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US Army Corps
of Engineers

The Hydrologic
Engineering Center

STATISTICAL ANALYSIS OF TIME SERIES DATA
(STATS)

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Users Manual (Preliminary)

May 1987

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16. Abstract (Limit: 200 words) The computer program STATS is designed to reduce large volumes of daily or monthly data to a few meaningful statistics or curves. The program will perform the following analyses: (1) duration curves, (2) annual maximum events, (3) annual minimum events, (4) departures of monthly and annual values from respective means, and (5) annual volume-duration of high and low events. The daily or monthly data to be used as input to this program can follow in the data file or the data can be accessed through HEC's Data Storage System (DSS). This latter capability provides for the analysis of output from other HEC programs like HEC5. The frequency analysis may be analytical for data that tends to follow a theoretical distribution, e.g. annual maximum daily flows; or graphical for those data that do not tend to follow any known distribution, e.g. regulated flows. The input data may be transformed to logarithms for the statistical analyses, if so desired. <i>Keywords:</i> <i>Computer program documentation. (K.R.)</i>			13. Type of Report & Period Covered Computer Program Documentation - Final 14.
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INPUT DESCRIPTION
STATISTICAL ANALYSIS OF TIME SERIES DATA
(STATS)

TI Record - TITLE INFORMATION

Field	Variable	Value	Description
0	ICD	TI	Record identifier.
1-10	TITLE	Alpha	Alphanumeric information to identify the job. As many TI records may be provided as necessary to input the desired descriptive information. Only the first three records are retained for labeling output tables.

J1 Record - JOB SPECIFICATIONS (optional record)

Field	Variable	Value	Description
0	ICD	J1	Record identifier.
1	JSTAT (3)	+	Statistical analysis options. The sum of the following options will govern kind of statistical analyses that are performed on the time series data. if blank the default is 3, activating analysis options 1 and 2.
		1	Graphical frequency analysis of annual events.
		2	Analytical frequency analysis of annual events.
		4	Duration analysis, CL record must be provided.
		8	Monthly means of data by year and statistics of monthly and annual means. Statistics include the mean, standard deviation, skew, maximum and minimum.
		16	Departures of monthly and annual values from respective means.
		32	Volume-duration analysis of daily values. Durations of 1, 3, 7, 15, 30, 60, 90, 120, and 183 days are presently used.

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J1 record (continued)

<u>Field</u>	<u>Variable</u>	<u>Value</u>	<u>Description</u>
2	NPRDS (365)	+	Nominal number of periods in each event, e.g., 365 if daily data and the event is a year, or 12 if monthly data.
3	NYRS	+	Number of years represented by the events. May be left blank if NYRS is equal to the number of input events.
4	MONWY (1)	+	Month order number of the first period in each event, e.g. 1 for JAN, 10 for OCT, etc. This value is used to specify the water year. If blank, 1 is assumed.
5	JBEGN (1)	+	Order number of first period in each event to select for analysis. If blank, period 1 is assumed. JBEGN and JEND are used to select a specific set of sequential periods from each event.
6	JEND (NPRDS)	+	Order number of last period in time series to select for analysis. If blank, the last period is assumed.
7	JPPF (2)		Plotting position formula option.
		1	Weibull plotting positions.
		2	Median (Beard) plotting positions, default value.
		3	Hazen plotting positions.
8	MONSS (0)		Suppress printout of selected statistics of monthly means. Sum the following desired codes:
		0	No statistics printout suppression.
		1	Suppress printout of the maximums.
		2	Suppress printout of the minimums.
		4	Suppress printout of the mean.

J1 record (continued)

<u>Field</u>	<u>Variable</u>	<u>Value</u>	<u>Description</u>
8	MONSS	(continued)	
		Note -	The following statistics of the logs may be suppressed if LOGTM = 1 (J1.9):
		8	Suppress printout of the mean of the logs.
		16	Suppress printout of the standard deviation.
		32	Suppress printout of the skew coefficient.
9	LOGTM (0)		Logarithmic transformation indicator for statistics of the monthly means.
		-1	Use same transformation as LOGT (LS.3).
		0	No transformation.
		1	Log (base 10) transformation.
10	NDECM (0)		Number of decimal places for table of monthly means.
		-1	Use same number as NDEC (LS.4).
		+	0, 1, 2, or 3 allowed. If LOGTM (J1.9) specifies a log transform, the mean, standard deviation, and skew will be printed with 4 decimal places.

ID record - LOCATION IDENTIFICATION (required record)

<u>Field</u>	<u>Variable</u>	<u>Value</u>	<u>Description</u>
0	ICD	ID	Record identifier.
1-10	LOCID	Alpha	Alphanumeric information such as location identification, station number, etc. Although columns 3-80 may be used, only columns 3-48 are printed as table headings.

LS record - LOCATION SPECIFICATIONS (optional record)

<u>Field</u>	<u>Variable</u>	<u>Value</u>	<u>Description</u>
0	ICD	LS	Record identifier.
1	IANAL (3)		Data selection option for frequency analysis specified by JSTAT (J1.1).
		1	Analyze the maximum values selected from each event.
		2	Analyze the minimum values selected from each event.
		3	Analyze both maximum and minimum values from each event.
		4	All data in each event will be analyzed. (not programmed yet).
2	VNAME (FLOW,CFS)	Alpha	Variable name and/or units to be used for table and graph headings.
3	LOGT (1)		Logarithmic transformation indicator for frequency analyses.
		-1	No transformation.
		0,1	Log (base 10) transform.
4	NDEC (0)	+	Number of decimal places to print in tables of plotting positions and frequency curve ordinates; 0, 1, 2, or 3 allowed.
5	NSIG (3)		Number of significant figures in printout of computed frequency curve ordinates.
		-1	No rounding will be done.
		0	Round to three (3) significant figures, default.
		+	Round values to NSIG significant figures.

LS record (continued)

<u>Field</u>	<u>Variable</u>	<u>Value</u>	<u>Description</u>
6	IPRNT (0)	+	The sum of the following printout suppression options will control the amount of output and diagnostic information.
		0	Standard output will not be suppressed and no diagnostic information will be output.
		1	Suppress listing of the input time series data.
		2	Suppress printout of plotting position table.
		4	Suppress printout of frequency curve ordinates.
		8	Suppress printout of frequency statistics.
		16	Suppress frequency curve printer plots.
		32	Not used.
		64	Write duration curve ordinates to a file in computer program HYDUR format.
		128	Provide diagnostic output at various steps of interpolation for frequency curve ordinates.

FR record - INPUT EXCEEDANCE FREQUENCIES (optional record)

This optional record specifies percent chance exceedance (exceedance frequency) values other than the following 12 default values:
0.2, 0.5, 1, 2, 5, 10, 20, 50, 80, 90, 95, and 99.

<u>Field</u>	<u>Variable</u>	<u>Value</u>	<u>Description</u>
0	ICD	FR	Record identifier.
1	--	--	Not used.
2	NFRQ (12)	+	Number of percent chance exceedance values for which to compute frequency curve ordinates. Dimensioned for a maximum of 18 values.
3-10	FREQ (see above)	+	Percent chance exceedance values. If there are more than 8 values, the 9th value must be in the first field of the second FR record.

SC record - SPECIFIED COORDINATES (optional record)

This record may be used to control the extrapolation at either or both ends of a graphical frequency curve. These specified points will be used in the polynomial curve fitting routines that estimate magnitudes of events for frequencies from the FR record that are beyond those of the input data (plotting positions).

<u>Field</u>	<u>Variable</u>	<u>Value</u>	<u>Description</u>
0	ICD	SC	Record identifier.
1	NSCV (0)	+	Number of pairs of specified coordinated. Dimensioned for 4.
2	XSC	+	Percent chance exceedance for the first coordinate.
3	YSC	+	Corresponding value of the response variable, for example the flow or stage corresponding to the percent chance exceedance XSC.
4-9	XSC,YSC	+	Remaining pairs of data.
10	--	--	Not used.

CL record - CLASS LIMITS FOR DURATION ANALYSIS (optional record)

This record specifies the number of classes and the lower limit for each class. Default values are not yet available.

<u>Field</u>	<u>Variable</u>	<u>Value</u>	<u>Description</u>
0	ICD	CL	Record identifier.
1	NCLV	+	Number of class limit values. Dimensioned for 59.
2	CLV	+	The lowest value (class limit) to be included in class 1. Smaller values will be assigned to class zero (0).
3-10	CLV	+	Repeat as required by NCLV. If there are more than 9 values, the 10th value will begin in the first field of the next record.

RV record - REVISION OF INPUT DATA (optional record)

This record is used to modify a set of data by the addition or multiplication of the specified constant.

<u>Field</u>	<u>Variable</u>	<u>Value</u>	<u>Description</u>
0	ICD	RV	Record identifier.
1	IFUNC		Mathematical operation to perform on data.
		1	Add the quantity CONST (RV.2) to each data value.
		2	Multiply the quantity CONST (RV.2) by each data value.
2	CONST	+	The value which will be used in the operations specifies by IFUNC (RV.1).

ZR record - DSS READ PATHNAME (optional record)

This record specifies the pathname for data to be acquired from the Data Storage System (DSS). The program will create "IN" records to be processed by the analysis portion of the program.

<u>Field</u>	<u>Variable</u>	<u>Value</u>	<u>Description</u>
0	ICD	ZR	Record identifier.
1-10	(pathname)	Alpha	Alphanumeric pathname of file as generated by DSS. Use the following format beginning in column 3:

A-PROJECT B-LOCATION C-PARAMETER, ETC.

Pathname parts A - E must be specified on the first ZR record. Subsequent ZR records need only provide those pathname parts that are different.

ZT record - DSS TIME AND DATES (optional record)

This record is used to specify the starting and ending times and dates for the data to be acquired from DSS. This record must be provided after the first ZR record only and all times and dates remain fixed until a EJ record is encountered.

<u>Field</u>	<u>Variable</u>	<u>Value</u>	<u>Description</u>
0	ICD	ZT	Record identifier.
1	ITIMST	+	Starting time in hours and minutes in 24-hour time, e.g. 1305 for 5 minutes after 1 pm. Use zero (0) for daily, monthly, or annual data.
2-3	IDATST	Alpha	Starting date for analysis in military style, e.g. 01JAN1933. Locate within columns 13 to 24, must be left justified.
4	ITIMEN	+	Ending time in minutes (24-hour time).
5-6	IDATEN	Alpha	Ending date for analysis in military style. Locate within columns 37-48, must be left justified.

ZW record - DSS WRITE PATHNAME (optional record)

This record specifies the pathname in which to write frequency and duration curve ordinates (as requested by J1.1). A ZW record must be provided at each location for which frequency and duration relationships are to be written to a DSS file. (Currently volume-duration relationships can not be written to DSS.)

<u>Field</u>	<u>Variable</u>	<u>Value</u>	<u>Description</u>
0	ICD	ZW	Record identifier.
1-10	(pathname)	Alpha	Alphanumeric pathname to be assigned to curves written to a DSS file. Parts A, B, C, E, and F in free format in columns 3-80 separated by space or comma. Each pathname part may not exceed 32 characters.

A - Project or Basin; i.e., OHIO RIVER.

B - Location; i.e., CINCINNATI.

C - Curve parameters. This part contains the two parameter names for the data. Valid parameters are FREQ-FLOW, FREQ-ELEV, etc. (These labels are used by the program to assign units to parameters; therefore, alternative labels should not be assigned.)

ZW record (continued)

<u>Field</u>	<u>Variable</u>	<u>Value</u>	<u>Description</u>
1-10	(pathname)		(continued)

D is assigned by the program to various output as follows:

a. For frequency curve analysis output;

MAX (or MIN) EVENTS - Ordinates for frequency curve based on plotting positions. Values may be from an analysis of maximum annual events (MAX) or minimum annual events (MIN).

MAX (or MIN) COMPUTED - Ordinates for frequency curve based on evaluation of statistics computed from the data.

MAX (or MIN) EXPECTED - Ordinates for frequency curve based on computed statistics and expected probability adjustment.

MAX (or MIN) 5 (or 95) PER CONF LIMIT - Ordinates for the 5 (or 95) percent chance exceedance confidence limit curves around the computed frequency curve.

b. For duration curve analysis output;

FLOW-DUR DATA - Ordinates for duration curve based on class limits and computed percent of time equalled or exceeded.

INTERPOLATED FLOW-DUR - Ordinates for duration curve based on even percentages with magnitudes interpolated between computed values.

E - Time Descriptor for data (usually not needed for paired data output by STATS).

F - Unique descriptor to identify the conditions, operation plan, projects assumed in place, etc; i.e., INFLOW, OUTFLOW, NATURAL, REGULATED, OUTFLOW W/ PLAN B, etc.

Example ZW record:

ZW A-OHIO,B-CINCINNATI,C-FREQ-FLOW,F-OBSERVED W/ REGULATION

BF record - BEFORE DATA (optional record)

This record is used to specify a input data format that is different than the default format and/or a variable number of periods in each event.

<u>Field</u>	<u>Variable</u>	<u>Value</u>	<u>Description</u>
0	ICD	BF	Record identifier.
1	IFMT (1)	0	Not programmed yet.
		1	Data will be input with 12 values on each record (useful for monthly data). Columns 3-6 are for an optional integer location number, columns 7-8 are for the last two digits of the year, and columns 9-80 are for 12 data values in each 6 column field.
		2	Data will be input with the first "IN" record containing an integer location number in columns 3-8 and the starting year in columns 13-16. The data will follow on successive "IN" records in 10 fields of 8 columns each.
		3	This format is generated by the program when the data read from DSS are monthly values.
		4	This format is generated by the program when the data read from DSS are daily values.
2	NPRDS	+	Actual number of periods for the event following on "IN" records until the next ID, BF, or EJ record.

IN record - TIME SERIES DATA (required record unless data acquired from DSS)

These records are used to input the time series information. If the data are input via DSS, these records will be generated by the program.

(Note - See BF record description for format of IN records.)

EJ record - END OF JOB INDICATOR (required between jobs)

An EJ record should be provided between time series data (jobs) at different locations when different job specifications (J1) are applicable. Otherwise, one EJ record at the very end is sufficient.

LISTING OF TEST DATA (INPUT)

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TT TEST NO. 1 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TT ANALYTICAL ANALYSIS OF MONTHLY FLOWS
TT ANALYZE BOTH MAXIMUM AND MINIMUM VALUES (ANNUAL SERIES)
J1 10 12
ID WINNIBIGOSHISH RESERVOIR INFLOW
LS 3FLOW,CFS
IN 130 212 483 356 498 924 484 186 464 509 337 278 234
IN 131 166 224 308 247 305 122 149 107 26 137 168 236
IN 132 263 289 273 425 906 289 155 101 209 138 361 295
IN 133 304 299 309 465 857 207 289 302 156 46 188 152
IN 134 161 146 187 224 189 184 178 244 95 32 104 144
IN 135 176 109 92 552 436 525 670 15 24 181 207 240
IN 136 189 181 370 509 899 259 282 253 65 206 76 1200
IN 137 198 296 318 682 907 476 205 141 1365 553 413 220
IN 138 258 235 227 815 2438 1496 177 467 48 44 272 175
IN 139 261 162 218 605 348 614 229 65 239 118 72 131
EJ
TT TEST NO. 2 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TT GRAPHICAL ANALYSIS OF MONTHLY RESERVOIR ELEVATIONS
TT ONLY MONTHS OF MAY THRU SEPT USED IN ANALYSIS
TT PRINTOUT SIX SIGNIFICANT FIGURES WITH TWO DECIMAL PLACES
TT RV CARD USED TO ADD 1290 FEET TO INPUT VALUES
TT LOG TRANSFORM AND FREQUENCY CURVE PLOT SUPPRESSED
J1 9 12 0 1 5 9 -1
ID WINNIBIGOSHISH RESERVOIR ELEVATION, 1290 FEET ADDED TO INPUT
LS 3STAGE,FT -1 2 6 16
RV 1 1290
130 7.19 7.07 6.94 7.13 7.71 8.27 8.30 7.06 6.12 6.43 6.62 6.77
131 6.87 6.92 6.94 7.01 7.18 7.29 7.18 6.96 6.80 6.76 6.80 6.90
132 7.05 7.03 6.94 7.09 7.53 8.10 8.07 7.73 7.09 6.57 6.57 5.87
133 5.05 5.05 5.05 5.36 5.97 6.39 6.25 5.85 5.29 4.94 4.94 4.94
134 4.94 4.94 4.99 5.10 5.22 5.31 5.20 4.89 4.65 4.56 4.58 4.66
135 4.78 4.88 4.92 5.18 5.60 6.01 6.48 6.71 6.61 6.59 6.68 6.80
EJ
TT TEST NO. 3 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TT ANALYTICAL ANALYSIS OF DAILY FLOWS
TT COMPUTE DURATION CURVE ALONG WITH MAXIMUM AND MINIMUM ANALYSIS
TT COMPUTE STATISTICS OF LOGS FOR MONTHLY SUMMARY TABLES
TT INPUT LISTING OF DAILY DATA SUPPRESSED
TT TEST OF 5 YEARS 1922-26
J1 14 365 1 -1
ID KAN LAKE INFLOWS
LS 3FLOW,CFS 1
CL 29 100 200 300 400 500 600 700 800 900
CL 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
CL 20000 30000 40000 50000 60000 70000 80000 90000 100000 200000
BF 2 365
IN 1 1922
IN 105. 202. 105. 87. 92. 100. 83. 139. 275. 127.
IN 102. 105. 110. 115. 164. 251. 140. 129. 170. 154.
IN 174. 180. 169. 155. 140. 119. 101. 97. 92. 88.
IN 95. 104. 108. 138. 141. 117. 107. 119. 144. 102.
IN 92. 95. 98. 87. 169. 318. 132. 95. 87. 116.
IN 186. 196. 261. 308. 428. 655. 645. 503. 398. 283.
IN 202. 270. 343. 352. 236. 353. 555. 546. 553. 532.
IN 533. 574. 1816. 6473. 12889. 14759. 9175. 5418. 3641. 2656.
IN 2110. 1809. 1796. 2067. 2546. 2168. 1679. 1385. 1236. 1146.
IN 1078. 1233. 4318. 5954. 5097. 3755. 8090. 26926. 29164. 27903.
IN 27845. 15308. 6453. 3687. 2932. 2603. 2415. 2217. 2046. 1875.
IN 1764. 1683. 1708. 2054. 2777. 3286. 4562. 5640. 5826. 5067.
IN 5725. 10923. 12719. 10292. 6889. 4270. 4343. 11152. 12461. 11097.
IN 8718. 6448. 5108. 3987. 3324. 2946. 2694. 2456. 2305. 3593.
IN 6646. 15578. 16726. 12131. 8167. 5443. 3864. 3712. 6079. 8108.
IN 6981. 4643. 3008. 2308. 2074. 1862. 1803. 1667. 1591. 1544.
IN 1478. 1410. 1348. 1290. 1245. 1168. 1133. 1173. 1179. 1198.
IN 1092. 983. 958. 925. 911. 1010. 1158. 1186. 1451. 1783.
IN 1630. 1629. 1916. 2135. 2134. 1841. 1581. 1338. 1169. 1088.
IN 15662. 29642. 47637. 46374. 29983. 11055. 5540. 7502. 20222. 23803.
IN 13947. 7641. 4795. 3550. 2842. 2501. 2237. 2013. 1789. 1654.

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IN 1510.	1421.	1345.	1317.	1334.	1334.	1236.	1150.	1125.	1142.
IN 1226.	1339.	1262.	1135.	1054.	978.	958.	908.	826.	794.
IN 820.	878.	863.	735.	645.	588.	574.	577.	529.	504.
IN 486.	473.	463.	433.	420.	411.	385.	366.	352.	336.
IN 338.	448.	788.	678.	628.	518.	439.	410.	393.	378.
IN 360.	365.	378.	378.	372.	368.	361.	343.	333.	330.
IN 328.	331.	352.	430.	416.	393.	358.	343.	340.	344.
IN 343.	331.	311.	296.	294.	291.	289.	286.	291.	291.
IN 308.	335.	340.	309.	298.	298.	306.	306.	306.	306.
IN 304.	300.	311.	604.	1741.	2918.	2211.	1266.	927.	848.
IN 795.	721.	673.	587.	767.	4135.	8154.	8138.	5675.	3378.
IN 2621.	1925.	1629.	1377.	1233.	1133.	1059.	992.	932.	902.
IN 863.	838.	804.	775.	756.	741.	735.	744.	729.	702.
IN 725.	723.	688.	672.	668.	615.	545.	559.	534.	520.
IN 489.	458.	473.	526.	596.	591.	580.	604.	679.	749.
IN 701.	585.	488.	407.	314.					
BF 2	365								
IN 1	1923								
IN 525.	561.	571.	489.	280.	236.	184.	152.	144.	142.
IN 135.	133.	133.	126.	144.	150.	126.	113.	118.	123.
IN 113.	123.	129.	108.	108.	116.	117.	108.	119.	136.
IN 147.	134.	113.	137.	205.	132.	126.	135.	134.	112.
IN 108.	108.	115.	130.	142.	122.	115.	105.	95.	105.
IN 110.	105.	123.	123.	113.	97.	105.	118.	113.	115.
IN 115.	122.	108.	93.	102.	105.	102.	102.	100.	147.
IN 289.	411.	435.	404.	358.	360.	405.	305.	256.	201.
IN 175.	162.	159.	137.	137.	132.	107.	100.	97.	95.
IN 92.	112.	26.	73.	536.	882.	597.	407.	263.	187.
IN 135.	122.	120.	186.	333.	184.	152.	125.	119.	123.
IN 117.	105.	150.	208.	217.	210.	301.	716.	1014.	426.
IN 426.	426.	426.	426.	426.	426.	426.	426.	426.	317.
IN 465.	416.	386.	398.	404.	370.	377.	375.	338.	423.
IN 3253.	6228.	7307.	11196.	15403.	14867.	9580.	5064.	4557.	5182.
IN 6737.	7366.	7693.	9012.	8414.	6779.	10541.	13392.	35711.	57284.
IN110960	92060.	68237.	50901.	33382.	32253.	49135.	47700.	35232.	24110.
IN14306.	10476.	8870.	8320.	7121.	6290.	6109.	5826.	4423.	3970.
IN 3596.	3248.	2909.	2894.	3222.	3819.	3770.	3120.	2609.	2324.
IN 2127.	2015.	1963.	1892.	1952.	2125.	2190.	2274.	2494.	2585.
IN 2328.	1968.	1754.	1702.	1711.	1891.	2266.	2240.	2098.	2017.
IN 1973.	1834.	1715.	1686.	1713.	1917.	1760.	1637.	1586.	1497.
IN 1457.	1595.	1884.	1823.	1776.	1856.	2005.	2105.	2008.	1978.
IN 2077.	2478.	2371.	2800.	4123.	3978.	3671.	3559.	4644.	5730.
IN 5898.	5059.	4368.	3796.	3528.	3460.	3422.	3092.	2822.	2543.
IN 2332.	2121.	1961.	1833.	1793.	1802.	1762.	1642.	1601.	1589.
IN 1764.	2201.	2664.	2618.	2305.	2217.	2684.	3029.	2788.	1767.
IN 1014.	4255.	6127.	4696.	3816.	2989.	2781.	2482.	2322.	2217.
IN 2103.	2101.	2100.	2396.	4486.	6899.	10527.	11002.	8044.	6120.
IN 4948.	4207.	3769.	3445.	3192.	3031.	2884.	2759.	2675.	2600.
IN 2484.	3232.	5544.	6331.	5076.	3973.	3649.	3676.	3691.	3409.
IN 3108.	2903.	2777.	2667.	2559.	2506.	2425.	2415.	2377.	2279.
IN 2191.	2165.	2130.	2050.	2010.	1944.	1914.	1846.	1806.	1729.
IN 1682.	1616.	1606.	1604.	1616.	1616.	1633.	1633.	1574.	1548.
IN 1548.	1540.	1511.	1462.	1444.	1495.	1702.	1853.	1852.	1706.
IN 1610.	1514.	1487.	1478.	1470.	1429.	1451.	1411.	1482.	1624.
IN 1683.	1653.	1675.	1597.	1435.					
BF 2	366								
IN 1	1924								
IN 1175.	979.	942.	888.	672.	711.	852.	1020.	1090.	1089.
IN 1117.	1076.	1023.	1037.	1037.	1037.	1021.	866.	866.	981.
IN 965.	1019.	1095.	1064.	1062.	1063.	1093.	1142.	1271.	1479.
IN 1605.	1592.	1652.	1761.	1970.	2150.	1943.	1714.	1416.	1294.
IN 1384.	1561.	2243.	3304.	3117.	2713.	2533.	2408.	2350.	2245.
IN 2118.	2042.	2085.	2107.	2130.	1990.	1861.	1752.	1823.	1754.
IN 1705.	1728.	1688.	1689.	1722.	1728.	1632.	1556.	1550.	1458.
IN 1451.	1835.	2381.	2192.	2361.	3467.	4365.	4158.	4302.	4404.
IN 4612.	4627.	4502.	4371.	4184.	4215.	4302.	5039.	6329.	5953.
IN 4935.	4154.	3730.	3333.	3182.	3150.	3160.	2998.	2845.	2640.
IN 2497.	2363.	2255.	2186.	2218.	2168.	2140.	2124.	2088.	2011.
IN 1986.	1976.	1950.	1911.	2912.	8253.	11509.	8729.	3743.	7454.
IN16045.	24276.	21560.	12184.	10022.	6968.	5113.	4234.	3631.	3322.
IN 3105.	2911.	2638.	2480.	2347.	2227.	2112.	1997.	1902.	1858.
IN 1770.	1676.	1591.	1573.	1615.	1726.	1733.	1810.	1849.	1883.

IN 1845.	1744.	1840.	1923.	1936.	1848.	1748.	1673.	1559.	1498.
IN 1432.	1430.	1395.	1305.	1214.	1139.	1073.	1047.	951.	873.
IN 791.	765.	805.	878.	888.	781.	691.	676.	627.	595.
IN 610.	546.	533.	527.	524.	529.	501.	469.	418.	395.
IN 425.	430.	474.	491.	437.	826.	1296.	1973.	2024.	1845.
IN 1777.	1560.	1335.	1412.	1357.	1054.	835.	746.	667.	593.
IN 564.	520.	510.	500.	485.	474.	271.	451.	5068.	5682.
IN 2605.	1070.	1021.	1609.	1767.	1239.	1041.	915.	774.	658.
IN 587.	539.	473.	430.	430.	436.	499.	381.	370.	349.
IN 344.	357.	357.	339.	309.	280.	281.	274.	278.	277.
IN 265.	221.	190.	181.	193.	224.	207.	206.	207.	204.
IN 192.	325.	1060.	1137.	611.	404.	354.	321.	291.	292.
IN 322.	275.	255.	251.	231.	218.	215.	210.	219.	281.
IN 510.	757.	934.	990.	855.	685.	550.	469.	409.	392.
IN 380.	362.	324.	310.	315.	309.	304.	290.	298.	293.
IN 289.	292.	289.	295.	287.	265.	249.	242.	247.	242.
IN 251.	256.	261.	262.	260.	319.	385.	572.	657.	688.
IN 616.	547.	499.	477.	442.	428.	427.	398.	395.	396.
IN 391.	395.	386.	399.	399.	400.	385.	409.	440.	433.
IN 433.	466.	466.	464.	442.	409.	384.	394.	417.	415.
IN 383.	379.	378.	376.	369.	364.	367.	380.	386.	363.
IN 322.	318.	316.	311.	311.	310.				
BF 2	365								
IN 1	1925								
IN 288.	275.	271.	275.	279.	286.	289.	295.	300.	290.
IN 255.	246.	250.	258.	266.	291.	318.	317.	301.	294.
IN 288.	288.	345.	627.	1073.	1261.	989.	691.	611.	554.
IN 468.	373.	286.	353.	508.	682.	744.	821.	877.	942.
IN 939.	866.	805.	793.	781.	742.	719.	697.	655.	624.
IN 623.	626.	631.	637.	593.	580.	520.	492.	489.	492.
IN 505.	491.	482.	454.	430.	440.	445.	458.	460.	460.
IN 485.	492.	495.	510.	505.	489.	518.	478.	475.	460.
IN 435.	426.	423.	414.	414.	383.	393.	400.	380.	388.
IN 420.	472.	567.	665.	693.	706.	768.	1341.	2322.	2380.
IN 1867.	1434.	1099.	945.	885.	830.	852.	827.	759.	661.
IN 586.	560.	588.	588.	1423.	1355.	1122.	1154.	1173.	1042.
IN 913.	796.	742.	712.	709.	709.	650.	620.	1908.	3884.
IN 2847.	1632.	1084.	889.	775.	697.	645.	668.	748.	748.
IN 696.	646.	636.	580.	637.	681.	614.	574.	511.	498.
IN 485.	463.	454.	423.	415.	528.	583.	466.	401.	363.
IN 361.	360.	486.	1088.	2032.	1925.	1366.	858.	630.	511.
IN 451.	407.	343.	302.	311.	318.	285.	271.	264.	251.
IN 236.	217.	207.	196.	185.	187.	190.	187.	170.	161.
IN 170.	184.	204.	219.	222.	225.	233.	222.	200.	195.
IN 208.	254.	288.	263.	227.	219.	216.	230.	294.	289.
IN 353.	562.	828.	808.	939.	1214.	1204.	1185.	1085.	1035.
IN 917.	822.	815.	743.	662.	731.	1154.	1286.	1198.	1150.
IN 1103.	1024.	1008.	860.	720.	551.	448.	388.	350.	303.
IN 273.	247.	224.	214.	211.	199.	177.	186.	205.	222.
IN 201.	161.	167.	210.	236.	271.	298.	286.	269.	280.
IN 314.	289.	270.	420.	1298.	2621.	1893.	1165.	909.	774.
IN 700.	607.	535.	530.	613.	602.	452.	366.	322.	309.
IN 291.	256.	247.	239.	224.	240.	275.	275.	292.	317.
IN 319.	320.	331.	348.	356.	397.	482.	574.	450.	420.
IN 403.	365.	330.	308.	300.	313.	325.	327.	330.	455.
IN 1036.	1728.	1679.	1054.	850.	761.	728.	714.	673.	619.
IN 566.	577.	572.	538.	505.	498.	501.	480.	466.	463.
IN 460.	447.	441.	430.	408.	418.	428.	465.	505.	473.
IN 476.	478.	475.	480.	455.	433.	414.	404.	393.	395.
IN 402.	382.	380.	390.	408.	352.	291.	289.	288.	285.
IN 281.	285.	306.	335.	380.					
BF 2	365								
IN 1	1926								
IN 433.	488.	522.	607.	713.	695.	709.	700.	596.	507.
IN 426.	370.	355.	393.	430.	494.	595.	691.	718.	708.
IN 608.	366.	331.	358.	410.	504.	549.	542.	529.	514.
IN 583.	626.	707.	663.	639.	667.	706.	679.	645.	643.
IN 601.	592.	577.	527.	493.	486.	505.	514.	572.	568.
IN 571.	596.	630.	655.	704.	752.	667.	495.	552.	639.
IN 654.	646.	614.	602.	569.	538.	546.	568.	538.	525.
IN 530.	534.	530.	526.	508.	505.	524.	530.	538.	555.
IN 581.	612.	624.	656.	666.	637.	631.	641.	670.	641.

IN 597.	601.	678.	839.	1072.	1404.	1643.	1546.	1423.	1524.
IN 2060.	2421.	2221.	1917.	1775.	1599.	1454.	1337.	1228.	1111.
IN 1021.	972.	934.	883.	825.	802.	763.	729.	714.	689.
IN 669.	630.	679.	808.	880.	799.	752.	741.	707.	763.
IN 861.	891.	795.	741.	708.	675.	671.	671.	657.	637.
IN 606.	568.	523.	497.	490.	445.	405.	368.	352.	350.
IN 365.	390.	422.	545.	707.	738.	598.	455.	365.	373.
IN 560.	751.	624.	418.	356.	323.	275.	263.	276.	256.
IN 244.	229.	241.	269.	279.	297.	333.	400.	418.	498.
IN 335.	264.	205.	174.	170.	176.	186.	191.	216.	335.
IN 358.	356.	393.	479.	561.	627.	576.	450.	355.	288.
IN 250.	232.	266.	340.	352.	295.	236.	204.	180.	161.
IN 153.	150.	150.	150.	167.	156.	142.	139.	136.	134.
IN 123.	115.	108.	110.	113.	158.	313.	814.	2172.	2478.
IN 2054.	2345.	1510.	1198.	857.	803.	916.	759.	482.	380.
IN 315.	467.	797.	558.	375.	12544.	16134.	30144.	14990.	3656.
IN 1802.	227.	92.	866.	1222.	1030.	1675.	1878.	1605.	1459.
IN 1163.	888.	769.	687.	577.	518.	491.	450.	444.	479.
IN 523.	531.	517.	17309.	31297.	63846.	68991.	57776.	33926.	18434.
IN 8363.	4479.	3134.	2869.	4233.	5923.	7339.	5790.	3841.	2800.
IN 2134.	1810.	1588.	1436.	1364.	1279.	1165.	1103.	1000.	953.
IN 941.	934.	938.	911.	854.	810.	771.	758.	752.	741.
IN 1048.	1871.	2660.	2858.	2653.	2296.	1775.	1635.	1667.	1591.
IN 1385.	1199.	1160.	1106.	1032.	976.	964.	952.	944.	932.
IN 907.	896.	876.	857.	821.	795.	795.	781.	773.	786.
IN 877.	1057.	1160.	1186.	1122.	1040.	965.	865.	727.	705.
IN 728.	763.	786.	808.	866.	935.	946.	932.	889.	865.
IN 832.	807.	799.	798.	796.					

EJ

OUTPUT FROM TEST DATA

```

*****
*                               *
*          STATS                *
* STATISTICAL ANALYSIS OF TIME SERIES DATA *
* PROGRAM DATE  - - - - - JULY 1982 *
* VERSION DATE  - - - - - 12 MAY 1986 *
* RUN DATE      AND      TIME:    *
*   7 JAN 87      8:38:26        *
*                               *
*****
*                               *
* U.S. ARMY CORPS OF ENGINEERS *
* THE HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 551-1748 OR (FTS) 460-1748 *
*                               *
*****

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**TITLE CARD(S)**
TI TEST NO. 1 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TI ANALYTICAL ANALYSIS OF MONTHLY FLOWS
TI ANALYZE BOTH MAXIMUM AND MINIMUM VALUES (ANNUAL SERIES)

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**JOB SPECIFICATIONS**
JSTAT  NPRDS  NYRS  MONMY  JBEGN  JEND  JPPF  MONSS  LOGTM  NDECM
J1    10    12    0    0    0    0    0    0    0

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**LOCATION IDENTIFICATION**
ID WINNIBIGOSHISH RESERVOIR INFLOW

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**LOCATION SPECIFICATIONS**
IAXIAL  NAME  LOGT  NDEC  NSIG  IPRINT  TEST
LS    3FLOW,CFS  0    0    0    0    0.

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**INPUT TIME SERIES DATA**
IN 1930 212. 483. 356. 498. 924. 484. 186. 464. 509. 337. 278. 234.
IN 1931 166. 224. 308. 247. 305. 122. 149. 107. 26. 137. 168. 236.
IN 1932 263. 289. 273. 425. 906. 289. 155. 101. 209. 138. 361. 295.
IN 1933 304. 299. 309. 465. 857. 207. 289. 302. 156. 46. 188. 152.
IN 1934 161. 146. 187. 224. 189. 184. 178. 244. 95. 32. 104. 144.
IN 1935 176. 109. 92. 552. 436. 525. 670. 15. 24. 181. 207. 240.
IN 1936 189. 181. 370. 509. 899. 259. 282. 253. 65. 206. 76. 120.
IN 1937 198. 296. 318. 682. 907. 476. 205. 141. 1365. 553. 413. 220.
IN 1938 258. 235. 227. 815. 2438. 1496. 177. 467. 48. 44. 272. 175.
IN 1939 261. 162. 218. 605. 348. 614. 229. 65. 239. 118. 72. 131.

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- ANALYSIS OF MAXIMUMS -

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- PLOTTING POSITIONS: WINNIBIGOSHISH RESERVOIR INFLOW
*****
* .....EVENTS ANALYZED.....* .....ORDERED EVENTS.....*
*                               * CALENDER          MEDIAN *
* MON DAY  YEAR  FLOW,CFS * RANK  YEAR  FLOW,CFS  PLOT POS *
* -----*-----*-----*-----*-----*-----*
* 5 -1 1930  924. * 1 1938  2438.  6.73 *
* 3 -1 1931  308. * 2 1937  1365.  16.35 *
* 5 -1 1932  906. * 3 1930  924.  25.96 *
* 5 -1 1933  857. * 4 1932  906.  35.58 *
* 8 -1 1934  244. * 5 1936  899.  45.19 *
* 7 -1 1935  670. * 6 1933  857.  54.81 *
* 5 -1 1936  899. * 7 1935  670.  64.42 *
* 9 -1 1937  1365. * 8 1939  614.  74.04 *
* 5 -1 1938  2438. * 9 1931  308.  83.65 *
* 6 -1 1939  614. * 10 1934  244.  93.27 *
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***** ANALYTICAL FIT TO DATA *****

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*****
CAUTION FROM SUBROUTINE WTSKEW
***** NO GENERALIZED SKEW PROVIDED
ADOPTED SKEW SET TO COMPUTED SKEW

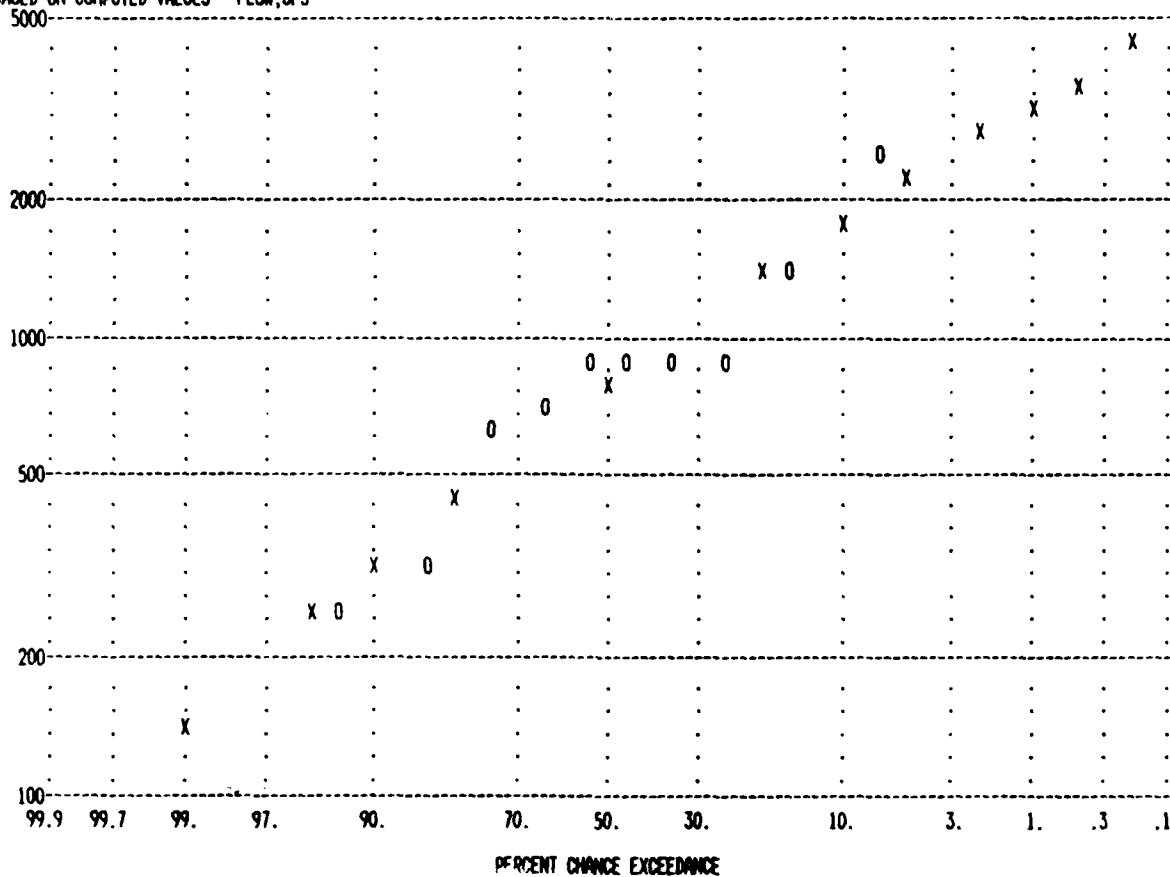
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***** FLOW, CFS *****				
.....FLOW, CFS.....	* EXPECTED	* PERCENT CHANCE	*...CONFIDENCE LIMITS...*	
* COMPUTED	* PROBABILITY	* EXCEEDANCE	* 0.05 LIMIT	* 0.95 LIMIT

* 4400.	* 8000.	* 0.2	* 14500.	* 2480.
* 3730.	* 5830.	* 0.5	* 11200.	* 2190.
* 3250.	* 4600.	* 1.0	* 8970.	* 1960.
* 2780.	* 3610.	* 2.0	* 7030.	* 1740.
* 2190.	* 2580.	* 5.0	* 4860.	* 1430.
* 1760.	* 1950.	* 10.0	* 3490.	* 1200.
* 1340.	* 1410.	* 20.0	* 2340.	* 940.
* 779.	* 779.	* 50.0	* 1140.	* 538.
* 439.	* 413.	* 80.0	* 625.	* 253.
* 321.	* 284.	* 90.0	* 475.	* 160.
* 246.	* 200.	* 95.0	* 381.	* 106.
* 147.	* 90.	* 99.0	* 255.	* 48.

* SYSTEMATIC STATISTICS *				
* LOG TRANSFORM OF FLOW, CFS	* NUMBER OF EVENTS			

* MEAN	2.8822	* HISTORIC EVENTS	0	*
* STANDARD DEV	0.2888	* HIGH OUTLIERS	0	*
* COMPUTED SKEW	-0.2120	* LOW OUTLIERS	0	*
* GENERALIZED SKEW	-99.0000	* ZERO OR MISSING	0	*
* ADOPTED SKEW	-0.2000	* SYSTEMATIC EVENTS	10	*



LEGEND - O:OBSERVED VALUE, H:HIGH OUTLIER OR HISTORIC VALUE, L:LOW OUTLIER, Z:ZERO OR MISSING, X:COMPUTED CURVE

- ANALYSIS OF MINIMUMS -

***** PLOTTING POSITIONS WINNIBIGOSHISH RESERVOIR INFLOW *****

EVENTS ANALYZED				ORDERED EVENTS			
MON	DAY	YEAR	FLOW,CFS	RANK	YEAR	FLOW,CFS	MEDIAN PLOT POS
7	-1	1930	186.	1	1935	15.	6.73
9	-1	1931	26.	2	1931	26.	16.35
8	-1	1932	101.	3	1934	32.	25.96
10	-1	1933	46.	4	1938	44.	35.58
10	-1	1934	32.	5	1933	46.	45.19
6	-1	1935	15.	6	1936	65.	54.81
9	-1	1936	65.	7	1939	65.	64.42
8	-1	1937	141.	8	1932	101.	74.04
10	-1	1938	44.	9	1937	141.	83.65
8	-1	1939	65.	10	1930	186.	93.27

***** ANALYTICAL FIT TO DATA *****

 CAUTION FROM SUBROUTINE WTSKEW
 ***** NO GENERALIZED SKEW PROVIDED
 ADOPTED SKEW SET TO COMPUTED SKEW

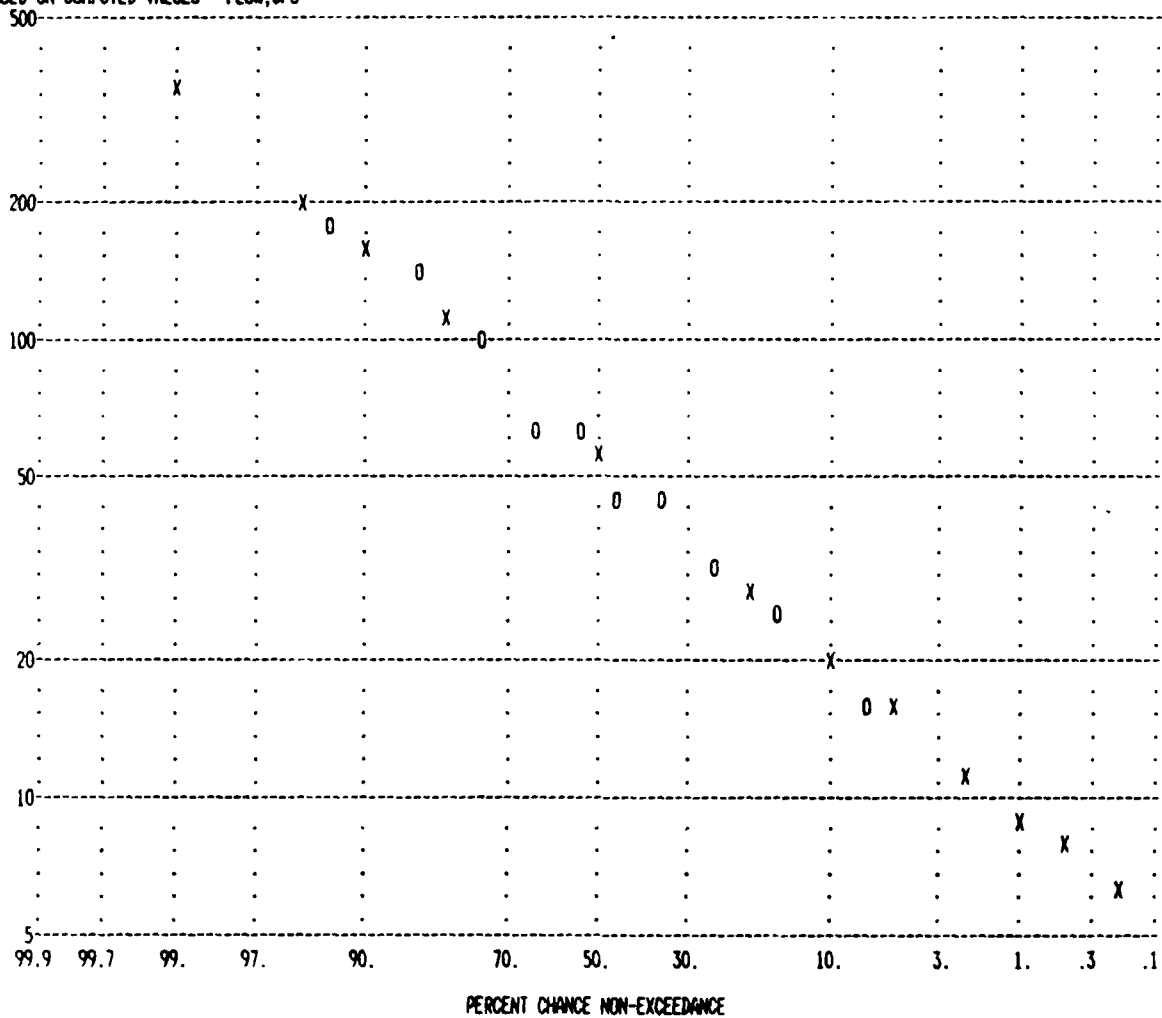
***** FREQUENCY CURVE- WINNIBIGOSHISH RESERVOIR INFLOW *****

FLOW,CFS		PERCENT	CONFIDENCE LIMITS	
EXPECTED	CHANCE NON-			
COMPUTED	PROBABILITY	EXCEEDANCE	0.05 LIMIT	0.95 LIMIT
6.	2.	0.2	12.	1.
8.	4.	0.5	15.	2.
9.	6.	1.0	17.	3.
11.	8.	2.0	20.	4.
16.	13.	5.0	26.	6.
21.	18.	10.0	32.	9.
29.	27.	20.0	44.	15.
56.	56.	50.0	86.	36.
107.	114.	80.0	204.	71.
150.	171.	90.0	337.	95.
199.	247.	95.0	518.	121.
338.	553.	99.0	1180.	183.

***** SYSTEMATIC STATISTICS *****

LOG TRANSFORM OF FLOW,CFS		NUMBER OF EVENTS	
MEAN	1.7451	HISTORIC EVENTS	0
STANDARD DEV	0.3370	HIGH OUTLIERS	0
COMPUTED SKEW	-0.0271	LOW OUTLIERS	0
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	0.0000	SYSTEMATIC EVENTS	10

-FREQUENCY PLOT - WINNIPEGGISH RESERVOIR INFLOW
 BASED ON COMPUTED VALUES - FLOW,CFS



LEGEND - O-OBSERVED VALUE, H-HIGH OUTLIER OR HISTORIC VALUE, L-LOW OUTLIER, Z-ZERO OR MISSING, X-COMPUTED CURVE

TEST NO. 1 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
ANALYTICAL ANALYSIS OF MONTHLY FLOWS
ANALYZE BOTH MAXIMUM AND MINIMUM VALUES (ANNUAL SERIES)

-MONTHLY SUMMARY- WINNIBIGOSHISH RESERVOIR INFLOW

YEAR	MONTHLY AND ANNUAL MEAN VALUES, FLOW,CFS												ANNUAL
	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	
1930	212.	483.	356.	498.	924.	484.	186.	464.	509.	337.	278.	234.	414.
1931	166.	224.	308.	247.	305.	122.	149.	107.	26.	137.	168.	236.	183.
1932	263.	289.	273.	425.	906.	289.	155.	101.	209.	138.	361.	295.	309.
1933	304.	299.	309.	465.	857.	207.	289.	302.	156.	46.	188.	152.	298.
1934	161.	146.	187.	224.	189.	184.	178.	244.	95.	32.	104.	144.	157.
1935	176.	109.	92.	552.	436.	525.	670.	15.	24.	181.	207.	240.	269.
1936	189.	181.	370.	509.	899.	259.	282.	253.	65.	206.	76.	120.	284.
1937	198.	296.	318.	682.	907.	476.	205.	141.	1365.	553.	413.	229.	481.
1938	258.	235.	227.	815.	2438.	1496.	177.	467.	48.	44.	272.	175.	554.
1939	261.	162.	218.	605.	348.	614.	229.	65.	239.	118.	72.	131.	255.
MEAN	219.	242.	266.	502.	821.	466.	252.	216.	274.	179.	214.	195.	320.
MAX	304.	483.	370.	815.	2438.	1496.	670.	467.	1365.	553.	413.	295.	554.
MIN	161.	109.	92.	224.	189.	122.	149.	15.	24.	32.	72.	120.	157.
STDV	49.	107.	85.	180.	640.	398.	155.	159.	410.	160.	117.	58.	126.
SKEW	0.	1.	-1.	0.	2.	2.	3.	1.	3.	2.	0.	0.	1.

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*****
*                               *
*          STATS                *
* * STATISTICAL ANALYSIS OF TIME SERIES DATA *
* * PROGRAM DATE  ----- JULY 1982 *
* * VERSION DATE  ----- 12 MAY 1986 *
* * RUN   DATE    AND    TIME:   *
* *   7 JAN 87          8:38:38  *
*                               *
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*****
*                               *
* * U.S. ARMY CORPS OF ENGINEERS *
* * THE HYDROLOGIC ENGINEERING CENTER *
* *   609 SECOND STREET          *
* *   DAVIS, CALIFORNIA 95616    *
* * (916) 551-1748 OR (FTS) 460-1748 *
*                               *
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**TITLE CARD(S)**
TT TEST NO. 2 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TT GRAPHICAL ANALYSIS OF MONTHLY RESERVOIR ELEVATIONS
TT ONLY MONTHS OF MAY THRU SEPT USED IN ANALYSIS
TT PRINTOUT SIX SIGNIFICANT FIGURES WITH TWO DECIMAL PLACES
TT RV CARD USED TO ADD 1290 FEET TO INPUT VALUES
TT LOG TRANSFORM AND FREQUENCY CURVE PLOT SUPPRESSED
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**JOB SPECIFICATIONS**
JSTAT  NPRDS  NYRS  MONMY  JBEGN  JEND  JPPF  MONSS  LOGTH  NDECH
J1      9     12     0      1      5      9      0      0      0     -1
```

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**LOCATION IDENTIFICATION**
ID WINNIBIGOSHISH RESERVOIR ELEVATION, 1290 FEET ADDED TO INPUT
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**LOCATION SPECIFICATIONS**
IANAL  NAME  LOGT  NDEC  NSIG  IPANT  TEST
LS     JSTAGE,FT  -1    2    6    16    0.
```

```
SELECTED OUTPUT OPTIONS
16 = SUPPRESS FREQUENCY PLOT
```

```
**REVISION OF DATA**
IFUNC  CONST
RV     1 1290.0000
```

INPUT TIME SERIES DATA

1930	7.	7.	7.	7.	8.	8.	8.	7.	6.	6.	7.	7.
1931	7.	7.	7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
1932	7.	7.	7.	7.	7.	8.	8.	8.	8.	7.	7.	6.
1933	5.	5.	5.	5.	6.	6.	6.	6.	5.	5.	5.	5.
1934	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
1935	5.	5.	5.	5.	6.	6.	6.	7.	7.	7.	7.	7.

- ANALYSIS OF MAXIMUMS -

-PLOTING POSITIONS- MINNIBIGOSHISH RESERVOIR ELEVATION, 1290 FEET ADD

EVENTS ANALYZED				ORDERED EVENTS			
				CALENDER		MEDIAN	
MON	DAY	YEAR	STAGE,FT	RANK	YEAR	STAGE,FT	PLOT POS
7	-1	1930	1298.30	1	1930	1298.30	10.94
6	-1	1931	1297.29	2	1932	1298.10	26.56
6	-1	1932	1298.10	3	1931	1297.29	42.19
6	-1	1933	1296.39	4	1935	1296.71	57.81
6	-1	1934	1295.31	5	1933	1296.39	73.44
8	-1	1935	1296.71	6	1934	1295.31	89.06

**** GRAPHICAL FIT TO DATA ****

-FREQUENCY CURVE- MINNIBIGOSHISH RESERVOIR ELEVATION, 1290 FEET ADD

STAGE,FT		PERCENT	CONFIDENCE LIMITS	
EXPECTED	CHANCE			
COMPUTED	PROBABILITY	EXCEEDANCE	0.50 LIMIT	0.50 LIMIT
1298.69	1298.69	0.2	-1.00	-1.00
1298.62	1298.62	0.5	-1.00	-1.00
1298.56	1298.56	1.0	-1.00	-1.00
1298.49	1298.49	2.0	-1.00	-1.00
1298.40	1298.40	5.0	-1.00	-1.00
1298.31	1298.31	10.0	-1.00	-1.00
1298.20	1298.20	20.0	-1.00	-1.00
1296.97	1296.97	50.0	-1.00	-1.00
1296.09	1296.09	80.0	-1.00	-1.00
1295.20	1295.20	90.0	-1.00	-1.00
1294.40	1294.40	95.0	-1.00	-1.00
1292.91	1292.91	99.0	-1.00	-1.00

- ANALYSIS OF MINIMUMS -

-PLOTING POSITIONS- MINNIBIGOSHISH RESERVOIR ELEVATION, 1290 FEET ADD

EVENTS ANALYZED				ORDERED EVENTS			
				CALENDER		MEDIAN	
MON	DAY	YEAR	STAGE,FT	RANK	YEAR	STAGE,FT	PLOT POS
9	-1	1930	1296.12	1	1934	1294.65	10.94
9	-1	1931	1296.80	2	1933	1295.29	26.56
9	-1	1932	1297.09	3	1935	1295.60	42.19
9	-1	1933	1295.29	4	1930	1296.12	57.81
9	-1	1934	1294.65	5	1931	1296.80	73.44
5	-1	1935	1295.60	6	1932	1297.09	89.06

**** GRAPHICAL FIT TO DATA ****

-FREQUENCY CURVE- WINNIPEGISH RESERVOIR ELEVATION, 1290 FEET ADD

STAGE, FT	PERCENT	CONFIDENCE LIMITS
EXPECTED	CHANGE NON-	
COMPUTED PROBABILITY	EXCEEDANCE	0.50 LIMIT 0.50 LIMIT
1292.66	0.2	-1.00 -1.00
1293.03	0.5	-1.00 -1.00
1293.33	1.0	-1.00 -1.00
1293.66	2.0	-1.00 -1.00
1294.15	5.0	-1.00 -1.00
1294.59	10.0	-1.00 -1.00
1295.09	20.0	-1.00 -1.00
1295.84	50.0	-1.00 -1.00
1296.93	80.0	-1.00 -1.00
1297.11	90.0	-1.00 -1.00
1297.24	95.0	-1.00 -1.00
1297.48	99.0	-1.00 -1.00

TEST NO. 2 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
GRAPHICAL ANALYSIS OF MONTHLY RESERVOIR ELEVATIONS
ONLY MONTHS OF MAY THRU SEPT USED IN ANALYSIS

-MONTHLY SUMMARY- WINNIPEGISH RESERVOIR ELEVATION, 1290 FEET ADDED TO INPUT

YEAR	MONTHLY AND ANNUAL MEAN VALUES, STAGE, FT												ANNUAL
	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	
1930	1297.19	1297.07	1296.94	1297.13	1297.71	1298.27	1298.30	1297.06	1296.12	1296.43	1296.62	1296.77	1297.13
1931	1296.87	1296.92	1296.94	1297.01	1297.18	1297.29	1297.18	1296.96	1296.80	1296.76	1296.80	1296.90	1296.97
1932	1297.05	1297.03	1296.94	1297.09	1297.63	1298.10	1298.07	1297.73	1297.09	1296.57	1296.57	1295.87	1297.14
1933	1295.05	1295.05	1295.05	1295.36	1295.97	1296.39	1296.25	1295.85	1295.29	1294.94	1294.94	1294.94	1295.42
1934	1294.94	1294.94	1294.99	1295.10	1295.22	1295.31	1295.20	1294.89	1294.65	1294.56	1294.58	1294.66	1294.92
1935	1294.78	1294.88	1294.92	1295.18	1295.60	1296.01	1296.48	1296.71	1296.61	1296.59	1296.68	1296.80	1295.94
MEAN	1295.98	1295.98	1295.96	1296.14	1296.55	1296.89	1296.91	1296.53	1296.09	1295.97	1296.03	1295.99	1296.25
MAY	1297.19	1297.07	1296.94	1297.13	1297.71	1298.27	1298.30	1297.73	1297.09	1296.76	1296.80	1296.90	1297.14
MIN	1294.78	1294.88	1294.92	1295.10	1295.22	1295.31	1295.20	1294.89	1294.65	1294.56	1294.58	1294.66	1294.92
STDEV	1.17	1.13	1.07	1.02	1.09	1.19	1.17	1.01	0.95	0.96	0.99	1.00	0.96
SKREW	0.01	0.00	-0.01	-0.02	-0.08	-0.07	-0.22	-0.82	-0.72	-0.98	-1.00	-0.53	-0.41

```

*****
*          STATS          *
* STATISTICAL ANALYSIS OF TIME SERIES DATA *
* PROGRAM DATE  - - - - - JULY 1982 *
* VERSION DATE  - - - - - 12 MAY 1986 *
* RUN   DATE    AND     TIME:   *
*       7 JAN 87      8:38:45   *
*                               *
*****

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*****
*                               *
* U.S. ARMY CORPS OF ENGINEERS *
* THE HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 551-1748 OR (FTS) 460-1748 *
*                               *
*****

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**TITLE CARD(S)**
TT TEST NO. 3 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TT ANALYTICAL ANALYSIS OF DAILY FLOWS
TT COMPUTE DURATION CURVE ALONG WITH MAXIMUM AND MINIMUM ANALYSIS
TT COMPUTE STATISTICS OF LOGS FOR MONTHLY SUMMARY TABLES
TT INPUT LISTING OF DAILY DATA SUPPRESSED
TT TEST OF 5 YEARS 1922-26

```

```

**JOB SPECIFICATIONS**
JSTAT  NPRDS  NYRS  MONMY  JBEGN  JEND  JPPF  MONSS  LOGTH  NDECH
J1    14    365    0      1      0      0      0      -1      0

```

```

**LOCATION IDENTIFICATION**
ID KAW LAKE INFLOWS

```

```

**LOCATION SPECIFICATIONS**
IAXIAL  NAME  LOGT  NDEC  NSIG  IPRINT  TEST
LS      3FLOW,CFS  0    0    0      1      0.

```

```

SELECTED OUTPUT OPTIONS
1 : SUPPRESS INPUT TIME SERIES DATA

```

```

**INPUT CLASS LIMITS**
CL 29 100. 200. 300. 400. 500. 600. 700. 800. 900.
CL 1000. 2000. 3000. 4000. 5000. 6000. 7000. 8000. 9000. 10000.
CL 20000. 30000. 40000. 50000. 60000. 70000. 80000. 90000. 100000. 200000.

```

- ANALYSIS OF MAXIMUMS -

PLOTTING POSITIONS- KAW LAKE INFLOWS

```

*****
* .....EVENTS ANALYZED.....* .....ORDERED EVENTS.....*
*                               * .....CALENDER.....* .....MEDIAN *
* MONTH DAY YEAR FLOW,CFS * RANK YEAR FLOW,CFS PLOT POS *
* .....* .....* .....* .....* .....* .....* .....* .....*
* 7 12 1922 4.37 * 1 1922 110960. 12.96 *
* 6 10 1923 110960. * 2 1926 68991. 31.48 *
* 5 1 1924 24276. * 3 1922 47437. 50.00 *
* 5 10 1925 3884. * 4 1924 24276. 68.52 *
* 10 4 1926 68991. * 5 1925 3884. 87.04 *
*****

```

```

***** ANALYTICAL FIT TO DATA *****

```

```

*****
CAUTION FROM SUBROUTINE WTSKEW
***** NO GENERALIZED SKEW PROVIDED
ADOPTED SKEW SET TO COMPUTED SKEW

```

-FREQUENCY CURVE- KAW LAKE INFLOWS

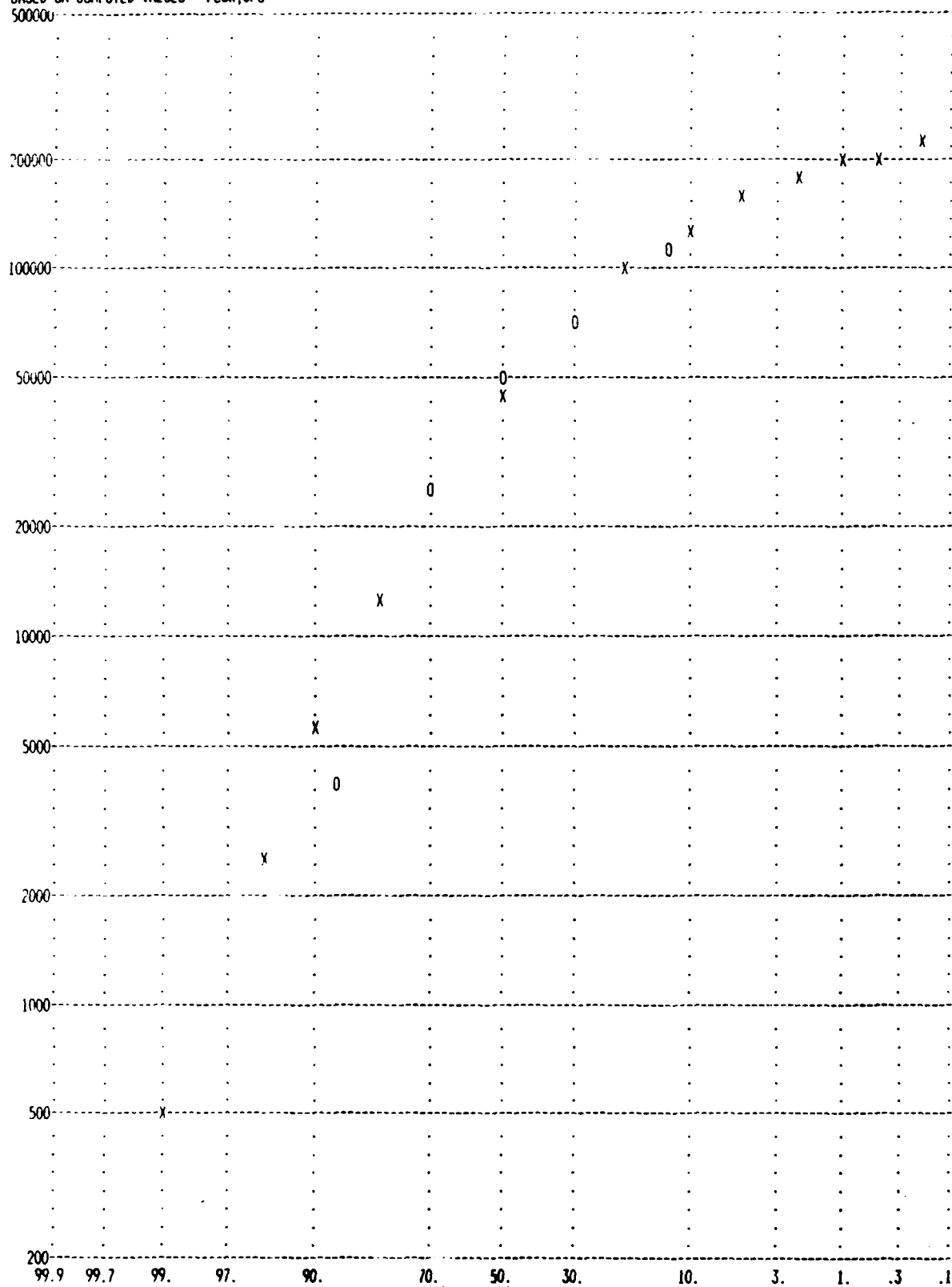
.....FLOW,CFS.....		* PERCENT	*...CONFIDENCE LIMITS...*		
* EXPECTED		* CHANCE	*		
* COMPUTED	* PROBABILITY	* EXCEEDANCE	* 0.05 LIMIT	* 0.95 LIMIT	*

* 217000.	278000.	* 0.2	* 4470000.	73900.	*
* 206000.	253000.	* 0.5	* 4000000.	71100.	*
* 195000.	239000.	* 1.0	* 3550000.	68000.	*
* 181000.	227000.	* 2.0	* 3000000.	63900.	*
* 155000.	196000.	* 5.0	* 2130000.	56200.	*
* 129000.	157000.	* 10.0	* 1430000.	48000.	*
* 96000.	109000.	* 20.0	* 770000.	36600.	*
* 42300.	42300.	* 50.0	* 162000.	14600.	*
* 12600.	8870.	* 80.0	* 32800.	1840.	*
* 5600.	2410.	* 90.0	* 15900.	330.	*
* 2610.	474.	* 95.0	* 8820.	59.	*
* 486.	1.	* 99.0	* 2730.	1.	*

* SYSTEMATIC STATISTICS *					
* LOG TRANSFORM OF FLOW,CFS *		* NUMBER OF EVENTS *			

* MEAN	4.5069	* HISTORIC EVENTS	0	*	*
* STANDARD DEV	0.5669	* HIGH OUTLIERS	0	*	*
* COMPUTED SKEW	-1.3201	* LOW OUTLIERS	0	*	*
* GENERALIZED SKEW	-99.0000	* ZERO OR MISSING	0	*	*
* ADOPTED SKEW	-1.3000	* SYSTEMATIC EVENTS	5	*	*

-FREQUENCY PLOT - KAW LAKE INFLOWS
 BASED ON COMPUTED VALUES - FLOW,CFS



LEGEND - O-OBSERVED VALUE, H-HIGH OUTLIER OR HISTORIC VALUE, L-LOW OUTLIER, Z-ZERO OR MISSING, X-COMPUTED CURVE

- ANALYSIS OF MINIMUMS -

-PLOTTING POSITIONS- KAW LAKE INFLOWS

```
*****
*.....EVENTS ANALYZED.....*.....ORDERED EVENTS.....*
*                               *      CALENDER      *
* MON DAY YEAR FLOW,CFS * RANK YEAR FLOW,CFS PLOT POS *
```

* 1	7	1922	83.	* 1	1923	26.	12.96	*
* 4	3	1923	26.	* 2	1922	83.	31.48	*
* 9	10	1924	181.	* 3	1926	92.	50.00	*
* 7	9	1925	161.	* 4	1925	161.	68.52	*
* 9	10	1926	92.	* 5	1924	181.	87.04	*

***** ANALYTICAL FIT TO DATA *****

 CAUTION FROM SUBROUTINE WTSKEW
 ***** NO GENERALIZED SKEW PROVIDED
 ADOPTED SKEW SET TO COMPUTED SKEW

-FREQUENCY CURVE- KAW LAKE INFLOWS

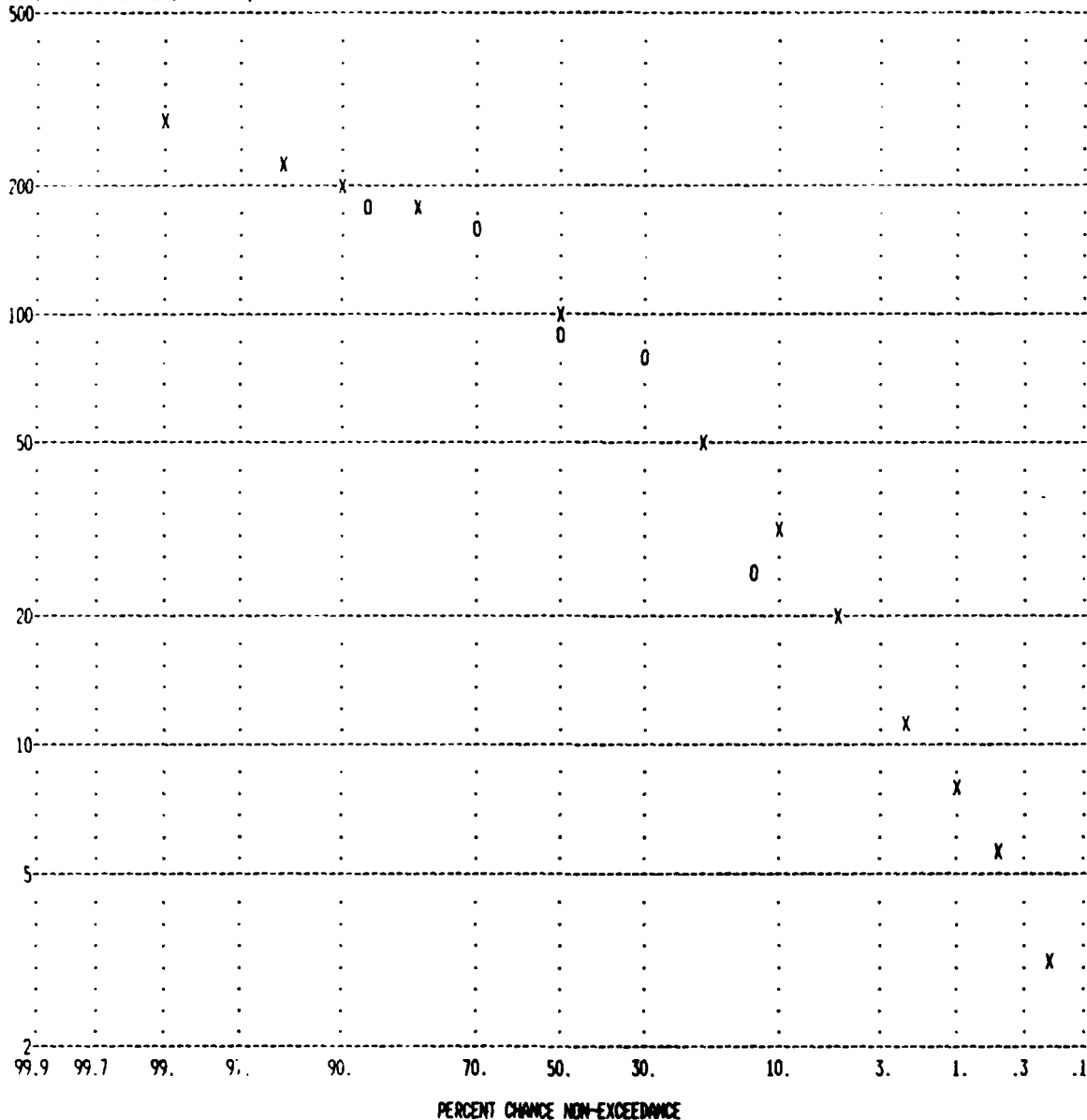
```
*****
*.....FLOW,CFS.....* PERCENT *...CONFIDENCE LIMITS...*
*      EXPECTED * CHANCE NON- *
* COMPUTED PROBABILITY * EXCEEDANCE * 0.05 LIMIT 0.95 LIMIT *
```

* 3.	0.	* 0.2	* 12.	0.	*
* 5.	0.	* 0.5	* 17.	0.	*
* 8.	0.	* 1.0	* 22.	0.	*
* 12.	2.	* 2.0	* 28.	1.	*
* 21.	8.	* 5.0	* 42.	2.	*
* 32.	20.	* 10.0	* 59.	6.	*
* 51.	42.	* 20.0	* 90.	16.	*
* 104.	104.	* 50.0	* 229.	55.	*
* 172.	186.	* 80.0	* 589.	97.	*
* 207.	236.	* 90.0	* 874.	115.	*
* 234.	274.	* 95.0	* 1140.	128.	*
* 274.	321.	* 99.0	* 1610.	145.	*

```
*
*      SYSTEMATIC STATISTICS
* LOG TRANSFORM OF FLOW,CFS * NUMBER OF EVENTS *
```

* MEAN	1.9525	* HISTORIC EVENTS	0	*
* STANDARD DEV	0.3347	* HIGH OUTLIERS	0	*
* COMPUTED SKEW	-1.2276	* LOW OUTLIERS	0	*
* GENERALIZED SKEW	-99.0000	* ZERO OR MISSING	0	*
* ADOPTED SKEW	-1.2000	* SYSTEMATIC EVENTS	5	*

-FREQUENCY PLOT - KAW LAKE INFLOWS
 BASED ON COMPUTED VALUES - FLOW,CFS



LEGEND - O-OBSERVED VALUE, H-HIGH OUTLIER OR HISTORIC VALUE, L-LOW OUTLIER, Z-ZERO OR MISSING, X-COMPUTED CURVE

- DURATION ANALYSIS -

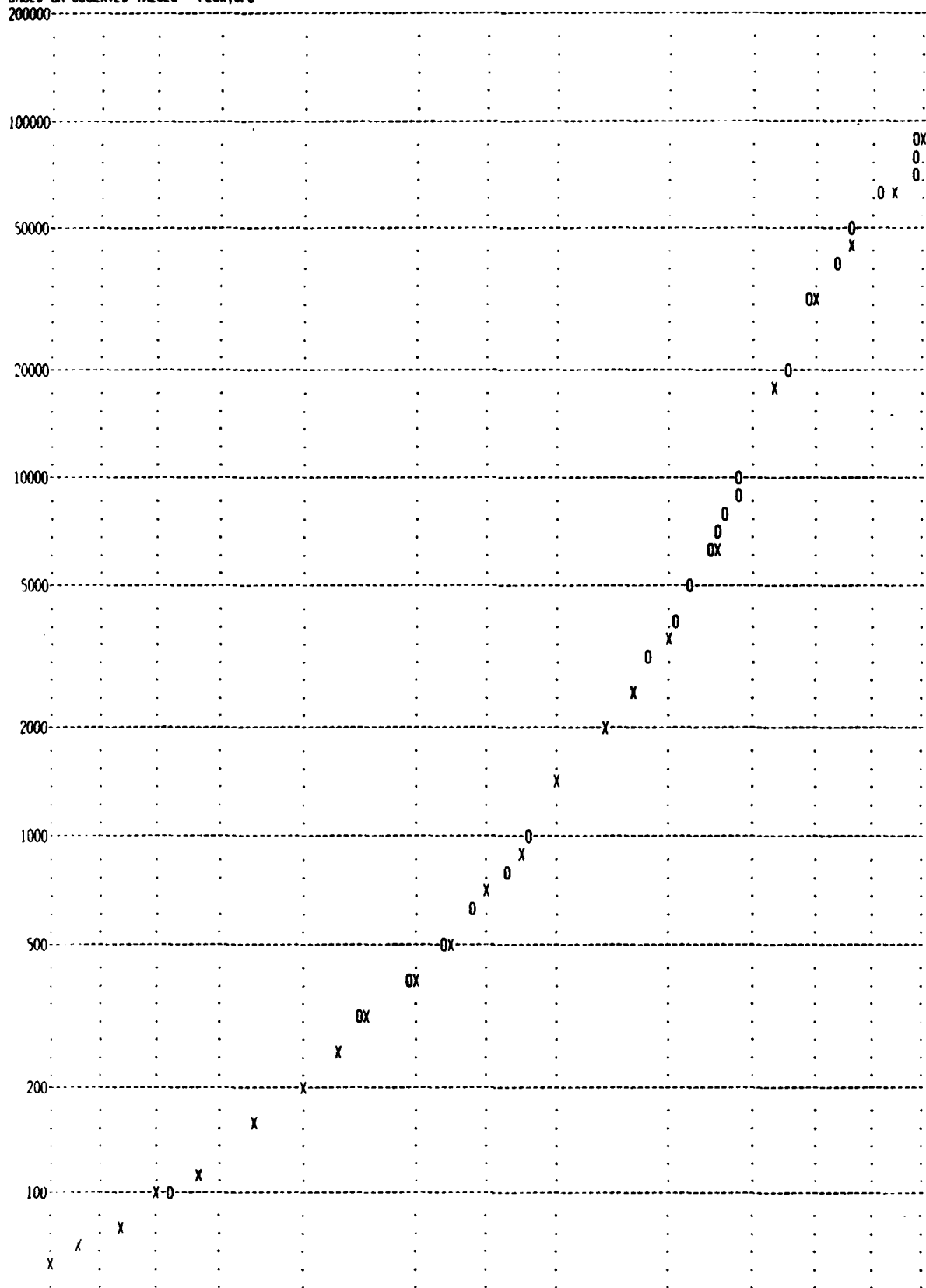
-DURATION DATA- KAW LAKE INFLOWS

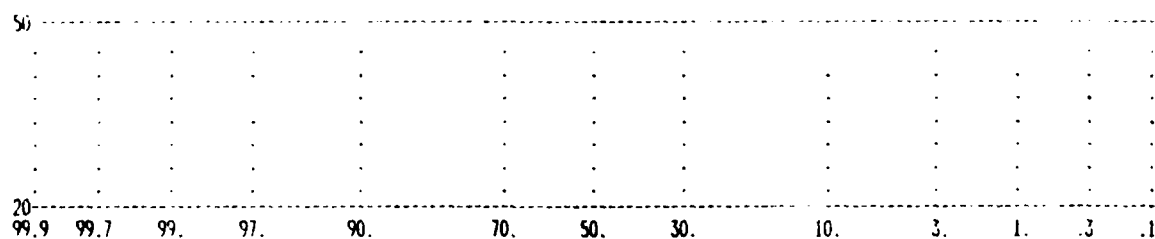
* CLASS * NUMBER	LOWER CLASS LIMIT FLOW,CFS	NUMBER IN CLASS	ACCUM NUMBER	PERCENT EQUAL OR EXCEED	* CLASS * NUMBER	LOWER CLASS LIMIT FLOW,CFS	NUMBER IN CLASS	ACCUM NUMBER	PERCENT EQUAL OR EXCEED	* CLASS * NUMBER	LOWER CLASS LIMIT FLOW,CFS	NUMBER IN CLASS	ACCUM NUMBER	PERCENT EQUAL OR EXCEED	* CLASS * NUMBER
* 0	26.00	22	1826	100.00	* 11	2000.00	145	366	20.04	* 21	30000.00	7	19	1.04	*
* 1	100.00	159	1804	98.80	* 12	3000.00	57	221	12.10	* 22	40000.00	4	12	0.66	*
* 2	200.00	165	1645	90.09	* 13	4000.00	33	164	8.98	* 23	50000.00	3	8	0.44	*
* 3	300.00	186	1480	81.05	* 14	5000.00	26	131	7.17	* 24	60000.00	3	5	0.27	*
* 4	400.00	169	1294	70.87	* 15	6000.00	18	105	5.75	* 25	70000.00	0	2	0.11	*
* 5	500.00	128	1125	61.61	* 16	7000.00	8	87	4.76	* 26	80000.00	0	2	0.11	*
* 6	600.00	101	997	54.60	* 17	8000.00	13	79	4.33	* 27	90000.00	1	2	0.11	*
* 7	700.00	92	896	49.07	* 18	9000.00	3	66	3.61	* 28	100000.00	1	1	0.05	*
* 8	800.00	64	804	44.03	* 19	10000.00	33	63	3.45	* 29	200000.00	0	0	0.00	*
* 9	900.00	45	740	40.53	* 20	20000.00	11	30	1.64						
* 10	1000.00	329	695	38.06											

-INTERPOLATED DURATION CURVE- KAW LAKE INFLOWS

* PERCENT * EQUAL OR * EXCEED	INTERPOLATED MAGNITUDE FLOW,CFS	* PERCENT * EQUAL OR * EXCEED	INTERPOLATED MAGNITUDE FLOW,CFS	*
* 0.01	111000.	* 60.00	521.	*
* 0.05	111000.	* 70.00	409.	*
* 0.10	92100.	* 80.00	311.	*
* 0.20	63100.	* 85.00	256.	*
* 0.50	46800.	* 90.00	201.	*
* 1.00	30900.	* 95.00	151.	*
* 2.00	17000.	* 98.00	114.	*
* 5.00	6690.	* 99.00	96.	*
* 10.00	3660.	* 99.50	82.	*
* 15.00	2530.	* 99.80	69.	*
* 20.00	2000.	* 99.90	61.	*
* 30.00	1350.	* 99.95	55.	*
* 40.00	919.	* 99.99	44.	*
* 50.00	682.	* 100.00	26.	*

-DURATION CURVE - KAW LAKE INFLOWS
 BASED ON OBSERVED VALUES - FLOW,CFS





PERCENT OF TIME

LEGEND - O-OBSERVED VALUE, H-HIGH OUTLIER OR HISTORIC VALUE, L-LOW OUTLIER, Z-ZERO OR MISSING, X-COMPUTED CURVE

TEST NO. 3 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
ANALYTICAL ANALYSIS OF DAILY FLOWS
COMPUTE DURATION CURVE ALONG WITH MAXIMUM AND MINIMUM ANALYSIS

-MONTHLY SUMMARY- KAW LAKE INFLOWS

YEAR	MONTHLY AND ANNUAL MEAN VALUES, FLOW, CFS												ANNUAL
	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	
1922	134.	212.	2584.	7176.	7254.	1541.	9611.	923.	412.	332.	1994.	610.	2752.
1923	191.	121.	191.	275.	3144.	25982.	2368.	2669.	2551.	4135.	2527.	1572.	3797.
1924	1043.	2035.	3240.	3924.	4377.	1151.	872.	1014.	330.	405.	392.	387.	1597.
1925	414.	657.	454.	1012.	933.	572.	232.	815.	520.	363.	628.	392.	581.
1926	530.	608.	583.	1226.	636.	408.	296.	664.	3276.	11545.	1298.	871.	1842.
MEAN	463.	727.	1411.	2722.	3269.	5931.	2676.	1217.	1418.	3356.	1368.	766.	2114.
MAX	1043.	2035.	3240.	7176.	7254.	25982.	9611.	2669.	3276.	11545.	2527.	1572.	3797.
MIN	134.	121.	191.	275.	636.	408.	232.	664.	330.	332.	392.	387.	581.
-STATISTICS OF THE LOGS OF VALUES GREATER THAN ZERO-													
MEAN	2.554	2.664	2.926	3.196	3.355	3.206	3.027	3.026	2.954	3.073	3.041	2.820	3.250
STDV	0.355	0.476	0.522	0.551	0.450	0.714	0.669	0.234	0.470	0.718	0.340	0.256	0.309
SKEW	0.075	0.147	0.075	-0.233	-0.312	1.672	-0.632	1.750	0.539	0.815	-0.420	0.753	-1.021

TEST NO. 3 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
ANALYTICAL ANALYSIS OF DAILY FLOWS
COMPUTE DURATION CURVE ALONG WITH MAXIMUM AND MINIMUM ANALYSIS

-MONTHLY SUMMARY- KAW LAKE INFLOWS

YEAR	MAXIMUM DAILY VALUES, FLOW,CFS												ANNUAL
	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	
1922	275.	655.	14759.	29164.	16726.	4643.	47437.	1345.	788.	604.	8154.	756.	47437.
1923	571.	205.	435.	1014.	15403.	110960.	3819.	5898.	6127.	11002.	5076.	1853.	110960.
1924	1605.	3304.	6329.	16045.	24276.	1936.	2024.	5682.	1137.	990.	686.	466.	24276.
1925	1261.	942.	518.	2380.	3884.	2032.	562.	1286.	2621.	613.	1728.	505.	3884.
1926	718.	752.	670.	2421.	891.	751.	627.	2478.	30144.	68991.	2858.	1186.	68991.

MEAN	886.	1172.	4542.	10205.	12236.	24064.	10894.	3338.	8163.	16440.	3701.	953.	51110.
MAX	1605.	3304.	14759.	29164.	24276.	110960.	47437.	5898.	30144.	68991.	8154.	1853.	110960.
MIN	275.	205.	435.	1014.	891.	751.	562.	1286.	788.	604.	688.	466.	3884.

-STATISTICS OF THE LOGS OF VALUES GREATER THAN ZERO-

MEAN	2.872	2.899	3.230	3.687	3.867	3.636	3.422	3.431	3.527	3.489	3.430	2.918	4.507
STDV	0.302	0.431	0.705	0.618	0.595	0.836	0.783	0.323	0.634	0.917	0.417	0.253	0.567
SKEW	-0.502	0.181	0.720	0.415	-1.138	1.625	1.236	0.143	0.856	0.977	-0.469	0.535	-1.320

TEST NO. 3 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
ANALYTICAL ANALYSIS OF DAILY FLOWS
COMPUTE DURATION CURVE ALONG WITH MAXIMUM AND MINIMUM ANALYSIS

-MONTHLY SUMMARY- KAW LAKE INFLOWS

YEAR	MINIMUM DAILY VALUES, FLOW,CFS												ANNUAL
	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	
1922	83.	87.	202.	1078.	2305.	911.	1088.	463.	328.	286.	587.	314.	83.
1923	108.	95.	93.	26.	317.	3596.	1702.	1457.	1014.	2100.	1604.	1411.	26.
1924	672.	1294.	1451.	1911.	1573.	546.	395.	271.	181.	210.	242.	310.	181.
1925	246.	286.	380.	420.	485.	236.	161.	224.	161.	224.	300.	281.	161.
1926	331.	486.	505.	597.	350.	229.	150.	108.	92.	911.	741.	705.	92.

MEAN	288.	450.	526.	806.	1006.	1104.	699.	505.	355.	746.	695.	604.	109.
MAX	672.	1294.	1451.	1911.	2305.	3596.	1702.	1457.	1014.	2100.	1604.	1411.	181.
MIN	83.	87.	93.	26.	317.	229.	150.	108.	92.	210.	242.	281.	26.

-STATISTICS OF THE LOGS OF VALUES GREATER THAN ZERO-

MEAN	2.338	2.434	2.544	2.626	2.858	2.797	2.649	2.529	2.390	2.682	2.741	2.687	1.952
STDV	0.369	0.494	0.446	0.722	0.395	0.494	0.477	0.421	0.396	0.441	0.328	0.305	0.335
SKEW	0.178	0.382	0.170	-1.575	0.579	0.970	0.237	0.724	1.003	0.919	0.453	1.111	-1.228

+++++
+ END OF RUN +
+ NORMAL STOP IN STATS +
+ HAVE A GOOD DAY +
+++++

CLASS USE OF HEC HARRIS 1000

1. To logon

- a. Enter: "Control G" (may need to repeat)
- b. In response to USER#

Enter: GP##,GP## Where: # IS THE GROUP NUMBER

2. CREATE INPUT FILE

```
COED MYDATA          [This creates a file named MYDATA]
NEW FILE
E>I T1  THIS IS THE FIRST TITLE CARD [This inputs a line]
E>I T2  THIS IS THE SECOND TITLE CARD
E>I T3  THIS IS THE THIRD TITLE CARD
E>FREE          [This enters into Free Format Input]
E>I            [This enters into Input mode]
F>J1 ,,2, ,,,,,,13
F>J2 1
F>
      [continue to enter data]

F>$$$           [This gets you out of input mode]
E>P A           [This prints the entire file]
```

[A file listing would be shown]

```
E>FS            [This will put you in full screen mode]

E>FILE          [This will save your file MYDATA]
MYDATA  EDITED
OK
```

3. RUNHEC [This MACRO runs HEC programs, see example]
4. COED OUTDATA [This allows you to look at your output on disk]
5. SP OUTDATA [This will send OUTPUT to the printer]
6. To logoff
 - a. Enter: OFF
 - b. WAIT until both cost and computer time accounting blocks have been displayed.
 - c. WAIT 20 seconds more, then power down terminal.