

### III.7-PXPP PRELIMINARY PRECIPITATION PROCESSING PROGRAM (PXPP)

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#### Purpose

The Preliminary Precipitation Processing Program (PXPP) is used to analyze station precipitation data that can then be used to develop a Mean Areal Precipitation (MAP) estimate using program MAP (see Chapter III.7-MAP).

Chapter III.2 describes how to obtain the historical station precipitation data.

Program PXPP works with monthly totals rather than the individual hourly and daily precipitation values that are processed by MAP. Thus the computations can be performed much quicker. Working with monthly totals is fully adequate in most cases for performing preliminary analysis to check and correct for data inconsistencies and determine inter-station relationships. The one unique function of program PXPP is the ability to compute mean monthly precipitation values in a consistent manner for stations with varying periods of record. Good estimates of long term means are essential to generating good estimates of MAP in mountainous areas.

Program PXPP includes methods to:

1. Estimate missing precipitation amounts (the program uses the  $1/D^2$  method to estimate missing monthly precipitation where station coordinates used to calculate the distance are input as degrees of latitude and longitude and then converted to polar stereographic coordinates).
2. Calculate and print the correlation of each station with all other stations. These correlations can be calculated on an annual or a seasonal basis.
3. Correct the precipitation of individual stations for inconsistencies occurring during the time period analyzed. Inconsistencies are generally the result of a change in station location or instrumentation. The corrections are determined by examining a consistency plot which can be done on either an annual or a seasonal basis.
4. Produce the input data set for program MAP. This data set will generate an MAP run that can be used to verify the consistency corrections using hourly and daily values rather than the monthly totals used by program PXPP. No areas are included in the MAP data set. Station order in the MAP data set will be different than the PXPP data set because the hourly stations are placed before daily stations to be consistent with MAP input requirements. The MAP data set is complete except for observation times which must be added before running the MAP program.
5. Analyze a maximum of 200 stations and 100 years of data.
6. Input a maximum of ten precipitation adjustment factors in chronological order for each station.
7. Input the latitude and longitude in decimal degrees or in degrees, minutes and seconds.
8. Print the dates for the station with the least deviation from the mean of the 5 stations in each consistency plot. The plots of each set of 5 stations can also be turned off if they are no longer needed. The monthly summaries of precipitation data for individual stations can also be suppressed.

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### Background

Program PXPP uses monthly precipitation at each station as a basis for analysis rather than daily and hourly values. Monthly totals are calculated from daily and hourly data, but if data for any day or hour is missing during a given month, that month is treated as missing data. The most prevalent observation time is used to determine monthly totals for the hourly data that correspond to those available for most of the daily data stations.

The method used to compute mean monthly values for all stations relies on determining the relationship between each station and a common base station. The base station is selected based on the completeness of record during the period of analysis and how representative precipitation at that station is of precipitation over the entire area being analyzed. Then monthly ratios of total precipitation at each station to total precipitation at the base station are calculated. It should be noted that the precipitation totals include only data for months where neither the base station nor the station being compared to the base has missing data. These monthly ratio to base values are then used to estimate missing data and to compute monthly means.

The other aspect of the data estimation process is the weighting of the stations surrounding the station with missing data. A  $1/d^{**2}$  method is used. The distance  $d$  is calculated from polar stereographic coordinates for each station which were derived from latitude and longitude coordinates. The nearest station in each quadrant surrounding the station whose data is to be estimated is then given a weight of  $1/d^{**2}$ . Only stations with observed data are used as estimators.

The equation used to estimate missing data is as follows:

$$P_{x,m} = \frac{\sum_{i=1}^N P_{i,m} * \frac{R_{x,m}}{R_{i,m}} * \left(\frac{1}{d_{x,i}}\right)^2}{\sum_{i=1}^N \left(\frac{1}{d_{x,i}}\right)^2}$$

where P is the precipitation total  
R is the ratio to base station  
d is the distance  
x is the station being estimated  
i is the estimator station  
m is the month being estimated  
n is the total number of estimators (maximum is 4)

Program PXPP provides information about the quality of the estimation procedure by computing some statistics for each station. The statistics are the root mean squared (RMS) error and the overall bias of the estimate. The statistics are generated by comparing estimated totals to observed values for all of the months that have complete data.

Mean precipitation can be computed in two ways. One method is to compute the average for each month using observed totals for all years with complete data and estimated totals for the other years. These are the values displayed in the summary table output from program PXPP. The second method involves multiplying the ratio to base for each month times the base station mean (base station mean computed by the first method). This method cannot be used for the base station (the base station should have very few months with estimated data). Both methods produce very similar results. The second method is used to produce the G card values that can be included in the MAP output

file produced by program PXPP.

Mean monthly precipitation values should be used in MAP computations when there are significant variations in long term means between stations. If mean monthly values are not going to be used operationally then they should not be used in the MAP program.

Inconsistencies in station data are checked by using a double mass analysis. A double mass analysis compares the accumulation at an individual station against the average accumulation for a group of other stations. If the station's data are consistent then the double mass plot should be close to a straight line. Minor deviations or wobbles about a straight line are due to natural variations in precipitation over the area. Sudden shifts in the slope of the line indicate inconsistencies. The consistency plot generated by program PXPP displays the double mass analysis by plotting the deviation of each station from the group mean against the base or average accumulation for the group. A maximum of 5 stations are included on a plot. A complete record is needed in order to perform a double mass analysis therefore estimated values are used for all months containing missing data. Corrections derived from the consistency plots are only applied to months with a complete data record.

The effect of varying seasonal relationships between stations, which are common in many mountainous areas, are removed before correlation coefficients are computed. This is done by dividing the monthly precipitation totals by the ratio to base for the month prior to computing the correlations. Only months with complete observed data are used in computing the correlations (i.e. no estimated values are used).

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### Input Format

The program uses fixed format for all cards.

Character input must be left justified (e.g., 'IN ' and not ' IN' in an A4 format) in the input field.

Integers must be right justified in the input field.

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### Input Data

<u>Card</u>	<u>Field</u>	<u>Format</u>	<u>Columns</u>	<u>Contents</u>
-------------	--------------	---------------	----------------	-----------------

#### **PERIOD OF RECORD AND INPUT OPTIONS**

A	1	I5	1-5	First month
	2	I5	6-10	First year (four digits)
	3	I5	11-15	Last month

<u>Card</u>	<u>Field</u>	<u>Format</u>	<u>Columns</u>	<u>Contents</u>
	4	I5	16-20	Last year (four digits)
	5	2X,A8	23-30	Base station identifier
	6	2X,A4	33-36	Latitude/Longitude units; default is decimal degrees: <u>1</u> / 'DGMS' = degrees, minutes and seconds
	7	2X,I2	39-40	Most prevalent observation time for the daily stations (hours 1 through 24)
	8	1X,A4	42-45	Units of station elevations ('FT' or 'M')
	9	I5	46-50	First month of winter
	10	I5	51-55	First month of summer

#### OUTPUT OPTIONS

B	1	A4	1-4	Calculate and print correlation tables showing correlation of each station to every other station in the analysis: <u>2</u> / 'NONE' = no tables printed 'YEAR' = correlation calculated on an annual basis and printed 'SEAS' = correlation calculated on a seasonal basis and printed
	2	1X,A4	6-9	Consistency plot print option: <u>2</u> / 'NONE' = do not print any consistency plots 'YEAR' = consistency plots on an annual basis 'SEAS' = consistency plots on a seasonal basis
	3	1X,A4	11-14	Option to print the date on consistency plots; the date printed will be for the station closest to the mean of the 5 stations in the plot ('YES' or 'NO') <u>3</u> /
	4	1X,A4	16-19	Option to print the monthly summaries of precipitation data and estimates of missing data for all stations ('YES' or 'NO')

<u>Card</u>	<u>Field</u>	<u>Format</u>	<u>Columns</u>	<u>Contents</u>
	5	1X,A4	21-24	Precipitation units for displays ('IN' or 'MM')
	6	5X,I1	30	Option to output MAP input data cards: 1 = output 0 = do not output
	7	4X,I1	35	Option to include mean monthly precipitation values in the MAP punch output (card G): 1 = include 0 = do not include

Repeat cards C and D for each station.

#### **STATION INFORMATION**

C	1	A8	1-8	Station identifier
	2	3X,F8.4	12-19	Latitude
	3	1X,F8.4	21-28	Longitude
	4	2X,F6.0	31-36	Elevation (units of M or FT)
	5	2X,I2	39-40	Time interval of station precipitation measurement: 1 = hourly station 24 = daily station
	6	4X,A4	45-48	Type of external file; default is 'CALB'
	7	4X,5A4	53-72	Station description

#### **STATION TIME SERIES INPUT FILE INFORMATION**

D				Repeat card D for each time series 4/
E	1		1-8	'ENDSTAN'

#### **STATION CONSISTENCY CORRECTIONS**

Card F is needed only if consistency corrections are to be entered.

Repeat card F for stations with more than 5 corrections and for each station with corrections.

F	1	A8	1-8	Station identifier of station being corrected
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<u>Card</u>	<u>Field</u>	<u>Format</u>	<u>Columns</u>	<u>Contents</u>
	2	2X,I3	13-15	Number of corrections for that station (corrections must be input in chronological order)
	3	5X,I2	21-22	Month of correction number 1
	4	1X,I2	24-27	Year of correction number 1 (4 digits)
	5	A1	28	Season indicator of correction number 1: 'W' = apply to winter months 'S' = apply to summer months blank = apply to all months
	6	F4.2	29-32	Correction factor 1
	6+	F4.2	33-44	Month, year, season indicator and correction factor for correction number 2
		F4.2	45-56	Month, year, season indicator and correction factor for correction number 3
		F4.2	57-68	Month, year, season indicator and correction factor for correction number 4
		F4.2	69-80	Month, year, season indicator and correction factor for correction number 5
G	1		1-8	'ENDCORR'

Cards H and I are only needed if consistency plots are to be produced.

#### **CONSISTENCY PLOT OPTIONS**

H	1	I5	1-5	Number of groups to plot (maximum is 3)
	2-6	5I5	6-30	Number of stations in each group

#### **CONSISTENCY PLOT CONTENTS**

Repeat card I for all stations in the group (last card may have less than 5 stations). Repeat card I for the other groups.

I	1-5	5(A8,2X)	1-50	Station identifiers for 5 stations in the group to be included in the same plot
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Figure 1. Sample input for program PXPP

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-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
      10      20      30      40      50      60      70      80
10 1959  9 1961  NC1055D      8 FT      10      5
NONE YEAR NO  YES  IN      1      1
NC7035H      35.17  82.89  2600.  1      QUEBEC, NC-HLY
Quebec NC
NC3492H      35.27  82.84  3120.  1      GLOUCESTER GAP, NC
GloucesterGap_NC
NC6778H      35.33  82.78  3285.  1      PINK BEDS, NC-HLY
PinkBeds_NC
NC1614H      35.15  83.65  2750.  1      CEDAR MTN, NC
CedarMtn_NC
NC3925H      35.30  82.91  5400.  1      HAYWOOD GAP, NC
HaywoodGap_NC
NC1055D      35.23  82.73  2155.  24     BREVARD, NC
Brevard_NC
NC6499D      35.20  82.98  3520.  24     OWENS GAP, NC
OwensGap_NC
NC6805D      35.27  82.70  2110.  24     PISGAH FOREST 1N, NC
PisgahForest1N_NC
NC7486D      35.24  82.83  2220.  24     ROSMAN, NC
Rosman NC
SC7737D      35.06  82.77  3500.  24     SASSAFRASS MTS, SC
SassafrassMtn_SC
ENDSTAN
NC7486D      1      7/1960  .87
ENDCORR
      1      10
NC7035H  NC3492H  NC6778H  NC1614H  NC3925H  YES
NC1055D  NC6499D  NC6805D  NC7486D  SC7737D  YES

```

Figure 2. Sample output from program PXPP

NWSRFS CALIBRATION SYSTEM - PROGRAM PXPP (VERSION: 1.1.8 - 01/20/99) DATE=Feb 24, 1999 - 07:52:15

SUMMARY OF PXPP INPUT PARAMETERS AND STATION INFORMATION

BASE STATION IDENTIFIER	MOST PREVALENT OBSERVATION TIME	PRINT MONTHLY SUMMARIES FOR EACH STATION	UNITS FOR PRECIPITATION	UNITS FOR ELEVATION INPUT
NC1055D	8:00 HOURS	YES	IN	FT
PRINT CORRELATION TABLES	FIRST MONTH OF WINTER	FIRST MONTH OF SUMMER	NUMBER OF STATIONS	LAT/LONG IN MINUTES AND SECONDS
NONE	OCT.	MAY	10	NO
PRINT DATE ON CONSISTENCY PLOT	CONSISTENCY PLOT OPTION	PRODUCE MAP3 INPUT DATA SET	INCLUDE @G CARD IN MAP3 INPUT	USE MULTIPLE CALIBRATION FILES
NO	YEAR	YES	YES	NO

PERIOD OF RECORD: 10/1959 THROUGH 9/1961

STATION NAME	DESCRIPTION	LATITUDE	LONGITUDE	ELEVATION (FT)	TIME INTERVAL	EXTERNAL FILE TYPE
NC7035H	QUEBEC, NC-HLY	35.17	82.89	2600.0	1	CALB
NC3492H	GLOUCESTER GAP, NC	35.27	82.84	3120.0	1	CALB
NC6778H	PINK BEDS, NC-HLY	35.33	82.78	3285.0	1	CALB
NC1614H	CEDAR MTN, NC	35.15	83.65	2750.0	1	CALB
NC3925H	HAYWOOD GAP, NC	35.30	82.91	5400.0	1	CALB
NC1055D	BREWARD, NC	35.23	82.73	2155.0	24	CALB
NC6499D	OWENS GAP, NC	35.20	82.98	3520.0	24	CALB
NC6805D	PISGAH FOREST 1N, NC	35.27	82.70	2110.0	24	CALB
NC7486D	ROSMAN, NC	35.24	82.83	2220.0	24	CALB
SC7737D	SASSAFRASS MTS, SC	35.06	82.77	3500.0	24	CALB

MAP PRELIMINARY COMPUTATIONS.

MEAN MONTHLY AND MEAN ANNUAL PRECIPITATION PLUS MONTHLY RATIO TO BASE STATION.

PERIOD ANALYZED IS 10/1959 TO 9/1961. NC1055D IS THE BASE STATION. UNITS ARE IN

OCT. IS THE FIRST MONTH OF WINTER. MAY IS THE FIRST MONTH OF SUMMER.

CORRECTION FACTORS USED ARE AS FOLLOWS. W INDICATES WINTER ONLY, S INDICATES SUMMER ONLY.

STATION I.D. CODE CORRECTIONS AND MONTH WHEN FIRST APPLIED.

NC7486D 7/1960 .87

STATION WEIGHTS BASED ON 1.0/DISTANCE SQUARED.

STATION	1	QUEBEC, NC-HLY												I.D.=	NC7035H	LAT=	35.17	LONG=	82.89	ELEVATION=	2600. FT
MONTH		1	2	3	4	5	6	7	8	9	10	11	12	ANNUAL							
YEARS USED		2	2	2	2	2	2	2	2	2	2	2	2								
RATIO TO BASE		.97	1.12	1.00	1.13	.95	.85	.96	.92	1.35	.93	1.49	1.04								
MEAN PRECIPITATION		4.66	9.98	6.34	5.60	3.74	7.27	6.22	13.36	4.73	8.09	2.19	3.69	75.87							
SEASONAL PRECIP.		OCT.-APR.= 40.55					MAY -SEPT= 35.32														
RMS ERROR OF ESTIMATION		PROCEDURE BASED ON MONTHS WITH VALID DATA IS													.98 IN		BIAS=	.0 %			
STATION	2	GLOUCESTER GAP, NC												I.D.=	NC3492H	LAT=	35.27	LONG=	82.84	ELEVATION=	3120. FT
MONTH		1	2	3	4	5	6	7	8	9	10	11	12	ANNUAL							
YEARS USED		2	2	2	2	2	2	2	2	2	2	2	2								
RATIO TO BASE		1.34	1.16	1.10	1.02	1.19	1.25	.64	1.02	1.06	1.17	1.97	1.15								
MEAN PRECIPITATION		6.48	10.32	6.96	5.04	4.70	10.63	4.16	14.75	3.69	10.16	2.90	4.08	83.84							
SEASONAL PRECIP.		OCT.-APR.= 45.92					MAY -SEPT= 37.92														
RMS ERROR OF ESTIMATION		PROCEDURE BASED ON MONTHS WITH VALID DATA IS													1.32 IN		BIAS=	.3 %			
STATION	3	PINK BEDS, NC-HLY												I.D.=	NC6778H	LAT=	35.33	LONG=	82.78	ELEVATION=	3285. FT
MONTH		1	2	3	4	5	6	7	8	9	10	11	12	ANNUAL							
YEARS USED		2	2	2	2	2	2	2	2	2	2	2	2								
RATIO TO BASE		1.14	1.05	1.12	.94	1.12	.85	.75	.87	1.04	1.13	1.68	1.03								
MEAN PRECIPITATION		5.49	9.36	7.14	4.66	4.43	7.27	4.86	12.63	3.62	9.80	2.47	3.66	75.38							
SEASONAL PRECIP.		OCT.-APR.= 42.58					MAY -SEPT= 32.80														
RMS ERROR OF ESTIMATION		PROCEDURE BASED ON MONTHS WITH VALID DATA IS													.52 IN		BIAS=	.0 %			
STATION	4	CEDAR MTN, NC												I.D.=	NC1614H	LAT=	35.15	LONG=	83.65	ELEVATION=	2750. FT
MONTH		1	2	3	4	5	6	7	8	9	10	11	12	ANNUAL							
YEARS USED		2	1	2	2	2	2	2	2	2	2	1	2								
RATIO TO BASE		1.23	1.29	1.17	1.22	1.33	.99	.79	1.10	1.06	1.19	2.67	1.31								
MEAN PRECIPITATION		5.94	11.75	7.44	6.03	5.28	8.47	5.10	15.85	3.71	10.35	3.42	4.64	87.96							
SEASONAL PRECIP.		OCT.-APR.= 49.57					MAY -SEPT= 38.40														
RMS ERROR OF ESTIMATION		PROCEDURE BASED ON MONTHS WITH VALID DATA IS													1.12 IN		BIAS=	.3 %			
STATION	5	HAYWOOD GAP, NC												I.D.=	NC3925H	LAT=	35.30	LONG=	82.91	ELEVATION=	5400. FT
MONTH		1	2	3	4	5	6	7	8	9	10	11	12	ANNUAL							
YEARS USED		2	2	2	2	2	2	1	2	2	1	2	2								
RATIO TO BASE		1.56	1.24	1.23	1.27	1.45	.93	1.19	.82	1.22	.92	2.56	1.36								

Figure 2. Sample output from program PXPP (continued)

MEAN PRECIPITATION	7.54	11.04	7.83	6.29	5.74	7.90	7.55	11.91	4.25	9.17	3.77	4.85	87.81
SEASONAL PRECIP.	OCT.-APR.= 50.47				MAY -SEPT= 37.34								
RMS ERROR OF ESTIMATION	PROCEDURE BASED ON MONTHS WITH VALID DATA IS 1.13 IN								BIAS= -1.4 %				
STATION	6	BREVARD, NC			I.D.= NC1055D		LAT= 35.23		LONG= 82.73		ELEVATION= 2155. FT		
MONTH	1	2	3	4	5	6	7	8	9	10	11	12	ANNUAL
YEARS USED	2	2	2	2	2	2	2	2	2	2	2	2	2
RATIO TO BASE	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MEAN PRECIPITATION	4.82	8.90	6.36	4.94	3.96	8.53	6.47	14.45	3.49	8.67	1.47	3.56	75.63
SEASONAL PRECIP.	OCT.-APR.= 38.72				MAY -SEPT= 36.91								
RMS ERROR OF ESTIMATION	PROCEDURE BASED ON MONTHS WITH VALID DATA IS .55 IN								BIAS= .0 %				
STATION	7	OWENS GAP, NC			I.D.= NC6499D		LAT= 35.20		LONG= 82.98		ELEVATION= 3520. FT		
MONTH	1	2	3	4	5	6	7	8	9	10	11	12	ANNUAL
YEARS USED	2	2	2	2	2	2	2	2	2	2	2	2	2
RATIO TO BASE	1.05	1.10	1.45	.85	.92	.86	.62	.66	1.39	1.21	1.61	.91	
MEAN PRECIPITATION	5.05	9.83	9.21	4.18	3.65	7.35	4.00	9.57	4.85	10.48	2.37	3.22	73.75
SEASONAL PRECIP.	OCT.-APR.= 44.34				MAY -SEPT= 29.42								
RMS ERROR OF ESTIMATION	PROCEDURE BASED ON MONTHS WITH VALID DATA IS .87 IN								BIAS= .7 %				
STATION	8	PISGAH FOREST 1N, NC			I.D.= NC6805D		LAT= 35.27		LONG= 82.70		ELEVATION= 2110. FT		
MONTH	1	2	3	4	5	6	7	8	9	10	11	12	ANNUAL
YEARS USED	2	2	2	2	2	2	2	2	2	2	2	2	2
RATIO TO BASE	1.08	1.01	1.02	.92	1.11	.87	.73	.86	.77	.92	1.29	.92	
MEAN PRECIPITATION	5.18	9.00	6.49	4.55	4.39	7.42	4.72	12.50	2.69	7.98	1.90	3.28	70.10
SEASONAL PRECIP.	OCT.-APR.= 38.38				MAY -SEPT= 31.72								
RMS ERROR OF ESTIMATION	PROCEDURE BASED ON MONTHS WITH VALID DATA IS .67 IN								BIAS= .0 %				
STATION	9	ROSMAN, NC			I.D.= NC7486D		LAT= 35.24		LONG= 82.83		ELEVATION= 2220. FT		
MONTH	1	2	3	4	5	6	7	8	9	10	11	12	ANNUAL
YEARS USED	2	2	2	2	2	2	2	2	2	2	2	2	2
RATIO TO BASE	1.15	1.12	1.04	1.08	1.58	.98	1.04	1.28	1.36	.87	2.05	1.46	
MEAN PRECIPITATION	5.56	10.00	6.62	5.34	6.27	8.33	6.76	18.56	4.74	7.55	3.01	5.20	87.96
SEASONAL PRECIP.	OCT.-APR.= 43.30				MAY -SEPT= 44.66								
RMS ERROR OF ESTIMATION	PROCEDURE BASED ON MONTHS WITH VALID DATA IS 1.22 IN								BIAS= .0 %				
STATION	10	SASSAFRASS MTS, SC			I.D.= SC7737D		LAT= 35.06		LONG= 82.77		ELEVATION= 3500. FT		
MONTH	1	2	3	4	5	6	7	8	9	10	11	12	ANNUAL
YEARS USED	2	2	2	2	2	2	2	2	2	2	2	2	2
RATIO TO BASE	1.13	1.08	1.20	1.14	1.19	1.07	1.41	.90	1.34	1.25	2.01	1.06	
MEAN PRECIPITATION	5.46	9.64	7.64	5.62	4.69	9.17	9.14	12.94	4.70	10.83	2.96	3.76	86.54
SEASONAL PRECIP.	OCT.-APR.= 45.91				MAY -SEPT= 40.63								
RMS ERROR OF ESTIMATION	PROCEDURE BASED ON MONTHS WITH VALID DATA IS 1.77 IN								BIAS= .0 %				
SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN													
QUEBEC, NC-HLY													
WATER YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
1960	11.62	2.67	5.32	5.93	9.09	7.38	4.60	3.85	6.10	4.59	7.53	6.88	75.56
1961	4.55	1.72	2.07	3.39	10.86	5.30	6.60	3.64	8.44	7.85	19.18	2.57	76.17
SUMMARY	8.09	2.19	3.69	4.66	9.98	6.34	5.60	3.74	7.27	6.22	13.36	4.73	75.87
MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.													
SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN													
GLOUCESTER GAP, NC													
WATER YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
1960	14.74	3.55	5.70	8.11	9.76	7.49	3.05	4.20	11.37	2.55	11.06	5.67	87.25
1961	5.58	2.25	2.45	4.84	10.87	6.43	7.02	5.19	9.88	5.77	18.44	1.71	80.43
SUMMARY	10.16	2.90	4.08	6.48	10.32	6.96	5.04	4.70	10.63	4.16	14.75	3.69	83.84
MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.													
SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN													
PINK BEDS, NC-HLY													
WATER YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
1960	14.18	3.22	4.97	7.46	8.33	7.97	3.56	4.02	7.08	3.55	8.34	5.07	77.75
1961	5.42	1.73	2.36	3.51	10.39	6.31	5.75	4.84	7.45	6.17	16.91	2.17	73.01
SUMMARY	9.80	2.47	3.66	5.49	9.36	7.14	4.66	4.43	7.27	4.86	12.63	3.62	75.38
MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.													
SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN													
CEDAR MTN, NC													
WATER YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
1960	15.98	-4.63	6.75	6.34	10.99	9.38	4.45	4.40	4.43	3.08	11.49	5.05	86.97
1961	4.71	2.22	2.53	5.54	-12.51	5.50	7.60	6.15	12.50	7.11	20.21	2.37	88.95
SUMMARY	10.35	3.42	4.64	5.94	11.75	7.44	6.03	5.28	8.47	5.10	15.85	3.71	87.96
MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.													

Figure 2. Sample output from program PXPP (continued)

SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN

HAYWOOD GAP, NC

WATER YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
1960	-11.47	4.70	6.86	9.86	8.12	7.08	5.25	4.59	6.55	5.14	9.46	6.28	85.36
1961	6.87	2.84	2.84	5.21	13.95	8.57	7.32	6.88	9.24	-9.95	14.36	2.23	90.26
SUMMARY	9.17	3.77	4.85	7.54	11.04	7.83	6.29	5.74	7.90	7.55	11.91	4.25	87.81

MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.

SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN

BREVARD, NC

WATER YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
1960	9.85	2.11	4.80	6.09	8.50	6.90	3.98	3.50	7.57	4.33	8.06	4.69	70.38
1961	7.50	.83	2.31	3.55	9.30	5.81	5.90	4.42	9.49	8.61	20.85	2.30	80.87
SUMMARY	8.67	1.47	3.56	4.82	8.90	6.36	4.94	3.96	8.53	6.47	14.45	3.49	75.63

MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.

SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN

OWENS GAP, NC

WATER YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
1960	14.82	2.79	4.87	6.08	8.97	11.20	2.55	3.72	5.10	3.87	8.00	7.48	79.45
1961	6.13	1.95	1.57	4.02	10.69	7.22	5.81	3.58	9.60	4.13	11.13	2.22	68.05
SUMMARY	10.48	2.37	3.22	5.05	9.83	9.21	4.18	3.65	7.35	4.00	9.57	4.85	73.75

MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.

SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN

PISGAH FOREST 1N, NC

WATER YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
1960	9.16	2.20	4.51	6.39	9.19	8.01	3.21	3.81	7.00	4.57	6.23	3.61	67.89
1961	6.81	1.60	2.04	3.98	8.81	4.96	5.88	4.97	7.84	4.88	18.76	1.77	72.30
SUMMARY	7.98	1.90	3.28	5.18	9.00	6.49	4.55	4.39	7.42	4.72	12.50	2.69	70.10

MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.

SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN

ROSMAN, NC

WATER YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
1960	10.70	3.81	8.20	7.11	10.10	7.94	4.12	5.27	4.81	3.87	12.01	7.15	85.10
1961	4.40	2.22	2.21	4.01	9.91	5.30	6.57	7.26	11.86	9.65	25.11	2.32	90.82
SUMMARY	7.55	3.01	5.20	5.56	10.00	6.62	5.34	6.27	8.33	6.76	18.56	4.74	87.96

MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.

SUMMARY OF MONTHLY AND WATER YEAR PRECIPITATION.UNITS=IN

SASSAFRASS MTS, SC

WATER YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
1960	16.19	2.99	5.06	6.02	9.82	7.79	4.47	4.57	6.75	7.49	13.05	6.76	90.96
1961	5.47	2.93	2.46	4.90	9.45	7.50	6.77	4.82	11.58	10.78	12.83	2.63	82.12
SUMMARY	10.83	2.96	3.76	5.46	9.64	7.64	5.62	4.69	9.17	9.14	12.94	4.70	86.54

MINUS SIGN INDICATES ESTIMATED MONTHLY VALUE.

PRECIPITATION CONSISTENCY CHECK.

STATIONS WITH POSITIVE NUMBERS CONSTITUTE THE GROUP BASE AND ARE PLOTTED AGAINST THE OTHER STATIONS IN THE GROUP BASE

STATIONS WITH NEGATIVE RUN NUMBERS ARE PLOTTED AGAINST THE GROUP BASE

STATIONS IN GROUP 1

STA. RUN NO.	STATION NAME
1	QUEBEC, NC-HLY
2	GLOUCESTER GAP, NC
3	PINK BEDS, NC-HLY
4	CEDAR MTN, NC
5	HAYWOOD GAP, NC
6	BREVARD, NC
7	OWENS GAP, NC
8	PISGAH FOREST 1N, NC
9	ROSMAN, NC
10	SASSAFRASS MTS, SC

MONTHLY LISTING OF ACCUMULATED PRECIPITATION AND BASE PRECIPITATION.

MO/YEAR	QUEBEC, NC-HLY		GLOUCESTER GAP, NC		PINK BEDS, NC-HLY		CEDAR MTN, NC		HAYWOOD GAP, NC	
	ACC. PX	BASE PX	ACC. PX	BASE PX	ACC. PX	BASE PX	ACC. PX	BASE PX	ACC. PX	BASE PX

Figure 2. Sample output from program PXPP (continued)

10/1959	11.6	13.0	14.7	12.7	14.2	12.7	16.0	12.5	11.5	13.0
11/1959	14.3	16.3	18.3	15.9	17.4	16.0	20.6	15.6	16.2	16.1
12/1959	19.6	22.1	24.0	21.6	22.4	21.8	27.4	21.2	23.0	21.7
1/1960	25.5	29.1	32.1	28.4	29.8	28.7	33.7	28.2	32.9	28.3
2/1960	34.6	38.4	41.9	37.6	38.2	38.1	44.7	37.3	41.0	37.7
3/1960	42.0	46.6	49.4	45.8	46.1	46.2	54.1	45.3	48.1	46.0
4/1960	46.6	50.5	52.4	49.9	49.7	50.2	58.5	49.2	53.3	49.7
5/1960	50.5	54.7	56.6	54.0	53.7	54.4	62.9	53.3	57.9	53.9
6/1960	56.6	61.5	68.0	60.2	60.8	61.0	67.3	60.3	64.5	60.6
7/1960	61.2	65.7	70.5	64.7	64.3	65.4	70.4	64.7	69.6	64.8
8/1960	68.7	75.5	81.6	74.0	72.7	75.0	81.9	74.0	79.1	74.3
9/1960	75.6	81.2	87.3	79.9	77.8	81.0	87.0	80.0	85.4	80.1
10/1960	80.1	87.1	92.8	85.7	83.2	86.8	91.7	85.8	92.2	85.8
11/1960	81.8	89.2	95.1	87.7	84.9	88.8	93.9	87.8	95.1	87.7
12/1960	83.9	91.5	97.5	90.0	87.3	91.1	96.4	90.1	97.9	89.9
1/1961	87.3	95.9	102.4	94.2	90.8	95.5	102.0	94.2	103.1	94.1
2/1961	98.2	106.5	113.2	104.9	101.2	106.2	114.5	104.7	117.1	104.4
3/1961	103.5	112.9	119.7	111.1	107.5	112.5	120.0	111.1	125.6	110.5
4/1961	110.1	119.4	126.7	117.6	113.2	119.1	127.6	117.5	133.0	116.9
5/1961	113.7	124.8	131.9	122.8	118.1	124.3	133.7	122.6	139.8	121.9
6/1961	122.1	134.7	141.8	132.5	125.5	134.4	146.2	132.0	149.1	131.7
7/1961	130.0	142.2	147.5	140.2	131.7	142.0	153.3	139.6	159.0	138.9
8/1961	149.2	159.8	166.0	157.9	148.6	159.9	173.6	157.1	173.4	157.1
9/1961	151.7	162.0	167.7	160.2	150.8	162.1	175.9	159.3	175.6	159.3

DEVIATION OF ACCUMULATED PRECIPITATION FROM THE GROUP BASE-----GROUP=1

STA. RUN NO.	STA. PLOT NO.	STATION NAME
1	1	QUEBEC, NC-HLY
2	2	GLOUCESTER GAP, NC
3	3	PINK BEDS, NC-HLY
4	4	CEDAR MTN, NC
5	5	HAYWOOD GAP, NC

ASTERISKS INDICATE ZERO DEVIATION

UNITS ARE IN

BASE PX	-39.6	-33.6	-27.6	-21.6	-15.6	-9.6	-3.6	2.4	8.4	14.4	20.4
.0	.	.	.	.	.	.	.	*	.	.	.
1.7	.	.	.	.	.	.	.	*	.	.	.
3.4	.	.	.	.	.	.	.	*	.	.	.
5.1	.	.	.	.	.	.	.	*	.	.	.
6.8	.	.	.	.	.	.	.	*	.	.	.
8.5	.	.	.	.	.	.	.	*	.	.	.
10.2	.	.	.	.	.	.	.	*	.	.	.
11.9	.	.	.	.	.	.	.	*	32.4	.	.
13.6	.	.	.	.	.	.	.	51*	.	.	.
15.3	.	.	.	.	.	.	.	5 3 2 4	.	.	.
17.0	.	.	.	.	.	.	.	1 *	.	.	.
18.7	.	.	.	.	.	.	.	*	.	.	.
20.4	.	.	.	.	.	.	.	*	.	4	.
22.1	.	.	.	.	.	.	.	1 *	35 2	.	.
23.8	.	.	.	.	.	.	.	*	.	.	.
25.5	.	.	.	.	.	.	.	*	.	.	.
27.2	.	.	.	.	.	.	.	*	.	.	.
28.9	.	.	.	.	.	.	.	1 *	3 2 54	.	.
30.6	.	.	.	.	.	.	.	*	.	.	.
32.3	.	.	.	.	.	.	.	*	.	.	.
34.0	.	.	.	.	.	.	.	*	.	.	.
35.7	.	.	.	.	.	.	.	*	.	.	.
37.4	.	.	.	.	.	.	.	3	5 2 4	.	.
39.1	.	.	.	.	.	.	.	1 *	.	.	.
40.8	.	.	.	.	.	.	.	*	.	.	.
42.5	.	.	.	.	.	.	.	*	.	.	.
44.2	.	.	.	.	.	.	.	*	.	.	.
45.9	.	.	.	.	.	.	.	*	.	.	.
47.6	.	.	.	.	.	.	.	1	3 5 2	4	.
49.3	.	.	.	.	.	.	.	*	.	.	.
51.0	.	.	.	.	.	.	.	1	3*	.	4
52.7	.	.	.	.	.	.	.	*	.	.	.
54.4	.	.	.	.	.	.	.	1	3*	2 5	.
56.1	.	.	.	.	.	.	.	*	.	.	.
57.8	.	.	.	.	.	.	.	*	.	.	.
59.5	.	.	.	.	.	.	.	*	.	42.	.
61.2	.	.	.	.	.	.	.	1	3	5	.
62.9	.	.	.	.	.	.	.	*	.	.	.
64.6	.	.	.	.	.	.	.	3	*	5 4	.
66.3	.	.	.	.	.	.	.	1	*	.	.
68.0	.	.	.	.	.	.	.	*	.	.	.
69.7	.	.	.	.	.	.	.	*	.	.	.
71.4	.	.	.	.	.	.	.	*	.	.	.
73.1	.	.	.	.	.	.	.	*	.	.	.
74.8	.	.	.	.	.	.	.	1	3	*	5 4.
76.5	.	.	.	.	.	.	.	*	.	.	.
78.2	.	.	.	.	.	.	.	*	.	.	.
79.9	.	.	.	.	.	.	.	*	.	5 4	.
81.6	.	.	.	.	.	.	.	1	3	*	.
83.3	.	.	.	.	.	.	.	*	.	.	.
85.0	.	.	.	.	.	.	.	*	.	452	.
86.7	.	.	.	.	.	.	.	1	3	*	.
88.4	.	.	.	.	.	.	.	1	3.	*	4 5.
90.1	.	.	.	.	.	.	.	*	.	4 5.	.
91.8	.	.	.	.	.	.	.	1	3	*	.
93.5	.	.	.	.	.	.	.	*	.	425	.
95.2	.	.	.	.	.	.	.	1	3	*	.
96.9	.	.	.	.	.	.	.	*	.	.	.
98.6	.	.	.	.	.	.	.	*	.	.	.

Figure 2. Sample output from program PXPP (continued)

100.3	.	.	.	.	.	.	.	*	.	.	.	.
102.0	.	.	.	.	.	.	.	*	.	.	.	.
103.7	.	.	.	.	.	.	.	*	.	.	5	.
105.4	.	.	.	.	.	.	3	*	.	2 4	.	.
107.1	.	.	.	.	.	1	.	*	.	.	.	.
108.8	.	.	.	.	.	.	.	*	.	.	.	.
110.5	.	.	.	.	.	.	.	*	.	24	.5	.
112.2	.	.	.	.	.	1	3	*	.	.	.	.
113.9	.	.	.	.	.	.	.	*	.	.	.	.
115.6	.	.	.	.	.	.	.	*	.	.	.	.
117.3	.	.	.	.	.	.	.	*	.	.2 4	.	5
119.0	.	.	.	.	.	1	3	*	.	.	.	.
120.7	.	.	.	.	.	.	.	*	.	.	.	.
122.4	.	.	.	.	.	.	.	*	.	.2 4	.	5
124.1	.	.	.	.	.	1	3	*	.	.	.	.
125.8	.	.	.	.	.	.	.	*	.	.	.	.
127.5	.	.	.	.	.	.	.	*	.	.	.	.
129.2	.	.	.	.	.	.	.	*	.	.	.	.
130.9	.	.	.	.	.	.	.	*	.	.	.	5
132.6	.	.	.	.	.	.	.	*	.	.2	4	.
134.3	.	.	.	.	.	1	.3	*	.	.	.	.
136.0	.	.	.	.	.	.	.	*	.	.	.	.
137.7	.	.	.	.	.	.	.	*	.	.	.	.
139.4	.	.	.	.	.	.	.	*	.	2	.	5
141.1	.	.	.	.	.	.	.	*	.	.	4	.
142.8	.	.	.	.	.	1	3	*	.	.	.	.
144.5	.	.	.	.	.	.	.	*	.	.	.	.
146.2	.	.	.	.	.	.	.	*	.	.	.	.
147.9	.	.	.	.	.	.	.	*	.	.	.	.
149.6	.	.	.	.	.	.	.	*	.	.	.	.
151.3	.	.	.	.	.	.	.	*	.	.	.	.
153.0	.	.	.	.	.	.	.	*	.	.	.	.
154.7	.	.	.	.	.	.	.	*	.	.	.	.
156.4	.	.	.	.	.	.	.	*	.	.	.	5
158.1	.	.	.	.	.	.	.	*	.	2	.	.
159.8	.	.	.	.	.	31	.	*	.	2	.	54
161.5	.	.	.	.	.	3 1	.	*	.	.	.	.
163.2	.	.	.	.	.	.	.	*	.	.	.	.
164.9	.	.	.	.	.	.	.	*	.	.	.	.
166.6	.	.	.	.	.	.	.	*	.	.	.	.
168.3	.	.	.	.	.	.	.	*	.	.	.	.
170.0	.	.	.	.	.	.	.	*	.	.	.	.

MONTHLY LISTING OF ACCUMULATED PRECIPITATION AND BASE PRECIPITATION.

MO/YEAR	BREVARD, NC		OWENS GAP, NC		PISGAH FOREST 1N, NC		ROSMAN, NC		SASSAFRASS MTS, SC	
	ACC. PX	BASE PX	ACC. PX	BASE PX	ACC. PX	BASE PX	ACC. PX	BASE PX	ACC. PX	BASE PX
10/1959	9.8	13.2	14.8	12.7	9.2	13.3	10.7	13.1	16.2	12.5
11/1959	12.0	16.6	17.6	16.0	11.4	16.7	14.5	16.3	19.2	15.8
12/1959	16.8	22.4	22.5	21.8	15.9	22.5	22.7	21.7	24.2	21.6
1/1960	22.8	29.4	28.6	28.8	22.3	29.5	29.8	28.7	30.3	28.6
2/1960	31.3	38.8	37.5	38.1	31.5	38.8	39.9	37.9	40.1	37.8
3/1960	38.3	47.1	48.7	45.9	39.5	46.9	47.9	46.0	47.9	46.0
4/1960	42.2	51.0	51.3	50.0	42.7	50.9	52.0	49.9	52.3	49.9
5/1960	45.7	55.3	55.0	54.2	46.5	55.2	57.3	54.0	56.9	54.0
6/1960	53.3	61.8	60.1	61.1	53.5	61.8	62.1	60.9	63.7	60.7
7/1960	57.6	66.1	64.0	65.4	58.0	66.1	65.9	65.2	71.2	64.6
8/1960	65.7	75.8	72.0	75.1	64.3	76.0	77.9	74.5	84.2	73.8
9/1960	70.4	81.8	79.5	80.8	67.9	82.1	85.1	80.2	91.0	79.5
10/1960	77.9	87.4	85.6	86.5	74.7	87.7	89.5	86.1	96.4	85.3
11/1960	78.7	89.5	87.5	88.5	76.3	89.8	91.7	88.1	99.4	87.2
12/1960	81.0	91.8	89.1	90.9	78.3	92.1	93.9	90.4	101.8	89.5
1/1961	84.6	96.2	93.1	95.2	82.3	96.4	97.9	94.7	106.7	93.7
2/1961	93.9	107.0	103.8	105.9	91.1	107.3	107.8	105.5	116.2	104.5
3/1961	99.7	113.3	111.0	112.1	96.1	113.7	113.1	111.9	123.7	110.7
4/1961	105.6	119.9	116.8	118.7	102.0	120.3	119.7	118.4	130.4	117.2
5/1961	110.0	125.2	120.4	124.0	106.9	125.5	127.0	123.3	135.3	122.4
6/1961	119.5	135.0	130.0	133.9	114.8	135.5	138.8	132.9	146.8	132.0
7/1961	128.1	142.4	134.2	141.7	119.7	143.3	148.5	140.1	157.6	139.1
8/1961	149.0	159.8	145.3	160.2	138.4	161.0	173.6	157.1	170.5	157.4
9/1961	151.3	162.0	147.5	162.5	140.2	163.3	175.9	159.3	173.1	159.6

DEVIATION OF ACCUMULATED PRECIPITATION FROM THE GROUP BASE-----GROUP=1

STA.	RUN NO.	STA.	PLOT NO.	STATION NAME
6	1			BREVARD, NC
7	2			OWENS GAP, NC
8	3			PISGAH FOREST 1N, NC
9	4			ROSMAN, NC
10	5			SASSAFRASS MTS, SC

ASTERISKS INDICATE ZERO DEVIATION

UNITS ARE IN

BASE PX	-41.4	-35.4	-29.4	-23.4	-17.4	-11.4	-5.4	.6	6.6	12.6	18.6
.0	.	.	.	.	.	.	.	*	.	.	.
1.7	.	.	.	.	.	.	.	*	.	.	.
3.4	.	.	.	.	.	.	.	*	.	.	.
5.1	.	.	.	.	.	.	.	*	.	.	.
6.8	.	.	.	.	.	.	.	*	.	.	.
8.5	.	.	.	.	.	.	.	*	.	.	.
10.2	.	.	.	.	.	.	.	*	.	.	.
11.9	.	.	.	.	.	.	.	*	2 5	.	.
13.6	.	.	.	.	.	.	.	*	.	.	.
15.3	.	.	.	.	.	.	.	*	2 5	.	.
17.0	.	.	.	.	.	.	.	*	.	.	.
18.7	.	.	.	.	.	.	.	*	.	.	.

Figure 2. Sample output from program PXPP (continued)

```

20.4 . . . . .
22.1 . . . . . 3 1 *
23.8 . . . . . *24 5
25.5 . . . . . *
27.2 . . . . . *
28.9 . . . . . 31 2.45
30.6 . . . . . *
32.3 . . . . . *
34.0 . . . . . *
35.7 . . . . . *
37.4 . . . . . 2* 45
39.1 . . . . . *
40.8 . . . . . 3 *
42.5 . . . . . *
44.2 . . . . . *
45.9 . . . . . * 5 2
47.6 . . . . . 1 3 *
49.3 . . . . . *245
51.0 . . . . . 13 *
52.7 . . . . . *
54.4 . . . . . 3 *2 5
56.1 . . . . . 1 *
57.8 . . . . . *
59.5 . . . . . *
61.2 . . . . . 3 2 *4 5
62.9 . . . . . *
64.6 . . . . . 2 *4 5
66.3 . . . . . 13 *
68.0 . . . . . *
69.7 . . . . . *
71.4 . . . . . *
73.1 . . . . . * 4 5
74.8 . . . . . *
76.5 . . . . . 3 1 2 * 4
78.2 . . . . . *
79.9 . . . . . * 4 5
81.6 . . . . . 3 1 2 *
83.3 . . . . . *
85.0 . . . . . * 5
86.7 . . . . . 1 2 * 4
88.4 . . . . . 3 2 * 4
90.1 . . . . . 3 .1 2 * 4
91.8 . . . . . 3 .1 *
93.5 . . . . . * .5
95.2 . . . . . 2 * 4
96.9 . . . . . 3 1 *
98.6 . . . . . *
100.3 . . . . . *
102.0 . . . . . *
103.7 . . . . . * 5
105.4 . . . . . 2 * 4
107.1 . . . . . *
108.8 . . . . . *
110.5 . . . . . * .5
112.2 . . . . . 2 *4
113.9 . . . . . 3 1 *
115.6 . . . . . *
117.3 . . . . . * .5
119.0 . . . . . 2 *4
120.7 . . . . . 3 1 *
122.4 . . . . . * 5
124.1 . . . . . 2 * 4
125.8 . . . . . 3 1 *
127.5 . . . . . *
129.2 . . . . . *
130.9 . . . . . * 4 5
132.6 . . . . . *
134.3 . . . . . 3 1 2 *
136.0 . . . . . 3 1 *
137.7 . . . . . * 4 5
139.4 . . . . . *
141.1 . . . . . 2 * 4
142.8 . . . . . 3 1 *
144.5 . . . . . *
146.2 . . . . . *
147.9 . . . . . *
149.6 . . . . . *
151.3 . . . . . *
153.0 . . . . . *
154.7 . . . . . *
156.4 . . . . . * 4
158.1 . . . . . * .5
159.8 . . . . . 2 .1 * .5 4
161.5 . . . . . .3 .1 *
163.2 . . . . . .3 2 *
164.9 . . . . . *
166.6 . . . . . *
168.3 . . . . . *
170.0 . . . . . *

```

\*\*\*\*\*

COMPLETION CODE = 0  
 CPU TIME USED = 0 MINUTES, 5 SECONDS

Figure 2. Sample output from program PXPP (continued)

CLOCK TIME USED = 0 MINUTES, 6 SECONDS

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