	61 44	62 47	64 49	66 52	67 55	69 58	70 61	72 64	73 68	74 71	76 74	77 78	79 81	80 85	81 88	82 92	84 96	85 100

WET BULB TEMPERATURES



DRY BULB TEMPERATURES

TA No. 454-0-1A
10-63

U. S. DEPARTMENT OF COMMERCE
WEATHER BUREAU

RELATIVE HUMIDITY and DEW POINT TABLE

Pressure 23 Inches of Mercury

For use at elevations between 6101 and 8500 feet above sea level
(In Alaska use at elevations between 5701 and 7900 feet above sea level)

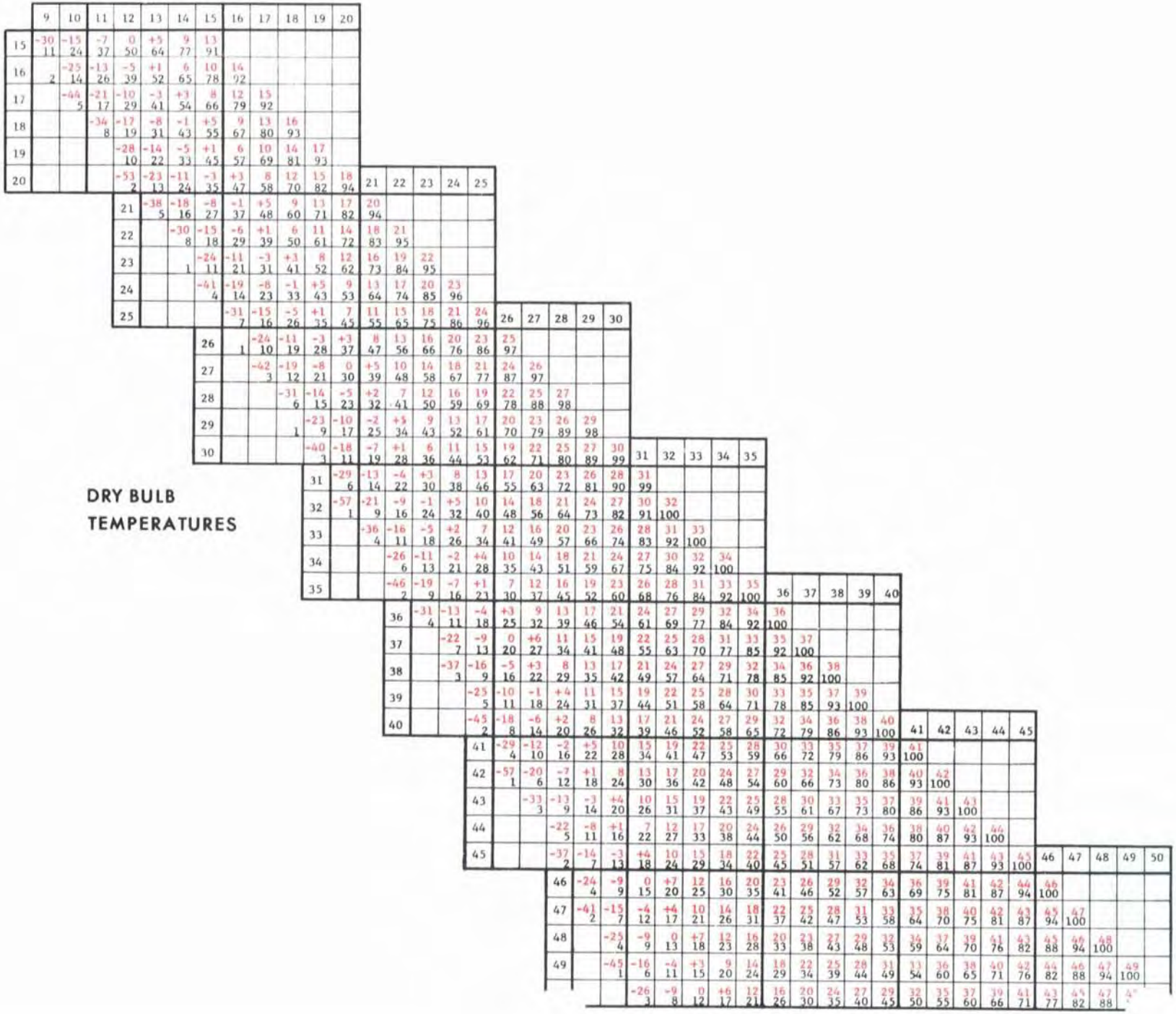
Values in the body of the table are relative humidities (in percent) and dew points (in deg. Fahr.), with respect to water, for indicated values of wet and dry bulb temperatures in degrees Fahrenheit.

HOW TO USE THE TABLE

Locate at the top of the column the reading corresponding to the wet bulb temperature. Locate at the left side of the table the reading corresponding to the dry bulb temperature. Follow down the column under the wet bulb temperature, and across from the dry bulb temperature; at the intersection of these two columns will be found the relative humidity (%) in black and the dew point (°F.) in red.

USCOMM-WB-D(

WET BULB TEMPERATURES



WET BULB TEMPERATURES

DRY BULB TEMPERATURES	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
51	-48 1	-16 5	-5 10	+3 14	9 18	14 23	18 27	22 32	25 36	28 41	31 46	33 51	36 56	38 61	40 66	42 72	44 77	46 83	48 88	49 94	51 100				
52		-27 3	-10 7	-1 11	+6 15	12 20	16 2?	20 28	24 33	27 37	30 42	32 47	35 52	37 57	39 62	41 67	43 72	45 77	47 83	49 88	50 94	52 100			
53		-50 1	-18 5	-5 9	+3 13	9 17	14 21	18 25	22 30	25 34	28 38	31 43	34 48	36 52	38 57	40 62	42 67	44 73	46 78	48 83	50 89	51 94	53 100		
54			-29 2	-11 6	-1 10	+6 14	12 18	16 22	20 26	24 31	27 35	30 39	33 44	35 49	37 53	40 58	42 63	44 68	46 73	47 78	49 83	51 89	52 94	54 100	
55			-57	-19 4	-6 8	+3 12	9 16	14 20	18 24	22 28	26 32	29 36	31 40	34 45	36 49	39 54	41 59	43 64	45 68	47 73	48 79	50 84	52 89	53 94	55 100
56			-30 2	-11 6	-1 9	+6 13	12 17	16 21	21 25	24 29	27 33	30 37	33 41	35 46	38 50	40 55	42 59	44 64	46 69	48 74	50 79	51 84	53 89	54 95	56 100
57				-19 4	-6 7	+3 11	9 15	14 18	19 22	22 26	26 30	29 34	32 38	34 42	37 47	39 51	41 55	43 60	45 65	47 69	49 74	51 79	52 84	54 89	55 95	57 100
58				-32 2	-12 5	-1 9	+6 12	12 16	17 20	21 23	24 27	28 31	31 35	33 39	36 43	38 47	40 52	42 56	44 61	46 65	48 70	50 75	52 79	53 84	55 90	56 95	58 100
59					-20 3	-6 7	+3 10	9 14	15 17	19 21	23 25	26 28	29 32	32 36	35 40	37 44	39 48	42 52	44 57	46 61	48 66	49 70	51 75	53 80	54 85	56 90	58 95	59 100
60					-32 2	-12 5	-1 8	+6 12	12 15	17 18	21 22	25 26	28 29	31 33	34 37	36 41	39 45	41 49	43 53	45 57	47 62	49 66	50 71	52 75	54 80	55 85	57 90	59 95	60 100
61						-20 3	-6 6	+3 10	10 13	15 16	19 20	23 23	27 27	30 30	33 34	35 38	38 42	40 46	42 50	44 54	46 58	48 62	50 67	52 71	53 76	55 80	56 85	58 90	60 95	61 100
62						-32 2	-11 5	-1 8	+7 11	13 14	17 17	21 21	25 24	28 28	31 31	34 35	37 39	39 43	41 46	43 50	45 54	47 59	49 63	51 67	53 72	54 76	56 81	58 85	59 90	61 95	62 100
63							-19 3	-5 6	+4 9	10 12	15 15	20 19	24 22	27 25	30 29	33 32	36 36	38 40	40 43	43 47	45 51	47 55	49 59	50 63	52 68	54 72	55 76	57 81	59 85	60 90	62 95	63 100
64							-32 1	-11 4	0 7	+7 10	13 13	18 17	22 20	26 23	29 26	32 30	35 33	37 37	40 40	42 44	44 48	46 52	48 56	50 60	52 64	53 68	55 72	57 77	58 81	60 86	61 90	63 95	64 100
65								-19 3	-5 6	+4 9	11 12	16 15	20 18	24 21	28 24	31 27	34 31	36 34	39 38	41 41	43 45	45 49	47 52	49 56	51 60	53 64	54 68	56 73	58 77	59 81	61 86	62 90	64 95	65 100
66									-31 1	-10 4	0 7	+8 10	14 13	18 16	22 19	26 22	29 25	32 28	35 32	38 35	40 39	42 42	44 46	46 49	48 53	50 57	52 61	54 65	55 69	57 73	59 77	60 82	62 86	63 91	65 95	66 100
67										-18 3	-4 6	+5 8	11 11	16 14	21 17	25 20	28 23	31 26	34 29	37 33	39 36	41 39	44 43	46 46	48 50	50 54	51 57	53 61	55 65	57 69	58 73	60 78	61 82	63 86	64 91	66 95	67 100
68										-29 1	-9 4	+1 7	8 10	14 12	19 15	23 18	27 21	30 24	33 27	36 30	38 33	41 37	43 40	45 44	47 47	49 51	51 54	53 58	54 62	56 66	58 70	59 74	61 78	62 82	64 86	65 91	67 95	68 100
69										-58	-16 3	-3 5	+5 8	12 11	17 13	21 16	25 19	29 22	32 25	35 28	37 31	40 34	42 38	44 41	46 44	48 48	50 51	52 55	54 58	56 62	57 66	59 70	60 74	62 78	63 82	65 87	66 91	68 95	69 100
70											-27 2	-8 4	+2 7	9 9	15 12	20 15	24 17	27 20	31 23	34 26	36 29	39 32	41 35	43 38	46 42	48 45	50 48	51 52	53 55	55 59	57 63	58 66	60 70	61 74	63 78	64 82	66 87	67 91	69 95	70 100
71											-50	-15 3	-2 5	+6 8	13 10	18 13	22 16	26 18	29 21	32 24	35 27	38 30	40 33	43 36	45 39	47 42	49 46	51 49	53 52	54 56	56 59	58 63	59 67	61 71	63 75	64 79	65 83	67 87	68 91	70 96	71 100
72												-25 2	-7 4	+3 6	10 9	16 11	20 14	24 17	28 19	31 22	34 25	37 28	39 31	42 34	44 37	46 40	48 43	50 46	52 50	54 53	56 56	57 60	59 64	61 67	62 71	64 75	65 79	67 83	68 87	69 91	71 96	72 100
73												-43 1	-13 3	-1 5	+7 8	13 10	18 13	23 15	27 18	30 20	33 23	36 26	39 29	41 32	43 34	46 37	48 41	50 44	52 47	53 50	55 53	56 57	58 60	60 64	62 68	63 71	65 75	66 79	68 83	69 87	70 91	72 96	73 100
74													-22 2	-6 4	+4 6	11 9	16 11	21 14	25 16	29 19	32 21	35 24	38 27	40 29	43 32	45 35	47 38	49 41	51 44	53 47	55 51	56 54	58 57	60 61	61 64	63 68	64 72	66 75	67 79	69 83	70 87	71 91	73 96	74 100
75													-37 1	-12 3	0 5	+8 7	14 10	19 12	24 15	27 17	31 20	34 22	37 25	39 28	42 30	44 33	46 36	48 39	50 42	52 45	54 48	56 51	58 55	59 58	61 61	62 65	64 68	65 72	67 76	68 80	70 83	71 87	72 92	74 96	75 100
76														-19 2	-4 4	+5 6	12 9	17 11	22 13	26 16	30 18	33 21	36 23	38 26	41 28	43 31	45 34	48 37	50 40	52 43	53 46	55 49	57 52	59 55	60 58	62 62	63 65	65 69	66 72	68 76	69 80	71 84	72 88	73 92	75 96	76 100
77														-32 1	-10 3	+2 5	9 7	15 10	20 12	24 14	28 17	32 19	35 21	37 24	40 26	42 29	45 32	47 35	49 37	51 40	53 43	55 46	56 49	58 52	60 55	61 59	63 62	65 66	66 69	68 73	69 76	70 80	72 84	73 88	74 92	76 96	77 100
78															-17 2	-1 4	+6 6	13 8	18 11	23 13	27 15	30 17	33 20	36 22	39 25	42 27	44 30	46 33	48 35	50 38	52 41	54 44	56 47	58 50	59 53	61 56	63 59	64 63	66 66	67 69	69 73	70 76	71 80	73 84	74 88	75 92	77 96	78 100
79															-27 1	-8 3	+3 5	11 7	16 9	21 12	25 14	29 16	32 18	35 21	38 23	41 26	43 28	45 31	48 33	50 36	52 39	54 41	55 44	57 47	59 50	61 53	62 56	64 60	65 63	67 66	68 70	70 73	71 77	72 80	74 84	75 88	76 92	78 96	79 100
80															-52	-14 2	-1 4	+8 6	14 8	19 10	24 12	28 15	31 17	34 19	37 22	40 24	42 26	45 29	47 31	49 34	51 37	53 39	55 42	57 45	58 48	60 51	62 54	63 57	65 60	66 63	68 67	69 70	71 73	72 77	73 81	75 84	76 88	77 92	78 96	79 100	80

WET BULB TEMPERATURES

DRY BULB TEMPERATURES	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	81	82	83	84	85
81	-23	-5	+5	12	17	22	26	30	33	36	39	42	44	46	48	50	52	54	56	58	60	61	63	64	66	68	69	70	72	73	75	76	77	78	80	81				
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	1	2	4	6	8	10	12	14	16	19	21	23	25	28	30	33	35	38	41	43	46	49	52	55	58	61	64	67	71	74	77	81	85	88	92	96	100			
83		-19	-3	+6	13	19	23	27	31	34	37	40	42	45	47	49	51	53	55	57	59	60	62	64	65	67	68	70	71	73	74	75	77	78	79	80	82	83		
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87		-44	-12	+1	9	16	21	26	29	33	36	39	42	44	46	49	51	53	55	57	59	60	62	64	65	67	68	70	71	73	74	75	77	78	79	81	82	83	85	
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88			-20	-3	+7	14	19	24	28	32	35	38	41	43	46	48	50	52	54	56	58	60	62	63	65	66	68	69	71	72	74	75	77	78	79	81	82	83	84		
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89			-33	-8	+3	11	17	22	27	30	34	37	40	43	45	47	50	52	54	56	58	59	61	63	64	66	68	69	71	72	73	75	76	78	79	80	82	83	84		
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90				-15	-1	+8	15	21	25	29	33	36	39	42	44	47	49	51	53	55	57	59	61	62	64	66	67	69	70	72	73	75	76	77	79	80	81	83	84		
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91				-25	-5	+5	13	19	24	28	32	35	38	41	43	46	48	50	53	55	57	58	60	62	64	65	67	68	70	71	73	74	76	77	78	80	81	82	84		
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92			-44	-11	+2	10	17	22	27	30	34	37	40	43	45	48	50	52	54	56	58	60	61	63	65	66	68	70	71	73	74	75	77	78	79	81	82	83		
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93				-18	-2	+8	15	20	25	29	33	36	39	42	44	47	49	51	53	55	57	59	61	63	64	66	68	69	71	72	74	75	76	78	79	81	82	83		
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96					-22	-3	+7	14	20	25	29	33	36	39	42	45	47	50	52	54	56	58	60	61	63	65	67	68	70	71	73	74	76	77	78	80	81	82			
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								1	2	3	4	5	7	8	9	10	12	13	15	16	17	19	20	22	24	25	27	29	30	32	34	36	38	40	42	44	46	48		
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106									-13	+2	11	18	24	28	32	36	39	42	45	48	50	52	55	57	59	61	63	64	66	68	69	71	73	74	76	77	79	80		
									1	2	3	4	6	7	8	9	10	12	13	14	16	17	19	20	22	23	25	26	28	30	31	33	35	37	39	41	43	45		
107									-21	-2	+9	16	22	27	31	35	38	41	44	47	49	52	54	56	58	60	62	64	66	67	69	71	72	74	75	77	78	80		
									1	2	3	4	5	6	7	9	10	11	12	14	15	16	18	19	21	22	24	25	27	28	30	32	34	35	37	39	41	43		
108									-35	-7	+5	14	20	25	30	34	37	41	43	46	49	51	53	56	58	60	62	63	65	67	69	70	72	74	75	77	78	79		
										1	2	3	5	6	7	8	9	10	12	13	14	15	17	18	20	21	23	24	26	27	29	31	32	34	36	38	39	41		
109										-13	+2	11	18	24	29	33	36	40	43	45	48	51	53	55	57	59	61	63	65	67	68	70	72	73	75	76	78	79		
										1	2	4	5	6	7	9	10	11	12	13	15	16	17	19	20	22	23	25	26	28	29	31	33	34	36	38	40	42		

APPENDIX 3. CLOUD CLASSIFICATION AND IDENTIFICATION

A3.1 Cloud Observations

Although detailed cloud observations are not a required part of routine fire-weather reporting, a sound knowledge of cloud types and forms can help fire management personnel in many ways, particularly during times of wildfire or prescribed burning. With this knowledge, a person will have a better chance of foreseeing such events as lightning, rainstorms, sudden gusts of wind, or possible sustained high winds (Hardy and others 1955).

CLOUD CLASSIFICATION

Clouds are classified into four families distinguished by their height above ground: High clouds (cirrus or cirroform clouds), middle clouds (given an "alto" prefix), low clouds, and clouds with vertical development (cumulus or cumuloform clouds). High clouds, usually composed entirely of ice crystals, generally occur at altitudes ranging from 20,000 to 40,000 ft. Middle clouds may have bases between about 8,000 ft and 20,000 ft.

Cumulus clouds, forming near the top of rising warm air columns (convection columns), can have base heights ranging from a few thousand feet to 15,000 ft or higher. In the Western United States, their formation is particularly favored over mountain terrain. The clouds may range from small, puffy but relatively flat, fair-weather cumulus to massive cumulonimbus associated with thunderstorms. These storm clouds ("thunderheads") commonly extend to altitudes of 30,000 ft and may reach 50,000 ft or higher.

CLOUD CHARACTERISTICS AND INDICATIONS

The basic cloud characteristics are summarized in figure A3.1. Illustrations of the various stages of cumulus cloud development appear in figures A3.2 through A3.5. In addition to the potential storm indication by towering cumulus, a middle type of cloud termed altocumulus castellanus (fig. A3.6) should also be noted. Forenoon occurrence of these clouds, with their characteristic turret form, often precedes thunderstorm activity in the afternoon.

Another type of cloud potentially significant in fire-weather is the lens-shaped altocumulus, termed a lenticular cloud (fig. A3.7). These clouds (Schroeder and Buck 1970; Schaefer and Day 1981), appearing over and to the lee of mountain ranges, indicate strong winds aloft and possible turbulence near ridges. The clouds result from waves in the air flow that are generated when the strong winds blow across the mountains.

A form of altocumulus often associated with a large-scale weather system is shown in figure A3.8; clouds producing rain may or may not follow. Termed altocumulus undulatus, the clouds are arranged in parallel bands at right angles to the wind. The distinct roll pattern usually indicates relatively strong winds at cloud level.

Cirrus-type clouds, composed of ice crystals and typically feathery in appearance (fig. A3.9), are sometimes the forerunner of an approaching weather system. Besides indicating high-altitude moisture and wind direction, they may also indicate an upper-air "jetstream," particularly when the cloud elements are in the form of long plumes (fig. A3.9, part B). A dense type of cirrus (fig. A3.10) may be produced from the anvil tops of thunderstorms.

Further details about cloud types may be obtained from Schroeder and Buck (1970), Schaefer and Day (1981), and cloud identification charts available at National Weather Service offices.

Family	Genus	Species	Abbreviation	Description
HIGH CLOUDS 16,500 to 45,000 feet	Cirrus		Ci	Wispy, hair-like clouds. Formed of delicate filaments, patches, narrow bands, or feather-like plumes.
	Cirrocumulus		Cc	Thin, white, grainy, and rippled patches or sheets or layers. Show very slight vertical development in the form of turrets and shallow towers.
	Cirrostratus		Cs	Transparent, hair-like or smooth whitish veil. Covers all or part of the sky. Produces halo phenomenon.
MIDDLE CLOUDS 6,500 to 23,000 feet	Altocumulus		Ac	Extensive sheet of regularly arranged white and gray, somewhat rounded cloudlets.
		Altocumulus castellanus	Ac cas	Altocumulus with vertical development in the form of small towers or turrets. Elements have a common horizontal base and appear to be arranged in lines.
		Altocumulus lenticularis	Ac len	A patch of altocumulus in the shape of a lens or almond. Often stationary and very elongated with well-defined outlines.
	Altostratus		As	Grayish or bluish sheet or layer covering all or part of the sky. Sun may show vaguely but no halo.
	Nimbostratus		Ns	Dark, gray cloud layer thick enough to blot out the sun. Continuous rain or snow; without lightning.
LOW CLOUDS Surface to 6,500 feet	Stratocumulus		Sc	Gray and whitish layer with dark patches formed of nonfibrous rounded masses or rolls. Like altocumulus but lower. May have virga at base.
	Stratus		St	Gray layer with uniform base which may give drizzle. When sun is visible through cloud, its outline is clearly discernible.
THE VERTICAL CLOUDS	Cumulus		Cu	Detached clouds, generally dense and sharply outlined. Developing vertically in the form of rising mounds, domes, or towers. Brilliant white in sunlight. Base is dark and nearly horizontal.
		Cumulus humilis	Cu hum	*Fair weather cumulus* with little vertical extent; generally appear flattened.
		Cumulus congestus	Cu con	*Towering cumulus* with strong vertical extent in the form of domes or towers. May be accompanied by other cumulus or stratocumulus with bases at same level.
	Cumulonimbus		Cb	Heavy and dense cloud with considerable vertical extent, in the form of a mountain or huge towers. The upper part usually smooth, sometimes fibrous, with top flattened to anvil shape or vast cirrus plume. Produces lightning, hail, tornadoes, heavy rain, and high winds.
		Cumulonimbus calvus	Cb cal	*Cumulonimbus without anvil.* Any tower development lacks sharp outlines. May have rain or virga at base.
		Cumulonimbus capillatus	Cb cap	*Cumulonimbus with anvil-shaped top.* Top may also be in the form of a plume, or a vast more or less disorderly mass of hair. Top may extend to 40,000 feet or more. May have rain or virga at base. Produces lightning, hail, heavy rain, and high winds.

Figure A3.1—A simplified cloud classification (reproduced from Fischer and Hardy 1976).

Figure A3.2—Fair-weather cumulus.

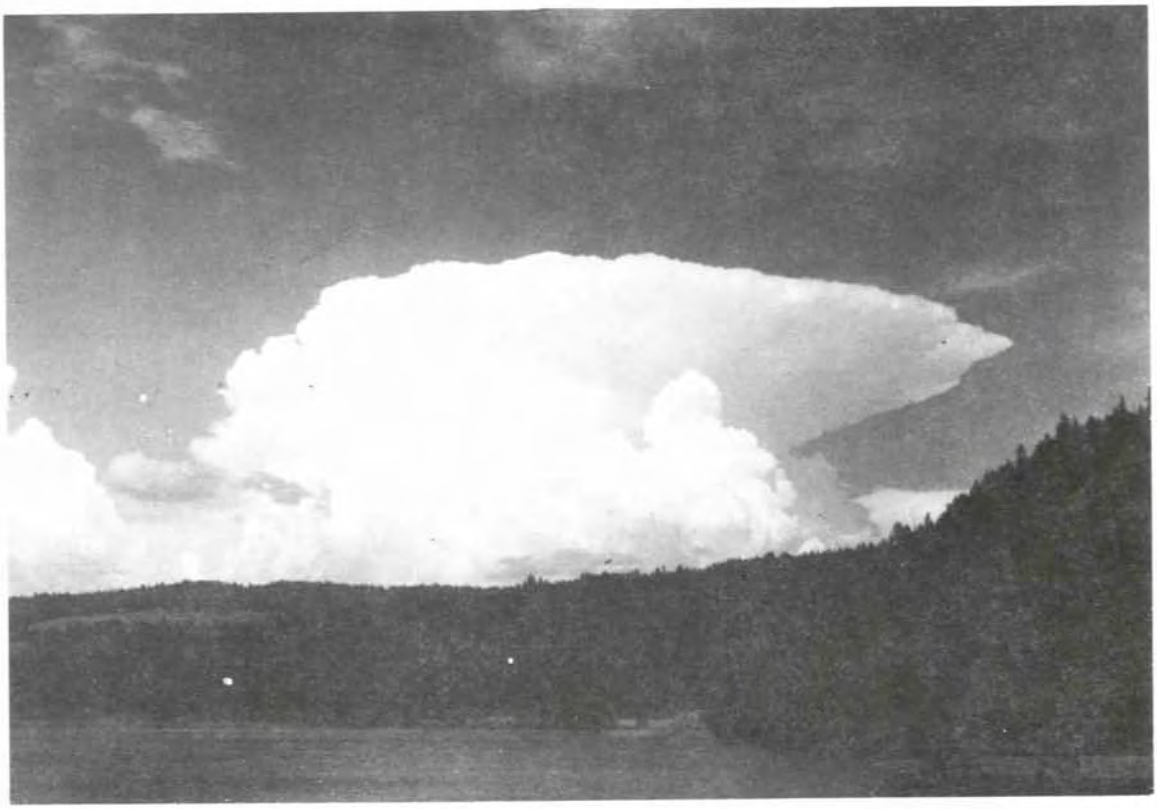
A

Figure A3.3 (A and B)—Towering cumulus.

B

Figure A3.3 (Con.)

Figure A3.4—Cumulonimbus (ice-topped cumulus), without anvil.



A

Figure A3.5 (A and B)—Cumulonimbus with anvil top. A: distant.

B

Figure A3.5 (con.)—B: thunderstorm in progress.

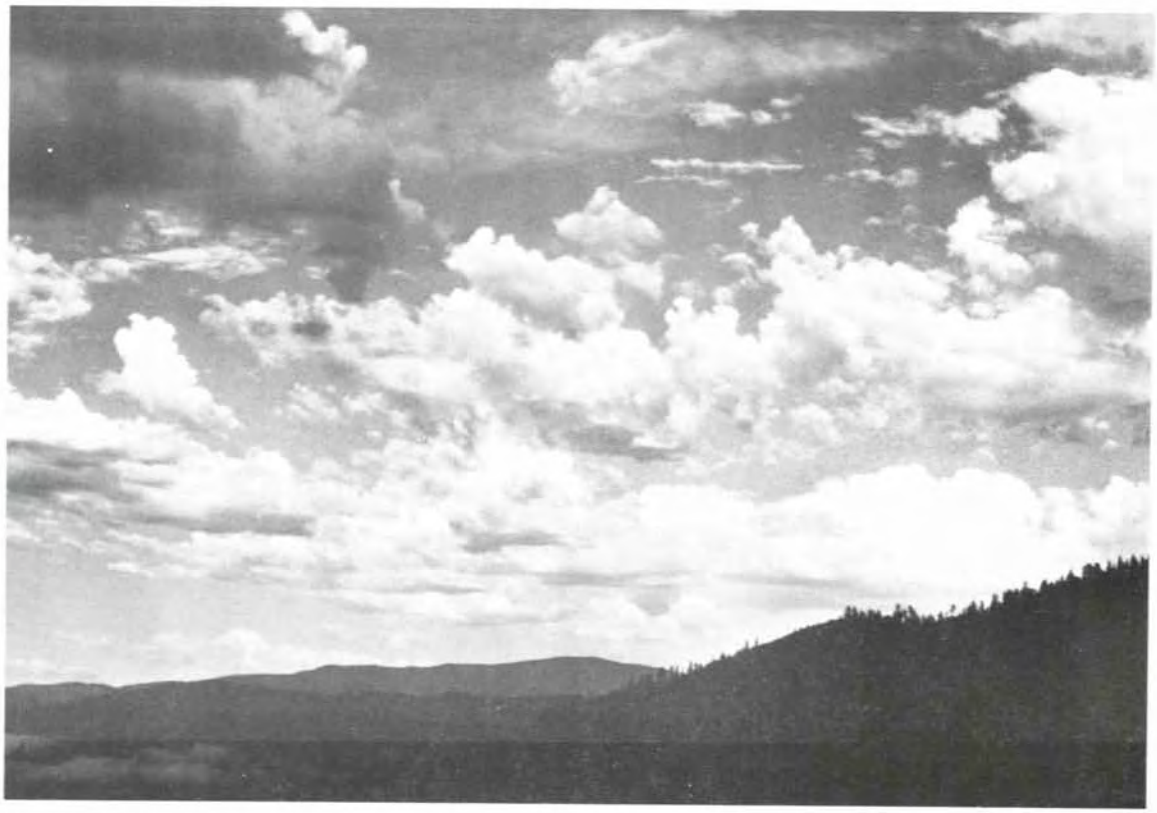


Figure A3.6—Altocumulus castellanus.

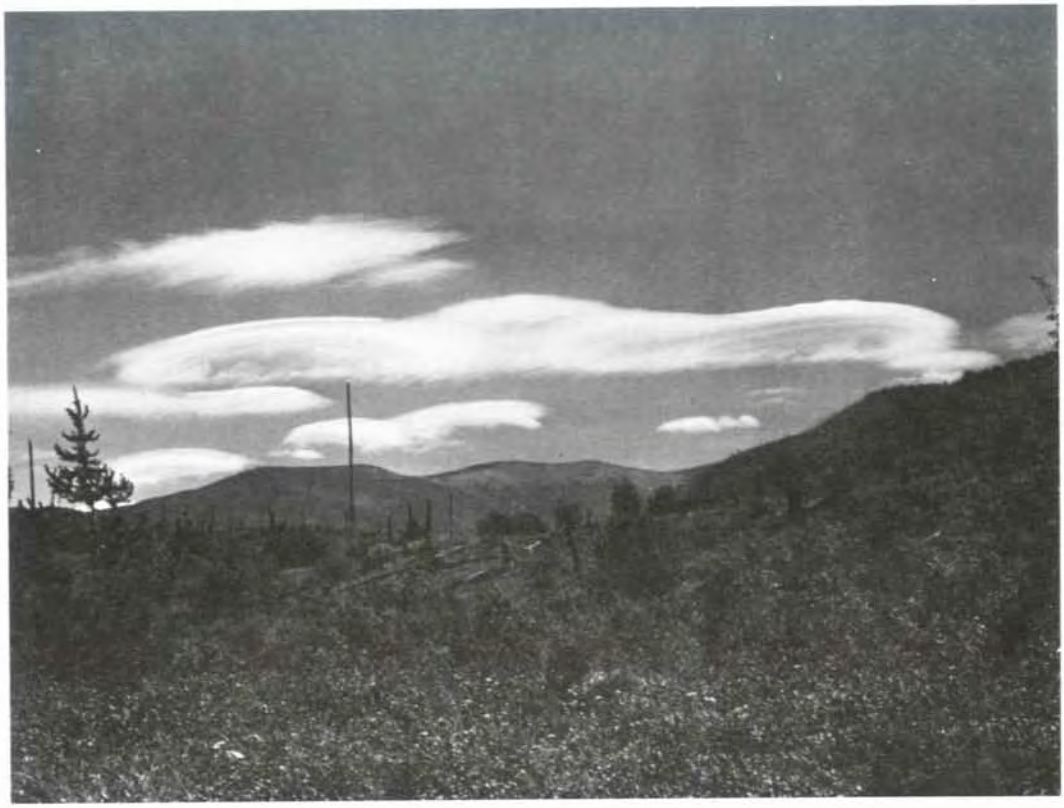


Figure A3.7—Altocumulus lenticularis (lenticular cloud).

Figure A3.8—Altocumulus undulatus.

A

B

Figure A3.9 (A and B)—Cirrus.

Figure A3.10—Dense cirrus, derived from anvil top of cumulonimbus.

APPENDIX 4. EQUIPMENT INSTALLATION AND MAINTENANCE CHECKLISTS FOR MANUAL FIRE-WEATHER STATIONS

FIRE-WEATHER STATION CONDITION REPORT

INSTRUCTIONS: This form may be used for several purposes--(1) as a station location record--Section 1; (2) as an equipment inventory record--Section 2; (3) as an inspection report--Section 3; and (4) as an observer self-training guide--Section 3.

SECTION 1 - STATION LOCATION RECORD

Enter information or check (✓) appropriate items.

Station name_____ Station number_____ Year established_____

Operating agency_____ Local unit_____ Operating season_____

State_____ County_____ T_____ R_____ Section_____

Topography: Flat or gently rolling_____, hilly or broken_____, mountain valley_____, mountaintop_____, mountain slope_____.

Aspect: N_____, S_____, E_____, W_____.

SECTION 2 - STATION EQUIPMENT RECORD

Enter information or check (✓) appropriate items.

Instrument shelter: Cotton region_____, other_____
Maximum-minimum thermometer: Standard_____, other_____
Psychrometer: Electric fan_____, other_____
Hygrothermograph: Make_____, chart period_____
Anemometer: Make_____, model_____
Wind counter: Type_____, make_____
Wind vane: Type_____, make_____
Wind direction indicator: Type_____, make_____
Rain gage (nonrecording): Forest Service type_____, Weather Service type_____
Recording rain gage: Type_____, make_____
Fuel moisture analog: 1/2-inch sticks_____, other_____
Fuel moisture scale: Type_____, make_____

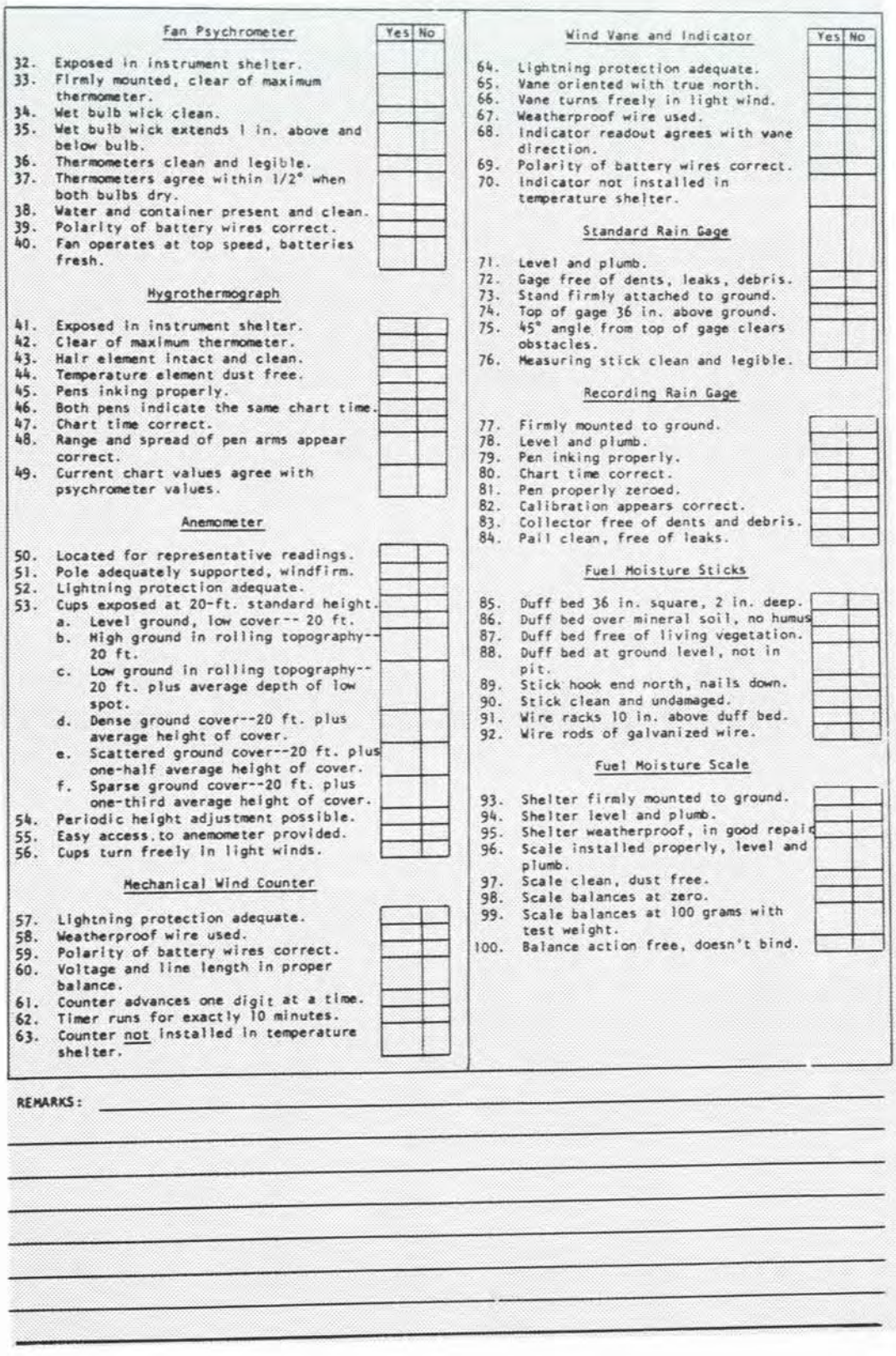
SECTION 3 - INSPECTION REPORT AND SELF-TRAINING GUIDE

Enter an X in either Yes or No column according to condition. Explain all No entries, by number, in REMARKS.

	Yes	No
Station Location		
1. Adequately represents area of concern.		
2. Allows for long term operation.		
3. Accommodates instrument exposure requirements.		
a. Dust sources at least 100 ft. on windward.		
b. Moisture sources at least 100 ft. on windward.		
c. Large reflective surfaces a distance equal to their height away.		
d. Paved or black topped areas at least 50 ft. away.		
e. Large obstructions at least a distance equal to their height away.		
f. Distinct changes in topography lacking.		
Station Layout		
4. Allows free flow of air.		
5. Allows full sun exposure.		
6. Tall vegetation cleared for 20 ft. around station.		
7. All vegetation on station grounds less than 4 in. high.		
8. Station grounds not irrigated.		
9. Fence of open type construction.		
10. Fence less than 4 ft. high.		

	Yes	No
Instrument Shelter		
11. Cotton region or other approved design.		
12. Shelter floor 4 ft. above ground.		
13. Shelter firmly secured to stand.		
14. Stand firmly secured to ground.		
15. Installation level and plumb.		
16. Door faces away from sun.		
17. Painted glossy white, inside and out.		
18. Inside clean of dirt and dust.		
19. Only temperature sensitive instruments in shelter.		
Standard Maximum-Minimum Thermometers		
20. Exposed in instrument shelter.		
21. Townsend Support securely mounted on crossboard.		
22. Townsend Support spinning clamp on bottom.		
23. Minimum bulb on left, in top clamp.		
24. Minimum bulb 5° below horizontal.		
25. Maximum bulb on left, in lower clamp.		
26. Maximum bulb 5° above horizontal.		
27. Thermometers clean and legible.		
28. Thermometer columns intact, not separated.		
29. Maximum column does not "retreat."		
30. Minimum index floats freely.		
31. Maximum spins freely in its clamp.		

Figure A4.1—Fire-weather station condition report (Fischer and Hardy 1976).



Fan Psychrometer

		Yes	No
32.	Exposed in instrument shelter.		
33.	Firmly mounted, clear of maximum thermometer.		
34.	Wet bulb wick clean.		
35.	Wet bulb wick extends 1 in. above and below bulb.		
36.	Thermometers clean and legible.		
37.	Thermometers agree within 1/2° when both bulbs dry.		
38.	Water and container present and clean.		
39.	Polarity of battery wires correct.		
40.	Fan operates at top speed, batteries fresh.		

Hygrothermograph

41.	Exposed in instrument shelter.		
42.	Clear of maximum thermometer.		
43.	Hair element intact and clean.		
44.	Temperature element dust free.		
45.	Pens inking properly.		
46.	Both pens indicate the same chart time.		
47.	Chart time correct.		
48.	Range and spread of pen arms appear correct.		
49.	Current chart values agree with psychrometer values.		

Anemometer

50.	Located for representative readings.		
51.	Pole adequately supported, windfirm.		
52.	Lightning protection adequate.		
53.	Cups exposed at 20-ft. standard height.		
	a. Level ground, low cover-- 20 ft.		
	b. High ground in rolling topography-- 20 ft.		
	c. Low ground in rolling topography-- 20 ft. plus average depth of low spot.		
	d. Dense ground cover--20 ft. plus average height of cover.		
	e. Scattered ground cover--20 ft. plus one-half average height of cover.		
	f. Sparse ground cover--20 ft. plus one-third average height of cover.		
54.	Periodic height adjustment possible.		
55.	Easy access to anemometer provided.		
56.	Cups turn freely in light winds.		

Mechanical Wind Counter

57.	Lightning protection adequate.		
58.	Weatherproof wire used.		
59.	Polarity of battery wires correct.		
60.	Voltage and line length in proper balance.		
61.	Counter advances one digit at a time.		
62.	Timer runs for exactly 10 minutes.		
63.	Counter not installed in temperature shelter.		

Wind Vane and Indicator

		Yes	No
64.	Lightning protection adequate.		
65.	Vane oriented with true north.		
66.	Vane turns freely in light wind.		
67.	Weatherproof wire used.		
68.	Indicator readout agrees with vane direction.		
69.	Polarity of battery wires correct.		
70.	Indicator not installed in temperature shelter.		

Standard Rain Gage

71.	Level and plumb.		
72.	Gage free of dents, leaks, debris.		
73.	Stand firmly attached to ground.		
74.	Top of gage 36 in. above ground.		
75.	45° angle from top of gage clears obstacles.		
76.	Measuring stick clean and legible.		

Recording Rain Gage

77.	Firmly mounted to ground.		
78.	Level and plumb.		
79.	Pen inking properly.		
80.	Chart time correct.		
81.	Pen properly zeroed.		
82.	Calibration appears correct.		
83.	Collector free of dents and debris.		
84.	Pail clean, free of leaks.		

Fuel Moisture Sticks

85.	Duff bed 36 in. square, 2 in. deep.		
86.	Duff bed over mineral soil, no humus		
87.	Duff bed free of living vegetation.		
88.	Duff bed at ground level, not in pit.		
89.	Stick hook end north, nails down.		
90.	Stick clean and undamaged.		
91.	Wire racks 10 in. above duff bed.		
92.	Wire rods of galvanized wire.		

Fuel Moisture Scale

93.	Shelter firmly mounted to ground.		
94.	Shelter level and plumb.		
95.	Shelter weatherproof, in good repair		
96.	Scale installed properly, level and plumb.		
97.	Scale clean, dust free.		
98.	Scale balances at zero.		
99.	Scale balances at 100 grams with test weight.		
100.	Balance action free, doesn't bind.		

REMARKS: _____

Figure 4.1 (Con.)

Instrument Shelter	YES	NO	POSS. PNTS.
Cotton Region ☐ Region 6 ☐ Other ☐			
Door opens to north			5
Painted glossy white--inside and out			3
Dust free--inside and out			1
Houses temperature sensitive instruments only			1
Firmly mounted, level, and plumb			2
Floor 48" above ground			4
Ground cover: Grass ☐ Other ☐			5
Exposed to direct sunlight from 0700–1700			4
Psychrometer	YES	NO	
Electric Fan ☐ Sling ☐ Mortar Board ☐ Other ☐			
Thermometers clean			1
Columns unseparated			5
Wet bulb uncalcified			4
Markings legible			3
Wicking clean			4
Fan working			5
Battery fresh			3
Mortar board level and plumb			4
Reservoir water clean			2
Max/Min Thermometer	YES	NO	
WB Type ☐ U-Type ☐ Other ☐			
Thermometers clean			5
Columns unseparated			5
Markings legible			3
Townsend support spins easily			2
Rain Gage	YES	NO	
8 inch ☐ 4 inch ☐ Recording ☐ Wedge ☐ Other ☐			
Level and plumb			5
Securely mounted			2
Measuring stick legible			5
45° clearance around gage			4
Anemometer	YES	NO	
Stewart ☐ Forester ☐ Friez ☐ Other ☐			
Age of anemometer _____ years			
Exposed correctly			5
Tower plumb and stable			5
Serviced at least twice annually			5
Date last serviced _____			
Counter/Timer operating well			5
Counter/Timer checked regularly			3
Date last calibrated _____			
Fuel Moisture Sticks	YES	NO	
Fence adequate			2
Duff bed 3' x 3' x 2"			5
Duff bed weed free			3
Exposed 10" above duff			5
Hook pointed north, brads down			2
Sticks changed every _____ months			4
Weighing Device	YES	NO	
Triple beam ☐ Appalachian ☐ Other ☐			
Dust free			1
Calibration checked regularly			5
Scale shelter: W/Window ☐ Appalachian ☐ Other ☐			3
Shelter level and secure			4

A seven-category, 40-item inspection form used to evaluate fire-weather stations.

Figure A4.2—Inspection form for evaluating station maintenance (Frost and Haines 1982).

APPENDIX 5. DETAILED SPECIFICATION DRAWINGS FOR MISCELLANEOUS ITEMS AT MANUAL FIRE-WEATHER STATIONS

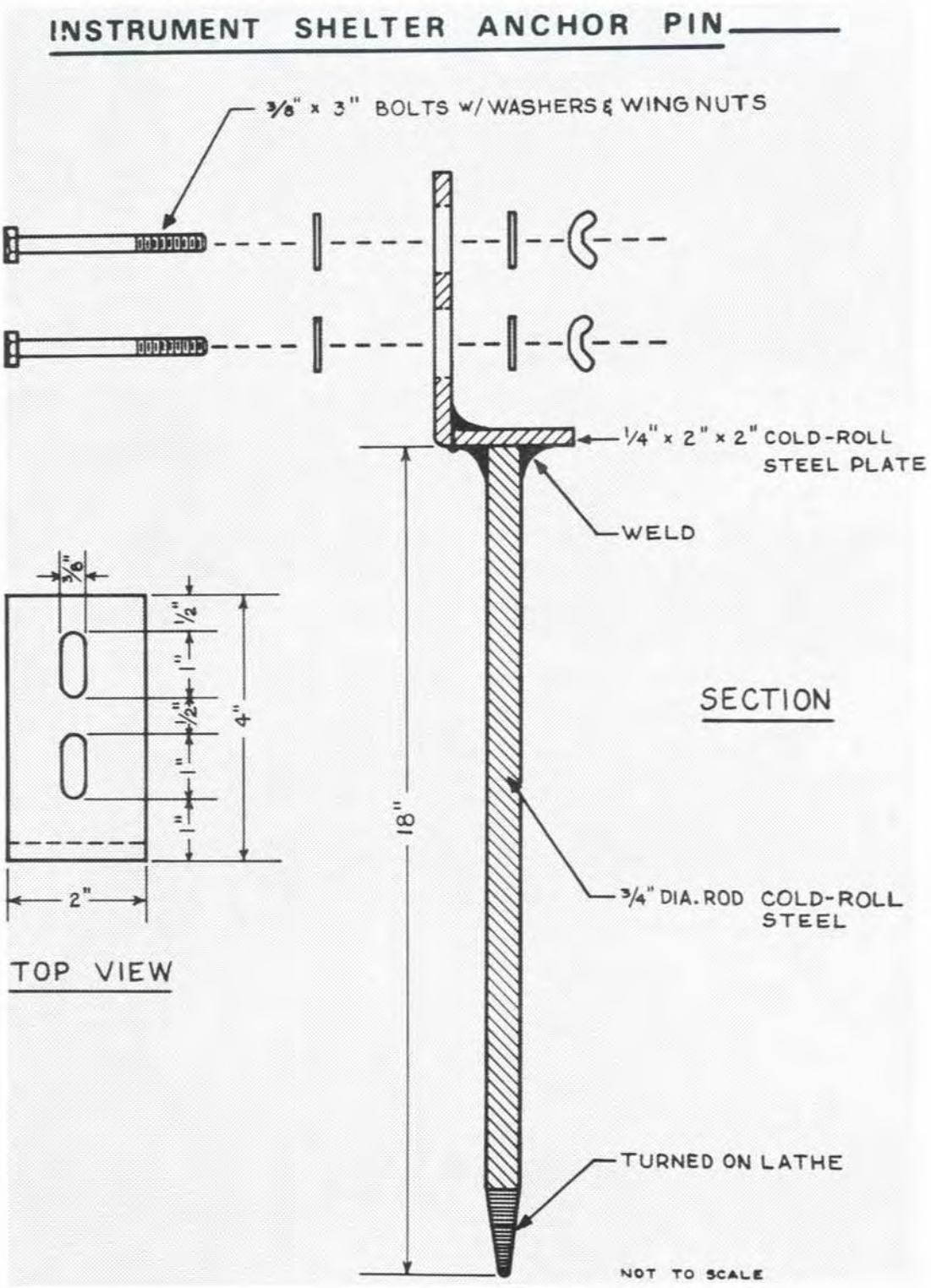


Figure A5.1—Instrument shelter anchor pin (section 16.1).

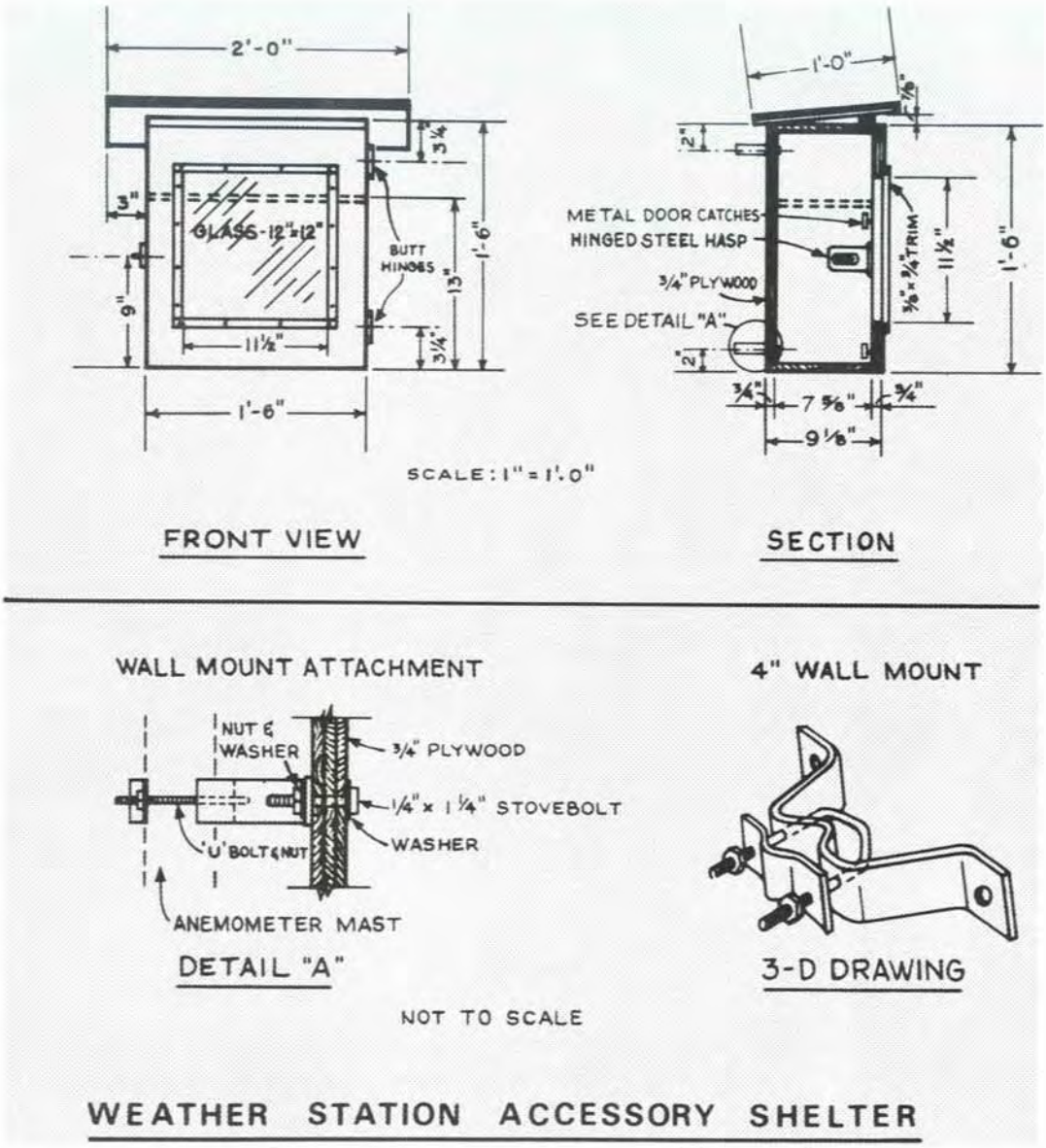


Figure A5.2—Weather station accessory shelter (section 17.2).

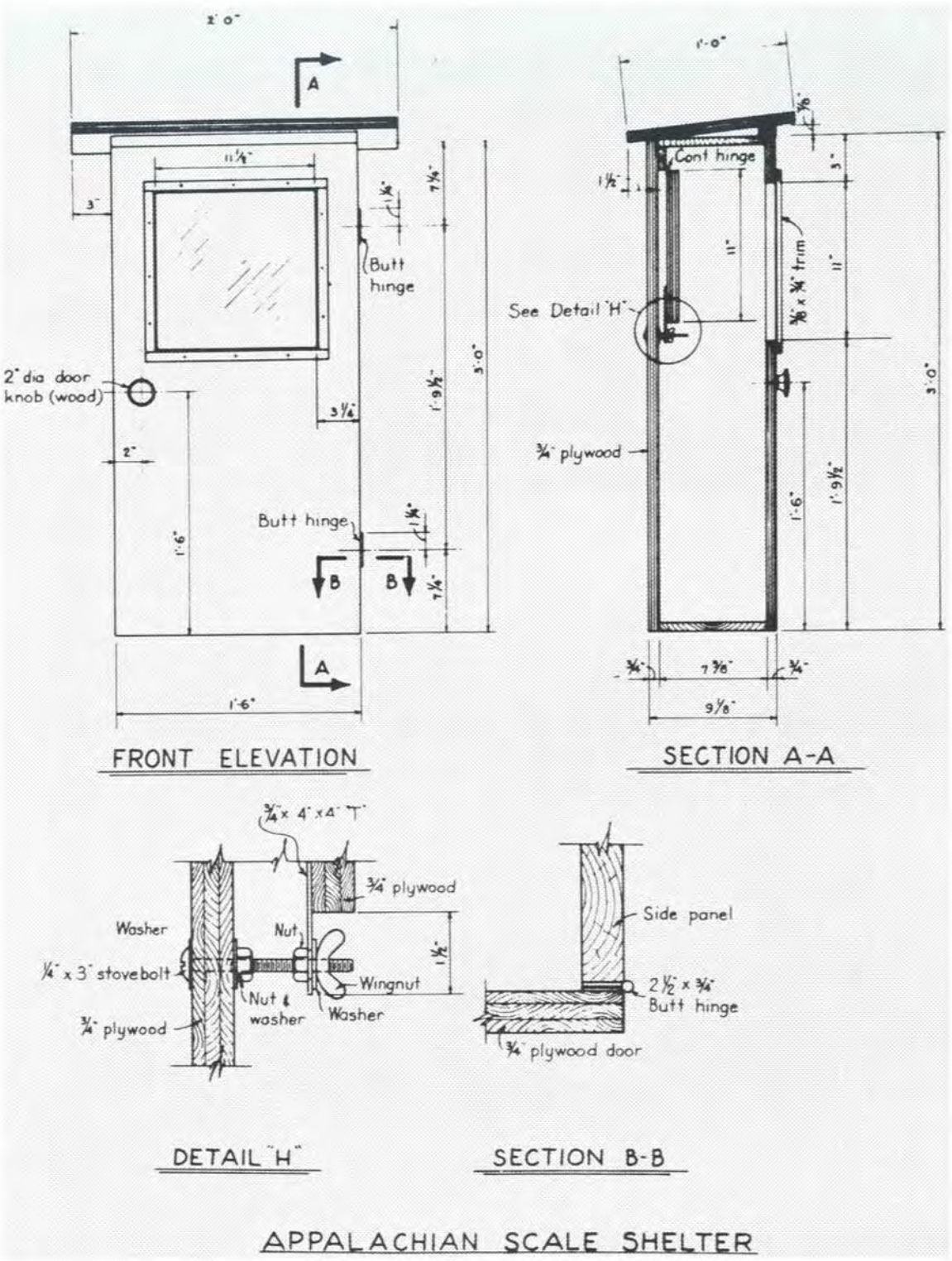


Figure A5.3—Appalachian scale shelter (sections 10.2, 19.2).

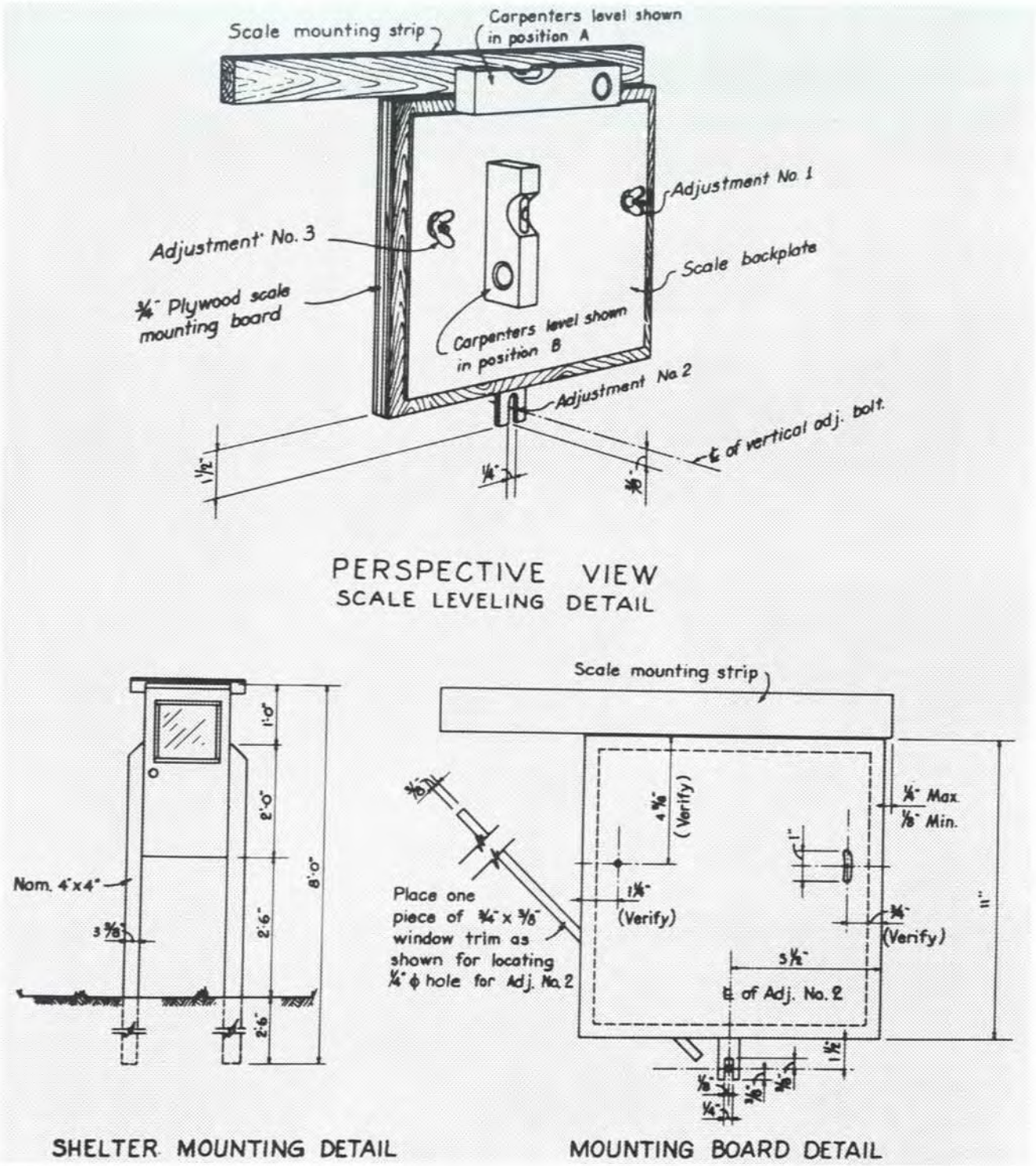
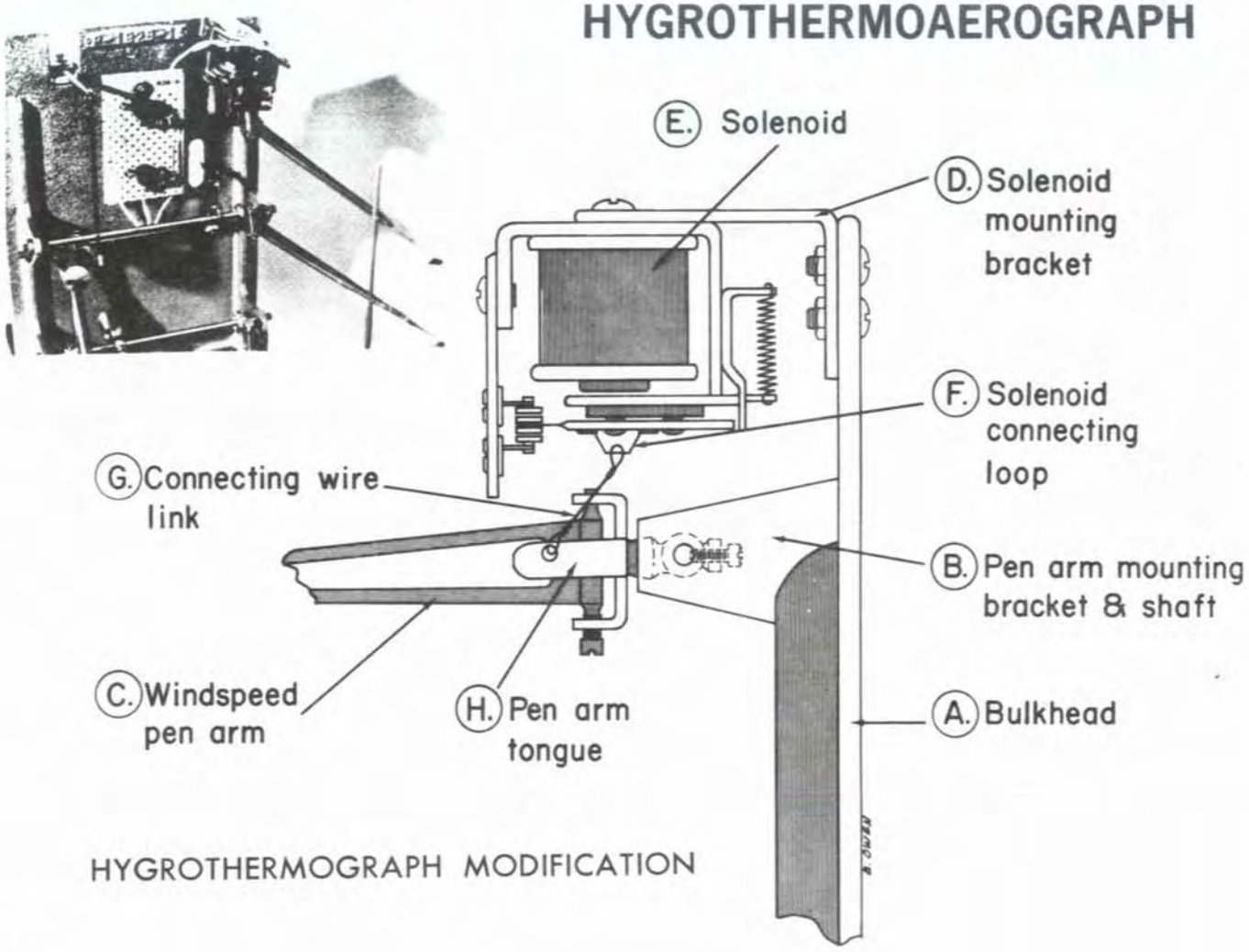
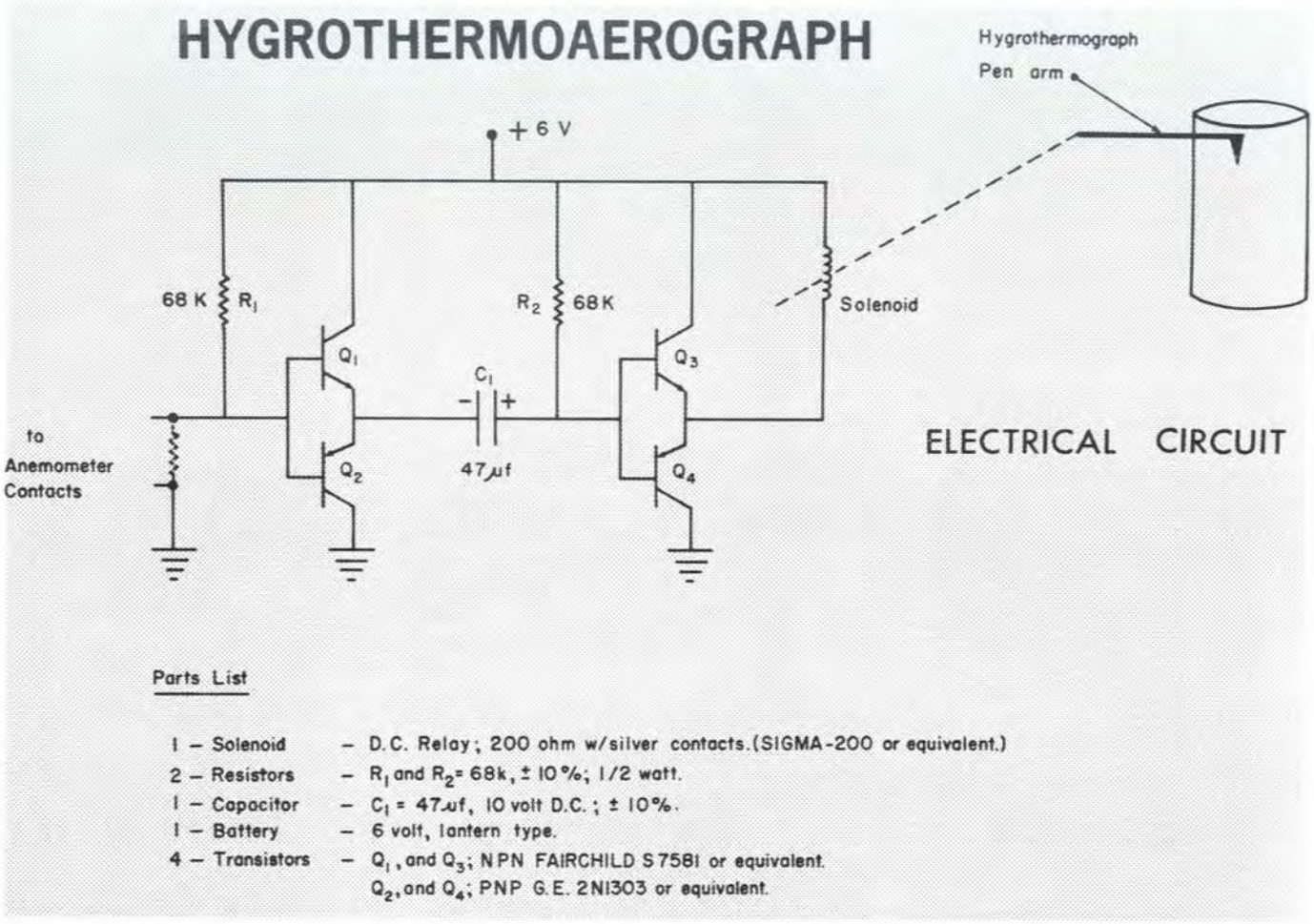


Figure A5.3 (Con.)



A

Figure A5.4—Hygrothermoaerograph (section 8.1): A, mechanical details; B, electrical circuit.



B

Figure A5.4 (Con.)

APPENDIX 6. USER INSTRUCTIONS FOR RETRIEVING RAWS DATA

A6.1 Retrieval of Data from AFFIRMS Computer

The following instructions enable a user to retrieve RAWS data via the Data General (Forest Service) computer system or other computer terminal and printer that can access the AFFIRMS computer (via telephone dial-up and modem if necessary). After proper identification (ID) has been entered, a series of command prompts are received and answered by the user, as shown here in upper-case letters.

COMMAND: RAWS

The RAWS command activates the RAWS processing module.

R-COMMAND:

To obtain RAWS data, the user responds to this prompt with any one or all of three basic commands, DSPW, DSPR, and DSPC, explained below. To exit from RAWS, the user enters RET. Any other response will cause the message "GARBLED INPUT, RETRY" to appear, followed by a repeat of the R-COMMAND prompt.

THE DSPW COMMAND

R-COMMAND: DSPW XXXXXXXX, where the X's denote a specified station's eight-digit transmission identification number (ID).

When the DSPW command is entered, the RAWS module will display the hourly data for the preceding 24 hours for the specified station. The data are formatted in columns with abbreviated headings. For example, the command DSPW 3248E192 will display the 24 hours of data for the station with the transmission ID of 3248E192. Repeat the command, with appropriate ID, for data from additional, selected stations. *It is important to include the assigned transmission ID*; otherwise, if DSPW alone is entered, the data for *all* RAWS sites will be displayed in sequence.

The DSPW command can also be used with a two-digit hour command to obtain data only for a single hourly observation time; the time is rounded to the nearest whole hour. An example would be DSPW 3248E192 15. (Note: there must be a blank space before the two-digit hour.)

Error Messages—There are two error messages associated with the DSPW two-digit hour command:

(1) If the time requested is after the latest update time (transmission time), the following message will be displayed on the computer terminal (with the actual hours given instead of the X symbols): TIME XX NOT AVAILABLE FOR TODAY; LAST UPDATE WAS XXXX

In such a case, request the time rounded to the nearest previous whole hour.

(2) Another error message is: NO DATA FOR CURRENT DAY

This occurs when there are no data in the file from 0000 hours to the requested time. In such a case, check the file by using the DSPW command for a 24-hour display of station data. If no data are found, notify your RAWS coordinator or call the BIFC RAWS Sensing System Branch at (FTS) 554-1576 to see if the data intercept link is broken.

THE DSPR COMMAND

R-COMMAND: DSPR XXXXXXXX (specify the station transmission ID)

The DSPR command displays the latest three days of data in the 1300 l.s.t. observational format (data for 1300, plus 24-hour maximum and minimum temperature and relative humidity values and 24-hour precipitation). The formatted columns have no headings but follow the AFFIRMS sequence. As with the DSPW command, *be sure to include the eight-digit station transmission ID.*

THE DSPC COMMAND

R-COMMAND: DSPC XXXXXXXX (specify the station transmission ID)

The DSPC command displays, in a format with column headings A through J, the hourly values of additional weather parameters (not included in the DSPW display). For example, columns A and B are commonly used for wind gust information. Column B shows the maximum 1-second windspeed value during the preceding 1-hour period; column A, the wind direction at that time.

THE RET COMMAND

R-COMMAND: RET

The RET command is used after all of the desired RAWS data have been obtained. This command will terminate communication with the RAWS module and activate a further prompt command. A reply of BYE will terminate connection with the AFFIRMS computer. Example, COMMAND: BYE

A6.2 Access of RAWS Data from NESDIS

The following instructions apply to retrieval of RAWS data directly from the National Environmental Satellite Data Information Service (NESDIS) computer at Silver Spring, MD. This option is available should AFFIRMS or the BLM/BIFC satellite downlink be out of service.

ACCESSING COMPUTER

To access the computer, with 300 baud rate; half duplex, 30 characters per second, even parity:

Dial (202) 899-2521

To access the computer, with 1200 baud rate:

Dial (202) 899-6595 or (202) 899-6596

When the computer prints DCS - ENTER ID, type DAFS06 (carriage return).

The computer will print several lines of information and then print ENTER: MSG, RLT, DIS or STOP

At this point, enter RLT/ followed by the first six digits of the station number, the Julian date on which the data are to begin, and the transmission time (hours, minutes, and seconds GMT) of the starting data group. An example follows:

ENTER: MSG, RLT, DIS, or STOP RLT/
324534,231234700

Here, the Julian date number is 231 (August 19) and the transmission time is 23 hours, 47 minutes, and 00 seconds G.m.t. The G.m.t. times are 5 hours faster than eastern standard time; 8 hours faster than Pacific standard time.

EXITING COMPUTER

After all of the desired data output has been received, hit the "BREAK" key.

The computer will print ENTER: MSG, RLT, DIS or STOP

Type in STOP, on the same line; then hit carriage return key.

EVALUATION OF DATA OUTPUT

In the above example, the following data output is received:

```
3245349C 231234733
00.01 00.55 18.70 224 161 176 163 001
00.01 00.69 18.10 226 165 185 148 001
00.01 00.47 19.40 225 168 192 134 001
 //////  30W
```

The first line contains the station ID, followed by the date (231) and transmission time of the data group (the time is 23 hours, 47 minutes, and 33 seconds G.m.t.).

For instructions in evaluating the data, the above columns will be numbered (example given for last line):

```
   1     2     3    4   5   6   7   8
00.01 00.47 19.40 225 168 192 134 001
```

(1) Accumulated precipitation; subtract the current value from that on previous line to obtain the hourly amount. Amount is zero.

(2) Windspeed; move decimal one place to right and round off. Speed is 5 miles per hour.

(3) Wind direction, in degrees azimuth; move decimal one place to the right. Direction is 194 degrees, or south.

(4) Battery voltage; requires conversion table. Value is 13.24.

(5) Air temperature; requires conversion table. Value is 61 °F.

(6) Fuel temperature; requires conversion table. Value is 78 °F.

(7) Relative humidity; requires conversion table. Value is 53 percent.

(8) Barometric pressure; requires conversion table. Disregard, no sensor installed.

APPENDIX 7. EQUIPMENT SOURCES; MANUFACTURERS AND SUPPLIERS

Table A7.1—Sources of equipment described in this handbook: name of company; classification of company (F, manufacturer; D, distributor); general category of equipment (M, manual, including manually read electronic instruments or their output devices; A, automated data acquisition systems); and types of instruments or sensors made or sold (T, air temperature; H, relative humidity or dewpoint; WS, windspeed; WD, wind direction; P, precipitation; B, barometric pressure; FT/M, fuel temperature and fuel moisture;[1] R, solar radiation; V, evaporation; ST/M, soil temperature and soil moisture; L, water level). Designations are based on literature from companies. Letter a denotes sensors can be used in automated systems; d, all of sensors for automated systems are from other manufacturers; e, primarily manually read electronic equipment with built-in data processing and storage; i, interface for computer/printer available; s, sensors only

Company	Class	Equipment category	Instruments or sensors											
			AT	H	WS	WD	P	B	FT/M	R	V	ST/M		L
Belfort Instrument Co.	F	M,A	X	X	X	X	X	X		X	X			X
Ben Meadows Co.	D	M	X	X	X	X	X	X	X		X		X	X
Campbell Scientific, Inc.	F	Ad	X	X	X	X	X			X		X	X	
Climatronics Corp.	F	A	X	X	X	X	X	X		X		X		
Climet Instruments	F	A	X	X	X	X	X	X		X		X		
Controlex, Inc.	F	Me,A	X		X					X				
Davis Instruments	F	M			X									
The Eppley Laboratory, Inc.	F	Ma								X				
Forestry Suppliers, Inc.	D	M	X	X	X	X	X	X	X	X	X	X	X	X
Handar	F	A	X	X	X	X	X	X	X X	X	X	X	X	X
Hinds International, Inc.	F	Me,i	X		X	X		X						
Kahl Scientific Instr. Co.	F	M,A	X	X	X	X	X	X	X	X	X	X		
John W. Kennedy Consultants	D	A	X	X	X	X	X			X		X		X
Leupold & Stevens, Inc.	F	M,A					X							X
Li-Cor, Inc.	F	A	X				X			X		X		
Maximum, Inc.	F	M	X		X	X		X						
Meteophysics Corp.	F	Ad	X	X	X	X	X	X		X		X		
Met One, Inc.	F	A	X	X	X	X	X	X		X		X		
NRG Systems	F	Me,A			X	X								
Omnidata International, Inc.	F	Ad	X	X	X	X	X	X		X			X	X
Palmer Instruments, Inc.	F	M	X									X		
Qualimetrics, Inc., Science Associates	D	M,A	X	X	X	X	X	X		X	X	X		X
Qualimetrics, Inc. Weathertronics Division	F	M,A	X	X	X	X	X	X		X	X	X	X	X
RainWise, Inc.	F	Me,i	X	X	X	X	X	X						
Rodco Products, Inc.	F	Me	X											
Rotronic Instrument Corp.	F	As	X	X										
Sensor Instruments, Inc.	F	Me,i	X	X	X		X	X		X				
Sierra-Misco, Inc.	F	M,A	X	X	X	X	X	X	X X	X	X	X	X	X
Simerl Instruments	F	M			X									
Sofrel, Inc.	F	Ad	X	X	X	X	X	X		X				
Taylor Scientific/Sybron	F	M	X	X	X	X	X	X						
Teledyne Geotech	F	A	X	X	X	X	X	X		X		X		
Texas Electronics, Inc.	F	Me,A	X	X	X	X	X	X		X				
Vaisala	F	M,A	X	X	X	X	X	X		X	X	X		X
Western Fire Equipment Co.	D	M	X	X	X	X			X					
R.M. Young Company	F	Me,i,As	X	X	X	X								

[1]Primary source of standard ½-inch fuel moisture sticks is: USDA Forest Service, Northern Region, Administration Division, Federal Building, P.O. Box 7669, Missoula, MT 59807.

Table A7.2—Name, address, and telephone number[1] of companies (table A7.1) manufacturing or distributing type of equipment described in this handbook

Company	Address	Phone
Belfort Instrument Company	727 S. Wolfe St. Baltimore, MD 21231	(301) 342-2626
Ben Meadows Co.	P.O. Box 80549 Atlanta (Chamblee), GA 30366	(404) 455-0907 TF (800) 241-6401 In GA (800) 241-3136
Campbell Scientific, Inc.	P.O. Box 551 Logan, UT 84321	(801) 753-2342
Climatronics Corp.	140 Wilbur Place Airport International Plaza Bohemia, NY 11716	(516) 567-7300
Climet Instruments	P.O. Box 1760 Redlands, CA 92373	(714) 793-2788
Controlex, Inc. (Natural Power, Inc.)	Francestown Turnpike New Boston, NH 03070	(603) 487-5512
Davis Instruments	3465 Diablo Ave. Hayward, CA 94545	(415) 732-9229
The Eppley Laboratory, Inc.	14 Sheffield Ave. Newport, RI 02840	(401) 847-1020
Forestry Suppliers, Inc.	P.O. Box 8397 Jackson, MS 39204	(601) 354-3565 TF (800) 647-5368
Handar	1180 Bordeaux Drive Sunnyvale, CA 94089-1281	(408) 734-9640
Hinds International, Inc.	P.O. Box 929 Hillsboro, OR 97123	(503) 648-1355
Kahl Scientific Instrument Corp.	P.O. Box 1166 El Cajon, CA 92022	(619) 444-2158
John W. Kennedy Consultants, Inc.	9101 Cherry Lane, #113 Laurel, MD 20708	(301) 490-1600
Leupold & Stevens, Inc.	P.O. Box 688 Beaverton, OR 97075	(503) 646-9171
Li-Cor, Inc.	P.O. Box 4425 Lincoln, NE 68504	(402) 467-3576
Maximum, Inc.	42 South Ave. Natick, MA 01760	(617) 785-0113
Meteophysics Corp.	3030 Bridgeway Bldg., #215 Sausalito, CA 94965	(415) 331-5181
Met One, Inc.	481 California Ave. Grants Pass, OR 97526	(503) 479-1248
NRG Systems	1955 Church Hill Road Charlotte, VT 05445	(802) 425-3468
Omnidata International, Inc.	P.O. Box 3489 Logan, UT 84321	(801) 753-7760 TF (800) 321-7218

(con.)

Table A7.2 (Con.)

Company	Address	Phone
Qualimetrics, Inc., Science Associates	P.O. Box 230 Princeton, NJ 08542	(609) 924-4470 TF (800) 247-7234
Qualimetrics, Inc., Weathertronics Division	P.O. Box 41039 Sacramento, CA 95841	(916) 923-0055 TF (800) 824-5873
Palmer Instruments, Inc.	3131 Wasson Rd. Cincinnati, OH 45209	(513) 871-7800
RainWise, Inc.	P.O. Box 443 Bar Harbor, ME 04609	(207) 288-5169
Rodco Products Co., Inc.	P.O. Box 944 Columbus, NE 68601	(402) 563-3596
Rotronic Instrument Corp.	160 E. Main Huntington, NY 11743	(516) 427-3994
Sensor Instruments Co., Inc.	41 Terrill Park Drive Concord, NH 03301	(603) 224-0167 TF (800) 633-1033
Sierra-Misco, Inc.	1825 Eastshore Highway Berkeley, CA 94710	(415) 843-1282
Simerl Instruments	238 West St. Annapolis, MD 21401	(301) 849-8667
Sofrel, Inc.	7685 Commerce Way, Suite 105 Eden Prairie, MN 55344	(612) 937-8835
Taylor Scientific/Sybron	95 Glenn Bridge Road Arden, NC 28704	(704) 684-8111
Teledyne Geotech	P.O. Box 469007 Garland, TX 75046-9007	(214) 271-2561
Texas Electronics, Inc.	P.O. Box 7225 Dallas, TX 75209	(214) 631-2490
Vaisala (USA)	2 Tower Office Park Woburn, MA 01801	(617) 933-4500
Western Fire Equipment Co.	440 Valley Drive Brisbane, CA 94005	(415) 467-5650
R.M. Young Company	2801 Aero-Park Drive Traverse City, MI 49684	(616) 946-3980

[1]TF denotes toll-free (800) number.

APPENDIX 8. CONVERSION OF MEASUREMENT UNITS—FORMULAS, EXAMPLES, AND CONDENSED TABLES

A8.1 Temperature

Degrees Fahrenheit (F) to degrees Celsius (C)—

$C = 5/9 (F - 32)$

Example, if $F = 54$, $C = 5/9 (22) = 110/9 = 12$

Example, if $F = 17$, $C = 5/9 (-15) = -75/9 = -8$

Example, if $F = -24$, $C = 5/9 (-56) = -280/9 = -31$

Degrees Celsius (C) to degrees Fahrenheit (F)—

$F = 9/5 (C) + 32$

Example, if $C = 31$, $F = 1.8 (31) + 32 = 56 + 32 = 88$

Example, if $C = -7$, $F = 1.8 (-7) + 32 = -13 + 32 = 19$

Table A8.1—Temperature conversion table (condensed)

Fahrenheit (F) to Celsius (C)		Celsius (C) to Fahrenheit (F)	
F	C	C	F
–40	–40	–40	–40
–30	–34	–30	–22
–20	–29	–20	–4
–10	–23	–10	14
0	–18	0	32
10	–12	10	50
20	–7	20	68
30	–1	30	86
40	4	40	104
50	10	50	122
60	16		
70	21		
80	27		
90	32		
100	38		
110	43		
120	49		

A8.2 Precipitation and Evaporation

Inches (in) to millimeters (mm)—

1.00 in = 25.4 mm

Example: 0.08 in = 0.08 (25.4) mm = 2 mm

Example: 1.30 in = 1.30 (25.4) mm = 33 mm

Millimeters (mm) to inches (in)—

1.00 mm = 0.0394 in

Example: 6 mm = 6 (0.0394) in = 0.24 in

Example: 65 mm = 65 (0.0394) in = 2.56 in

SNOWFALL OR SNOW DEPTH

Inches (in) to centimeters (cm)—

1.00 in = 2.54 cm

Example: 7.8 in = 7.8 (2.54) cm = 19.8 cm

Centimeters (cm) to inches (in)—

1.00 cm = 0.394 in

Example: 53 cm = 53 (0.394) in = 21 in

Table A8.2—Precipitation or evaporation conversion table (condensed)

Inches to millimeters		Millimeters to inches		Inches to centimeters	
In	mm	mm	In	In	cm
0.01	0.25	1	0.04	0.10	0.3
.05	1.3	5	.20	.50	1.3
.10	2.5	10	.39	1.00	2.5
.20	5.1	20	.79	2.00	5.1
.30	7.6	30	1.18	3.00	7.6
.40	10.2	40	1.58	4.00	10.2
.50	12.7	50	1.97	5.00	12.7
.60	15.2	60	2.36	6.00	15.2
.80	20.3	70	2.76	8.00	20.3
1.00	25.4	80	3.15	10.00	25.4
1.50	38.1	90	3.55	15.00	38.1
2.00	50.8	100	3.94	20.00	50.8
3.00	76.2	120	4.72	30.00	76.2
4.00	101.6	140	5.52	40.00	101.6
5.00	127.0	160	6.30	50.00	127.0

A8.3 Windspeed

Miles per hour (mi/h) to kilometers per hour (km/h)—

1 mi/h = 1.609 km/h

Example: 6 mi/h = 6 (1.609) km/h = 10 km/h

Example: 27 mi/h = 27 (1.609) km/h = 43 km/h

Kilometers per hour (km/h) to miles per hour (mi/h)—

1 km/h = 0.621 mi/h

Example: 7 km/h = 7 (0.621) mi/h = 4 mi/h

Miles per hour (mi/h) to knots (kt)—

1 mi/h = 0.868 kt

Example: 22 mi/h = 22 (0.868) kt = 19 kt

Knots (kt) to miles per hour (mi/h)—

1 kt = 1.152 mi/h

Example: 12 kt = 12 (1.152) mi/h = 14 mi/h

Table A8.3—Windspeed conversion table (condensed)

Miles/hour to kilometers/hour		Kilometers/hour to miles/hour	
Mi/h	km/h	km/h	Mi/h
1	1.6	1	0.6
2	3.2	2	1.2
4	6.4	4	2.5
6	9.7	6	3.7
8	12.9	8	5.0
10	16.1	10	6.2
12	19.3	12	7.5
14	22.5	14	8.7
16	25.7	16	9.9
18	29.0	18	11.2
20	32.2	20	12.4
25	40.2	25	15.5
30	48.3	30	18.6
35	56.3	35	21.7
40	64.4	40	24.8
45	72.4	45	27.9
50	80.5	50	31.1

A8.4 Barometric Pressure

Inches of mercury (in Hg) to millibars (mb)—

1 in Hg = 33.864 mb Example: 30.12 in Hg = 1,020 mb

Millibars (mb) to inches of mercury (in Hg)—

1 mb = 0.02953 in Hg Example: 988 mb = 29.18 in

Table A8.4—Barometric pressure conversion table (condensed)

Inches of mercury to millibars		Millibars to inches of mercury	
In Hg	mb	mb	In Hg
23.00	779	750	22.15
24.00	813	800	23.62
25.00	847	850	25.10
26.00	880	900	26.58
27.00	914	950	28.05
28.00	948	960	28.35
28.50	965	970	28.64
29.00	982	980	28.94
29.20	989	990	29.23
29.40	996	1,000	29.53
29.60	1,002	1,010	29.83
29.80	1,009	1,020	30.12
30.00	1,016	1,030	30.42
30.20	1,023	1,040	30.71
30.40	1,029	1,050	31.01
30.60	1,036	1,060	31.30
30.80	1,043		
31.00	1,050		

A8.5 Solar Radiation

RADIANT FLUX PER UNIT AREA, AS IN INSTANTANEOUS MEASUREMENT

Langleys per minute (ly/min) to watts per square meter (W/m^2)—
(Note: 1 langley = 1 gram calorie per square centimeter)

1 ly/min = 698 W/m^2 Example: 1.25 ly/min = 873 W/m^2

Langleys per minute (ly/min) to Btu per square foot per minute ($Btu/ft^2/min$)—

1 ly/min = 3.69 $Btu/ft^2/min$ Example: 1.25 ly/min = 4.61 $Btu/ft^2/min$

QUANTITY OF RADIATION PER UNIT AREA, AS IN DAILY TOTAL

Langleys (ly) to watt-hours per square meter (Wh/m^2)—

1 ly = 11.61 Wh/m^2 Example: 540 ly = 6,269 Wh/m^2

Langleys (ly) to Btu per square foot (Btu/ft^2)—

1 ly = 3.69 Btu/ft^2 Example: 540 ly = 1,993 Btu/ft^2

A8.6 Other Measures

WEIGHTS

Ounces (oz) to grams (g)—

1 oz = 28.353 g

Grams (g) to ounces (oz)—

1 g = 0.03527 oz Example: 100 g = 3.53 oz

Pounds (lb) to kilograms (kg)—

1 lb (16 oz) = 0.454 kg

Kilograms (kg) to pounds (lb)—

1 kg = 2.2046 lb

LIQUID VOLUME

Gallons (gal) to liters (L)—

1 gal (4 quarts) = 3.788 L

Liters (L) to gallons (gal)—

1 L = 0.264 gal

DISTANCES

(See section A8.2 for inches, millimeters, and centimeters.)

Feet (ft) to meters (m)—

1 ft = 0.305 m Example: 20 ft = 6.1 m

Meters (m) to feet (ft)—

1 m = 3.28 ft

Miles (mi) to kilometers (km)—

1 mi = 1.609 km

Kilometers (km) to miles (mi)—

1 km = 0.621 mi

AREAS

Acres to hectares (ha)—

1 acre (43,560 ft^2) = 0.405 ha

Hectares (ha) to acres—

1 ha = 2.471 acres

APPENDIX 9. ABBREVIATIONS AND ACRONYMS

AC	Alternating current
AFFIRMS	Administrative Forest Fire Information Retrieval and Management System
AWS	Automatic weather station(s)
BIFC	Boise Interagency Fire Center
BLM	Bureau of Land Management
DC	Direct current; VDC, volts direct current
DCP	Data collection platform
DG	Data General
DRGS	Direct readout ground station
FS	Forest Service
GOES	Geostationary operational environmental satellite
LCD	Liquid crystal display
LED	Light-emitting diode
NCC-FC	National Computer Center at Fort Collins, CO
NCDC	National Climatic Data Center
NESDIS	National Environmental Satellite Data Information Service
NFDRS	National Fire Danger Rating System
NFWDL	National Fire-Weather Data Library
NOAA	National Oceanic and Atmospheric Adminstration
NPS	National Park Service
NWS	National Weather Service
RAWS	Remote automatic weather station(s); P-RAWS, portable RAWS
SCS	Soil Conservation Service
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior

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S

Z

Finklin, Arnold I.; Fischer, William C. 1990. Weather station handbook—an interagency guide for wildland managers. NFES No.1140. Boise, ID: National Wildfire Coordinating Group. 237 p.

A comprehensive guide for the operation of weather stations providing data for wildland resource management. Both manually operated and automatic-type weather stations are included. Especially intended for use by USDI Bureau of Land Management and National Park Service, USDA Forest Service, and similar agencies. Describes instrumental equipment, siting, installation, data collection, and maintenance.

KEYWORDS: weather stations, weather instruments, weather observations, fire-weather, fire management

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