Assessment of the Applicability of the National Fire Weather Data Library to Wind Energy Analyses

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May 1979

**Prepared for
Pacific Northwest Laboratory
Under Agreement B-50369-A-L**

**Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute**

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PACIFIC NORTHWEST LABORATORY
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BATTELLE
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UNITED STATES DEPARTMENT OF ENERGY
Under Contract EY-76-C-06-1830

Printed in the United States of America
Available from
National Technical Information Service
United States Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22151
Price: Printed Copy \$ ____*; Microfiche \$3.00

*Pages	NTIS Selling Price
001-025	\$4.00
026-050	\$4.50
051-075	\$5.25
076-100	\$6.00
101-125	\$6.50
126-150	\$7.25
151-175	\$8.00
176-200	\$9.00
201-225	\$9.25
226-250	\$9.50
251-275	\$10.75
276-300	\$11.00

ASSESSMENT OF THE APPLICABILITY
OF THE NATIONAL FIRE WEATHER DATA LIBRARY TO
WIND ENERGY ANALYSES

Final Report
To
Pacific Northwest Laboratory
Richland, Washington

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May 1979

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EXECUTIVE SUMMARY

One of the objectives of the Wind Characteristics Program Element of the Federal Wind Energy Program is to incorporate all available, pertinent wind data in the assessment of the wind power resource. The National Fire Weather Data Library (NFWDL), maintained by the U.S. Forest Service, contains wind data from over 800 stations located on lands under the jurisdiction of the federal government, e.g., national forests and parks, and Indian reservations. Daily mid-afternoon observations of wind speed and direction, temperature, relative humidity and other information pertinent to estimating forest-fire hazards are contained in the library. These observations, usually at sites far from conventional weather stations, provide valuable information for the assessment of the wind resource in data sparse areas.

In this study, the NFWDL for the Northwest region was used to identify stations with usable data records. These stations were screened and those with adequate wind identified. Summary methods were developed for assessing the wind power potential of these stations, and the geographic distribution of wind energy data based in the NFWDL was determined.

From 755 stations initially screened in the Northwest, 64 stations were identified as having in excess of 70% of all wind observations ≥ 3.5 m/s, which is representative of the lower bound used by wind turbines. Speed frequency distributions, total available wind power (P/A), and the ratio of days with wind speeds in and out of the power-producing range ($3.5 \leq V \leq 26.8$ m/s) were also determined for the 64 stations identified above.

Mountain and ridgetop locations seem best suited for wind power production. Stations located on isolated mountain ranges or ridges seemed favored over stations located in complex mountainous terrain. The southern Idaho area around Twin Falls, the northwest portion of Wyoming and southwestern segment of Montana around Yellowstone National Park, and the mountainous regions of eastern Oregon demonstrated high wind energy production potential during the summer at mid-afternoon. Conclusions must not be drawn, however, that these are the only potentially productive areas in the Northwest. Analysis indicates that coastal as well as mountainous areas throughout the region display high wind energy production capability.

Although the present analysis of the data in the NFWDL has demonstrated the utility of these data in wind resource assessments, the analysis is far from complete. Further analysis of the interaction of wind speed with wind direction and local terrain is necessary to properly interpret station values in a regional assessment. The statistical relationship between a once-daily observation and the long-term mean wind climatology must also receive further attention. Furthermore, the adjustment of wind speeds in mountainous and forested terrain to standard reference heights needs to be more thoroughly investigated.

Listing of States Containing Fire Weather Stations

With No Location Information

OREGON - 2 stations with no location information
 1 station location estimated in Figure 2

WASHINGTON - 1 station with no location information

WYOMING - 1 station with no location information
 1 station location estimated in Figure 2

1.0 INTRODUCTION

The success of the Wind Energy Program of the U. S. Department of Energy is dependent upon selection of sites with wind characteristics favorable for maximizing the wind energy potential. The Wind Characteristics Program Element under the technical and management direction of Pacific Northwest Laboratory (PNL) has four primary objectives:

1. To describe wind and other meteorological and environment characteristics important for use in design, performance evaluation and siting of wind energy conversion systems (WECS);
2. To analyze and present meteorological data for use in preliminary planning of WECS implementation and develop methods for estimating the wind energy potential at selected locations;
3. To develop and demonstrate reliable, efficient and economical techniques for identifying favorable wind energy conversion sites;
4. To describe the day-to-day variability of wind energy in terms of predictability for WECS production.

Earlier studies (Elliot, 1977; Hewson, 1975; Hewson, et al., 1977) have indicated that the Pacific Northwest area (Washington, Idaho, Wyoming, Oregon and Montana) is a promising region for wind power generation. Wind generated energy can easily be integrated into and supplement the existing hydroelectric generation system. A combination wind and hydro energy system could supply a major portion of the Northwest's future electrical needs; however, before this could occur, effective aerogeneration systems must be located in favorable areas for wind.

There are extensive climatic data sources such as:

1. First order stations manned by the U. S. Weather Service
2. Second order stations manned by the military, F.A.A. or the U. S. Weather Service
3. Cooperative stations
4. Stations established by private industry

Most of the stations from the above data sources are located at readily accessible sites or in urban areas. These sites are often not representative of the windiest locations in a particular region. In mountainous regions, the windiest locations are often associated with terrain features which are located more often than not in areas distant from established weather stations.

One source of data that potentially can extend the network of existing wind measurements is the National Fire Weather Data Library maintained by the U. S. Forest Service. This data set initially established for fire managers as input into fire management programs now contains more than 700 stations in the Pacific Northwest monitoring weather statistics at least once daily. Observations are taken in the early afternoon during the fire season (generally May through September). This report summarizes a short study conducted to determine the usefulness of this library for wind characteristics studies. Emphasis was placed on designing methodologies for evaluation of wind data for wind energy studies.

2.0 STUDY OBJECTIVES

The specific scope of work for this effort followed this sequence:

1. Review of the Fire Weather Library for stations with usable records.

2. Development of statistical summaries for selected individual stations.
3. Screen summaries for common windy areas.
4. Develop statistical comparisons of fire weather stations with nonfire weather stations having multiple observations per day.
5. Develop frequency spectra of wind periods above threshold values.
6. Estimate seasonal and geographic distributions of wind energy.

Following discussions with the PNL, efforts for objective four, the comparison of one observation per day to multiple observations for the same station, were deferred until the results from a similar study at Northwestern University were available.

3.0 DESCRIPTION OF DATA SOURCE

The National Fire Weather Data Labrary (NFWDL) is a computer-based collection of historical weather data maintained by the U. S. Forest Service at the Rocky Mountain Forest and Range Experiment Station. Data for this library are accumulated from over 800 stations during the fire season of each year, some stations for the past 15 years. The data collected consist of wind direction and speed, temperature, relative humidity and other information necessary for estimating fire hazard. In January, the data from the previous year are incorporated into each station's data set. The information is stored on several computer tapes sorted by station. Information can be retrieved from the library in stations blocks, individual years or groups of stations. The data is packed onto the magnetic tapes to minimize the size of the library. Routines for unpacking the data into stations blocks or card images are supplied by the U. S. Forest Service.

U.S.D.A.-Forest Service General Technical Report RM-19 (Furman and Brink, 1975), included in Appendix A, is a detailed description of the library and how to use it.

Most of the stations included in the library have only one observation per day. After beginning this study however, it was learned that some of the stations have three observations per day and that some of the station data histories go back to the 1920's. These additional data are now being punched and will be included in the library within a few months. It was also found that several of the stations with only one observation per day listed in the library do, in fact, have hourly observations. Listings of these data are available from the National Climatic Center, Asheville, North Carolina.

4.0 METHOD OF ANALYSIS AND SUMMARY OF RESULTS

The NFWDL contains a tremendous amount of data. In order to efficiently process and analyze this information, computer programming has been employed throughout the study. Several computer programs were written especially for this investigation and are described in detail in the rear appendices. The following section describes the analysis and results in metric units, while the rear appendices use standard English units because the raw data from the library is in English units.

4.1 Geographic Distribution of Data

The fire weather network is generally limited to land areas under the jurisdiction of the federal government. These include national forests, national parks, Indian reservations, BLM lands, etc. While the library does include a large number of stations, the geographical

distribution of the stations is thus biased with large areas of eastern Washington, eastern Idaho and eastern and southern Wyoming having only a few observations (Figure 1). Further, many of the stations have only a few years of record. Some stations have long records but few observations of wind speeds above the 3.5 meters per second (8 mph) threshold value. Locations exist where the maximum wind speed is at night or early morning. The fire weather network data would not identify these locations. The first analysis, therefore, was to identify those stations in the network with a significant fraction of the recorded observations above the threshold wind speed.

Program SUMMARY was written to allow for the quick evaluation of a large number of stations and the selection of a small number of "working" stations for further analysis. Over 700 stations were analyzed for the percentage of wind observations ≥ 3.5 mps (3.5 mps is considered the lowest wind speed able to produce wind power using current generator design (Hewson, 1977)), average wind speed for all observations, minimum and maximum wind speeds and the number of years of observation.

The reduction of the large number of stations to a size that could be handled easily for future analysis was accomplished by locating stations with at least 70% or greater of all observations being ≥ 3.5 mps. Table 1 summarizes the data from the five station region in terms of percentage of wind observations ≥ 3.5 mps. Figure 2 shows the geographical distribution of stations which have at least 70% of midafternoon observations ≥ 3.5 mps, while Figure 3 illustrates the distribution of stations having at least 80% of observations ≥ 3.5 mps. No attempt was made at this point to evaluate any of the stations in terms of period of record. From Figures 2 and 3, it appears that no single geographical

FIGURE 1. Location of Stations in the National Fire Weather Data Library.
(Map prepared by Elliot, Pacific Northwest Laboratory).

Table 1. Percent of Total Observations With Wind Speeds $\geq$ 3.5 mps.
National Fire Weather Station Network.

Location	Total Number Stations Analyzed	Percent of Total Observations $\geq$ 3.5 mps				
		0 - 49%	50 - 59%	60 - 69%	70 - 79%	80 - 100%
OREGON	236	179	17	19	13	8
WASHINGTON	174	136	14	14	7	5
IDAHO	133	100	12	9	9	3
MONTANA	165	118	12	22	9	5
WYOMING	47	18	5	16	3	5
	—	—	—	—	—	—
TOTAL	755	551	60	80	41	26

Figure 2. Fire Weather Stations With at Least 70 Percent of Observations ≥ 3.5 mps.

Figure 3. Fire Weather Stations With at Least 80 Percent of Observations ≥ 3.5 mps.

area is favored for persistent afternoon winds during the summertime. The flowchart and program description of Program SUMMARY are given in Appendix B.

4.2 Wind Speed and Direction Distribution Analysis

Program FREQNCY was developed to display the frequency distribution of wind speed and direction by season for each station. The wind speed distribution significantly affects the production of wind power because gross wind power varies with the cube of the wind speed. Therefore, stations with wind speed distributions skewed towards higher speeds will show dramatically higher wind power. The determination of the wind directions having the most persistent high wind speeds or very high destructive wind speeds can also be derived from this analysis. These data can be especially important in the locating of monitoring towers.

An example of the output of Program FREQNCY is given in Table 2. The program description, flow chart and listing are given in Appendix C. Summary tables for the final working station are also provided in Appendix C.

4.3 Wind Power Analysis

Previous sections of this report have provided the geographical location of fire weather stations that maintain wind speed consistently within the power production range of modern generators. The next step in this analysis was to determine the total wind power available ($\frac{P}{A}$) at these sites.

The $\frac{P}{A}$ available from the wind passing through a unit area normal to the wind is:

$$P = \frac{1}{2} \rho V^3$$

Table 2. Example Output of Program FREQUENCY

WIND SPEED AND DIRECTION FREQUENCY DISTRIBUTION											
STATION NUMBER 400108					TOTAL OBSERVATIONS 456					YEARS 9	
SEASON: SUMMER				WIND DIRECTION							
M.P.S.	N	NE	E	SE	S	SW	W	NW	NO DIR.	TOTAL	PER CENT
W 0.0-3.1	5	0	0	4	50	19	6	3	1	88	24.
T 3.5-4.5	1	0	1	6	46	11	1	5	0	71	19.
N 4.9-6.7	0	1	0	7	57	12	0	3	0	80	22.
D 7.1-9.0	1	0	0	1	56	8	0	2	0	68	18.
9.4-11.2	0	0	0	9	27	1	0	0	0	37	10.
S 11.6-13.4	0	0	0	1	15	0	0	0	0	16	4.
P 13.8-17.9	0	0	0	1	6	0	0	0	0	7	2.
F 18.3-22.4	0	0	0	0	2	0	0	0	0	2	1.
D 22.8-	0	0	0	0	1	0	0	0	0	1	0.
TOTAL	7	1	1	29	260	51	7	13	1	370	
PER CENT	2.	0.	0.	8.	70.	14.	2.	4.	0.		
SEASON: FALL				WIND DIRECTION							
	N	NE	E	SE	S	SW	W	NW	NO DIR.	TOTAL	PER CENT
W 0.0-3.1	1	2	0	1	11	7	1	2	0	25	29.
T 3.5-4.5	1	2	0	0	11	1	1	0	0	16	19.
N 4.9-6.7	1	0	0	0	12	1	0	0	0	14	16.
D 7.1-9.0	2	0	0	0	9	1	0	1	0	13	15.
9.4-11.2	0	0	0	0	8	2	0	0	0	10	12.
S 11.6-13.4	0	0	0	0	3	0	0	1	0	4	5.
P 13.8-17.9	0	0	0	0	3	0	0	0	0	3	3.
F 18.3-22.4	0	0	0	0	0	0	0	0	0	0	0.
D 22.8-	0	0	0	0	1	0	0	0	0	1	1.
TOTAL	5	4	0	1	58	12	2	4	0	86	
PER CENT	6.	5.	0.	1.	67.	14.	2.	5.	0.		
ANNUAL				WIND DIRECTION							
	N	NE	E	SE	S	SW	W	NW	NO DIR.	TOTAL	PER CENT
W 0.0-3.1	6	2	0	5	61	26	7	5	1	113	25.
T 3.5-4.5	2	2	1	6	57	12	2	5	0	87	19.
N 4.9-6.7	1	1	0	7	69	13	0	3	0	94	21.
D 7.1-9.0	3	0	0	1	65	9	0	3	0	81	18.
9.4-11.2	0	0	0	9	35	3	0	0	0	47	10.
S 11.6-13.4	0	0	0	1	18	0	0	1	0	20	4.
P 13.8-17.9	0	0	0	1	9	0	0	0	0	10	2.
F 18.3-22.4	0	0	0	0	2	0	0	0	0	2	0.
D 22.8-	0	0	0	0	2	0	0	0	0	2	0.
TOTAL	12	5	1	30	318	63	9	17	1	456	
PER CENT	3.	1.	0.	7.	70.	14.	2.	4.	0.		

where: P = power in watts/m² (Elliot, 1977)

ρ = the atmospheric density in kg/m³

V = the wind speed in m/s.

Program INFOPA was developed to calculate for all working stations on a monthly and yearly basis from the years 1961 to 1977, the $\frac{P}{A}$ for each wind speed observation falling within the power production range (3.5 mps to 26.8 mps). From visual analysis of program output, those stations that could have been producing power during the same time periods could be determined as well as the quantity of available power. An attempt at locating geographical areas with favorable wind patterns was next performed. This initial output from Program INFOPA provides the opportunity to compare wind power produced at several stations during similar time periods. It also provides for the summation of total wind power available from several stations in different geographic areas. Tables 3 and 4 provide a summary of the site and wind characteristics for all stations with 70% of observations $\geq$ 3.5 mps.

Program INFOPA output also provides a summary table describing the number of days within the power production range, the number of days outside of the power production range, and an average $\frac{P}{A}$ value for each station. Average $\frac{P}{A}$ is valuable in describing stations with a high wind power production potential and in the selection of sites for future monitoring towers.

The ratio of the number of days within to the number of days outside of the power production range (wpa/wopa) is useful in describing the persistence of winds that produce power. If a high wpa/wopa value is combined with a high average $\frac{P}{A}$ value, it would appear to indicate a favorable station for future monitoring. However, output from Program INFOPA

Table 3. Summary of Site Characteristics and Wind Data for Fire Weather Stations with 70 Percent of Observations $\geq$ 3.5 mps.

Station Number	Station Location	Agency	Lat. (Deg.)	Long. (Deg.)	Elev. (m)	Total Observ.	Period of Record	Anemom. Height (m)	Site Loc.	Mean Wind Speed (m/s)	Mean Total Wind Power (w/m ²)
150111	Astoria	7	46.09	121.53	1	577	1970-74	6	4	4.59	95
150711	Hood National Forest	1	45.18	121.44	1204	455	1961-67			4.22	72
150725	Hood National Forest	1	44.54	121.51	1711	120	1975-77	12	1	5.97	243
150807	Hood National Forest	1	45.40	121.52	48	1067	1969-77	7	2	4.71	123
150902	Hood National Forest	1	45.09	121.43	1158	1259	1965-77	12	1	5.42	153
152014	Willamette National Forest	1	44.30	122.50	877	355	1970-74	7	2	4.32	74
152203	Ochoco National Forest	1	44.50	120.20	2077	865	1961-69			4.72	85
152421	Deschutes National Forest	1	44.92	119.67	1441	194	1971-77	10	1	4.76	134
152408	Whitman National Forest	1	45.10	117.10	2282	799	1964-77	23	1	5.60	188
152409	Whitman National Forest	1	44.90	117.30	1506	310	1964-68		1	7.19	451
152509	Willamette National Forest	1	43.70	122.50	1099	355	1961-68		1	6.66	228
152516	Eugene	7	44.07	123.13	108	115	1972-74	7	6	4.49	100
152611	Deschutes National Forest	8	44.30	121.15	917	1859	1960-72	1	6	4.52	103
152812	North Bend	8	43.40	124.25	4	382	1972-77	7	4	6.31	246
153005	Umpqua National Forest	1	43.24	122.10	1955	694	1960-69		1	5.09	135
153016	Umpqua National Forest	1	42.57	122.51	1004	1121	1964-77	12	1	4.77	63
153401	Fremont National Forest	1	42.07	120.43	2114	1726	1961-77	7	1	5.79	224
153506	Bathurst County	1	43.80	118.90	2035	581	1961-69		1	5.78	196
153512	Harney County	1	43.15	119.53	1640	342	1971-77	7	1	6.85	414
153602	Bathurst County	1	43.18	117.56	1755	731	1969-77		1	6.17	324
156071						200	1970-71			6.82	244
157062						1533	1960-71			4.53	95
158507						133	1970-71			5.42	193
240102	Kootenai National Forest	1	48.51	115.55	1992	347	1967-72	7	1	5.14	194
240805	Phillips County	1	48.48	107.50	900	447	1970-72	6	6	5.00	196
241208	KawKaw National Forest	1	48.06	115.55	1879	616	1961-72	7	1	5.55	262
241801	Levens and Clark National Forest	1	47.40	112.51	2465	596	1962-73	3	1	5.96	237
241905	Bellevue National Forest	1	47.06	112.31	2316	693	1961-73	10	1	7.41	436
242101	Levens and Clark National Forest	1	46.42	110.16	2527	261	1961-65		1	6.14	314
242201	Levens and Clark National Forest	1	47.04	109.28	1263	297	1961-65		2	5.60	214
243001	Beer Lodge National Forest	1	46.11	111.37	2621	354	1960-67		1	4.62	101
243103	Flathead National Forest	1	47.24	111.10	2516	657	1961-72	7	1	6.69	508
243402	Levens and Clark National Forest	1	46.51	110.42	2528	1000	1962-77	15	1	5.04	140
244101	Helena City, Montana	1	46.23	105.50	801	1407	1966-77	10	1	5.69	227
244606	Gallatin National Forest	1	44.45	111.11	2157	263	1965-68	20	1	7.74	529

Table 3. Continued

Station Number	Station Location	Agency	Lat. (Deg.)	Long. (Deg.)	Elev. (m)	Total Obser.	Period of Record	Anemom. Height (m)	Site Loc.	Mean Wind Speed (m/s)	Mean Total Wind Power (w/m^2)
244605	Helena National Forest	1	45.80	111.16	2814	114	1965-68			6.37	270
244701	Gallatin National Forest	1	45.60	110.14	1008	242	1965-68	5	1	6.74	218
480104	Yellowstone (Mt. Holmes) Nat'l. Park	9	44.82	110.87	3150	601	1974-77	15	1	8.12	524
480106	Yellowstone National Park	9	44.80	110.43	3122	369				8.16	
480108	Yellowstone National Park	9	44.65	110.20	2919	456	1969-77			6.05	301
481405	Shoshone National Forest	1	41.70	109.42	2804	258	1969-77	15	2	5.01	145
481407	Shoshone (Cody, Wyo.) National Forest	1	42.52	108.75	2506	329	1974-77	5	2	6.36	231
481599	Casper (Casper Mountain)	3				610		7	3	5.69	191
481901	Rock Springs	3				191	1976-77	11	1	5.65	225
482006	Rawlins	3	41.78	107.25	2067	1154	1965-77	6	3	6.27	208
100707	Clearwater National Forest	1	46.20	115.30	1850	782	1960-70			4.51	107
101015	Nez Perce National Forest	1	46.60	114.40	2010	280	1963-69			4.80	174
101213	Boise National Forest	1	44.20	115.40	2065	671	1964-71	7	1	4.32	87
101216	Boise National Forest	1	44.20	116.10	2464	896	1964-74	7	1	4.57	110
101308	Salmon National Forest	1	44.58	114.19	2775	675	1966-74	10	1	5.06	160
102705	Boise National Forest	1	43.20	115.20	1470	2010	1964-77	7	1	3.86	57
102801	Sawtooth National Forest	1	43.30	115.00	2969	582	1964-74	7	1	5.22	353
101201	Owyhee County, ID-South Htn. Loc.	1	42.40	116.20	2392	1058	1965-77	7	1	5.65	292
101501	Lincoln Cnty, ID-Rotch Butte Loc.	3	42.50	114.20	1297	1702	1965-77	7	1	6.96	423
101601	Hidaka Cnty, ID-Klana Butte Loc.	3	42.40	111.50	1524	819	1965-77	7	1	7.41	464
101801	Bannock Ranger Station, Bannock Cnty.	3	42.40	112.20	1567	1677	1965-77	7	2	5.03	142
101802	Bannock County-Chukis Park Location	3	42.50	112.20	2069	917	1964-72	7	1	6.24	272
450120	Clallam Airport	7	48.00	124.50	54	811	1972-77	7	3	4.19	70
450314	Grays Harbor	8	47.00	121.90	4	820	1972-77	5	4	5.17	118
450406	Pacific County, WA-Chinook	5	46.30	123.90	9	547	1975-77	7	4	5.14	112
451302	Pinchot National Forest	1	46.60	121.90	1618	541	1962-68			4.39	92
451411	Bellingham	8	48.80	122.50	48	812	1972-77	7	4	4.81	112
451607	Baker-Snoqual National Forest	1	47.80	121.50	548	215	1962-68			4.08	72
451711	Baker-Snoqual National Forest	1	47.30	121.30	1207	705	1972-77	7	2	4.68	102
451717	Baker-Snoqual National Forest	1	47.40	121.70	711	389	1974-77	15	2	5.00	137
451915	Pinchot National Forest	1	46.02	121.59	1046	127	1967-68			4.32	
452120	Wenatchee National Forest	1	47.70	120.40	947	266	1965-68	12	2	5.96	251
452307	Yakima Indian Reservation	9	46.20	121.10	1222	868	1970-77	30	1	5.04	151
458009						1204	1960-71			4.87	93

Table 4. Wind Speed Distributions for Fire Weather Stations With 70 Percent of Observations $\geq$ 3.5 mps. (Wind Speeds are meters per second.).

Station Number	% Wind Speeds 0-3.1	% Wind Speeds 3.5-4.5	% Wind Speeds 4.9-6.7	% Wind Speeds 7.1-9.0	% Wind Speeds 9.4-11.2	% Wind Speeds 11.6-13.5	% Wind Speeds 13.8-17.9	% Wind Speeds 18.3-22.4	% Wind Speeds $\geq$ 22.8	Years of Observation
350111	21	38	14	7	1	0	0	0	0	5
350711	25	17	34	4	0	0	0	0	0	7
350725	19	26	26	13	10	3	2	0	0	3
350807	20	31	40	9	1	0	0	0	0	8
350902	17	24	38	15	4	1	1	0	0	13
352014	21	38	38	3	0	0	0	0	0	3
352203	20	39	29	8	2	1	0	0	0	9
352323	27	26	35	9	3	2	0	0	0	5
352408	21	20	30	20	7	3	0	0	0	13
352409	15	12	28	16	13	9	5	1	0	5
352509	10	6	35	19	10	1	0	0	0	6
352536	28	30	33	8	1	0	0	0	0	3
352611	27	28	36	8	1	0	0	0	0	13
352812	10	19	32	30	8	1	1	0	0	4
353005	24	20	30	20	3	0	0	0	0	10
353016	21	39	38	1	0	0	0	0	0	13
353403	21	21	27	18	8	4	2	0	0	17
353506	18	20	33	17	8	3	3	0	0	8
353512	16	20	21	20	9	8	4	1	1	8
353602	18	22	25	17	6	7	4	0	0	5
356071	6	18	32	30	12	4	0	0	0	2
357062	27	28	36	9	1	0	0	0	0	10
358507	28	14	26	23	9	0	0	0	1	2
240102	24	27	27	14	5	2	0	0	0	5
240805	29	19	30	13	8	1	0	0	0	3
241208	25	22	26	17	5	4	1	0	0	11
241801	21	19	28	18	10	2	2	0	0	11
241905	17	11	28	24	10	7	6	1	0	12
242101	23	15	24	22	10	3	4	0	0	5
242201	24	14	29	22	9	1	1	0	0	3
243001	28	28	30	11	3	0	0	0	0	7
243103	26	14	18	14	12	7	7	2	0	9
243402	23	28	30	12	4	1	0	0	0	15
244101	18	25	30	18	5	4	1	0	0	10
244604	17	3	21	18	18	10	6	2	0	3

Table 4. Continued

Station Number	Σ Wind Speeds 0-3.1	Σ Wind Speeds 3.5-4.5	Σ Wind Speeds 4.9-6.7	Σ Wind Speeds 7.1-9.0	Σ Wind Speeds 9.4-11.2	Σ Wind Speeds 11.6-13.4	Σ Wind Speeds 13.8-17.9	Σ Wind Speeds 18.3-22.4	Σ Wind Speeds ≥22.8	Years of Observation
244605	19	16	25	25	10	4	2	0	0	2
244703	10	19	27	25	13	4	1	0	0	3
480104	14	11	19	19	16	8	9	2	1	3
480106										4
480108	25	19	21	18	10	4	2	0	0	8
481405	26	23	27	17	5	1	0	0	0	2
481407	16	18	34	20	7	3	2	0	0	4
481599	19	20	29	22	8	1	0	0	0	3
481901	24	19	24	18	13	1	1	0	0	2
482006	14	16	33	25	9	3	1	0	0	7
100707	27	31	31	8	2	1	0	0	0	10
101015	30	33	18	12	5	2	1	0	0	5
101213	30	33	28	7	1	0	0	0	0	7
101216	29	26	32	11	2	1	0	0	0	10
101303	27	24	28	14	6	1	1	0	0	8
102705	29	48	22	1	0	0	0	0	0	13
102801	25	23	30	14	7	2	0	0	0	7
103201	10	16	25	28	11	6	3	0	0	11
103401	15	17	24	25	7	6	5	1	0	11
103601	13	15	24	22	11	7	5	1	0	9
103801	24	28	30	12	4	1	0	0	0	11
103802	15	32	18	24	4	6	1	0	0	8
450120	25	43	30	2	0	0	0	0	0	6
450314	13	23	51	12	1	0	0	0	0	6
450406	12	31	43	4	1	0	0	0	0	3
451102	28	34	32	4	1	0	0	0	0	6
451411	20	30	37	12	1	0	0	0	0	6
451607	29	34	33	4	0	0	0	0	0	5
451711	25	29	34	12	1	0	0	0	0	6
451717	23	26	35	12	1	1	0	0	0	4
451915										1
452120	17	24	27	19	9	3	2	0	0	2
452307	27	29	23	13	4	1	2	0	0	7
458009	17	28	44	10	0	0	0	0	0	10

should be viewed with some caution because correction for anemometer height was not attempted here.

The program description, flow charts and listings for INFOPA are given in Appendix D, together with the output of the midafternoon $\frac{P}{A}$ values for the final working stations. Table 5 summarizes the wind power statistics for the top 20 stations in terms of average wind power at midafternoon. This table indicates that large variations in wind power exist and that high wind power recordings are not concentrated into one area or state.

It was originally hoped that probability estimates could be determined for station B being in operation when winds at station A were below threshold, station C when neither station A or B, etc. From the output of Program INFOPA it appears that because of the exceedingly large number of missing observations, such an analysis would not be possible.

4.4 Regional and Topographic Analysis

Responsible officials in the national forests, parks, etc. in which the top 20 stations are found were contacted to secure information on the station topography, anemometer height, anemometer location and any other site or recording factors that would affect a station's wind speed frequency distribution. In a number of cases, the fire weather station had been discontinued and all of the prementioned information lost. Table 3 shows that anemometer height and location were not available for many stations. However, the majority of stations are currently in use or have topographic information available. Because of time constraints, correlation analysis of $\frac{P}{A}$ values with major site topographic features was not possible. It is hoped that at a future date these analyses will be performed.

Table 5. Summary of Wind Power Statistics for the Top 20 Stations in Terms of Average Wind Power at Mid-Afternoon.

Station Number	P A Average	Days With/ Days Without	Station Location	Station Elevation (meters)	Degrees Latitude	Degrees Longitude	State
244604	529	218/45 (4.8)	1	2157	44.45	111.13	MT
480104	524	512/79 (6.5)	1	3150	44.82	110.87	WY
243103	508	337/120 (2.8)	1	2516	47.24	113.10	MT
103601	464	688/100 (6.9)	1	1524	42.40	113.50	ID
352409	451	272/33 (8.2)	1	1506	44.90	117.30	OR
241905	436	610/83 (7.4)	1	2316	47.06	112.31	MT
103401	423	1270/215 (5.9)	1	1292	42.50	114.20	ID
353512	414	285/56 (5.1)	1	1440	43.15	119.53	OR
102801	353	629/69 (9.1)	1	2969	43.30	115.00	ID
353602	324	166/39 (4.3)	1	1755	43.38	117.54	OR
242101	314	200/61 (3.3)	1	2527	46.42	110.16	MT
480108	301	343/113 (3.0)	-	2919	44.65	110.20	WY
103201	292	765/277 (2.7)	1	2392	42.40	116.20	ID
103802	272	706/126 (5.6)	1	2069	42.50	112.20	ID
244605	270	92/22 (4.2)	1	2157	45.80	111.16	MT
241208	262	462/154 (3.0)	1	1879	48.06	115.55	MT
452120	251	205/41 (5.0)	2	947	47.70	120.40	WA
352812	246	295/29 (10.2)	4	4	43.40	124.25	OR
356073	244	171/9 (19.0)	-	-	-	-	OR
350725	243	233/55 (4.2)	1	1711	44.54	121.51	OR

The results of Program INFOPA were next plotted onto a shaded relief map of the Pacific Northwest to illustrate the geographical distribution of wind power. Figures 4, 5, 6, 7 and 8 show the location of stations with $\frac{P}{A}$ values of 100 to 199, 200 to 299, 300 to 399, 400 to 499, and $\frac{P}{A}$ values greater than 500, respectively. From these figures it appears that intermountain regions were favored over coastal locations. The rank order for the top 20 $\frac{P}{A}$ stations and their locations are shown in Figure 9. This geographical analysis indicates that there is no one specific area producing significantly higher wind power. But several general areas of high wind power do appear. The southern Idaho area around Twin Falls, the high elevation areas surrounding Yellowstone National Park in Montana and Wyoming, and the arid mountainous region of eastern Oregon all demonstrated high wind energy production potential associated with complex terrain (see Figure 10).

Table 5 shows that the top 20 average $\frac{P}{A}$ stations are all located on mountain or ridge tops, except for a mountain valley and a coastal location. Sixteen of the 20 stations are lookout towers. Figure 9 is a map showing the locations of the top 20 stations in rank order. Thirteen of the 18 mountain top stations are located on relatively isolated mountain ranges or ridges, while the remaining five mountain top stations are located in complex mountain terrain. High elevation also appears to play a major role in the production of favorable wind patterns because only two stations, 352812 and 452120, are located at elevations below 1,000 meters.

Table 3 shows that the anemometer heights varied from six to 30 meters above the ground. If the wind speeds for the top 20 stations were adjusted to the same height by some power law function, the rank

Figure 4. Fire Weather Stations With P/A of 100 to 199

Figure 5. Fire Weather Stations With P/A of 200 to 299

Figure 6. Fire Weather Stations With P/A of 300 to 399

Figure 7. Fire Weather Stations With P/A of 400 to 499

Figure 8. Fire Weather Stations With $P/A > 500$

Figure 9. Locations of the Top 20 Stations in Rank Order.
(Information unavailable on location of Station 19.)

FIGURE 10. Location of Top 19 Stations.

order would change considerably (for example, station 1 (#244604) would drop to rank order 12, station 2 becomes rank order 7, station 3 becomes rank order 1, etc.). This type of adjustment would not be proper, however, since anemometer height above the ground for many forest sites would not be the same as above the surface. A station at 15 meters for example, may in reality only be seven meters above the forest canopy.

Summarizing the results of this section, it appears that mountain and ridgetop locations are best suited for wind power production. Stations located on isolated mountain ranges or ridges seemed favored over stations located in complex mountainous terrain. Only three geographic areas seemed to show any consistently high wind power production. The southern Idaho area around Twin Falls, the northwest portion of Wyoming and southwestern segment of Montana around Yellowstone National Park, and the mountainous regions of eastern Oregon demonstrated high wind energy production potential during the summertime at midafternoon. Conclusions must not be drawn, however, that these are the only potentially productive areas in the northwest region. Analysis indicates that coastal as well as mountainous areas throughout the region display high wind energy production capability.

5.0 CONCLUSIONS

While the National Fire Weather Library has a number of deficiencies which limit its usefulness for wind characteristic analysis, the above evaluations do provide a considerable insight into the geography, elevation and topographical parameters influencing midafternoon wind speeds in the northwestern United States. The remote mountainous and forested

areas of this region show considerable potential for the generation of electrical power from afternoon winds during the summer months. High elevation mountain and ridgetops throughout the region showed the highest wind power potential.

The programs developed for this study employed once-day weather observations, however, these programs are directly applicable to the evaluation of data from stations having hourly observations.

Included within this report is a description of methodologies for the evaluation of sites for wind power from the National Fire Weather Library. Also contained is a listing of fire weather stations showing very high wind energy production potential in the northwestern portion of the United States.

6.0 SUGGESTIONS FOR FUTURE ANALYSES

The analysis to date has compiled and computed a great deal of data. Future analyses should look more closely at the interaction, the interrelation, and the relative importance of each type of data compiled or computed.

Of the 69 stations listed in Table 3, only six have hourly data available. One of these six stations is included in the top 20 $\frac{P}{A}$ list and only one other is located on a ridge.

It is necessary, therefore, to investigate other sources of wind data to evaluate fully the applicability of the Fire Weather Stations' single value of wind speed to average daily wind speed and to the wind power analysis for a single station.

Many of the stations in the library have few observations but high power availability averages. Whether this type of record is an anomaly or the average for a given station should be investigated further.

Many of the station records cover only a few years. The data may only show an anomaly for a station rather than the average conditions. Observations were taken, for the most part, during the summer months. Wind characteristics for the entire year at a station are necessary to fully evaluate its potential for wind power production. The data taken from snow avalanche weather stations may partially fill in the gap.

The optimum wind speeds for wind power production are generally between 4.5 m/s (10 mph) and 27 m/s (60 mph) (Hewson, 1977). Many aerogenerators reach a maximum power output at a particular wind speed, called the rated speed, and the power production is not increased with increasing wind speed. Thus, the percentage of wind speed observations above 4.5 m/s (10 mph) is important but the percentage of wind speed above the rated and cut-out speeds for a particular aerogenerator is also critical. Indepth analysis of the effects that different wind speed distributions have on wind power is needed in the future to more adequately evaluate the potential of a station.

The role that topography plays in potential wind power production should be more extensively investigated. Topography can affect production in several ways:

1. Daily wind speed flow patterns often vary between mountaintop, foothill and valley areas. Under certain conditions heated air from low elevation areas rises creating local afternoon winds in mountainous regions. While during the evening, winds can shift directions due to cool mountain air sinking into lower

elevations. Therefore, topography can affect the time of day when maximum and minimum wind occur.

2. Channeling may occur in several mountain valleys because of topographic features.
3. Topographic features may produce blocks or deflections of the winds from a particular station.

No analysis was performed on the effect of wind direction on a station's wind power potential. This can be important in evaluating power potential from valley stations where channeling may occur.

Table 5 indicates the ratio of days with power available to days without power available for the top 20 stations. Further analysis should attempt to interrelate this ratio with the average power available and the number and yearly distribution of observations from a particular station. For example, which station has better potential: station 356073, rank number 19, with an average $\frac{P}{A}$ of 244, with a ratio of 19.0, but only 180 observations; or station 480108, rank number 12, with an average $\frac{P}{A}$ of 301 and a ratio of 3.0, but with 456 observations? This question should be further analyzed.

Anemometer heights are given in Table 3. Because wind speed increases with height, the possibility exists that a particular station's $\frac{P}{A}$ may be increased or decreased with the raising or lowering of the anemometer. Further investigation of anemometer locations and site characteristics are needed.

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APPENDIX A

THE NATIONAL FIRE WEATHER DATA LIBRARY:
What It Is and How to Use It

The National Fire Weather Data Library:

What It Is and How to Use It

R. William Furman and Glen E. Brink

USDA Forest Service
General Technical Report RM-19
December 1975
Rocky Mountain Forest and
Range Experiment Station
Forest Service
U.S. Department of Agriculture
Fort Collins, Colorado 80521

Abstract

Furman, R. William, and Glen E. Brink.

1975. The national fire weather data library: What it is and how to use it.
USDA For. Serv. Gen. Tech. Rep. RM-19, 8 p. Rocky Mt. For. and
Range Exp. Stn., Fort Collins, Colo. 80521.

The National Fire Weather Data Library is a collection of daily weather observations from fire weather stations across the Nation. Current data are accumulated on collection tapes, then merged onto library tapes annually. Example run streams are given for using the library on the UNIVAC 1108 computer at the Fort Collins Computer Center.

Keyword: Fire weather

The National Fire Weather Data Library: What It Is and How to Use It

R. William Furman and Glen E. Brink¹

What Is It?

The National Fire Weather Data Library is a collection of computerized historical weather data. The Library was conceived and assembled by the Forest and Mountain Meteorology Staff at the Rocky Mountain Forest and Range Experiment Station. A user-oriented version of the Library is maintained on the USDA UNIVAC 1108 at the Fort Collins, Colorado Computer Center (FCCC), by the National Fire Danger Rating Staff, Northern Forest Fire Laboratory, Missoula, Montana. The Library consists of daily weather observations, usually taken during the fire season, at sites maintained across the entire Nation by fire management agencies for use in their fire suppression planning.

The main source of current data is the fire danger rating program AFFIRMS (Administrative and Forest Fire Information Retrieval and Management System), (Furman and Helfman 1973, Helfman et al. 1975). For some fire weather stations, the length of record exceeds 15 years. The data are from active and inactive fire danger stations.

This pool of weather data is a valuable source of information on the climatology and meteorology of our forested and mountainous regions. It is available to all agencies who have access to the computer at the FCCC. For agencies that do not have access to FCCC, requests for data can be made directly to the authors.

What Is It For?

Data were initially collected by fire managers for input into fire management decisionmaking, because the National Weather Service observing stations were not located where they could monitor weather conditions meaningful to fire danger problems in forested areas. Federal agencies concerned with resource fire protection established their own network of weather observation stations in locations where the fire danger could be more accurately monitored. This fire danger network has grown to more than 800 stations monitoring weather once daily. The observations are taken

during the early afternoon when fire danger is usually the worst. In addition to planning for fire suppression activities, the data have become useful for other planning efforts such as slash disposal, prescribed fire, and environmental impact evaluation.

There is also an important need for a good data base in support of forest meteorology research. The fire danger observations are a source of weather and climate information not available elsewhere. The importance of a forest and mountain climate data base is destined to increase as the management of our natural resources comes under closer public scrutiny.

It is therefore important to have a system designed to facilitate the cataloging and retrieval of the vast quantities of weather data being gathered from all parts of the Nation. The Fire Weather Data Library is such a system.

How Does It Work?

The Fire Weather Data Library was designed to facilitate the cataloging and retrieval of the large quantities of data for research being conducted at the Rocky Mountain Forest and Range Experiment Station in forest and mountain meteorology. The primary source of current data is a tape prepared by AFFIRMS from information gathered via a time-share computer system from participating agencies across the Nation. Each participating unit relays weather information via computer terminal to AFFIRMS where fire danger indexes are computed, and the weather information is stored for future retrieval. Historic data for years past, obtained from a number of sources in many different formats, are included in the Library.

The Library system has two main parts, the 'collection' tape and the 'library' tapes. The collection tape is updated weekly. As data are received at the Rocky Mountain Station from AFFIRMS, or as new historic data are received from other sources, they are sorted and merged onto the collection tape. These data are available for anyone having a need of current-year data. In January of each year the collection tape is merged onto the library tapes and a new collection tape is started. The library tape is the repository for all but the current year's data and

¹Authors are Meteorologist and Computer Programmer, respectively, Rocky Mountain Forest and Range Experiment Station, with central headquarters maintained at Fort Collins, in cooperation with Colorado State University.

Table 1. FIRE WEATHER DATA - CARD EDITING AS OF NOVEMBER 1, 1975

Item	Column	Minimum Value	Maximum Value	Error	Action taken with notification ¹
Station Number	1-6	1	509999	Outside range of permissible values	Card rejected
Year	7-8	0	99	Blank field	Card rejected
Month	9-10	1	12	Outside range of permissible values	Card rejected
Day	11-12	1	31	Outside range of permissible values	Card rejected
State of weather	13	0	9		None
Dry-bulb temp.	14-16	-99	136	Outside range of permissible values or blank field	Card rejected
Humid. variable	17-19			Outside range of permissible values or blank field	Card rejected
Wet-bulb (col. 61=1)		-99	Dry-bulb		
Rel. humid. (col. 61=2)		0	100		
Dewpoint (col. 61=3)		-99	Dry-bulb		
1-Hr. TLFM (Time Lag Fuel Moisture)	20-22				Unconditionally converted to blanks
Herb. veg. condition	23-24	0	99 ²	Outside range of permissible values	Converted to blanks
Man-caused risk	25-27	0	100	Outside range of permissible values	Converted to blanks
Wind direction	28	0	8	Outside range of permissible values	Converted to a blank
Wind speed	29-31	0	99	Outside range of permissible values	Converted to blanks
Woody veg. condition	32	5	9	Value other than 5, 7, or 9	Converted to blanks
10-Hr. TLFM	33-35	0	99	Value of -25 Value of -1 through -24 Outside range of permissible values	Converted to 225 (without notification) Converted to 001 through 024 Converted to blanks
100-Hr. TLFM	36-38				Unconditionally converted to blanks
24-Hr. max. temp.	39-41	Dry-bulb ³	136	Max.=min.=100 Outside range of permissible values	Both fields converted to blanks Converted to blanks
24-Hr. min. temp.	42-44	-99	Dry-bulb ³	Outside range of permissible values	Converted to blanks
24-Hr. max. rel. humid.	45-47	1	100	Max.=min.=100 Outside range of permissible values	Both fields converted to blanks Converted to blanks
24-Hr. min. rel. humid.	48-50	1	100	Outside range of permissible values Min.> max.	Converted to blanks Both fields converted to blanks
Precip. kind	51	0	9		None
Precip. duration	52-53	0	24	Negative value >24	Converted to its absolute value Converted to a blank
Precip. amount	54-57	0	999	Col. 54=T Outside range of permissible values	Col. 55-57 converted to zeros Converted to blanks
Lightning activity level	58-60	1	5	Outside range of permissible values	Converted to blanks
Humid. variable indicator	61	1	3	Value other than 1, 2, or 3	Card rejected

¹Notification consists of printing the offending field along with a message stating the action taken.

²Some historic data contained codes -1, -2 and -3, which were retained during the edit, but all new entries must be within the specified limits.

³Due to slight differences in instruments, a variance of 5° from dry-bulb temperature for the limits on daily extreme temperatures is allowed.

NOTES.--Valid characters are the digits 0 through 9; - is allowed in certain fields; T is allowed in column 54. Invalid characters cause the field to be converted to blanks, with notification. Leading and embedded blanks are converted to zeros without notification. Unless otherwise specified, fields that are entirely blank remain unchanged.

newly acquired historical data. The data in the library are stored on several computer tapes in a sorted order by station number, then by date. Hence fire weather data are available to users from both the library and collection tapes, which contain all data of record and are current to within a month.

Forecasts (saved by request of the user) received from AFFIRMS are stored on a separate 'forecast' tape. Forecasts are collected for an entire year and then are sent to USFS regional data processing centers. No library of forecast data is maintained. At any time during the year, however, data on the forecast tape are available to users in exactly the same manner as data on the collection tape.

Retrieval of information stored on the library, collection, and forecast tapes is facilitated by a collection of routines called GETDATA available to all users on demand. These routines perform the functions of finding the information requested by the user, and transferring it to some storage device (tape, disk, or cards). These routines can retrieve large or small blocks of information such as all records for a given State, or a year's data for an individual station.

Data arriving at the Rocky Mountain Station are first screened and edited according to the criteria listed in table 1. In instances when a data record is rejected an effort is made to salvage it. Usual procedure is to send a list of the rejected data to the

originating agency and ask for corrections from the source documents. The corrected data records may then be returned to the Rocky Mountain Station and checked again. Checked data are sorted by station number and date, and merged onto the appropriate collection or forecast tape. At this time, data are checked for duplicate station-date entries. If duplicates occur in the incoming data only, the last of the duplicate records encountered will be saved and merged. If a duplicate station-date is found on the collection tape, the new record will replace the existing record. In both situations, messages are printed to inform the library manager of the action taken.

At the end of the calendar year, the collection tape is merged onto the library tapes. As with the collection tape, new or incoming records will replace existing records where duplications in station-dates are encountered. Erroneous data can be corrected in this manner. At this time, the lag in the recording of lightning activity level (Deeming et al. 1972) is removed, so that the lightning activity level applies to the date of the record, not the previous day. Otherwise the data are not altered.

As the volume of stored data increases, more tapes must be used and the redistribution of data over the old and new library tapes must be recognized. Hence, a short cross reference of station-years and file names is available, and should be accessed at least once a

year (around January 31) to verify the location of a particular State or station (an example follows in a later section).

How Can It Be Used?

A major effort has been made to construct a *useful* data retrieval system. Access to the Fire Weather Data Library is therefore provided by a series of routines entitled GETDATA. In the discussion that follows, we will be concerned with retrieval of data from the library stored on the U.S. Department of Agriculture UNIVAC 1108 computer at the FCCC. This library is actually a duplicate of the one maintained for research purposes on the Colorado State University CDC 6400 computer, thus assuring a modest level of protection against data loss.

The program file FIREDATALIB*PROGRAMS at FCCC contains the software to obtain the following kinds of information from the data library;

- I. A listing of file names and station-year limits.
- II. An inventory of the data on any given data tape.
- III. A file of selected data for analyses.
- IV. A list of card images.

Sample run streams with explanations follow.

I. Obtaining File Names

The following run will print a short table, including the station-year limits for each reel. Those limits are of the form SSSSSYY (SSSSS = station number, YY = year) and may represent an allowable range of data as opposed to an actual station-year appear-

ing in the library.

1. Obtain exclusive use of the program file.
2. Execute the absolute element which will produce the table.
3. Terminate the run.

```

1. @ASG,AX FIREDATALIB*PROGRAMS.
2. @XQT FIREDATALIB*PROGRAMS.LISTFILES
3. @FIN

```

FILE	STATION-YEAR LIMITS FROM	THROUGH	DATE OF LAST UPDATE
FIREDATALIB*00-04	00000000	04079999	062475
FIREDATALIB*04A	04080000	04510599	062475
FIREDATALIB*04E	04510600	04999999	070175
FIREDATALIB*05-09	05000000	09999999	061975
FIREDATALIB*10-20	10000000	20999999	062175
FIREDATALIB*21-26	21000000	26999999	062075
FIREDATALIB*27-41	27000000	41999999	062575
FIREDATALIB*42-47	42000000	47999999	070375
FIREDATALIB*48-50	48000000	50999999	070375
FIREDATALIB*NEWYR	00000000	99999999	101075
FIREDATALIB*FRGST	00000000	99999999	101075

NOTE - THE TIME LAG IN THE RECORDING OF THE LIGHTNING ACTIVITY LEVEL HAS BEEN REMOVED FROM THE DATA IN THE REGULAR LIBRARY, BUT IS STILL PRESENT IN THE NEW DATA BEING COLLECTED (NEWDAT). IT WILL BE REMOVED WHEN THAT DATA IS MERGED INTO THE REGULAR LIBRARY.

II. Obtaining a New Inventory

The cross-reference table produced in part I supplies the date of the last update to each tape. When desired, a new inventory may be printed by the following:

Note: The user who is familiar with the UNIVAC EXEC 8 features may wish to use list processors other than the EDITOR; or it may be desirable to use commands within the EDITOR other than PRINT! to obtain only certain portions of the inventory. The PRINT command will produce an average of 6 pages of inventory information.

1. Obtain exclusive use of the program file.
2. Enter the editor in READ mode. The element name must be supplied and it begins with INV followed by the file name.
3. Editor lists the entire element and displays the following:
 - a. station number
 - b. total number of records (a record represents one day's data)
 - c. years represented in the records
 - d. number of records for each year
4. Exit from editor.
5. Terminate the run.

1.	@ASG, AX FIRE DATA LIB*PROGRAMS.						
2.	@ED, 2 FIRE DATA LIB*PROGRAMS. INV00-04						
3.	PRINT!						
4.	EXIT						
5.	@FIN						

INVENTORY OF FIRE WEATHER DATA TAPE 00-04 AS OF 06/24/75
PAGE 1 STATION-YEAR LIMITS 00000000 THROUGH 04079999

STATION	TOT REC	YR (N REC) . . .
000111	547	70 (201), 71 (176), 72 (170),
000486	1489	64 (152), 65 (122), 66 (142), 67 (184), 68 (173),
		69 (184), 70 (174), 71 (181), 73 (177),
000582	1579	64 (184), 66 (173), 67 (184), 68 (184), 69 (183),
		70 (184), 71 (183), 72 (166), 73 (138),
000583	1723	64 (170), 65 (184), 66 (184), 67 (184), 68 (184),
		69 (184), 70 (174), 71 (179), 72 (111), 73 (169),
000961	243	73 (92), 74 (151),
001115	629	70 (188), 71 (183), 72 (182), 73 (76),
002201	30	66 (30),
003040	10	66 (10),
003201	198	73 (75), 74 (123),
009002	243	73 (92), 74 (151),
010701	2191	65 (365), 66 (365), 67 (365), 68 (366), 69 (365),
		70 (365),
012701	2191	65 (365), 66 (365), 67 (365), 68 (366), 69 (365),
		70 (365),
015902	1733	65 (279), 66 (364), 67 (364), 68 (366), 69 (360),
020101	914	65 (107), 66 (107), 67 (151), 69 (106), 70 (138),
		71 (153), 72 (152),

⋮

III. Obtaining Data for Analysis

The data may be obtained as card images² or in the station-year blocking format. The card image format is simplest to use since the resulting file may be read by the normal formatted READ or it may be "added" to the input stream by the use of the @ADD,E command. One possible use of the second format, the station-year blocks, is to create a library tape for a particular area that crosses State boundaries. An example would be the Yellowstone area: Data from Wyoming, Idaho, and Montana may well be on three separate reels; by creating a tape containing only selected data, the user could still have the benefits of rapid access to any part of the data without accessing two or three tapes.

A. Data Card Format

col	contents
3-10	First Station-year
13-20	Last Station-year
25	Blank for card images; 1 for station-year blocks.

Sample data:

1.	0 4 0 3	0 7 7 4			
2.	0 4 5 1	0 5 6 1	0 4 5	1 0 5 7 0	
3.	0 4 5 6	1 1 0 0	0 4 5 6	1 1 9 9	
4.	0 5 0 1	0 1 0 0	0 5 6 0	0 2 9 9	1

1. Obtain card images for 1974 for 04030/.
2. Obtain card images for 1961 through 1970 for 045105.
3. Obtain card images for all years for 045611.
4. Obtain station-year blocks for all years, and for all stations in State 05. (Note that leading zeroes must be entered.)

Note: It will save processing time if the input cards (or entries from the terminal) are in ascending order.

B. Sample Run (see p. 6 top)

1. Obtain exclusive use of the program file.
2. Assign the *first* file from which data are to be extracted. If the files are needed, they will be dynamically assigned and freed during execution.
3. Assign a mass storage file to receive the card images and catalog it if the run terminates normally.

²Data format is set forth in Helfman et al. 1975 [p. G-1] and repeated in Appendix B.

4. Assign a blank tape to receive the station-year blocks.

*Note: Either or both of steps 3 and 4 may be assigned to scratch files.

5. Assign internal unit number of 2 to the library tape.
6. CARDS will be referenced as file 15.
7. BLOCKS will be referenced as file 16.
8. Execute the absolute element to select the data.
9. Data cards as described in part A.
10. End of data cards.
11. Terminate the run. The mass storage file CARDS and the magnetic tape BLOCKS are now available for use by analysis programs.

IV. Listing the Card Images

If the user suspects an error in the data, the year in question may be listed for proofreading by the following sequence (see p. 6 bottom):

1. Obtain exclusive use of the program file.
2. Assign the inventory tape which contains the year(s) to be listed.
3. Assign a mass storage file to receive the card images and catalog it unconditionally.
4. Assign a scratch file for the block images.
5. Execute the absolute element to select the data.
6. Data cards as described in Part III, A.
7. End of data cards.
8. Complete the cataloging of the file containing the card images.
9. Execute the absolute element to list the cards.
10. Add the card image file to the runstream to be listed.
11. Delete the cataloged file (if no longer needed).
12. Terminate the run.

Note: Steps 9 and 10, which perform the actual list, may be accomplished more economically by the @PRT.@ELT or @ED processors, if desired.

Summary

The Fire Weather Data Library has been compiled and made available at FCCC and Colorado State University for scientists and resource managers who need historic weather data to support their predictions and decisions. Most of the data are from stations in forested and/or mountainous areas not adequately covered by the National Weather Service. These data should therefore be useful in mountain and forest meteorology research.

The Data Library is accessible to all users of the USDA computer in Fort Collins, Colo. Auxiliary

III. Obtaining Data for Analysis

1.	@ASG, AX FIREDATALIB*PROGRAMS.			
2.	@ASG, A FIREDATALIB*00-04.			
3.	@ASG, CP CARDS.			
4.	@ASG, T BLOCKS., 49V			
5.	@USE 2., FIREDATALIB*00-04.			
6.	@USE 15., CARDS.			
7.	@USE 16., BLOCKS.			
8.	@XQT FIREDATALIB*PROGRAMS.GETDATA2			
9.	04020574			
	04040400 04041099			
10.	@EOF			
11.	@FIN			

DATA SELECTION 11/04/75

FROM	TO	REEL	OUTPUT
04020574	04020574	00-04	FORMATTED CARD IMAGES, N = 165
04040400	04041099	00-04	FORMATTED CARD IMAGES, N = 3235

THERE ARE 3400 FORMATTED CARD IMAGES TOTAL ON THE FILE CREATED BY THIS SELECTION

IV. Listing the Card Images

1.	@ASG, AX FIREDATALIB*PROGRAMS.			
2.	@ASG, A FIREDATALIB*00-04.			
3.	@USE 2, FIREDATALIB*00-04.			
4.	@ASG, UP 15.			
5.	@XQT FIREDATALIB*PROGRAMS.GETDATA2			
6.	04010174			
	04040400 04040499			
7.	@EOF			
8.	@FREE 15.			
9.	@XQT FIREDATALIB*PROGRAMS.ABSLISTCARDS			
10.	@ADD, EP 15.			
11.	@DELETE 15.			
12.	@FIN			

NUMBER	STATION	COUNTY	STATE AGENCY	PROTECTION UNIT	LAT	LONG	SEC	TWP	RNG	ELEV	FS
050101	ROUND TOP LG	MOFFAT	CA NPS	DINOSAUR NM	40.43	108.92	25	04N	103W	8575	02
050102	ARTESIA	MOFFAT	CO NPS	DINOSAUR NM	40.25	109.00	07	04N	103W	6000	02
050202	MORRISON CRY.	MOULT	CO USFS	MOULT NF	40.22	106.79	23	03N	84W	8400	02
050203	COLUMBINE	MOULT	CO USFS	MOULT NF	40.88	106.98	06	16N	85W	9500	02
050302	GOULD	JACKSON	CO USFS	MOULT NF	40.53	106.03	04	04N	77W	9975	02
050402	GRAND LAKE PS	GRAND	CO NPS	ROCKY MT. NP	40.25	105.23	31	04N	75W	8575	02
050403	WINTER PARK	GRAND	CO USFS	ARAPAH0 NF	39.88	105.77	10	02S	75W	9000	02
050503	RED FEATHER PS	CRIMMER	CO USFS	ROOSEVELT NF	40.90	105.53	35	10N	73W	8200	02
050507	UTILITY AREA	CRIMMER	CO NPS	ROCKY MT. NP	40.36	105.55	34	04N	73W	7800	02
051001	RIO BLANCO	GARFIELD	CO USFS	WHITE RVR NF	40.03	107.24	21	01N	88W	8800	02
051601	FULFORD	EAGLE	CO USFS	WHITE RVR NF	39.52	106.47	13	04S	83W	9800	02
051602	BASALT PS	EAGLE	CO USFS	WHITE RVR NF	39.38	107.01	08	04S	86W	6624	02
051603	MINTURN	EAGLE	CO USFS	WHITE RVR NF	39.57	106.40	36	04S	81W	7800	02
051701	OILLON PS	SUMMIT	CO USFS	ARAPAH0 NF	39.62	106.05	17	05S	77W	9000	02
051801	BERTHOOD PASS	CLEAR CREEK	CO USFS	ARAPAH0 NF	39.80	105.79	10	03S	75W	11314	02
051803	SQUAW MTN.	CLEAR CREEK	CO USFS	ARAPAH0 NF	39.67	105.50	30	04S	72W	11475	02
051804	CORRAL CREEK	CLEAR CREEK	CO USFS	ARAPAH0 NF	39.65	105.44	04	04S	72W	8100	02
051901	MT. THOMPSON	GILPIN	CO USFS	ROOSEVELT NF	39.88	105.42	11	02S	72W	10500	02
052001	INTERCANYON	JEFFERSON	CO CSFS	GOLDEN DIST.	39.57	105.22	34	04S	70W	7080	02
052401	COLORADO NM	MESA	CO NPS	COLORADO NM	39.10	108.71	13	01S	102W	5800	02
052405	CUPPICH	MESA	CO USFS	GM-JUNCOM NF	39.25	107.71	02	09S	93W	8000	02
052406	GRAND JUNCTION	MESA	CO RLM								
052601	LEADVILLE PS	LAKE	CO USFS	SAN ISABEL NF	39.23	106.29	26	09S	80W	10200	02
052801	CRESTED BUTTE	GUNNISON	CO USFS	GUNNISON NF	38.97	106.99	03	14S	86W	9000	02
052802	GUNNISON	GUNNISON	CO USFS	GUNNISON NF	38.53	107.23	02	11W	87		

Figure 1.—Example of computer print-out available on fire weather stations.

programs are provided as part of the Library to aid the user in retrieving data. Software is also available to allow the user to obtain an inventory of any or all of the data tapes in the Library.

A problem that has not been adequately solved is how to provide station identification information to the users. At present, if a user wants geographical information about any of the stations in the Library, he must request the information from the authors. Figure 1 is an example of the information about each station that is available upon request.

Literature Cited

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- Helfman, Robert S., John E. Deeming, Robert J. Straub, and R. William Furman.
1975. User's guide to AFFIRMS: Time-share computerized processing for fire danger rating. USDA For. Serv. Gen. Tech. Rep. RM-15, 107 p. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo.

Appendix A States of the United States

Station numbers are always six digits: SSCCWW, where

SS represents the state number

CC represents the county number

WW represents the weather station number

00. *	24. Montana
01. Alabama	25. Nebraska
50. Alaska	26. Nevada
02. Arizona	27. New Hampshire
03. Arkansas	28. New Jersey
04. California	29. New Mexico
05. Colorado	30. New York
06. Connecticut	31. North Carolina
07. Delaware	32. North Dakota
08. Florida	33. Ohio
09. Georgia	34. Oklahoma
49. Hawaii	35. Oregon
10. Idaho	36. Pennsylvania
11. Illinois	37. Rhode Island
12. Indiana	38. South Carolina
13. Iowa	39. South Dakota
14. Kansas	40. Tennessee
15. Kentucky	41. Texas
16. Louisiana	42. Utah
17. Maine	43. Vermont
18. Maryland	44. Virginia
19. Massachusetts	45. Washington
20. Michigan	46. West Virginia
21. Minnesota	47. Wisconsin
22. Mississippi	48. Wyoming
23. Missouri	

*Used only for a few National Weather Service stations not in the current 6-digit number system.

Appendix B

The Format of AFFIRMS Archived Fire Weather Data

Punch Card Format (Modified) for WS Form D-9a

Field Description	Begin Col. #	End Col. #
Station Number	1	6
Year	7	8
Month	9	10
Day	11	12
State of Weather		13
Dry-Bulb Temp. (°F)	14	16
Relative Humidity (%)	17	19
*1-Hr-T/L Moist.	20	22
Herb-Veg-Cond (Model 1)	23	24
Man-Caused-Risk	25	27
Wind Direction (8 point)		28
Wind Speed (mph)	29	31
Woody-Veg-Cond (Model 1)		32
*10-Hr-T/L Moist. (%)	33	35
*100-Hr-T/L Moist. (%)	36	38
Max. Temp (°F)	39	41
Min. Temp (°F)	42	44
Max. R.H. (%)	45	47
Min. R.H. (%)	48	50
Not Used		51
Precip. Duration	52	53
Precip. Amount (in)	54	57
Lightning Act. Level	58	60
Digit "2"		61
Model 1 I.D.		62
Secondary Models:		
Model 2 I.D.		63
Model 2 Woody		64
Model 2 Herb	65	66
Model 3 I.D.		67
Model 3 Woody		68
Model 3 Herb	69	70
Model 4 I.D.		71
Model 4 Woody		72
Model 4 Herb	73	74
Model 5 I.D.		75
Model 5 Woody		76
Model 5 Herb	77	78
**Forecast Flag		79
Region Number		80

*See paragraph 6

**1 = Forecast; 0 or blank = Observation

Explanatory Notes for Modified WS D-9a Card Format

The card images are generated by the archiving processor of the "AFFIRMS" program. Some variations

from the normal Weather Service WS D-9a form have been introduced. They are described below:

1) Because all humidity entries are converted by "AFFIRMS" to relative humidity (even though the input may have been wet-bulb, dewpoint, or R.H.) only the relative humidity is available for archiving. The presence of the digit "2" in card column 61 indicates that the data in columns 17-19 are relative humidity and not wet-bulb (standard for the WS-D9a).

2) The "AFFIRMS" system permits up to 5 fuel models to be associated with any given station. A separate woody-vegetation-condition and herbaceous-vegetation-condition can be specified for each model. Because later use of this data may require these conditions (for example, if live fuels are involved), the card format has been modified to include the first model's values in the normal positions on the card (23-25 for herbaceous, 23 for woody condition). The model identifier (a letter from A through I) for the first model is then placed in column 62. The other four models have their identification herbaceous-condition, and woody-condition placed in columns 63 through 78. Subsequent processing of these card images should check for a blank Model I.D. in column 62 indicating no model specification.

3) In the Max/Min temperature and humidity fields, a value of 100 in both Max and Min indicates that *both* values were missing. Subsequent processing should make this check.

4) The Forest Service Region number (column 79-80) is included for convenience in sorting by the National Fire Danger Rating Library before distribution to regional ADP offices.

5) The wind direction 8-point code in the card images has been derived from the sorted degrees-of-the-compass value. Some stations may enter wind direction in systems other than 8 point which offer more resolution, such as 16 point or degrees-of-the-compass. Such additional resolution is, of course, lost when this conversion to 8 point is made. Missing direction is recorded in the card images as "0".

6) The 1-, 10-, and 100-hour timelag fuel moistures are only archived if actually entered (non-missing) in an observation. In all cases where these items are computed from ambient conditions, they appear in the archived records as zero or blank.

7) For the period 1973 through March 1975, "AFFIRMS" made only one consistency check on the precip. amount: values were required to be between 0 and 10.00 inches. Occasionally, field personnel would enter 9 when they should have entered .90 or .09. These three values are all valid as far as the AFFIRMS program is concerned, therefore large precipitation amounts should be viewed with suspicion for this period.

APPENDIX B
PROGRAM SUMMARY

PROGRAM SUMMARY

Program SUMMARY takes wind speed observations from fire weather stations for a period of years and summarizes the wind data to determine consistent wind. The wind speed is divided into two categories: 1) Wind speeds < 8 mph; and 2) Wind speed $\geq$ 8 mph. Maximum wind speed, minimum wind speed, average wind speed, average of wind speeds $\geq$ 8 mph and percent of winds $\geq$ 8 mph are computed.

INPUT

Program SUMMARY uses input data from the National Fire Weather Data Library. The input variables (ICURST, ICURYR, IWNDSP) are read from a card image file (TAPE7). The format for the input is as follows:

<u>Card Column</u>	<u>Format</u>	<u>Variable</u>	<u>Description</u>
1-6	I6	ICURST	Station Number
7-8	I2	ICURYR	Year
29-31	I3	IWNDSP	Wind Speed

OUTPUT

The output of Program SUMMARY is a table giving the number of total observations, number of observations for winds $\geq$ 8 mph, total wind speeds, total wind speeds $\geq$ 8 mph, average wind speed, average wind speed for winds $\geq$ 8 mph, minimum wind speed, maximum wind speed, and number of years of observations for each station. The output variables include:

ISTCNT	Number of stations
ISTEMP	Station number
ITOTOB	Total number of observations
I8CNT	Total number of observations of wind speed $\geq$ 8 mph
IWTOT	Total wind speeds
IWND8	Total wind speeds $\geq$ 8 mph
PERC8	Percent for winds $\geq$ 8 mph
AVGWND	Average of wind speeds
AVG8	Average of winds $\geq$ 8 mph
IWMIN	Minimum wind speed
IWMAX	Maximum wind speed
IYRCNT	Number of years of observations

PROGRAM SUMMARY

```

1      PROGRAM SUMMARY(CARDS,OUTPUT,TAPE7=CARDS,TAPE6=OUTPUT)
      C
      C
      C      THIS PROGRAM SUMMARIZES THE WIND DATA TO DETERMINE CONSISTENT
5      C      WIND IN THE 5 STATE REGION - WASHINGTON, OREGON, IDAHO,
      C      MONTANA, WYOMING.
      C
10     CALL INITIAL
      CALL STATS
      STOP
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS	DEF LINE	REFERENCES
4114 SUMMARY	1	

FILE NAMES	MODE
0 CARDS	
2043 OUTPUT	
2043 TAPE6	
0 TAPE7	

EXTERNALS	TYPE	ARGS	REFERENCES
INITIAL		0	9
STATS		0	10

STATISTICS	PROGRAM LENGTH	10B	8
BUFFER LENGTH	4106B	2118	

```

1      SUBROUTINE INITIAL
      C
      C      THIS ROUTINE SETS ALL VARIABLES TO APPROPRIATE VALUES
5      C      AND DOES THE INITIAL READ.
      C
      COMMON /DATA/ ICURST,IWNDSP,ISTMAX,IWMAX,IWMIN,ISTEMP
      COMMON /DATA1/ ITCNT,IYR,ICURYR,IYRCNT
10     COMMON /DATA2/ AVGWND,AVG8,ITOTOB,IWNB8,IBCNT,PERC8,IWTOT
      C
      READ ( 7,700 ) ICURST,ICURYR,IWNDSP
700   FORMAT ( I6,I2,20X,I3 )
      WRITE ( 6,600 )
15     600   FORMAT ( //,2X,*STATION NO*,3X,*TOTAL OBS*,3X,*OBS > 8*,
      *3X,*TOTAL WIND*,3X,*WIND > 8*,3X,*% > 8*,3X,
      *3X,*AVG WIND*,3X,*AVG WIND > 8*,3X,*MIN WIND*,3X,*MAX WIND*,
      *3X,*YEARS*)
      IWTOT = 0
20     ITCNT = 0
      ITOTOB = 0
      IWNB8 = 0
      IWMAX = IWNDSP
      IWMIN = IWNDSP
25     ITCNT = 0
      IYRCNT = 0
      ITEMP = ICURST
      IYR = ICURYR
30     RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF LINE	REFERENCES
1	INITIAL	1	29

VARIABLES	SN	TYPE	RELOCATION	REFS		DEFINED	
0 AVGWND		REAL	DATA2	10			
1 AVG8		REAL	DATA2	10			
0 ICURST		INTEGER	DATA1	8	27	DEFINED	12
2 ICURYR		INTEGER	DATA1	9	28	DEFINED	12
0 ITCNT		INTEGER	DATA1	9	DEFINED	25	
5 ITEMP		INTEGER	DATA1	8	DEFINED	27	
2 ISTMAX		INTEGER	DATA1	8			
2 ITOTOB		INTEGER	DATA2	10	DEFINED	21	
3 IWMAX		INTEGER	DATA1	8	DEFINED	23	
4 IWMIN		INTEGER	DATA1	8	DEFINED	24	
1 IWNDSP		INTEGER	DATA1	8	DEFINED	23	DEFINED 12
3 IWNB8		INTEGER	DATA2	10	DEFINED	22	
6 IWTOT		INTEGER	DATA2	10	DEFINED	19	
1 IYR		INTEGER	DATA1	9	DEFINED	28	
3 IYRCNT		INTEGER	DATA1	9	DEFINED	26	
4 IBCNT		INTEGER	DATA2	10	DEFINED	20	
5 PERC8		REAL	DATA2	10			

SUBROUTINE INITIAL 73/73 OPT=1

FTN 4.6+439

78/10/17. 16.03.07

PAGE

2

FILE NAMES	MODE		
TAPE6	FMT	WRITES	14
TAPE7	FMT	READS	12

STATEMENT LABELS	DEF LINE	REFERENCES
17 600 FMT	15	14
11 700 FMT	13	12

COMMON BLOCKS	LENGTH	MEMBERS	-	BIAS NAME (LENGTH)
DATA	6	0		ICURST (1)
		3		IWMAX (1)
		0		ISTCNT (1)
DATA1	4	3		IYRCNT (1)
		0		AVGWNO (1)
DATA2	7	3		IWNDB (1)
		6		IWTOT (1)

STATISTICS		
PROGRAM LENGTH	418	33
CM LABELED COMMON LENGTH	218	17

1	IWNOSP (1)	2	ISTMAX (1)
4	IWHIN (1)	5	ISTEMP (1)
1	IYR (1)	2	ICURYR (1)
1	AVGB (1)	2	ITOTOB (1)
4	IBCNT (1)	5	PERCB (1)

```

1      SUBROUTINE STATS
      C
      C
      C      THIS ROUTINE ADDS UP THE NECESSARY INFO FOR DETERMINING
5      C      THE WINDS ATTRIBUTES AT EACH STATION.
      C
      COMMON /DATA/ ICURST,IWNDSP,ISTMAX,IWMAX,IWMIN,ISTEMP
      COMMON /DATA1/ ITCNT,IYR,ICURYR,IYRCNT
10     COMMON /DATA2/ AVGWND,AVGB,ITOTOB,IWNB8,IBCNT,PERCB,IWTOT
      C
      C
      C      CHECK FOR A DIFFERENT STATION NUMBER. IF DIFFERENT THEN PERFORM
15     C      CALCULATIONS ON TOTALS, ELSE CONTINUE.
      C
10     CONTINUE
      IF ( ICURST .NE. ITEMP ) CALL CALCU
      C
      C      STATION NUMBER HAS NOT CHANGED SO INCREMENT OBSERVATION COUNT, WIND
20     C      TOTAL, AND CHECK FOR A WIND GREATER THAN 8 MPH.
      C
20     CONTINUE
      ITOTOB = ITOTOB + 1
      IWTOT = IWNDSP + IWTOT
      IF ( IWNDSP .LT. 8 ) GO TO 30
25     IBCNT = IBCNT + 1
      IWNB8 = IWNB8 + IWNDSP
      C
      C      DETERMINE MAX AND MIN OF WIND FOR THIS STATION.
      C
30     CONTINUE
      IF ( IWNDSP .GT. IWMAX ) IWMAX = IWNDSP
      IF ( IWNDSP .LT. IWMIN .AND. IWNDSP .NE. 0 ) IWMIN = IWNDSP
      CALL IYRCNT
      C
      C      READ NEXT RECORD OF DATA.
35     C      READ ( 7,700 ) ICURST,ICURYR,IWNDSP
      C
700    FORMAT ( 16,12,20X,13 )
      IF ( EOF ( 7 ) ) 70,10
70     CONTINUE
      CALL CALCU
      CALL IYRCNT
40     WRITE ( 6,600 ) ITCNT
      C
600    FORMAT ( //,2X,* THE NUMBER OF STATIONS WAS*,I10 )
      RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF	LINE	REFERENCES
1	STATS	1	43	

VARIABLES	SN	TYPE	RELOCATION	REFS	DEFINED	DEFINED	35
0	AVGWND	REAL	DATA2	10			
1	AVGB	REAL	DATA2	10			
0	ICURST	INTEGER	DATA	8	17		
2	ICURYR	INTEGER	DATA1	9	DEFINED	35	
0	ITCNT	INTEGER	DATA1	9	41		
5	ISTEMP	INTEGER	DATA	8	17		

SUBROUTINE STATS

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VARIABLES	SN	TYPE	RELOCATION	REFS
2	ISTMAX	INTEGER	DATA	REFS
2	ITOTOB	INTEGER	DATA2	REFS
3	IWMAX	INTEGER	DATA	REFS
4	IWMIN	INTEGER	DATA	REFS
1	IWNOSP	INTEGER	DATA	REFS
3	IWNDB	INTEGER	DATA2	REFS
6	IWTOT	INTEGER	DATA2	REFS
1	IYR	INTEGER	DATA1	REFS
3	IYRCNT	INTEGER	DATA1	REFS
4	I8CNT	INTEGER	DATA2	REFS
5	PERCB	REAL	DATA2	REFS

FILE NAMES	MODE	WRITES	READS
TAPE6	FMT		41
TAPE7	FMT		35

EXTERNALS	TYPE	ARGS	REFERENCES
CALCU		0	17
EOF	REAL	1	37
IYRCNT		0	32

STATEMENT LABELS	DEF LINE	REFERENCES
0 10	16	37
400000 20	21	
400000 30	29	24
0 70	38	37
20 600 FMT	42	41
11 700 FMT	36	35

COMMON BLOCKS	LENGTH	MEMBERS -	BIAS NAME (LENGTH)
DATA	6	0	ICURST (1)
		3	IWMAX (1)
		0	I8CNT (1)
DATA1	4	3	IYRCNT (1)
		0	AVGWND (1)
DATA2	7	3	IWNDB (1)
		6	IWTOT (1)

STATISTICS	PROGRAM LENGTH	CM LABELED COMMON LENGTH
	268	22
	218	17

8	10	22	DEFINED	22	2*30	3*31
10	30	31	DEFINED	30		
8	23	24	DEFINED	26		
35	26	23	DEFINED	26		
10	23	25	DEFINED	23		
9						
9						
10						
10						

1	IWNOSP (1)	2	ISTMAX (1)
4	IWMIN (1)	3	ISTEMP (1)
1	IYR (1)	2	ICURVR (1)
1	AVGB (1)	2	ITOTOB (1)
4	I8CNT (1)	5	PERCB (1)

```

1      SUBROUTINE CALCU
      C
      C      THIS ROUTINE CALCULATES THE PERCENTAGE OF 8 MPH WINDS
5      C      THAT EXISTED, THE AVERAGE WIND SPEED, AND THE AVERAGE WIND
      C      SPEED OF WINDS GREATER THAN 8 MPH.
      C
10     COMMON /DATA/ ICURST,IWNDSP,ISTMAX,IWMAX,IWMIN,ISTEMP
      C      COMMON /DATA1/ ISTCNT,IYR,ICURYR,IYRCNT
      C      COMMON /DATA2/ AVGWND,AVG8,ITOTOB,IWND8,I8CNT,PERC8,IWTOT
      C
15     ISTCNT = ISTCNT + 1
      R8CNT = FLOAT( I8CNT )
      PERC8 = ( R8CNT/ITOTOB ) * 100
      RWTOT = FLOAT( IWTOT )
      AVGWND = ( RWTOT/ITOTOB )
      RWND8 = FLOAT( IWND8 )
      AVG8 = ( RWND8/I8CNT )
20     CALL CLENUP
      RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF	LINE	REFERENCES
1	CALCU	1	21	

VARIABLES	SN	TYPE	RELOCATION	REFS		DEFINED	
0	AVGWND	REAL	DATA2	11		17	
1	AVG8	REAL	DATA2	11		19	
0	ICURST	INTEGER	DATA	9			
2	ICURYR	INTEGER	DATA1	10			
0	ISTCNT	INTEGER	DATA1	10	13	DEFINED	13
5	ISTEMP	INTEGER	DATA	9			
2	ISTMAX	INTEGER	DATA	9			
2	ITOTOB	INTEGER	DATA2	11	15	17	
3	IWMAX	INTEGER	DATA	9			
4	IWMIN	INTEGER	DATA	9			
1	IWNDSP	INTEGER	DATA	9			
3	IWND8	INTEGER	DATA2	11	18		
6	IWTOT	INTEGER	DATA2	11	16		
1	IYR	INTEGER	DATA1	10			
3	IYRCNT	INTEGER	DATA1	10			
4	I8CNT	INTEGER	DATA2	11	14	19	
5	PERC8	REAL	DATA2	11	DEFINED	15	
5	RWND8	REAL		19	DEFINED	18	
4	RWTOT	REAL		17	DEFINED	16	
3	R8CNT	REAL		15	DEFINED	14	

EXTERNALS	TYPE	ARGS	REFERENCES
CLENUP		0	20

INLINE FUNCTIONS	TYPE	ARGS	DEF LINE	REFERENCES
FLOAT	REAL	1	INTRIN	14

SUBROUTINE CALCU 73/73 OPT=1

COMMON BLOCKS	LENGTH	MEMBERS	BIAS NAME (LENGTH)
DATA	6	0	ICURST (1)
DATA1	4	3	IWMAX (1)
DATA2	7	0	ISTCNT (1)
		3	IYRCNT (1)
		0	AVGWND (1)
		3	IWNDB (1)
		6	IWTOT (1)

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2

1	IWNDS (1)	2	ISTMAX (1)
4	IWMIN (1)	5	ISTEMP (1)
1	IYR (1)	2	ICURYR (1)
1	AVGB (1)	2	ITOTOB (1)
4	IBCNT (1)	5	PERCB (1)

STATISTICS

PROGRAM LENGTH	68	6
CM LABELED COMMON LENGTH	218	17

SUBROUTINE CLENUP 73/73 OPT=1

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1

1 SUBROUTINE CLENUP

5 THIS ROUTINE WRITES OUT THE INFO FOR EACH STATION AFTER
BEING ANALYZED. IT ALSO REINITIALIZES THE STATION VARIABLES.

10 COMMON /DATA/ ICURST,IWNDS,ISTMAX,IWMAX,IWMIN,ISTEMP
COMMON /DATA1/ IISTCNT,IYR,ICURYR,IYRCNT
COMMON /DATA2/ AVGWND,AVGB,ITOTOB,IWNDB,IBCNT,PERCB,IWTOT

15 WRITE(6,600)ISTEMP,ITOTOB,IBCNT,IWTOT,IWNDB,PERCB,AVGWND,AVGB,
600 +IWMIN,IWMAX,IYRCNT
FORMAT(//,2X,110,3X,19,3X,17,3X,110,3X,18,3X,11,2,3X,18,2,3X,
+F12,2,3X,18,3X,18,3X,15)

20 IYRCNT = 0
IWTOT = 0
ITOTOB = 0
IBCNT = 0
IWNDB = 0
IWMAX = IWNDS
IWMIN = IWNDS
ISTEMP = ICURST
IYR = ICURYR
RETURN
END

7

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF LINE	REFERENCES
1	CLENUP	1	26

VARIABLES	SN	TYPE	RELOCATION	REFS		REFS		REFS	
0	AVGWND	REAL	DATA2	10		13			
1	AVGB	REAL	DATA2	10		13			
0	ICURST	INTEGER	DATA	8		24			
2	ICURYR	INTEGER	DATA1	9					
30	ICURYR7	INTEGER	*UNDEF	25					
0	ISTCNT	INTEGER	DATA1	9					
5	ISTEMP	INTEGER	DATA	8		13	DEFINED	24	
2	ISTMAX	INTEGER	DATA	8					
2	ITOTOB	INTEGER	DATA2	10		13	DEFINED	19	
3	IWMAX	INTEGER	DATA	8		13	DEFINED	22	
4	IWMIN	INTEGER	DATA	8		13	DEFINED	23	
1	IWNDS	INTEGER	DATA	8		22	23		
3	IWNDB	INTEGER	DATA2	10		13	DEFINED	21	
6	IWTOT	INTEGER	DATA2	10		13	DEFINED	18	
1	IYR	INTEGER	DATA1	9	DEFINED	25			
3	IYRCNT	INTEGER	DATA1	9		13	DEFINED	17	
4	IBCNT	INTEGER	DATA2	10		13	DEFINED	20	
5	PERCB	REAL	DATA2	10		13			

F	NAMES	MODE		
	TAPE6	FMT	WRITES	13

SUBROUTINE CLENUP		73/73	OPT=1	FTN 4.6+439	78/10/17. 16.03.07	PAGE	2
STATEMENT LABELS		DEF LINE	REFERENCES				
20	600 FMT	15	13				
COMMON BLOCKS	LENGTH	MEMBERS	- BIAS NAME (LENGTH)				
DATA	6	0	ICURST (1)	1	IWNDSB (1)	2	ISTMAX (1)
		3	IWMAX (1)	4	IWMIN (1)	3	ISTEMP (1)
DATA1	4	0	ISTCNT (1)	1	IYR (1)	2	ICURYR (1)
		3	IYRCNT (1)				
DATA2	7	0	AVGWND (1)	1	AVGB (1)	2	ITOTOB (1)
		3	IWNDB (1)	4	IBCNT (1)	5	PERCB (1)
		6	IWTOT (1)				
STATISTICS							
PROGRAM LENGTH		318	25				
CM LABELED COMMON LENGTH		218	17				

SUBROUTINE YRCNT		73/73	OPT=1	FTN 4.6+439	78/10/17. 16.03.07	PAGE	1
1		SUBROUTINE YRCNT					
5	C	THIS ROUTINE DETERMINES HOW MANY YEARS OF DATA WAS TAKEN IN EACH STATE.					
	C						
	C	COMMON /DATA1/ ISTCNT,IYR,ICURYR,IYRCNT					
	C						
10		IF (ICURYR .EQ. IYR) GO TO 10					
		IYRCNT = IYRCNT + 1					
		IYR = ICURYR					
	10	RETURN					
		END					

SYMBOLIC REFERENCE MAP (R=3)							
ENTRY POINTS	DEF LINE	REFERENCES					
1 YRCNT	1	13					
VARIABLES	SN	TYPE	RELOCATION	REFS			
2 ICURYR		INTEGER	DATA1	8	10	12	
0 ISTCNT		INTEGER	DATA1	8			
1 IYR		INTEGER	DATA1	8	10	DEFINED	12
3 IYRCNT		INTEGER	DATA1	8	11	DEFINED	11
STATEMENT LABELS							
400000 10	DEF LINE	REFERENCES					
	13	10					
COMMON BLOCKS	LENGTH	MEMBERS	- BIAS NAME (LENGTH)				
DATA1	4	0	ISTCNT (1)	1	IYR (1)	2	ICURYR (1)
		3	IYRCNT (1)				
STATISTICS							
PROGRAM LENGTH		28	2				
CM LABELED COMMON LENGTH		48	4				

APPENDIX C
PROGRAM FREQNCY

PROGRAM FREQNCY

Program FREQNCY takes wind speed and wind direction observations from fire weather stations for a period of years and tallies the frequencies of these observations for certain wind speeds and direction. The observations are divided into seasons:

Winter (December, January, February)

Spring (March, April, May)

Summer (June, July, August)

Fall (September, October, November)

Within these seasons, observations are then tallied according to speed and direction. The possible directions are N, NE, E, SE, S, SW, W, NW and no direction. The speed categories are 0-7, 8-10, 11-15, 16-20, 21-25, 26-30, 31-40, 41-50 and over 51 miles per hour. Percentages are then computed for the observations in each category.

An annual tally as described above for the seasons is also incorporated into this analysis.

INPUT

Program FREQNCY uses input data obtained from the National Fire Weather Data Library. The input variables (ICURST, ICURYR, ICURMO, IWNDIR, IWNDSP) are read from a card image file (TAPE7). The format for the input is as follows:

<u>Card Column</u>	<u>Format</u>	<u>Variable</u>	<u>Description</u>
1-6	I6	ICURST	Station Number
7-8	I2	ICURYR	Year
9-10	I2	ICURMO	Month
28	I1	IWNDIR	Wind Direction (Integers 0 through 8 are used for direction) 0 = no direction 1 = N 2 = NE 3 = E 4 = SE 5 = S 6 = SW 7 = W 8 = NW
29-31	I3	IWNDSP	Wind speed (mph)

OUTPUT

The output of Program FREQUENCY consists of tables for each station. These tables include a table for each season (if data was available) and an annual table. The output includes: number of observations in a particular wind speed category for a particular wind direction, the total observations for each category, the total observations for each direction, and the percent for these observations. The output variables include:

ISPRNG	Array (I,J) where the rows depict the wind speed categories and the columns depict the wind direction. The last column of the array gives the category totals and the last row of the array gives the wind direction totals.
ISUMMR	Array (I,J) -- same description as above
IFALL	Array (I,J) "
IWINTR	Array (I,J) "
IANNUAL	Array (I,J) "

ITOTOB Total observations

INTLST Station Number

IYRCNT Number of years of observed data

SPRCNT Array (I,J) percent for speed categories. Rows depict
season (1 = Winter, 2 = Spring, 3 = Summer, 4 = Fall,
5 = Annual). Columns depict percent.

DPRSNT Array (I,J) percent for wind direction.
Rows depict season, columns depict percent.

PROGRAM FREQNCY

SUBROUTINE (WINTER, SPRING, SUMMER, FALL)

SUBROUTINE PRNTOUT

```

1      PROGRAM FREQUENCY (CARDS, OUTPUT, TAPE 7 = CARDS,
      * TAPE6 = OUTPUT)
      THIS PROGRAM WAS WRITTEN APRIL, 1978, BY JANE FISHER.
      THIS PROGRAM TALLIES WIND DATA AND PRINTS OUT FREQUENCY
5      DISTRIBUTION OF WIND SPEED AND DIRECTION.
      INPUT VARIABLE ICURST - STATION NUMBER
      ICURYR - YEAR
      ICURMO - MONTH
      IWNDIR - WIND DIRECTION
10     IWNDSP - WIND SPEED
      OUTPUT VARIABLE ISPRNG - ARRAY(I,J) WHERE THE ROWS DEPICT THE
      WIND SPEED CATEGORIES AND THE COLUMNS
      DEPICT THE WIND DIRECTION. THE LAST
      COLUMN OF THE ARRAY GIVES THE CATEGORY
15     TOTALS AND THE LAST ROW OF THE ARRAY
      GIVES THE WIND DIRECTION TOTALS.
      ISUMMR - ARRAY(I,J)
      IFALL - ARHAY(I,J)
      IWINTR - ARRAY(I,J)
      IANNUAL - ARRAY(I,J)
20     ITOTOB - TOTAL OBSERVATIONS
      INTLST - STATION NUMBER
      IYRCNT - NUMBER OF YEARS OF DATA COLLECTION
      OTHER VARIABLES IYR - TEMPORARY HOLDER FOR YEAR
25     LABEL - ARRAY FOR TABLE LABELS
      ISPROB - TEMPORARY HOLDER FOR SPRING OBSERVATIONS
      ISUMOB - TEMPORARY HOLDER FOR SUMMER OBSERVATIONS
      IWINOB - TEMPORARY HOLDER FOR WINTER OBSERVATIONS
      IFALOB - TEMPORARY HOLDER FOR FALL OBSERVATIONS
30     SPRCNT - ARRAY(I,J) HOLDS PER CENT OF TOTAL
      OBSERVATIONS FOR SPEED CATEGORIES.
      ROW IS SEASON. COLUMN IS PER CENT.
      DPRCNT - ARRAY(I,J) - HOLDS PER CENT OF TOTAL
      OBSERVATIONS FOR WIND DIRECTION.
35     -----
      CALL INITIAL
      CALL PROCES
40     STOP
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS	DEF LINE	REFERENCES
4114 FREQUENCY	1	

FILE NAMES	MODE
0 CARDS	
2043 OUTPUT	
2043 TAPE6	
0 TAPE7	

EXTERNALS	TYPE	ARGS	REFERENCES
INITIAL		0	38
PROCES		0	39

```

1      SUBROUTINE INITIAL
      C
      C      THIS SUBROUTINE SETS ALL VARIABLES TO APPROPRIATE VALUES
      C      AND DOES THE INITIAL READ.
5      C
      COMMON /DATA1/ICURST, ICURYR, ICURMO, IWNDIR, IWNDSP
      COMMON /DATA2/ISPRNG(10,10), ISUMMR(10,10), IFALL(10,10),
      + IWINTR(10,10), IANNUAL(10,10), SPRCNT(5,10), DPRCNT(5,10),
      + ITOTOB, IYRCNT
10     C
      COMMON /DATA3/INTLST, IYR, LABEL(11), ISPROB, ISUMOB, IWINOB,
      + IFALOB
100    READ (7,100) ICURST, ICURYR, ICURMO, IWNDIR, IWNDSP
      C
      FORMAT (16, 12, 12, 17X, 11,13)
15     INTLST = ICURST
      IYR = ICURYR
      DO 10 I = 1,10
      DO 20 J = 1, 10
20        ISPRNG(I,J) = 0
          ISUMMR(I,J) = 0
          IFALL(I,J) = 0
          IWINTR(I,J) = 0
          IANNUAL(I,J) = 0
25        CONTINUE
      CONTINUE
      DO 30 I = 1,5
      DO 40 J = 1, 10
30        SPRCNT(I,J) = 0
          DPRCNT(I,J) = 0
40        CONTINUE
      CONTINUE
      C
35     ITOTOB = 0
      IYRCNT = 0
      IWINOB = 0
      IFALOB = 0
      ISPROB = 0
      ISUMOB = 0
40
      LABEL (1) = 10H W 0-7
      LABEL (2) = 10H I 8-10
      LABEL (3) = 10H N 11-15
      LABEL (4) = 10H D 16-20
45     LABEL (5) = 10H 21-25
      LABEL (6) = 10H S 26-30
      LABEL (7) = 10H P 31-40
      LABEL (8) = 10H E 41-50
      LABEL (9) = 10H D 51-
50     LABEL (10) = 10H TOTAL
      LABEL (11) = 10H PER CENT
      C
      RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

SUBROUTINE INITIAL		73/73	OPT=1	FTN 4.6+439		78/10/17. 16.03.55		PAGE	2
ENTRY POINTS	DEF LINE	REFERENCES							
1 INITIAL	1	53							

VARIABLES	SN	TYPE	RELOCATION	REFS	7	DEFINED	30				
1046 DPCNT		REAL	DATA2	REFS	19	20	21				
31 I		INTEGER	ARRAY	DEFINED	17	27		22	23	29	30
620 IANNUAL		INTEGER	DATA2	REFS	7	DEFINED	23				
2 ICURMO		INTEGER	DATA1	REFS	6	DEFINED	12				
0 ICURST		INTEGER	DATA1	REFS	6	15	DEFINED	12			
1 ICURYR		INTEGER	DATA1	REFS	6	16	DEFINED				
310 IFALL		INTEGER	DATA2	REFS	7	DEFINED	21				
20 IFALOB		INTEGER	DATA3	REFS	10	DEFINED	37				
0 INTLST		INTEGER	DATA3	REFS	10	DEFINED	15				
0 ISPRNG		INTEGER	DATA2	REFS	7	DEFINED	19				
15 ISPROB		INTEGER	DATA3	REFS	10	DEFINED	38				
144 ISUMMR		INTEGER	DATA2	REFS	7	DEFINED	20				
16 ISUMOB		INTEGER	DATA3	REFS	10	DEFINED	39				
1130 ITOTOB		INTEGER	DATA2	REFS	7	DEFINED	34				
17 IWINOB		INTEGER	DATA3	REFS	10	DEFINED	36				
454 IWINTR		INTEGER	ARRAY	REFS	7	DEFINED	22				
3 IWNDIR		INTEGER	DATA1	REFS	6	DEFINED	13				
4 IWNDSP		INTEGER	DATA1	REFS	6	DEFINED	12				
1 IYR		INTEGER	DATA3	REFS	10	DEFINED	16				
1131 IYRCNT		INTEGER	DATA2	REFS	7	DEFINED	29				
32 J		INTEGER		DEFINED	19	20	21	22	23	29	30
2 LABEL		INTEGER	ARRAY	REFS	18	28					
764 SPRCNT		REAL	ARRAY	REFS	47	48	41	42	43	44	45
					7	DEFINED	29	50	51		

FILE NAMES	MODE	READS	12
TAPE7	FMT		

STATEMENT LABELS	DEF LINE	REFERENCES
400000 10	25	17
0 20	24	18
0 30	32	27
400000 40	31	28
13 100 FMT	13	12

COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME (LENGTH)
DATA1	5	0 ICURST (1)
		3 IWNDIR (1)
DATA2	602	0 ISPRNG (100)
		300 IWINTR (100)
		550 DPCNT (50)
DATA3	17	0 INTLST (1)
		13 ISPROB (1)
		16 IFALOB (1)

1 ICURYR (1)	2 ICURMO (1)
4 IWNDSP (1)	
100 ISUMMR (100)	200 IFALL (100)
400 IANNUAL (100)	500 SPRCNT (50)
600 ITOTOB (1)	601 IYRCNT (1)
1 IYR (1)	2 LABEL (1)
14 ISUMOB (1)	15 IWINOB (1)

STATISTICS	
PROGRAM LENGTH	338 27
CM LABELED COMMON LENGTH	11608 624

```

1      SUBROUTINE PROCES
      C      THIS SUBROUTINE BEGINS PROCESSING THE DATA FOR EACH STATION.
      C
5      COMMON /DATA1/ICURST, ICURYR, ICURMO, IWNDIR, IWNDSP
      COMMON /DATA2/ISPRNG(10,10), ISUMMR(10,10), IFALL(10,10),
      * IWINTR(10,10), IANNUAL(10,10), SPRCNT(15,10), DPRCNT(15,10),
      * ITOTOB, IYRCNT
      COMMON /DATA3/INTLST, IYR, LABEL(11), ISPROB, ISUMOB, IWINOB,
      * IFALOB
10     C      CHECK FOR DIFFERENT STATION. IF DIFFERENT THEN PRINT
      C      OUT TABLES, ELSE CONTINUE.
      C
15     C      IF (ICURST.NE. INTLST) CALL PRNTOUT
      C      STATION NUMBER HAS NOT CHANGED SO INCREMENT OBSERVATION COUNT.
      C      ITOTOB = ITOTOB + 1
      C
20     C      DETERMINE ROW (WIND SPEED CATEGORY) IN WHICH WIND SPEED FALLS.
      C      I = IROW (IWNDSP)
      C
      C      DETERMINE THE COLUMN (WIND DIRECTION) IN WHICH WIND DIRECTION FALLS.
25     C      J = IWNDIR
      C      IF (IWNDIR.EQ. 0) J = 9
      C
      C      DETERMINE THE SEASON
30     C      Z=<0((ICURMO.EQ. 12).OR. (ICURMO.LT.3)) CALL WINTER(I,J)
      C      IF ((ICURMO.GT. 2).AND. (ICURMO.LT. 6)) CALL SPRING(I,J)
      C      IF ((ICURMO.GT. 5).AND. (ICURMO.LT. 9)) CALL SUMMER(I,J)
      C      IF ((ICURMO.GT. 8).AND. (ICURMO.LT. 12)) CALL FALL(I,J)
35     C      CHECK FOR CHANGE IN YEAR.
      C      CALL YRCNT
      C
      C      READ NEXT RECORD OF DATA
40     C
      C      20 READ (7,60) ICURST, ICURYR, ICURMO, IWNDIR, IWNDSP
      C      60 FORMAT (1, 16, 12, 12, 17X, 11, 13 )
      C      IF ( EOF (7) ) 70,10
45     C      CALL PRNTOUT
      C
      C      RETURN
      C      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF	LINE	REFERENCES
1	PROCES	1		47

VARIABLES	SN	TYPE	RELOCATION
1046 DPRCNT		REAL	ARRAY DATA2
15 I		INTEGER	
620 IANNUAL		INTEGER	ARRAY DATA2
2 ICURMO		INTEGER	DATA1
0 ICURST		INTEGER	DATA1
1 ICURYR		INTEGER	DATA1
310 IFALL		INTEGER	ARRAY DATA2
20 IFALOB		INTEGER	DATA3
0 INTLST		INTEGER	DATA3
0 ISPRNG		INTEGER	ARRAY DATA2
15 ISPROB		INTEGER	DATA3
144 ISUMMR		INTEGER	ARRAY DATA2
16 ISUMOB		INTEGER	DATA3
1130 ITOTOB		INTEGER	DATA2
17 IWINOB		INTEGER	DATA3
454 IWINTR		INTEGER	ARRAY DATA2
3 IWNDIR		INTEGER	DATA1
4 IWNDSP		INTEGER	DATA1
1 IYR		INTEGER	DATA3
1131 IYRCNT		INTEGER	DATA2
16 J		INTEGER	
2 LABEL		INTEGER	ARRAY DATA3
764 SPRCNT		REAL	ARRAY DATA2

REFS
5
31
5
4
4
4
4
5
8
8
5
8
5
8
5
8
5
4
4
8
5
31
8
5

32	33	DEFINED	21
2*31	2*32	2*33	DEFINED 41
14	DEFINED 41		
DEFINED			
14			
17	DEFINED	17	
25	26	DEFINED 41	41
21	DEFINED		
32	33	DEFINED	25 46

FILE NAMES	MODE	READS
TAPE7	FMT	41

EXTERNALS	TYPE	ARGS	REFERENCES
EOF	REAL	1	43
FALL		2	33
IROW	INTEGER	1	21
PRNTOUT		0	14
SPRING		2	31
SUMMER		2	32
YRCNT		0	37

STATEMENT LABELS	DEF	LINE	REFERENCES
0 10		14	43
400000 20	INACTIVE	41	
11 60	FMT	42	41
400000 70	INACTIVE	45	43

COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME (LENGTH)
DATA1	5	0 ICURST (1)
		3 IWNDIR (1)
		0 ISPRNG (100)
		300 IWINTR (100)
		550 DPRCNT (50)
		0 INTLST (1)
		13 ISPROB (1)
		16 IFALOB (1)
DATA2	602	
DATA3	17	

1 ICURYR (1)	2 ICURMO (1)
4 IWNDSP (1)	
100 ISUMMR (100)	200 IFALL (100)
400 IANNUAL (100)	500 SPRCNT (50)
600 ITOTOB (1)	601 IYRCNT (1)
1 IYR (1)	2 LABEL (1)
14 ISUMOB (1)	15 IWINOB (1)

```

1      SUBROUTINE WINTER (I,J)
      C      THIS SUBROUTINE TALLIES THE FREQUENCIES OF THE APPRSRIATE
      C      WIND SPEED AND WIND DIRECTION. IT ALSO TALLIES THE TOTALS
      C      FOR WIND SPEED AND WIND DIRECTION FOR THE WINTER SEASON.
5      C
      COMMON /DATA2/ISPRNG(10,10), ISUMMR(10,10), IFALL(10,10),
      * IWINTR(10,10), IANNUAL (10,10), SPRCNT (5,10), DPRCNT (5,10),
      * ITOTOB, IYRCNT
10     COMMON /DATA3/INTLST, IYR, LABEL(11), ISPROB, ISUMOB, IWINOB,
      * IFALOB
      C
      IWINTR (I,J) = IWINTR (I,J) + 1
      C
      C      INCREMENT ROW (WIND SPEED CATEGORY) TOTAL
15     C
      IWINTR (I,10) = IWINTR(I,10) + 1
      C
      C      INCREMENT COLUMN (WIND DIRECTION) TOTAL
      C
20     C
      IWINTR (10,J) = IWINTR (10,J) + 1
      C
      C      INCREMENT THE TOTAL OF TOTALS
      C
      IWINTR (10,10) = IWINTR (10,10) + 1
25     C
      C      INCREMENT WINTER OBSERVATIONS
      C
      IWINOB = IWINOB + 1
30     RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF LINE	REFERENCES
3	WINTER	1	29

VARIABLES	SN	TYPE	RELOCATION	REFS	6	2*12	2*16	DEFINED	1
1046	DPRCNT	REAL	DATA2	REFS	6				
0	I	INTEGER	F.P.	REFS	2*12				
620	IANNUAL	INTEGER	DATA2	REFS	6				
310	IFALL	INTEGER	DATA2	REFS	6				
20	IFALOB	INTEGER	DATA3	REFS	9				
0	INTLST	INTEGER	DATA3	REFS	9				
0	ISPRNG	INTEGER	DATA2	REFS	6				
15	ISPROB	INTEGER	DATA3	REFS	9				
144	ISUMMR	INTEGER	DATA2	REFS	6				
16	ISUMOB	INTEGER	DATA3	REFS	9				
1130	ITOTOB	INTEGER	DATA2	REFS	6				
17	IWINOB	INTEGER	DATA3	REFS	9		28	DEFINED	28
454	IWINTR	INTEGER	DATA2	REFS	6		12	16	20
				DEFINED	12		16	20	24
1	IYR	INTEGER	DATA3	REFS	9				
1131	IYRCNT	INTEGER	DATA2	REFS	6				
0	J	INTEGER	F.P.	REFS	2*12				
2	LABEL	INTEGER	DATA3	REFS	9		2*20	DEFINED	1
764	SPRCNT	REAL	DATA2	REFS	6				

COMMON	BLOCKS	LENGTH	MEMBERS	-	BIAS	NAME(LENGTH)
DATA2		602	0		ISPRNG	(100)
			300		IWINTR	(100)
			550		DPRCNT	(50)
DATA3		17	0		INTLST	(1)
			13		ISPROB	(1)
			16		IFALOB	(1)

100	ISUMMR	(100)	200	IFALL	(100)
400	IANNUAL	(100)	500	SPRCNT	(50)
600	ITOTOB	(1)	601	IYRCNT	(1)
1	IYR	(1)	2	LABEL	(1)
14	ISUMOB	(1)	15	IWINOB	(1)

STATISTICS	PROGRAM LENGTH	58	5
CM LABELED COMMON LENGTH	1153B	619	

```

1      SUBROUTINE SPRING (I,J)
      C      THIS SUBROUTINE TALLIES THE FREQUENCIES OF THE APPROPRIATE
      C      WIND SPEED AND WIND DIRECTION. IT ALSO TALLIES THE TOTALS
      C      FOR THE WIND SPEED AND WIND DIRECTION FOR THE SPRING SEASON.
5      C
      COMMON /DATA2/ISPRNG(10,10), ISUMMR(10,10), IFALL(10,10),
      * IWINTR(10,10), IANNUAL(10,10), SPRCNT(5,10), DPRCNT(5,10),
      * ITOTOB, IYRCNT
      COMMON /DATA3/INTLST, IYR, LABEL(11), ISPROB, ISUMOB, IWINOB,
      * IFALOB
10     C
      ISPRNG (I,J) = ISPRNG(I,J) + 1
      C
      C      INCREMENT ROW (WIND SPEED CATEGORY) TOTAL
      C
15     C      ISPRNG (I,10) = ISPRNG (I,10) + 1
      C
      C      INCREMENT COLUMN (WIND DIRECTION) TOTAL
      C
20     C      ISPRNG (10,J) = ISPRNG (10,J) + 1
      C
      C      INCREMENT THE TOTAL OF TOTALS
      C
      C      ISPRNG (10,10) = ISPRNG (10,10) + 1
25     C
      C      INCREMENT SPRING OBSERVATIONS
      ISPROB = ISPROB + 1
      RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF	LINE	REFERENCES
3	SPRING	1	28	
VARIABLES	SN	TYPE	RELOCATION	
1046	DPRCNT	REAL	ARRAY DATA2	REFS 6
0	I	INTEGER	F P	REFS 2*12
620	IANNUAL	INTEGER	ARRAY DATA2	REFS 2*16
310	IFALL	INTEGER	ARRAY DATA2	REFS 6
20	IFALOB	INTEGER	DATA3	REFS 9
0	INTLST	INTEGER	DATA3	REFS 9
0	ISPRNG	INTEGER	ARRAY DATA2	REFS 12
				DEFINED 12
15	ISPROB	INTEGER	DATA3	REFS 9
144	ISUMMR	INTEGER	ARRAY DATA2	REFS 6
16	ISUMOB	INTEGER	DATA3	REFS 9
1130	ITOTOB	INTEGER	DATA2	REFS 6
17	IWINOB	INTEGER	DATA3	REFS 9
454	IWINTR	INTEGER	ARRAY DATA2	REFS 6
1	IYR	INTEGER	DATA3	REFS 9
1131	IYRCNT	INTEGER	DATA2	REFS 6
0	J	INTEGER	F P	REFS 2*12
2	LABEL	INTEGER	ARRAY DATA3	REFS 2*20
764	SPRCNT	REAL	ARRAY DATA2	REFS 6

```

COMMON BLOCKS LENGTH MEMBERS - BIAS NAME(LENGTH)
DATA2 602
      0 ISPRNG (100)
      300 IWINTR (100)
      550 DPRCNT (50)
DATA3 17
      0 INTLST (1)
      13 ISPROB (1)
      16 IFALOB (1)

```

```

100 ISUMMR (100)
400 IANNUAL (100)
600 ITOTOB (1)
1 IYR (1)
14 ISUMOB (1)
200 IFALL (100)
500 SPRCNT (50)
601 IYRCNT (1)
2 LABEL (11)
15 IWINOB (1)

```

```

STATISTICS
P  VAN LENGTH 58 5
C  RELED COMMON LENGTH 11538 619

```



```

1      SUBROUTINE SUMMER (I,J)
      C      THIS SUBROUTINE TALLIES THE FREQUENCIES OF THE APPROPRIATE
      C      WIND SPEED AND WIND DIRECTION. IT ALSO TALLIES THE TOTALS
      C      FOR WIND SPEED AND WIND DIRECTION FOR THE SUMMER SEASON.
5      C
      COMMON /DATA2/ISPRNG(10,10), ISUMMR(10,10), IFALL(10,10),
      * IWINTR(10,10), IANNUAL(10,10), SPRCNT(5,10), DPRCNT(5,10),
      * ITOTOB, IYRCNT
10     COMMON /DATA3/INTLST, IYR, LABEL(11), ISPROG, ISUMOB, IWINOB,
      * IFALOB
      C
      ISUMMR (I,J) = ISUMMR (I,J) + 1
      C
      C      INCREMENT ROW (WIND SPEED CATEGORY) TOTAL
15     C
      ISUMMR (I,10) = ISUMMR(I, 10) + 1
      C
      C      INCREMENT COLUMN (WIND DIRECTION) TOTAL
20     C
      ISUMMR (10,J) = ISUMMR (10,J) + 1
      C
      C      INCREMENT THE TOTAL OF TOTALS
      ISUMMR (10,10) = ISUMMR (10,10) + 1
25     C
      C      INCREMENT THE SUMMER OBSERVATIONS
      ISUMOB = ISUMOB + 1
      C
30     RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS DEF LINE REFERENCES
3 SUMMER 1 29

VARIABLES	SN	TYPE	RELOCATION	REFS					
1046	OPRCNT	REAL	ARRAY	DATA2	REFS	6			
0	I	INTEGER		F.P.	REFS	2*12	2*16	DEFINED	1
620	IANNUAL	INTEGER	ARRAY	DATA2	REFS	6			
310	IFALL	INTEGER	ARRAY	DATA2	REFS	6			
20	IFALOB	INTEGER		DATA3	REFS	9			
0	INTLST	INTEGER		DATA3	REFS	9			
0	ISPRNG	INTEGER	ARRAY	DATA2	REFS	6			
15	ISPROG	INTEGER		DATA3	REFS	9			
144	ISUMMR	INTEGER	ARRAY	DATA2	REFS	6	12	16	20
					REFS	6		20	24
16	ISUMOB	INTEGER		DATA3	REFS	12	16	20	28
1130	ITOTOB	INTEGER		DATA2	REFS	6	28	DEFINED	
17	IWINOB	INTEGER		DATA3	REFS	9			
454	IWINTR	INTEGER	ARRAY	DATA2	REFS	6			
1	IYR	INTEGER		DATA3	REFS	9			
1131	IYRCNT	INTEGER		DATA2	REFS	6			
0	J	INTEGER		F.P.	REFS	2*12	2*20	DEFINED	1
2	LABEL	INTEGER	ARRAY	DATA3	REFS	9			
764	SPRCNT	REAL	ARRAY	DATA2	REFS	6			

SUBROUTINE SUMMER 73/73 OPT=1

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PAGE 2

COMMON BLOCKS LENGTH MEMBERS - BIAS NAME(LENGTH)

DATA2	602	0	ISPRNG (100)
		300	IWINTR (100)
		550	OPRCNT (50)
DATA3	17	0	INTLST (1)
		13	ISPROG (1)
		16	IFALOB (1)

100	ISUMMR (100)	200	IFALL (100)
400	IANNUAL (100)	500	SPRCNT (50)
600	ITOTOB (1)	601	IYRCNT (1)
1	IYR (1)	2	LABEL (11)
14	ISUMOB (1)	15	IWINOB (1)

STATISTICS
PROGRAM LENGTH 58 5
CM LABELED COMMON LENGTH 1153B 619

```

1      SUBROUTINE FALL (I,J)
      C      THIS SUBROUTINE TALLIES THE FREQUENCIES OF THE APPROPRIATE
      C      WIND SPEED AND WIND DIRECTION. IT ALSO TALLIES THE TOTALS
      C      FOR WIND SPEED AND WIND DIRECTION FOR THE FALL SEASON.
5      C
      COMMON /DATA2/ISPRNG(10,10), ISUMMR(10,10), IFALL(10,10),
      + IWINTR(10,10), IANNUAL(10,10), SPRCNT(5,10), DPRCNT(5,10),
      + ITOTOB, IYRCNT
10     COMMON /DATA3/INTLST, IYR, LABEL(11), ISPROB, ISUMOB, IWINOB,
      + IFALOB
      C
      IFALL(I,J) = IFALL(I,J) + 1
      C
      C      INCREMENT ROW (WIND SPEED CATEGORY) TOTAL
15     C
      IFALL(I,10) = IFALL(I,10) + 1
      C
      C      INCREMENT COLUMN (WIND DIRECTION) TOTAL
20     C
      IFALL(10,J) = IFALL(10,J) + 1
      C
      C      INCREMENT THE TOTAL OF TOTALS
      IFALL(10,10) = IFALL(10,10) + 1
25     C
      IFALL(10,10) = IFALL(10,10) + 1
      C
      C      INCREMENT THE FALL OBSERVATIONS
30     C
      IFALOB = IFALOB + 1
      RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF	LINE	REFERENCES						
3	FALL		1	31						
VARIABLES	SN	TYPE	RELOCATION	REFS						
1046 DPRCNT		REAL	DATA2	REFS	6					
0 I		INTEGER	F.P.	REFS	2*12	2*16	DEFINED	1		
620 IANNUAL		INTEGER	DATA2	REFS	6					
310 IFALL		INTEGER	DATA2	REFS	6	12	16	20	24	26
				DEFINED	12	16	20	24	26	26
20 IFALOB		INTEGER	DATA3	REFS	9					
0 INTLST		INTEGER	DATA3	REFS	9					
0 ISPRNG		INTEGER	DATA2	REFS	6					
15 ISPROB		INTEGER	DATA3	REFS	9					
144 ISUMMR		INTEGER	DATA2	REFS	6					
16 ISUMOB		INTEGER	DATA3	REFS	9					
1130 ITOTOB		INTEGER	DATA2	REFS	6					
17 IWINOB		INTEGER	DATA3	REFS	9					
454 IWINTR		INTEGER	DATA2	REFS	6					
1 IYR		INTEGER	DATA3	REFS	9					
1131 IYRCNT		INTEGER	DATA2	REFS	6					
0 J		INTEGER	F.P.	REFS	2*12	2*20	DEFINED	1		
2 LABEL		INTEGER	DATA3	REFS	9					

SUBROUTINE FALL

73/73 OPT=1

FTN 4.6+439

78/10/17. 16.03.55

PAGE

2

VARIABLES	SN	TYPE	RELOCATION	REFS						
764 SPRCNT		REAL	DATA2	REFS	6					
COMMON BLOCKS	LENGTH	MEMBERS -	BIAS NAME (LENGTH)							
DATA2	602		0 ISPRNG (100)	100	ISUMMR (100)		200	IFALL (100)		
			300 IWINTR (100)	400	IANNUAL (100)		500	SPRCNT (50)		
			550 DPRCNT (50)	600	ITOTOB (1)		601	IYRCNT (1)		
			0 INTLST (1)	1	IYR (1)		2	LABEL (11)		
DATA3	17		13 ISPROB (1)	14	ISUMOB (1)		15	IWINOB (1)		
			16 IFALOB (1)							

ST STICS

PROGRAM LENGTH

CM LABELED COMMON LENGTH

58
1153B5
619

C-14

```

1      SUBROUTINE ANNUAL
      C      THIS SUBROUTINE COMPUTES THE FREQUENCIES OF THE APPROPRIATE
      C      WIND SPEED AND WIND DIRECTION FOR THE ENTIRE YEAR.
      C
5      COMMON /DATA2/ISPRNG(10,10), ISUMMR(10,10), IFALL(10,10),
      C      + IWINTR(10,10), IANNUAL(10,10), SPRCNT(5,10), DPRCNT(5,10),
      C      + ITOTOB, IYRCNT
      C
10     DO 10 I = 1,10
      C      DO 20 J = 1,10
      C          IANNUAL(I,J) = IWINTR(I,J) + ISPRNG(I,J) + ISUMMR(I,J)
      C          + IFALL(I,J)
      C      20 CONTINUE
      C      10 CONTINUE
15     C      RETURN
      C      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF LINE	REFERENCES
1	ANNUAL	1	16

VARIABLES	SN	TYPE	RELOCATION	REFS			
1046 DPRCNT		REAL	ARRAY DATA2	REFS	5		
2 I		INTEGER		REFS	5*11	DEFINED	9
620 IANNUAL		INTEGER	ARRAY DATA2	REFS	5*11	DEFINED	11
310 IFALL		INTEGER	ARRAY DATA2	REFS	5*11		
0 ISPRNG		INTEGER	ARRAY DATA2	REFS	5*11		
144 ISUMMR		INTEGER	ARRAY DATA2	REFS	5*11		
1130 ITOTOB		INTEGER	DATA2	REFS	5*11		
454 IWINTR		INTEGER	ARRAY DATA2	REFS	5*11		
1131 IYRCNT		INTEGER	DATA2	REFS	5*11		
3 J		INTEGER		REFS	5*11	DEFINED	10
764 SPRCNT		REAL	ARRAY DATA2	REFS	5		

STATEMENT LABELS	DEF LINE	REFERENCES
0 10	14	9
400000 20	13	10

COMMON BLOCKS	LENGTH	MEMBERS	BIAS NAME (LENGTH)
DATA2	602	0 ISPRNG (100)	100 ISUMMR (100)
		300 IWINTR (100)	400 IANNUAL (100)
		550 DPRCNT (50)	600 ITOTOB (1)
			200 IFALL (100)
			500 SPRCNT (50)
			601 IYRCNT (1)

STATISTICS	PROGRAM LENGTH	CM LABELED COMMON LENGTH
	40	4
	1132B	602

```

1      SUBROUTINE YRCNT
      C      THIS SUBROUTINE DETERMINES HOW MANY YEARS OF DATA WAS TAKEN
      C      AT EACH STATION.
5      COMMON /DATA1/ICURST, ICURYR, ICURMO, IWNDIR, IWNDSP
      COMMON /DATA2/ISPRNG(10,10), ISUMMR(10,10), IFALL(10,10),
      * IWINTR(10,10), IANNUAL(10,10), SPRCNT(5,10), DPRCNT(5,10),
      * ITOTOB, IYRCNT
10     COMMON /DATA3/INTLST, IRY, LABEL(11), ISPROB, ISUMOB, IWINOB,
      * IFALOB
      C
      IF (ICURYR.EQ. IYR) GO TO 1
      IYRCNT = IYRCNT + 1
      IYR = ICURYR
15     RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF LINE	REFERENCES
1	YRCNT	1	15

VARIABLES	SN	TYPE	RELOCATION
1046 DPHCNT		REAL	DATA2
620 IANNUAL		INTEGER	DATA2
2 ICURMO		INTEGER	DATA1
0 ICURST		INTEGER	DATA1
1 ICURYR		INTEGER	DATA1
310 IFALL		INTEGER	DATA2
20 IFALOB		INTEGER	DATA3
0 INTLST		INTEGER	DATA3
1 IRY		INTEGER	DATA3
0 ISPRNG		INTEGER	DATA2
15 ISPROB		INTEGER	DATA3
144 ISUMMR		INTEGER	DATA2
16 ISUMOB		INTEGER	DATA3
1130 ITOTOB		INTEGER	DATA2
17 IWINOB		INTEGER	DATA3
454 IWINTR		INTEGER	DATA2
3 IWNDIR		INTEGER	DATA1
4 IWNDSP		INTEGER	DATA1
2 IYR		INTEGER	
1131 IYRCNT		INTEGER	DATA2
2 LABEL		INTEGER	DATA3
764 SPRCNT		REAL	DATA2

REFS			
6			
6			
5			
5			
5			
12		14	
6			
9			
9			
9			
6			
9			
6			
9			
6			
9			
6			
5			
12	DEFINED	14	
6	13	DEFINED	13
9			
6			

STATEMENT LABELS	DEF LINE	REFERENCES
400000 1	15	12

COMMON BLOCKS	LENGTH	MEMBERS	BIAS NAME(LENGTH)
DATA1	5	0 ICURST (1)	
		3 IWNDIR (1)	
DATA2	602	0 ISPRNG (100)	
		300 IWINTR (100)	
		550 DPRCNT (50)	
DATA3	17	0 INTLST (1)	
		13 ISPROB (1)	

1 ICURYR (1)		2 ICURMO (1)
4 IWNDSP (1)		
100 ISUMMR (100)		200 IFALL (100)
400 IANNUAL (100)		500 SPRCNT (50)
600 ITOTOB (1)		601 IYRCNT (1)
1 IRY (1)		2 LABEL (1)
14 ISUMOB (1)		15 IWINOB (1)

COMMON BLOCKS	LENGTH	MEMBERS	BIAS NAME(LENGTH)
		16 IFALOB (1)	

STATISTICS		
PROGRAM LENGTH	38	3
CM LABELED COMMON LENGTH	1160B	624

```

1      SUBROUTINE PERCENT
C      THIS SUBROUTINE COMPUTES FOR EACH SEASON AND ENTIRE YEAR THE
C      PER CENT OF OBSERVATIONS FOR EACH DIRECTION AND THE PER CENT
C      OF OBSERVATIONS FOR EACH WIND SPEED CATEGORY.
5      COMMON/DATA2/ISPRNG(10,10), ISUMMR(10,10), IFALL(10,10),
C      * IWINTR(10,10), IANNUAL(10,10), SPRCNT(5,10), DPRCNT(5,10),
C      * ITOTOB, IYRCNT
10     C
C      IF (IWINTR(10,10).EQ. 0) GO TO 11
DO 10 I = 1, 9
    SPRCNT(1,I) = (FLOAT(IWINTR(I,10)) / FLOAT(IWINTR(10,10)))
    * 100.0
    DPRCNT(1,I) = (FLOAT(IWINTR(10,I)) / FLOAT(IWINTR(10,10)))
    * 100.0
15     *
10     CONTINUE
C
11     IF (ISPRNG(10,10).EQ. 0) GO TO 21
DO 20 I = 1, 9
    SPRCNT(2,I) = (FLOAT(ISPRNG(I,10)) / FLOAT(ISPRNG(10,10)))
    * 100.0
    SPRCNT(2,I) = (FLOAT(ISPRNG(I,10)) / FLOAT(ISPRNG(10,10)))
    * 100.0
    DPRCNT(2,I) = (FLOAT(ISPRNG(10,I)) / FLOAT(ISPRNG(10,10)))
    * 100.0
25     *
20     CONTINUE
C
21     IF (ISUMMR(10,10).EQ. 0) GO TO 31
DO 30 I = 1, 9
    SPRCNT(3,I) = (FLOAT(ISUMMR(I,10)) / FLOAT(ISUMMR(10,10)))
    * 100.0
    DPRCNT(3,I) = (FLOAT(ISUMMR(10,I)) / FLOAT(ISUMMR(10,10)))
    * 100.0
30     *
30     CONTINUE
C
31     IF (IFALL(10,10).EQ. 0) GO TO 41
DO 40 I = 1, 9
    SPRCNT(4,I) = (FLOAT(IFALL(I,10)) / FLOAT(IFALL(10,10)))
    * 100.0
    DPRCNT(4,I) = (FLOAT(IFALL(10,I)) / FLOAT(IFALL(10,10)))
    * 100.0
40     *
40     CONTINUE
C
41     IF (IANNUAL(10,10).EQ. 0) GO TO 51
DO 50 I = 1, 9
    SPRCNT(5,I) = (FLOAT(IANNUAL(I,10)) / FLOAT(IANNUAL(10,10)))
    * 100.0
    DPRCNT(5,I) = (FLOAT(IANNUAL(10,I)) / FLOAT(IANNUAL(10,10)))
    * 100.0
50     *
50     CONTINUE
C
51     RETURN
    END

```

SYMBOLIC REFERENCE MAP (R=3)

SUBROUTINE PERCENT		73/73	OPT=1	FTN 4.6+439		78/10/17. 22.42.40		PAGE		2	
ENTRY	POINTS	DEF LINE	REFERENCES								
1	PERCENT	1	52								
VARIABLES		SN	TYPE	RELOCATION	REFS	DEFINED	14	24	32	40	48
1046	DPRCNT		REAL	DATA2	REFS	2*12	2*14	2*20	2*22	2*24	2*30
3	I		INTEGER	ARRAY	REFS	2*40	2*46	2*48	DEFINED	11	19
					REFS	45					29
620	IANNUAL		INTEGER	ARRAY	DATA2	REFS	44	2*46	2*48		
310	IFALL		INTEGER	ARRAY	DATA2	REFS	36	2*38	2*40		
0	ISPRNG		INTEGER	ARRAY	DATA2	REFS	18	2*20	2*22	2*24	
144	ISUMMR		INTEGER	ARRAY	DATA2	REFS	28	2*30	2*32		
1130	ITOTOB		INTEGER	ARRAY	DATA2	REFS	6				
454	IWINTR		INTEGER	ARRAY	DATA2	REFS	10	2*12	2*14		
1131	IYRCNT		INTEGER	ARRAY	DATA2	REFS	6				
764	SPRCNT		REAL	ARRAY	DATA2	REFS	6	DEFINED	12	20	22
						46				30	38
INLINE FUNCTIONS		TYPE	ARGS	DEF LINE	REFERENCES						
FLOAT		REAL	1 INTRIN		2*12	2*14	2*20	2*22	2*24	2*30	2*32
					2*40	2*46	2*48				2*38
STATEMENT LABELS		DEF LINE	REFERENCES								
0	10	16	11								
0	11	18	10								
0	20	26	19								
0	21	28	18								
0	30	34	29								
0	31	36	28								
0	40	42	37								
0	41	44	36								
0	50	50	45								
0	51	52	44								
COMMON BLOCKS		LENGTH	MEMBERS - BIAS NAME(LENGTH)								
DATA2		602	0 ISPRNG (100)		100 ISUMMR (100)	200 IFALL (100)					
			300 IWINTR (100)		400 IANNUAL (100)	500 SPRCNT (50)					
			550 DPRCNT (50)		600 ITOTOB (1)	601 IYRCNT (1)					
STATISTICS											
PROGRAM LENGTH		48	4								
CM Labeled COMMON LENGTH		11328	602								

```

1      SUBROUTINE PRNTOUT
      C      THIS SUBROUTINE SUMMARIZES MATERIAL, PRINTS OUT TABLES,
      C      AND INITIALIZES VARIABLES FOR A NEW STATION.
5      COMMON /DATA1/ICURST, ICURYR, ICURMO, IWNDIR, IWNDSP
      COMMON /DATA2/ISPRNG(10,10), ISUMMR(10,10), IFALL(10,10),
      * IWINTR(10,10), IANNUAL(10,10), SPRCNT(5,10), DPRCNT(5,10),
      * ITOTOB, IYRCNT
10     COMMON /DATA3/INTLST, IYR, LABEL(11), ISPROB, ISUMOB, IWINOB,
      * IFALOB
      C      CALL ANNUAL
      C      CALL PERCENT
15     WRITE (6,1)
1      FORMAT(*1*,31X,*WIND SPEED AND DIRECTION FREQUENCY DISTRIBUTION*)
      WRITE (6,2) INTLST, ITOTOB, IYRCNT
2      FORMAT(*--*,15X,*STATION NUMBER *, I6, 14X,*TOTAL OBSERVATIONS
      * I4, 14X,*YEARS *, I2)
20     IF (ISPROB.EQ. 0) GO TO 100
      WRITE (6,3)
3      FORMAT(*0*, 5X,*SEASON SPRING*, 28X,*WIND DIRECTION *)
      WRITE (6,5)
5      FORMAT(* *, 16X,*N*, 6X,*NE*, 7X,*E*, 6X,*SE*, 7X,*S*,
      * 6X,*SW*, 7X,*W*, 6X,*NW*, 3X,*NO DIR.*, 2X,*TOTAL*, 2X,
      * *PER CENT*)
      WRITE (6,12)
12     FORMAT(* *, 50(*--*))
      DO 10 I = 1,9
30     WRITE (6,6) LABEL(I), (ISPRNG(I,J), J = 1,10), SPRCNT(2,I)
10     CONTINUE
6      FORMAT(* *, A10, 10(3X, I4, 1X), 4X, F4.0)
      WRITE (6,14) LABEL(10), (ISPRNG(10,J), J = 1,10)
14     FORMAT(* *, A10, 10(3X, I4, 1X) )
35     WRITE (6,11) LABEL(11), (DPRCNT(2,J), J=1,9)
11     FORMAT(* *, A10, 9(4X, F4.0))
100    IF (ISUMOB.EQ. 0) GO TO 200
      WRITE (6,7)
7      FORMAT(*0*, 5X,*SEASON SUMMER*,28X,*WIND DIRECTION*)
      WRITE (6,5)
40     WRITE (6,12)
      DO 40 I = 1,9
40     WRITE (6,6) LABEL(I), (ISUMMR(I,J), J=1,10 ),SPRCNT(3,I)
      CONTINUE
45     WRITE (6,14) LABEL(10), (ISUMMR(10,J), J = 1,10)
      WRITE (6,11) LABEL(11), (DPRCNT(3,J), J = 1,9)
200    IF (IFALOB.EQ. 0) GO TO 300
      WRITE (6,8)
50     FORMAT(*0*, 5X,*SEASON FALL*,28X,*WIND DIRECTION*)
      WRITE (6,5)
      WRITE (6,12)
      DO 50 I = 1,9
50     WRITE (6,6) LABEL(I), (IFALL(I,J), J= 1, 10), SPRCNT(4,I)
      CONTINUE
55     WRITE (6,14) LABEL(10), (IFALL(10,J), J = 1,10)
      WRITE (6,11) LABEL(11), (DPRCNT(4,J), J = 1,9)
300    IF (IWINOB.EQ. 0) GO TO 400
      WRITE (6,9)
60     FORMAT(*0*, 5X,*SEASON WINTER*, 28X,*WIND DIRECTION *)
      WRITE (6,5)
      WRITE (6,12)

```

```

        DO 60 I = 1,9
          WRITE (6,6) LABEL(I), (IWINTR(I,J), J = 1,10 ), SPRCNT (1,I)
65      60  CONTINUE
          WRITE (6,14) LABEL (10), (IWINTR(10,J), J = 1,10)
          WRITE (6,11) LABEL (11), (DPRCNT (1,J), J = 1,9)
      C
      400  WRITE (6,13)
      13  FORMAT (*0%, 5X, *ANNUAL*, 36X, *WIND DIRECTION*)
70      WRITE (6,5)
      WRITE (6,12)
      DO 70 I = 1,9
        WRITE (6,6) LABEL (I), (IANNUAL (I,J), J = 1,10), SPRCNT (5,I)
75      70  CONTINUE
          WRITE (6,14) LABEL (10), (IANNUAL (10,J), J = 1,10)
          WRITE (6,11) LABEL (11), (DPRCNT (5,J), J = 1,9)
      C
      C
      C      INITIALIZE FOR A NEW STATION
80      IYR = ICURYR
      INTLST = ICURST
      ITOTOB = 0
      IYRCNT = 0
85      ISPROB = 0
      ISUMOB = 0
      IFALOB = 0
      IWINOB = 0
      C
      DO 20 M = 1,10
        DO 30 N = 1,10
          ISPRNO (M,N) = 0
          ISUMMR (M,N) = 0
          IFALL (M,N) = 0
          IWINTR (M,N) = 0
          IANNUAL (M,N) = 0
90      30  CONTINUE
        20  CONTINUE
      C
      DO 80 I = 1,5
        DO 90 J = 1,10
          SPRCNT (I,J) = 0
          DPRCNT (I,J) = 0
95      90  CONTINUE
        80  CONTINUE
100
105      RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS	DEF LINE	REFERENCES
1 PRNTOUT	1	106

VARIABLES	SN	TYPE	RELOCATION
1046 DPRCNT		REAL	ARRAY DATA2
356 I		INTEGER	

REFS	6	35	46	56	66	76
DEFINED	102					
REFS	3*30	3*43	3*53	3*63	3*73	101
DEFINED	29	42	52	62	72	99

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SUBROUTINE PRNTOUT

73/73 OPT=1

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STATEMENT	LABELS	DEF LINE	REFERENCES
0	60	64	62
0	70	74	72
0	80	104	99
400000	90	103	100
400000	100	37	20
400000	200	47	37
400000	300	57	47
0	400	68	57

COMMON BLOCKS	LENGTH	MEMBERS	- BIAS NAME (LENGTH)
DATA1	5	0	CURST (1)
		3	WINDIR (1)
DATA2	602	0	SPRNG (100)
		300	WINTR (100)
		550	OPRCNT (50)
DATA3	17	0	INTLST (1)
		13	ISPROB (1)
		16	IFALOB (1)

1	ICURYR (1)
4	WINDSP (1)
100	SUHRM (100)
400	ANNUAL (100)
600	TOTOB (1)
1	YR (1)
14	SUMOB (1)

2	ICURMO (1)
200	IFALL (100)
500	SPRCNT (50)
601	IYRCNT (1)
2	LABEL (1)
15	IWINOB (1)

STATISTICS	PROGRAM LENGTH	CM LABELED COMMON LENGTH
	3628	242
	11608	624

FUNCTION IROW

73/73 OPT=1

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```

1      C      INTEGER FUNCTION IROW (IWNDSP)
      C      THIS FUNCTION RETURNS THE ROW (WIND SPEED CATEGORY) IN WHICH
      C      THE WIND SPEED FALLS.
5      IF (IWNDSP .LT. 8) IROW = 1
      IF ((IWNDSP .GT. 7) .AND. (IWNDSP .LT. 11)) IROW = 2
      IF ((IWNDSP .GT. 10) .AND. (IWNDSP .LT. 16)) IROW = 3
      IF ((IWNDSP .GT. 15) .AND. (IWNDSP .LT. 21)) IROW = 4
      IF ((IWNDSP .GT. 20) .AND. (IWNDSP .LT. 26)) IROW = 5
      IF ((IWNDSP .GT. 25) .AND. (IWNDSP .LT. 31)) IROW = 6
      IF ((IWNDSP .GT. 30) .AND. (IWNDSP .LT. 41)) IROW = 7
      IF ((IWNDSP .GT. 40) .AND. (IWNDSP .LT. 51)) IROW = 8
      IF (IWNDSP .GT. 50) IROW = 9
15     RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS	DEF LINE	REFERENCES
4 IROW	1	14

VARIABLES	SN	TYPE	RELOCATION	DEFINED	5	6	7	8	9	10	11
6 IROW		INTEGER		12	13						
0 IWNDSP		INTEGER	F.P.	REFS	5	2*6	2*7	2*8	2*9	2*10	2*11
				2*12	13	DEFINED	1				

STATISTICS	PROGRAM LENGTH	78	7

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APPENDIX D
PROGRAM INFOPA

PROGRAM INFOPA

Program INFOPA considers wind speed observations from fire weather stations during the period of May 1 to September 30 for the years 1961 through 1977. If the wind speed is ≥ 8 mph and ≤ 60 mph a $\frac{P}{A}$ value is computed for the station. If the wind speed does not fall into this speed category, no $\frac{P}{A}$ value is computed. In particular, the program computes the $\frac{P}{A}$ value for each day in the time period mentioned above for each station, the sum of the $\frac{P}{A}$ values of all stations for each day, the number of stations with observations but with no computed $\frac{P}{A}$ value for each day.

INPUT

Program INFOPA uses input data obtained from the National Fire Weather Data Library. The input variables (ICURST, ICURYR, ICURMO, ICURDAY, IWNDSP) are read from a card image file (TAPE8). The format for these variables is as follows.

<u>Card Column</u>	<u>Format</u>	<u>Variable</u>	<u>Description</u>
1-6	I6	ICURST	Station Number
7-8	I2	ICURYR	Year
9-10	I2	ICURMO	Month
11-12	I2	ICURDAY	Day
29-31	I3	IWNDSP	Wind Speed (mph)

The input variable, ALT, is read from data cards (input) with the format:

<u>Card Column</u>	<u>Format</u>	<u>Variable</u>	<u>Description</u>
1-4	I4	ALT	Altitude of Station (meters)

OUTPUT

All output of Program INFOPA (except for the total number of stations) is written onto a tape (TAPE9) for future reference. The total number of stations is written onto TAPE10. The information is written onto TAPE9 in the following order.

1. The station number with the $\frac{P}{A}$ value for each day. (A value of -1.0 indicates no observation. A value of 0.0 indicates an observation, but no $\frac{P}{A}$ computed.)
2. The sum of the $\frac{P}{A}$ values for each day.
3. The number of stations with a $\frac{P}{A}$ value for each day.
4. The number of stations with observations, but no computed $\frac{P}{A}$ value for each day.

The output variables include:

ADATA(1,I)	Array for the $\frac{P}{A}$ values of a particular station. The columns represent the day.
ADATA(2,I)	Array for the sum of the $\frac{P}{A}$ values of all stations. The columns represent the day.
ADATA(3,I)	Array for the number of stations with a $\frac{P}{A}$ value. The columns represent the day.
ADATA(4,I)	Array for the number of stations with observations, but no computed $\frac{P}{A}$. The columns represent the day.
ITOTST	Total number of stations observed.

PROGRAM INFOPA

SUBROUTINE STATS

SUBROUTINE CALCU

```

1  PROGRAM INFOPA (INPUT, OUTPUT, TAPE9, CARDS, TAPE 8 = CARDS,
2  + TAPE 6 = OUTPUT, TAPE 5 = INPUT, TAPE10)
3  THIS PROGRAM WAS WRITTEN BY JANE FISHER DURING MAY, 1978.
4  DURING THE PERIOD OF MAY 1 TO SEPTEMBER 30 FOR THE YEARS
5  1961 - 1977 OBSERVATIONS ARE CONSIDERED. IF THE WIND SPEED
6  IS GREATER THAN 7 MILES PER HOUR AND LESS THAN 60 MILES PER
7  HOUR A P/A VALUE IS COMPUTED FOR THE STATION. IF THE WIND
8  SPEED DOES NOT FALL INTO THIS CATEGORY NO P/A IS COMPUTED.
9  HENCE THE PROGRAM COMPUTES THE P/A FOR EACH DAY IN THE
10 TIME PERIOD AT A PARTICULAR STATION; THE SUM OF THE P/A
11 OF ALL STATIONS ON A PARTICULAR DATE, THE NUMBER OF
12 STATIONS WITH A P/A VALUE ON A PARTICULAR DATE, AND THE
13 NUMBER OF STATIONS WITH OBSERVATIONS, BUT WITH NO COMPUTED
14 P/A VALUE. A -1.0 ON THE OUTPUT INDICATES NO OBSERVATION;
15 0.0 INDICATES AN OBSERVATION BUT NO P/A COMPUTED.

16 INPUT VARIABLES I CURST - STATION NUMBER
17                  I CURYR - YEAR
18                  I CURMO - MONTH
19                  I CURDAY - DAY
20                  I WNDSP - WIND SPEED
21                  ALT - ALTITUDE OF STATION
22 OUTPUT VARIABLES ADATA (1,1) - ARRAY FOR THE P/A VALUE OF A
23                      PARTICULAR STATION. THE COLUMNS
24                      REPRESENT THE DAY
25                      ADATA (2,1) - ARRAY FOR THE SUM OF THE P/A OF
26                      ALL STATIONS ON THAT DAY.
27                      ADATA (3,1) - ARRAY FOR THE NUMBER OF STATIONS
28                      WITH A P/A VALUE ON THAT DAY.
29                      ADATA (4,1) - ARRAY FOR THE NUMBER OF STATIONS
30                      WITH OBSERVATIONS BUT NO COMPUTED
31                      P/A ON THAT DAY.
32 OTHER VARIABLES ITOTST - TOTAL NUMBER OF STATIONS

33 - - - - -
34 COMMON / CMPDATA/ ADATA (4,2618), ITOTST
35 COMMON / INDATA/ I CURST, I CURYR, I CURMO, I CURDAY, I WNDSP, ALT,
36 + INTLST

37 CALL INITLZE
38 IF (EOF(8)) 300, 7
39 CHECK FOR NEW STATION NUMBER.
40 IF (I CURST .NE. INTLST) CALL WRITEA1
41 IF (EOF(5)) 400, 8
42 CHECK FOR MONTHS MAY THROUGH SEPTEMBER
43 IF ((I CURMO .GT. 9) .OR. (I CURMO .LT. 5) .OR. (I CURYR .LT. 61))
44 GO TO 9
45 * INDEX = IDATE (I CURYR, I CURMO, I CURDAY)
46 CHECK TO SEE IF P/A IS TO BE COMPUTED.
47 IF ((I WNDSP .LE. 7) .OR. (I WNDSP .GT. 60)) GO TO 200
48 ADATA (1,INDEX) = COMPPA (I WNDSP, ALT)
49 ADD P/A VALUE TO THE SUM OF P/A VALUES.
50 ADATA (2,INDEX) = ADATA (2,INDEX) + ADATA (1,INDEX)
51 INCREMENT NUMBER OF STATIONS WITH P/A VALUE FOR THAT DATE.
52 ADATA (3,INDEX) = ADATA (3,INDEX) + 1.0

```

```

C
C 9 READ NEXT DATA RECORD
65 100 READ (8,100) ICURST, ICURYR, ICURMO, ICURDAY, IWNDS
    FORMAT (16, 12, 12, 12, 16X, 13)
    GO TO 1
C
C 200 CONTINUE
70 ADATA (1,INDEX) = 0.0
C
C INCREMENT NUMBER OF STATIONS WITH NO P/A BUT WITH OBSERVATIONS
C ADATA (4,INDEX) = ADATA (4,INDEX) + 1.0
C
C READ NEXT DATA RECORD
75 READ (8,100) ICURST, ICURYR, ICURMO, ICURDAY, IWNDS
    GO TO 1
    400 WRITE (6,500)
    500 FORMAT (*0*, * ERROR - NUMBER OF STATIONS AND NUMBER OF ALTITUDES
80 * ARE NOT THE SAME.*)
    STOP
C
C 300 CALL WRITEA1
    CALL WRITEA2
85 END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS	DEF LINE	REFERENCES
12271 INFOPA	1	

VARIABLES	SN	TYPE	RELOCATION	REFS	36	2*58	61	72	DEFINED	57	58
0 ADATA		REAL	ARRAY	CMPPDATA	36	2*58	61	72	DEFINED	57	58
5 ALT		REAL		INDATA	61	72					
3 ICURDAY		INTEGER		INDATA	37	55					
2 ICURMO		INTEGER		INDATA	37	51	DEFINED	64	75		
0 ICURST		INTEGER		INDATA	37	2*49	51	DEFINED	64	75	
1 ICURYR		INTEGER		INDATA	37	45	DEFINED	64	75		
12340 INDEX		INTEGER		INDATA	37	49	51	DEFINED	64	75	
6 INTLST		INTEGER		INDATA	55	3*58	2*61	69	2*72		
24350 ITOTST		INTEGER		CMPPDATA	51	45					
4 IWNDS		INTEGER		INDATA	37	2*54	55	DEFINED	64	75	

FILE NAMES	MODE	TYPE	ARGS	REFERENCES
6151 CARDS		REAL	2	55
0 INPUT		REAL	1	42
2043 OUTPUT				
10214 TAPE10				
0 TAPE5				
2043 TAPE6	FMT			77
6151 TAPE8	FMT			64
4106 TAPE9				75

EXTERNALS	TYPE	ARGS	REFERENCES
COMPPA	REAL	2	55
EOF	REAL	1	42

PROGRAM INFO		73/73	OPT=1	
EXTERNALS	TYPE	ARGS	REFERENCES	
IDATE	INTEGER	3	51	
INITLZE		0	40	
WRITEA1		0	45	82
WRITEA2		0	83	

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STATEMENT	LABELS		DEF LINE	REFERENCES	
0	1		42	66	76
400000	7	INACTIVE	45	42	
400000	8	INACTIVE	49	46	
0	9		64	49	
12303	100	FMT	65	64	75
0	200		68	54	
0	300		82	42	
400000	400		77	46	
12322	500	FMT	78	77	

COMMON	BLOCKS	LENGTH	MEMBERS	- BIAS NAME (LENGTH)
	CHPODATA	10473	0	ADATA (10472)
	INDATA	7	0	ICURST (1)
			3	ICURDAY (1)
			6	INTLST (1)

10472 ITOTST (1)
1 ICURYR (1)
4 IWNDSP (1)

2 ICURMO (1)
5 ALT (1)

STATISTICS	
PROGRAM LENGTH	628 50
BUFFER LENGTH	122578 5295
CM LABELED COMMON LENGTH	243608 10480

```

1      SUBROUTINE INITLZE
      C      (THIS SUBROUTINE INITIALIZES THE VARIABLES AND DOES THE INITIAL READ)
      C
5      COMMON /CHPDATA/ ADATA (4,2618),ITOTST
      COMMON /INDATA/ ICURST, ICURYR, ICURMO, ICURDAY, IWNDSP, ALT,
      + INTLST
      C
      READ (8,100) ICURST, ICURYR, ICURMO, ICURDAY, IWNDSP
10     FORMAT (16, 12, 12, 12, 16X, 13)
      IF (EOF (8) ) 11, 8
      8     READ (5,200) ALT
      200    FORMAT (F4.0)
      WRITE (6,601) ALT
15     601    FORMAT (*0 ALT = *,F10.0)
      IF (EOF (5) ) 11,9
      C
      9      DO 10 I = 1, 2618
          ADATA (1,I) = -1.0
20         ADATA (2,I) = 0.0
          ADATA (3,I) = 0.0
          ADATA (4,I) = 0.0
      10     CONTINUE
      WRITE (6,602)
25     602    FORMAT (*0 CHECK*)
      INTLST = ICURST
      ITOTST = 0
      11     RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF	LINE	REFERENCES
1	INITLZE	1	27	

VARIABLES	SN	TYPE	RELOCATION	REFS	4	DEFINED	18	19	20	21
0	ADATA	REAL	ARRAY	CHPDATA	REFS	4	DEFINED	18		21
5	ALT	REAL		INDATA	REFS	18	13	DEFINED	11	
47	I	INTEGER			REFS	18	19	20	21	DEFINED
3	ICURDAY	INTEGER		INDATA	REFS	5	DEFINED	8		
2	ICURMO	INTEGER		INDATA	REFS	5	DEFINED	8		
0	ICURST	INTEGER		INDATA	REFS	5	25	DEFINED	8	
1	ICURYR	INTEGER		INDATA	REFS	5	DEFINED	8		
6	INTLST	INTEGER		INDATA	REFS	5	DEFINED	25		
24350	ITOTST	INTEGER		CHPDATA	REFS	4	DEFINED	26		
4	IWNDSP	INTEGER		INDATA	REFS	5	DEFINED	8		

FILE NAMES	MODE	READS	WRITES	READS
TAPE5	FMT	11		
TAPE6	FMT	13		
TAPE8	FMT	8		

EXTERNALS	TYPE	ARGS	REFERENCES
EOF	REAL	1	10

STATEMENT LABELS	DEF	LINE	REFERENCES
400000 8	INACTIVE	11	10
400000 9	INACTIVE	17	15

```

SUBROUTINE INITLZE      73/73  OPT=1

STATEMENT LABELS
  0 10
400000 11
 13 100 FMT
 23 200 FMT
 31 601 FMT
 40 602 FMT

COMMON BLOCKS LENGTH
  CMPDATA 10473
  INDATA 7

STATISTICS
PROGRAM LENGTH 508 40
CM LABELED COMMON LENGTH 243608 10480

```

```

DEF LINE REFERENCES
  22 17
  27 10 15
  9 8
 12 11
 14 13
 24 23

MEMBERS - BIAS NAME(LENGTH)
  0 ADATA (10472)
  0 ICURST (1)
  3 ICURDAY (1)
  6 INTLST (1)

```

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```

10472 ITOTST (1)
      1 ICURYR (1)
      4 IWNDSP (1)

```

```

2 ICURMO (1)
5 ALT (1)

```

```

1      SUBROUTINE WRITEA1
      C      THIS SUBROUTINE WRITES THE COMPUTED P/A FOR A PARTICULAR
      C      STATION ON A FILE FOR FURTHER REFERENCE
      C
5      COMMON /CMPDATA/ ADATA (4,2618), ITOTST,
      COMMON /INDATA/ ICURST, ICURYR, ICURMO, ICURDAY, IWNDSP, ALT,
      * INTLST
      C
10     WRITE (9) INTLST, (ADATA (1,I), I = 1, 2618)
      ITOTST = ITOTST + 1
      C
      C      INITIALIZE ADATA (1,I)
      DO 10 I = 1, 2618
      ADATA (1,I) = -1.0
15     CONTINUE
      C
      C      WRITE (6,601) ALT, INTLST, ICURST
601    FORMAT ('0 ALT, INTLST, ICURST = *,F10.3,5X,18,10X,18)
      INTLST = ICURST
20     READ (5,200) ALT
      C      FORMAT (F4.0)
      RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF LINE	REFERENCES
1	WRITEA1	1	22

VARIABLES	SN	TYPE	RELOCATION	REFS	5	9	DEFINED	14	13
0 ADATA		REAL	ARRAY	CMPDATA	REFS	5	9	DEFINED	14
5 ALT		REAL		INDATA	REFS	6	17	DEFINED	20
35 I		INTEGER			REFS	9	14	DEFINED	9
3 ICURDAY		INTEGER		INDATA	REFS	6			
2 ICURMO		INTEGER		INDATA	REFS	6			
0 ICURST		INTEGER		INDATA	REFS	6	17	19	
1 ICURYR		INTEGER		INDATA	REFS	6			
6 INTLST		INTEGER		INDATA	REFS	6	9	17	DEFINED
24350 ITOTST		INTEGER		CMPDATA	REFS	5	10	DEFINED	10
4 IWNDSP		INTEGER		INDATA	REFS	6			

FILE NAMES	MODE	READS	WRITES
TAPE5	FMT	20	
TAPE6	FMT	17	
TAPE9	UNFMT	9	

STATEMENT LABELS	DEF LINE	REFERENCES
400000 10	15	13
31 200 FMT	21	20
16 601 FMT	18	17

COMMON BLOCKS	LENGTH	MEMBERS	BIAS NAME (LENGTH)
CMPDATA	10473	0	ADATA (10472)
INDATA	7	0	ICURST (1)
		3	ICURDAY (1)
		6	INTLST (1)

10472	ITOTST (1)	1	ICURYR (1)	2	ICURMO (1)	5	ALT (1)

```

1      C      INTEGER FUNCTION IDATE (ICURYR, ICURMO, ICURDAY)
      C      THIS FUNCTION DETERMINES THE INDEX OF THE ARRAY FOR A
      C      PARTICULAR DATE.
5      IMO = ICURMO - 5
      IYR = ICURYR - 61
      IDATE = (154 * IYR) + (31 * IMO) + ICURDAY
      RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF LINE	REFERENCES
4	IDATE	1	8

VARIABLES	SN	TYPE	RELOCATION	REFS	DEFINED	
0	ICURDAY	INTEGER	F.P.	REFS	7	DEFINED 1
0	ICURMO	INTEGER	F.P.	REFS	5	DEFINED 1
0	ICURYR	INTEGER	F.P.	REFS	6	DEFINED 1
6	IDATE	INTEGER		DEFINED	7	
7	IMO	INTEGER		REFS	7	DEFINED 5
10	IYR	INTEGER		REFS	7	DEFINED 6

STATISTICS
PROGRAM LENGTH

11B	9
-----	---


```

1      C      REAL FUNCTION COMPPA (IWNDSP, ALT)
      C      THIS FUNCTION RETURNS THE P/A VALUE FOR A PARTICULAR
      C      STATION ON A PARTICULAR DATE.
5      C      COMMON /TEST/ AMAX, AMIN
      C      DATA AMAX, AMIN /-50,777777777B/
      C      V = .4470 * FLOAT (IWNDSP)
10     REDUC = DENSIT (ALT)
      COMPPA = 1.225 * REDUC * (V**3) * 0.5
      IF (COMPPA .GT. AMAX) AMAX = COMPPA
      IF (COMPPA .LT. AMIN) AMIN = COMPPA
      RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF LINE	REFERENCES
4	COMPPA	1	13

VARIABLES	SN	TYPE	RELOCATION
0 ALT		REAL	F.P.
0 AMAX		REAL	TEST
1 AMIN		REAL	TEST
10 COMPPA		REAL	
0 IWNDSP		INTEGER	F.P.
12 REDUC		REAL	
11 V		REAL	

REFS	DEFINED	DEFINED	DEFINED	DEFINED
9	11	11	6	11
5	12	12	6	12
5	12	12	6	12
2*11	2*12	2*12	10	
8	DEFINED	DEFINED	1	
10	DEFINED	DEFINED	9	
10	DEFINED	DEFINED	8	

EXTERNALS	TYPE	ARGS	REFERENCES
DENSIT	REAL	1	9

INLINE FUNCTIONS	TYPE	ARGS	DEF LINE	REFERENCES
FLOAT	REAL	1	INTRIN	8

COMMON BLOCKS	LENGTH	MEMBERS	BIAS NAME (LENGTH)
TEST	2	0	AMAX (1)

1 AMIN (1)

STATISTICS	PROGRAM LENGTH	CM LABELED COMMON LENGTH
	138	11
	28	2

```

1      REAL FUNCTION DENSIT (ALT)
        DIMENSION ALTTAB(9), DENTAB (9)
        DATA (ALTTAB(I),I=1,9) /0.0,500.0,1000.,1500.,2000.,2500.
5      * ,3000.,3500.,4000./
        DATA (DENTAB(I),I=1,9) /1.0,.95,.90,.86,.82,.77,.74,.70,.67/
        C
        INDEX = 1
        IF ( ALT .LE. ALTTAB (INDEX) ) GO TO 50
10      INDEX = INDEX + 1
        IF ( INDEX .LT. 8 ) GO TO 5
        INDEX = 9
50     CONTINUE
        DENSIT = DENTAB (INDEX)
15     RETURN
        END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF LINE	REFERENCES
4	DENSIT	1	14

VARIABLES	SN	TYPE	RELOCATION
0 ALT		REAL	F.P.
10 ALTTAB		REAL	ARRAY
6 DENSIT		REAL	ARRAY
21 DENTAB		REAL	ARRAY
7 INDEX		INTEGER	

REFS	DEFINED
8	1
13	8
2	13
8	9
11	10

REFS	DEFINED
8	1
13	8
2	13
8	9
11	10

REFS	DEFINED
8	1
13	8
2	13
8	9
11	10

REFS	DEFINED
8	1
13	8
2	13
8	9
11	10

REFS	DEFINED
8	1
13	8
2	13
8	9
11	10

REFS	DEFINED
8	1
13	8
2	13
8	9
11	10

REFS	DEFINED
8	1
13	8
2	13
8	9
11	10

REFS	DEFINED
8	1
13	8
2	13
8	9
11	10

STATEMENT LABELS
0 5
0 50

DEF LINE	REFERENCES
8	10
12	8

STATISTICS
PROGRAM LENGTH

328	26

```

1      C      SUBROUTINE WRITEA2
      C      THIS SUBROUTINE WRITES THE REMAINING COMPUTED DATA ONTO A
      C      FILE FOR FURTHER REFERENCE.
5      C      COMMON /CMPDATA/ ADATA (4,2618), ITOTST
      C      COMMON /TEST/ AMAX, AMIN
      C
10     C      WRITE (10) ITOTST
      C      WRITE (6,601) ITOTST
      C      601  FORMAT (*0 TOTAL STATIONS = *, 18)
      C      WRITE (6,602) AMAX,AMIN
      C      602  FORMAT (*0 AMAX, AMIN = *,2(F15.1,5X))
15     C      INTLST = 0
      C      WRITE (9) INTLST, (ADATA(2,I), I = 1, 2618)
      C      WRITE (9) INTLST, (ADATA(3,I), I = 1, 2618)
      C      WRITE (9) INTLST, (ADATA(4,I), I = 1, 2618)
20     C      RETURN
      C      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF LINE	REFERENCES
1	WRITEA2	1	19

VARIABLES	SN	TYPE	RELOCATION	REFS	5	16	17	18
0 ADATA		REAL	ARRAY	CMPDATA	5	16	17	18
0 AMAX		REAL		TEST	6	12		
1 AMIN		REAL		TEST	6	12		
52 I		INTEGER			16	17	18	DEFINED
51 INTLST		INTEGER			16	17	18	DEFINED
24350 ITOTST		INTEGER		CMPDATA	5	9	10	

FILE NAMES	MODE	WRITES	9	12	18
TAPE10	UNFMT	WRITES	10	17	
TAPE6	FMT	WRITES	16		
TAPE9	UNFMT	WRITES	16		

STATEMENT LABELS	DEF LINE	REFERENCES
11 601 FMT	11	10
22 602 FMT	13	12

COMMON BLOCKS	LENGTH	MEMBERS	- BIAS NAME(LENGTH)
CMPDATA	10473	0	ADATA (10472)
TEST	2	0	AMAX (1)
			10472 ITOTST (1)
			1 AMIN (1)

STATISTICS	PROGRAM LENGTH	538	43
CM LAELED COMMON LENGTH	243538	10475	

APPENDIX E
PROGRAM PAWRIT

PROGRAM PAWRIT

Program PAWRIT prints the information generated by Program INFOPA. Program PAWRIT reads information from a binary file (TAPE9) (which has been generated by Program INFOPA) and computes for each station, the number of days with a $\frac{P}{A}$ value, the total $\frac{P}{A}$, the number of days without a $\frac{P}{A}$ value and the average $\frac{P}{A}$. This information is then printed in a table. Monthly (May - September) tables are printed giving the $\frac{P}{A}$ value for each station. A file (TAPE8) is generated which contains the sum of the $\frac{P}{A}$ of all stations for each day, the number of stations with a $\frac{P}{A}$ value for each day, the number of stations with an observation but no $\frac{P}{A}$ and the average $\frac{P}{A}$ each day.

INPUT

Information is read from TAPE9 by an unformatted read statement. A description of the input variables follows:

ITOTST	Total number of stations (read from TAPE10)
ADATA	Array used for $\frac{P}{A}$ values from TAPE9. One year's data for each station is extracted and written into IARRAY.
BDATA	Array of total $\frac{P}{A}$ values.

OUTPUT

The output variables include:

ISTATN	Station number
IARRAY	Array (I,J) of $\frac{P}{A}$ values. The rows depict the station number and the column depicts the date.
IYEAR	Year
ATOT	Array (I,J) where the columns depict the stations. I = 1 depicts day with $\frac{P}{A}$; I = 2 depicts total $\frac{P}{A}$; I = 3 depicts days with no $\frac{P}{A}$.
AVPA	Average $\frac{P}{A}$ value for each station
BDATA,ADATA	Arrays used by subroutine TOTPRO for manipulating total $\frac{P}{A}$, daily average $\frac{P}{A}$, number of stations with $\frac{P}{A}$ and number of stations without $\frac{P}{A}$.

PROGRAM PAWRIT

SUBROUTINE READIT

SUBROUTINE EXTRACT

```

1      :
      C      PROGRAM PAWRIT (OUTPUT, TAPE 9, TAPE 10, TAPE 6 = OUTPUT, TAPE 8)
      C      THIS PROGRAM READS INFORMATION FROM A FILE AND PRINTS THE
      C      APPROPRIATE INFORMATION IN CHARTS.
5      C
      C      INPUT TAPE 9, TAPE 10
      C      OUTPUT VARIABLES - ISTATN - ARRAY OF STATION NUMBERS
      C      IARRAY - ARRAY OF PA VALUES
10     C      OTHER VARIABLES - ADATA - ARRAY OF TEMPORARY HOLDERS FOR PA VALUES
      C      ITOTST - TOTAL NUMBER OF STATIONS
      C      IYEAR - YEAR FOR PARTICULAR INFORMATION
      C      ATOT(1,1) - # OF DAYS WITH PA
      C      ATOT(2,1) - TOTAL PA
      C      ATOT(3,1) - # OF DAYS WITHOUT PA
15     C
      C      COMMON / CMPDATA/ ADATA (26,18), ITOTST
      C      COMMON / OTDATA/ IARRAY (72,154), ISTATN (72), IYEAR, ATOT(3,72)
20     C
      C      DATA (ATOT(1,1), I=1,72) /72*(0.0)/
      C      *, (ATOT(2,1), I=1,72) /72*(0.0)/
      C      *, (ATOT(3,1), I=1,72) /72*(0.0)/
      C
      C      READ (10) ITOTST
      C      IYEAR = 1961
25     C
      C      BEGIN READING PROCESS
      C      DO 10 IPORT = 1,17
      C      REWIND 9
      C      CALL READIT (IPORT)
30     C
      C      CALL PRINTIT
      C      CONTINUE
      C      CALL TOTPRO
      C      CALL TOTALS
35     C      STOP
      C      END

```

CARD NR. SEVERITY DETAILS DIAGNOSIS OF PROBLEM
 1 1 UNRECOGNIZED STATEMENT.

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS	DEF LINE	REFERENCES
10223 PAWRIT	2	

VARIABLES	SN	TYPE	RELOCATION	REFS		
0 ADATA		REAL	ARRAY	CMPDATA	17	
25631 ATOT		REAL	ARRAY	OTDATA	18	DEFINED 3*20
0 IARRAY		INTEGER	ARRAY	OTDATA	18	
10232 IPORT		INTEGER			30	DEFINED 28
25520 ISTATN		INTEGER	ARRAY	OTDATA	18	
5072 ITOTST		INTEGER		CMPDATA	17	DEFINED 24

PROGRAM PAWRIT 73/73 OPT=1
 VARIABLES SN TYPE RELOCATION
 25630 IYEAR INTEGER OTDATA REFS
 FILE NAMES MODE
 0 OUTPUT
 4106 TAPE10 UNFMT READS 24
 0 TAPE6
 6151 TAPE8 MOTION 29
 2043 TAPE9
 EXTERNALS TYPE ARGS REFERENCES
 PRINTIT 0 32
 READIT 1 30
 TOTALS 0 35
 TOTPRO 0 34
 STATEMENT LABELS DEF LINE REFERENCES
 400000 10 33 28
 COMMON BLOCKS LENGTH MEMBERS - BIAS NAME (LENGTH)
 CMPDATA 2619 0 ADATA (2618)
 OTDATA 11377 0 IARRAY (11088)
 11161 ATOT (216)
 STATISTICS
 PROGRAM LENGTH 178 15
 BUFFER LENGTH 102148 4236
 CM LABELED COMMON LENGTH 332548 13996

FTN 4.6+439
 18 DEFINED 25

78/10/17. 22.42.40

PAGE 2

2618 ITOTST (1)
 11088 ISTATN (72)

11160 IYEAR (1)

```

1      C      SUBROUTINE READIT (IPORT)
      C      THIS SUBROUTINE READS THE DATA FOR ALL THE STATIONS A YEAR AT A TIME.
5      C      COMMON / CMPDATA/ ADATA (2618), ITOTST
      C      COMMON /OTDATA/ IARRAY (72,154), ISTATN (72), IYEAR, ATOT(3,72)
10     C      DO 10 ISTAT = 1, ITOTST
      C      READ (9) ISTATN (ISTAT), (ADATA (I), I= 1, 2618)
      C      IF ( EOF(9) ) 999, 5
      C      CALL EXTRACT (IPORT, ISTAT)
      C      CONTINUE
      C      RETURN
      C      END
999

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF LINE	REFERENCES
3	READIT	1	12

VARIABLES	SN	TYPE	RELOCATION	REFS	DEFINED	8
0 ADATA	REAL	ARRAY	CMPDATA	REFS	4	DEFINED
25631 ATOT	REAL	ARRAY	OTDATA	REFS	5	DEFINED
14 I	INTEGER	ARRAY	OTDATA	REFS	8	DEFINED
0 IARRAY	INTEGER	ARRAY	OTDATA	REFS	5	DEFINED
0 IPORT	INTEGER	F.P.		REFS	10	DEFINED
13 ISTAT	INTEGER			REFS	8	DEFINED
25520 ISTATN	INTEGER	ARRAY	OTDATA	REFS	5	DEFINED
5072 ITOTST	INTEGER		CMPDATA	REFS	4	DEFINED
25630 IYEAR	INTEGER		OTDATA	REFS	5	DEFINED

FILE NAMES	MODE	READS	8
TAPE9	UNFMT		

EXTERNALS	TYPE	ARGS	REFERENCES
EOF	REAL	1	9
EXTRACT		2	10

STATEMENT LABELS	DEF LINE	REFERENCES
0 5	INACTIVE	10
400000 10		11
0 999		12

COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME (LENGTH)
CMPDATA	2619	0 ADATA (2618)
OTDATA	11377	0 IARRAY (11088)
		11161 ATOT (216)

2618 ITOTST (1)
11088 ISTATN (72)

11160 IYEAR (1)

STATISTICS	PROGRAM LENGTH	158	13
CM LABELED COMMON LENGTH	332548	13996	

```

1      SUBROUTINE EXTRACT (IPOINT, ISTAT)
      C      (THIS SUBROUTINE DETERMINES THE BEGINNING AND END PORTION OF THE
      C      TAPE THAT IS TO BE USED AND EXTRACTS IT FOR FURTHER USE.)
5      COMMON /CMPDATA/ ADATA (2618), ITOTST
      C      COMMON /OTDATA/ IARRAY (72,154), ISTATN (72), IYEAR, ATOT(3,72)
      C
      ISTART = ((IPOINT - 1)*154) + 1
      IEND = ISTART + 153
      ICON = ISTART - 1
10     DO 10 J = ISTART, IEND
          INDEX = J - ICON
          IARRAY (ISTAT, INDEX) = IFIX (ADATA (J))
      IF (ADATA(J).EQ. -1.0) GO TO 10
15     IF (ADATA(J).GT. 0.0 ) CALL FILL (ADATA(J),ISTAT)
      IF (ADATA(J).EQ. 0.0 ) ATOT(3,ISTAT)=ATOT(3,ISTAT) + 1.0
      C
10     CONTINUE
      RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF	LINE	REFERENCES
3	EXTRACT	1	18	

VARIABLES	SN	TYPE	RELOCATION	REFS	5	13	14	2*15	16
0	ADATA	REAL	ARRAY	CMPDATA	REFS	6	16	DEFINED	16
25631	ATOT	REAL	ARRAY	OTDATA	REFS	6	13	DEFINED	16
0	IARRAY	INTEGER	ARRAY	OTDATA	REFS	12	DEFINED	13	
11	ICON	INTEGER			REFS	11	DEFINED	10	
10	IEND	INTEGER			REFS	13	DEFINED	9	
13	INDEX	INTEGER			REFS	8	DEFINED	12	
0	IPOINT	INTEGER		F.P.	REFS	9	DEFINED	1	
7	ISTART	INTEGER			REFS	13	10	DEFINED	8
0	ISTAT	INTEGER		F.P.	REFS	6	15	2*16	DEFINED
25520	ISTATN	INTEGER	ARRAY	OTDATA	REFS	5		DEFINED	1
5072	ITOTST	INTEGER		CMPDATA	REFS	6			
25630	IYEAR	INTEGER		OTDATA	REFS	12	13	14	2*15
12	J	INTEGER			REFS	11			16

EXTERNALS	TYPE	ARGS	REFERENCES
FILL		2	15

INLINE FUNCTIONS	TYPE	ARGS	DEF LINE	REFERENCES
IFIX	INTEGER	1	INTRIN	13

STATEMENT LABELS	DEF LINE	REFERENCES
400000 10	17	11 14

COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME (LENGTH)
CMPDATA	2619	0 ADATA (2618)
OTDATA	11377	0 IARRAY (11088)
		11161 ATOT (216)

2618	ITOTST (1)
11088	ISTATN (72)

11160	IYEAR (1)

```

1      SUBROUTINE FILL (DAT, ISTAT)
      COMMON /OTDATA/ IARRAY (72,154), ISTATN (72), IYEAR, ATOT(3,72)
      ATOT (1,ISTAT) =ATOT(1,ISTAT) + 1.0
      ATOT (2,ISTAT) =ATOT(2,ISTAT) + DAT
5      RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF LINE	REFERENCES
3	FILL	1	5

VARIABLES	SN	TYPE	RELOCATION	REFS
25631	ATOT	REAL	ARRAY	OTDATA
0	DAT	REAL	F.P.	REFS
0	IARRAY	INTEGER	ARRAY	OTDATA
0	ISTAT	INTEGER	F.P.	REFS
25520	ISTATN	INTEGER	ARRAY	OTDATA
25630	IYEAR	INTEGER	OTDATA	REFS

2	3	4	DEFINED	3	4
4	DEFINED	1			
2*3	2*4	DEFINED	1		
2					
2					

COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME (LENGTH)
OTDATA	11377	0 IARRAY (11088)
		11161 ATOT (216)

11088 ISTATN (72)

11160 IYEAR (1)

STATISTICS	PROGRAM LENGTH	68	6
CM LARELED COMMON LENGTH	261618	11377	

```

1      SUBROUTINE PRINTIT
      C      THIS SUBROUTINE PRINTS OUT THE APPROPRIATE TABLES
      C
5      COMMON /CMPDATA/ ADATA (2618), ITOTST
      COMMON /OTDATA/ IARRAY (72,154), ISTATN (72), IYEAR, ATOT(3,72)
      C
      WRITE (6,99)
      99      FORMAT (*1*, 49X, *FIRE WEATHER STATION WIND POWER MATRIX*)
      WRITE (6,100) IYEAR
      100     FORMAT (*0*, 62X, *MAY - *, 14)
      WRITE (6,200)
      WRITE (6,601)
      601     FORMAT (3X,130(1H-))
      200     FORMAT (*0*, *STATION *, * 1*, * 2*, * 3*, * 4*, * 5*
15      * 6*, * 7*, * 8*, * 9*, * 10*, * 11*, * 12*, * 13*,
      * 14*, * 15*, * 16*, * 17*, * 18*, * 19*, * 20*, * 21*,
      * 22*, * 23*, * 24*, * 25*, * 26*, * 27*, * 28*, * 29*,
      * 30*, * 31*)
      C
      DO 10 I = 1, ITOTST
      300     WRITE (6,300) ISTATN (I), (IARRAY (I,J), J = 1,31)
      10      FORMAT (*0*, 2X, 16, 2X, 31(1X, 13))
      CONTINUE
      C
25     WRITE (6,400) IYEAR
      400     FORMAT (*1*, 62X, *JUNE - *, 14)
      WRITE (6,500)
      WRITE (6,601)
      500     FORMAT (*0*, *STATION *, * 1*, * 2*, * 3*, * 4*, * 5*,
30      * 6*, * 7*, * 8*, * 9*, * 10*, * 11*, * 12*, * 13*,
      * 14*, * 15*, * 16*, * 17*, * 18*, * 19*, * 20*, * 21*,
      * 22*, * 23*, * 24*, * 25*, * 26*, * 27*, * 28*, * 29*,
      * 30*)
      C
35     DO 20 I = 1, ITOTST
      600     WRITE (6,600) ISTATN (I), (IARRAY (I,J), J = 32, 61)
      20      FORMAT (*0*, 2X, 16, 2X, 30(1X, 13))
      CONTINUE
      WRITE (6,700) IYEAR
      40     700     FORMAT (*1*, 62X, *JULY - *, 14)
      WRITE (6,200)
      WRITE (6,601)
      C
45     DO 30 I = 1, ITOTST
      30      WRITE (6,300) ISTATN (I), (IARRAY (I,J), J = 63, 93)
      CONTINUE
      C
      WRITE (6,800) IYEAR
      800     FORMAT (*1*, 61X, *AUGUST - *, 14)
      WRITE (6,200)
      WRITE (6,601)
      DO 40 I = 1, ITOTST
      40     40      WRITE (6,300) ISTATN (I), (IARRAY (I,J), J = 94,124)
      CONTINUE
      C
55     WRITE (6,900) IYEAR
      900     FORMAT (*1*, 59X, *SEPTEMBER - *, 14)
      WRITE (6,500)
      WRITE (6,601)
      C
60     DO 50 I = 1, ITOTST

```

```

        WRITE (6,600) ISTATN (1), (IARRAY (I,J), J = 125,154)
50      CONTINUE
C      INCREMENT THE YEAR FOR OUTPUT
C      IYEAR = IYEAR + 1
        RETURN
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF LINE	REFERENCES
1	PRINTIT	1	67

VARIABLES	SN	TYPE	RELOCATION	REFS	4	2*21	2*36	2*45	2*53	2*62	66
0 ADATA		REAL	ARRAY	CMPDATA	4						
25631 ATOT		REAL	ARRAY	OTDATA	5						
270 I		INTEGER			20						
0 IARRAY		INTEGER	ARRAY	OTDATA	5						
25520 ISTATN		INTEGER	ARRAY	OTDATA	5						
5072 ITOTST		INTEGER		CMPDATA	4						
25630 IYEAR		INTEGER		OTDATA	5						
271 J		INTEGER			66						

FILE NAMES	MODE	WRITES	7	9	11	12	21	25	27	28
TAPE6	FMT	36	39	41	42	45	48	50	51	53
		56	58	59	62					

STATEMENT LABELS	DEF LINE	REFERENCES
400000 10	23	20
0 20	38	35
0 30	46	44
0 40	54	52
400000 50	63	61
5 99	8	7
20 100	10	9
35 200	14	11
100 300	22	21
110 400	26	25
122 500	29	27
165 600	37	36
32 601	13	12
175 700	40	39
222 800	49	48
247 900	57	56

COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME (LENGTH)
CMPDATA	2619	0 ADATA (2618)
OTDATA	11377	0 IARRAY (11088)
		11161 ATOT (216)

2618 ITOTST (1)
11088 ISTATN (72)

11160 IYEAR (1)

STATISTICS	PROGRAM LENGTH	2728	186
CM LABELED COMMON LENGTH	332548	13996	

E-11


```

1      SUBROUTINE TOTPRO
      COMMON /OTDATA/ IARRAY (72,154), ISTATN (72), IYEAR, ATOT(3,72)
      C
5      601  WRITE (6,601)
          FORMAT (*1*,*# DAYS WITH PA*,3X,*TOTAL PA*,3X,*# DAYS NO PA*,
1          3X,*AVERAGE PA*)
          DO 10 I = 1,72
          AVPA = ATOT(2,1)/ATOT(1,1)
10     602  WRITE (6,602) (ATOT(J,1),J=1,3), AVPA, ISTATN(I)
          FORMAT (*0*, 2X, 4(F10.1,3X),10X,I8)
          CONTINUE
          RETURN
          END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY	POINTS	DEF LINE	REFERENCES
1	TOTPRO	1	12

VARIABLES	SN	TYPE	RELOCATION	REFS	2	2*8	9
25631 ATOT		REAL	ARRAY	OTDATA	REFS		
31 AVPA		REAL			REFS	DEFINED	8
30 I		INTEGER			REFS	2*9	DEFINED
0 IARRAY		INTEGER	ARRAY	OTDATA	REFS		
25520 ISTATN		INTEGER	ARRAY	OTDATA	REFS	9	
25630 IYEAR		INTEGER			REFS		
32 J		INTEGER			REFS	DEFINED	9

FILE NAMES	MODE	WRITES	4	9
TAPE6	FMT			

STATEMENT LABELS	DEF LINE	REFERENCES
400000 10	11	7
5 601	5	4
24 602	10	9

COMMON BLOCKS	LENGTH	MEMBERS - BY AS NAME(LENGTH)	11088 ISTATN (72)	11160 IYEAR (1)
OTDATA	11377	0 IARRAY (11088)		
		11161 ATOT (216)		

STATISTICS	PROGRAM LENGTH	338	27
CM LABELED COMMON LENGTH	261618	11377	

```

1      SUBROUTINE TOTALS
      COMMON /OTDATA/ IARRAY (72,154), ISTATN (72), IYEAR, ATOT(3,72)
      COMMON /CMPDATA/ ADATA(2618), ITOTST
      DIMENSION BDATA(2618)
      READ (9) (BDATA(I), I=1,2618)
      IF (EOF(9)) 999,5
      5  READ(9) (ADATA(I), I=1,2618)
      IF (EOF(9)) 999,10
      10 CALL PRNTOT (ADATA, 10HN DAYS/PA )
      CALL PRNTOT (BDATA, 10HTOTAL PA )
      DO 11 I = 1,2618
      11  BDATA(I) = BDATA(I) / ADATA(I)
      READ (9) (ADATA(I), I=1,2618)
      CALL PRNTOT (ADATA, 10HNO PA )
      CALL PRNTOT (BDATA, 10HAV. PA )
      RETURN
      999 WRITE (6,657)
      657 FORMAT (1H0, * ERROR READ ON TAPE 9 *)
      END

```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS	DEF LINE	REFERENCES	16	19
VARIABLES	SN	TYPE	RELOCATION	
0 ADATA	REAL	ARRAY	CMPDATA	REFS 3
25631 ATOT	REAL	ARRAY	OTDATA	REFS 9
30 BDATA	REAL	ARRAY		REFS 12
27 I	INTEGER			REFS 14
0 IARRAY	INTEGER	ARRAY	OTDATA	REFS 12
25520 ISTATN	INTEGER	ARRAY	OTDATA	REFS 15
5072 ITOTST	INTEGER		CMPDATA	REFS 13
25630 IYEAR	INTEGER		OTDATA	REFS 13
FILE NAMES	MODE			
TAPE6	FMT		WRITES	17
TAPE9	UNFMT		READS	5
EXTERNALS	TYPE	ARGS	REFERENCES	
EOF	REAL	1	6	8
PRNTOT		2	9	10
STATEMENT LABELS	DEF LINE	REFERENCES		
400000 5	INACTIVE	7	6	
400000 10	INACTIVE	9	8	
0 11		12	11	
21 657	FMT	18	17	
400000 999		17	6	8
COMMON BLOCKS	LENGTH	MEMBERS	BIAS NAME (LENGTH)	
OTDATA	11377	0	IARRAY (11088)	11088 ISTATN (72)
		11161	ATOT (2618)	11160 IYEAR (1)
CMPDATA	2619	0	ADATA (2618)	2618 ITOTST (1)

SUBROUTINE PRNTOT 73/73 OPT=1

FTN 4.6+439

78/10/17. 22.42.40

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```

1      SUBROUTINE PRNTOT (DAT, IHEAD )
        DIMENSION DAT (2618)
        C
5      WRITE (8) IHEAD, (DAT(I),I=1,2618)
        RETURN
        END
  
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS	DEF LINE	REFERENCES				
3 PRNTOT	1	5				
VARIABLES						
0 DAT	SN	TYPE	RELOCATION	REFS	DEFINED	1
11 I		REAL	ARRAY F.P.	4	4	
0 IHEAD		INTEGER	F.P.	4	DEFINED	
		INTEGER	F.P.	4	DEFINED	1
FILE NAMES						
TAPER	MODE		WRITES	4		
	UNFMT					
STATISTICS						
PROGRAM LENGTH		128	10			

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