ort No. FHWA-RD-78-58

MPUTER PROGRAMS USED TO ANALYZE WIND AND BRIDGE DATA ACQUIRED AT SITKA, ALASKA

May 1977

Final Report

Document is available to the public through the National Technical Information Service, Springfield, Virginia 22161

Prepared for

FEDERAL HIGHWAY ADMINISTRATION

Offices of Research & Development

Washington, D. C. 20590

FOREWORD

This report contains the software which describes the programs and subroutines used for analysis of wind and acceleration data recorded at long-span bridge sites. Twelve of the most significant Fortran programs and their subroutines are presented as a catalog. The presentation is enhanced by flow charts, variable name lists, and output listings. The companion report, FHWA RD 78-57, describes acquisition at the Sitka site of wind and motion data.

Charles F. Scheffey
Director, Office of Research

NOTICE

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA-RD-78-58		

4. Title and Subtitle
Computer Programs Used to Analyze Wind and Bridge Data Acquired at Sitka, Alaska

5. Report Date
May 1977

6. Performing Organization Code

7. Author(s)
D. D. Nelson, D. M. Greene

8. Performing Organization Report No.

9. Performing Organization Name and Address
Systems Technology Associates, Inc.
2990 Telestar Court
Falls Church, Va. 22042

10. Work Unit No.
35A1-012

11. Contract or Grant No.
DOT-FH-11-7769

12. Sponsoring Agency Name and Address
Federal Highway Administration
Office of Research (FHS)
Structures and Applied Mechanics Division
Washington, D. C. 20591

13. Type of Report and Period Covered
Final, Software
July 1976-May 1977

14. Sponsoring Agency Code

15. Supplementary Notes
Contract Manager: Lloyd R. Cayes

16. Abstract
Twelve of the most significant Fortran programs and their subroutines are presented as a catalog. The presentation is enhanced by flow charts, variable name lists and output listings.

17. Key Words
Bridge Motion, Acceleration, Software

18. Distribution Statement
No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22161.

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	241	

Form DOT F 1700.7 (8-69)

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (continued)

LIST OF TABLES

INTRODUCTION

This document is the Software Report describing the programs and subroutines used for analysis of wind and acceleration data recorded at long-span bridge sites using a Government-owned Instrumentation system.

The software package consists of various combinations of programs, routines and subroutines which allow for tape reading, statistical data summaries, calibration and outputting of data values. It also allows for obtaining acceleration time series plots and frequency spectra, and plots for the wind parameters relative to model frequency spectra.

This report, as listed in Table 1, comprises twelve of the most significant programs which include those routines associated with individual programs. In addition, general subroutines are provided separately to support programs as indicated by Table 2. Each program and subroutines are individually organized containing, for the most part, the following data:

- Programming Introduction
- Operational Notes
- General Program Setup
- General Program Flow Chart
- Program Listings
- Variable Name List
- Input Card Format
- Sample Outputs

The following documents are suggested to be consulted for more detailed information on the Instrumentation System:

1. Installation and Operation Manual for An Instrumentation System to Monitor and Record Wind Velocities, Directions, and Effects at Suspension Bridge Site, Falls Church, Virginia, Undated.

2. Final Report for An Instrumentation System to Monitor and Record Wind Velocity, Directors, and Effects at Suspension Bridges, Falls Church, Virginia, March 1971.

3. C. L. Gerhardt and D. D. Nelson, Monitoring and Recording Wind Velocities, Directions, and Effects at Comp-Span Bridge Sites, Report No. FHWA-RD-76-10, Washington, D.C., August 1977.

4. C. L. Gerhardt, D. D. Nelson, and D. M. Grene, Selected Wind and Bridge Motion Data Recorded at Long-Span Bridge Sites, Report No. FHWA-RD-76-180, Washington, D.C., August 1976.

5. A Software System To Analyze Wind Sensor and Accelerometer Data Acquired At Bridge Sites, Falls Church, Virginia, July 1974.

Table 1. Signalling Computer Programs, Routines & Subroutines.

NAME	PURPOSE
ACCPLT	Generates side-by-side calibration plots of data from all accelerometers for selected data records. (15 recs/page).
ACCSPC	Calculates and plots power spectral density for selected accelerometer data. 10 RB + 2 Tower.
STPSPC	Stepping Spectra of 1 accel. channel.
CALFIL	Updates and maintains instrumentation system channel calibration file.
COPY	Copies selected records from data base to work tape.
DBLINT	
MODE3D	Plots three-dimensional views of "geometrical bridge configuration" at sequential instants of time. Based on accel. data.
RBMPLT	Generates table of record-by-record accelerometer maxima, and averages wind directions and velocities. (One pt. per record + wind/accel. correlation + wind polar).
RHARM	Finds the fourier coefficients of one dimensional real data.
TAPSUM	Generates index and 10-minute statistical summaries for all data recorded on field data tapes.
WNDSPC	Calculates and plots power spectral density for selected anemometer data for up to 5 channel each U, R, W plus their averages.
WNDPRM	
INTRPN	A subroutine to generate missing data points through interpolation.
DETRND	
NEWPRT	A subroutine to read Newport data tapes, and demultiplex and calibrate sensor data.
SITKA	A subroutine to read Sitka data tapes, and demultiplex and calibrate sensor data.
WINDOW	A subroutine to apply 10% cosine^2 taper to data samples.

Table 2. Major Data Analysis Programs

NOMENCLATURE	ASSOCIATED SUBROUTINES	GENERAL SUBROUTINE CALLED	
ACCPLT		SITKA	
ACCSPC	INTPWA, SPCPWA	SITKA	DETRND WINDOW RHARM
STPSPC	(INTPW2, SPCPW2)		
CALFIL			
COPY			
DBLINT	TAPE, CLEAN, DDTRND, TTRACE, SPECT	INTPWA SPCPWA SITKA	DETRND2 WINDOW RHARM
MODE3D		SITKA	
RBMPLT	POLAR	SITKA	
RHARM	HARM (IBM)		
TAPSUM	TIME, HDG, EVINST, EVTERM, INTSUM		
WNDSPC	INTPWW, SPCPWW, VVCAL, WANGL, AVERG2	SITKA	DETRND2 WINDOW RHARM
+WNDPRM			
INTRPN			
DETRND2			
NEWPRT			
SITKA			
WINDOW			

PROGRAM ACCPLT

INTRODUCTION

Program ACCPLT provides a continuous printer plot of 13 channels of acceleration and two of wind direction and velocity from magnetic tapes recorded at the Sitka Harbor, Alaska bridge. Also, it optionally plots all 13 accelerometers on a Calcomp/ Tektronix plot of 15 records (68 seconds of data) per page.

In addition to outputting plots of A1 through A13, the ten bridge deck accelerometers may be displayed as sum and difference pairs by setting NDIF $\neq 0$. For example, instead of the top two traces being A1 and A2, the top trace will show the algebraic sum of A1 and A2 and the second trace the difference A1-A2. This provides a good indication of whether the bridge deck motion is vertical or torsional, corresponding to opposite sides of the bridge being in or out of phase.

See Figures 1 through 6, Table 3 and Listing 1.

OPERATIONAL NOTES

From the actual calls to plot in inches, all data is shrunk by the factor CCSIZE for the desired size of the actual Calcomp lot. Since the Tektronix graphics further shrinks its plots to approximately 57% of the Calcomp, programs such as ACCPLT which use it contain another factor of 1.74 to compensate for this.

Multiple request cards may be used but must be all for the same tape file.

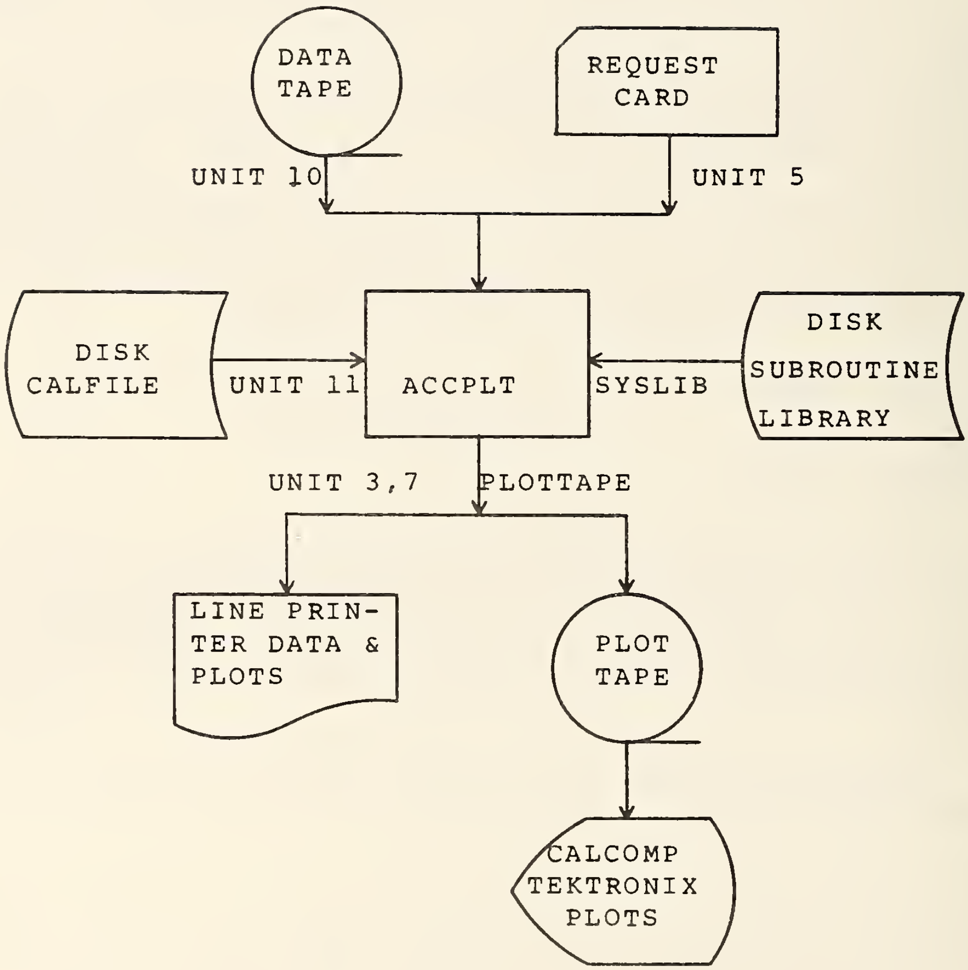


Figure 1. Program ACCPLT Setup

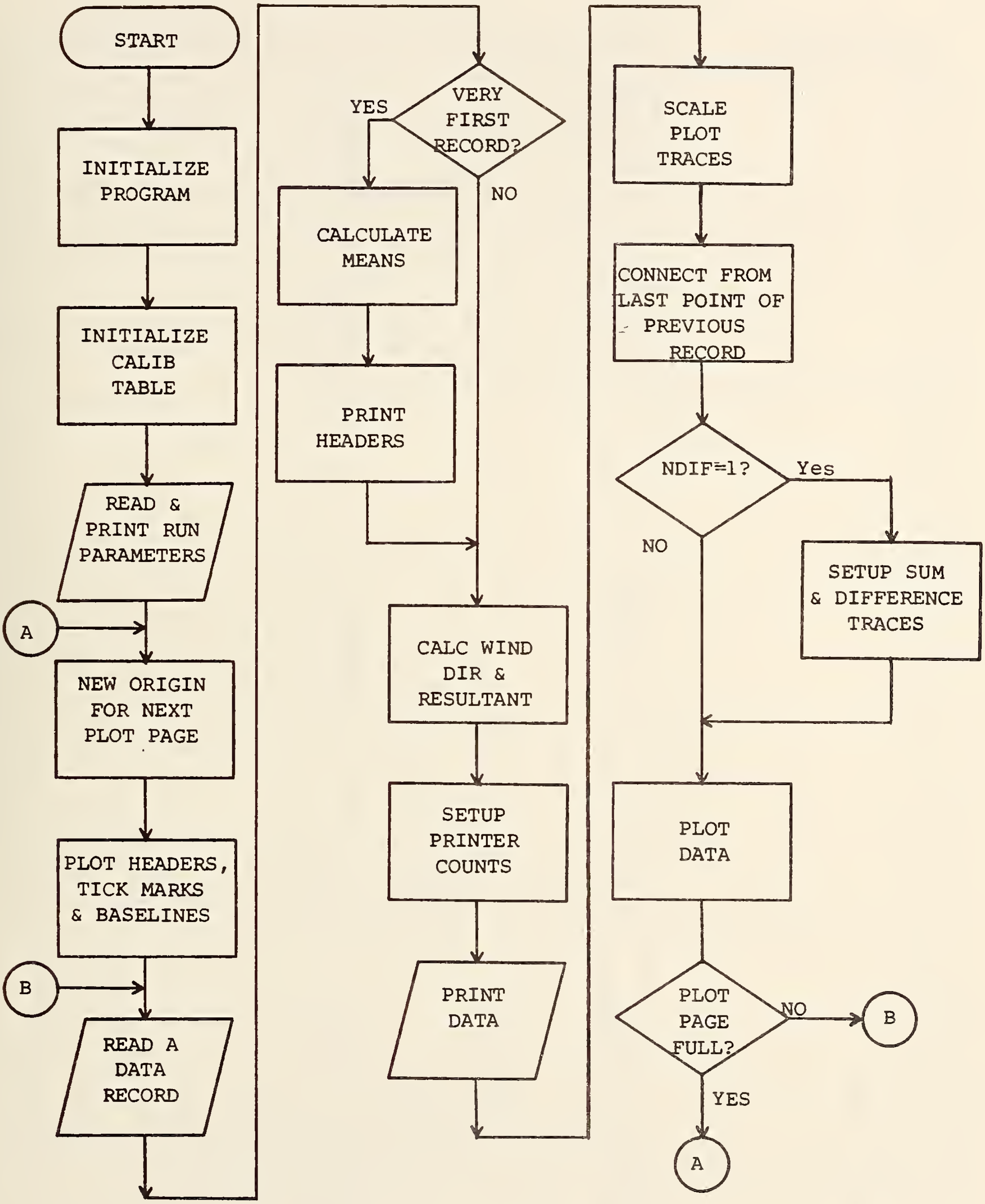


Figure 2. ACCPLT Flow Chart

```
00010436  76300
```

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	---	Tape Number	2A4	1-8
2	70300 - 72161 (Newport)	Recording date	I5	11-15

Figure 3. ACCPLT Tape Number Card Format

00270 00285

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	1-9999	Beginning record number	I5	1-5
2	1-9999	Ending record number	I5	11-15
3	0,1	NDIF	I5	21-25

Figure 4. ACCPLT Request Card Format

RECORD/ TIME	A11 0.0 .3	A12-A13 0.0 .06	W1 DIR	W1 VEL	A1-A2 0.0 .03	A3-A4 0.0 .03	A5-A6 0.0 .03	A7-A8 0.0 .03	A9-A10 0.0 .03	W5 DIR	W5 VEL
-------	I----I----I	I----I----I	----	---	I----I----I	I----I----I	I----I----I	I----I----I	I----I----I	----	---
270	S	NS	211	48	*	SN	ISN	I*	*	160	40
0.14	S	NS	212	48	*	*	ISN	SN	*	162	38
0.21	S	NS	213	46	*	*	SN	*	*	162	37
0.28	S	*	214	45	*	*	SN	*	*	166	42
0.35	S	*	215	46	*	*	NS	*	*	166	44
0.42	S	SN	215	47	*	*	NSI	*	*	168	50
0.49	S	NS	215	47	*	NS	NSI	*	*	168	50
0.56	S	*	215	47	*	NS	NSI	*I	*	170	50
0.63	S	NS	217	46	*	*I	* I	*I	*	170	49
0.70	S	*	218	46	NS	SNI	SNI	SN	NS	171	45
0.77	S	*	219	45	I*	*I	SNI	SN	SN	173	45
0.84	S	NS	220	44	I*	SN	*I	*	*	172	44
0.91	S	*	220	43	NS	*	*I	*	*	173	42
0.98	S	SN	220	42	*	*	*	*	NS	173	42
1.05	S	*	219	47	*	*	NS	I*	SN	171	44
1.12	S	*	220	43	*	I*	INS	I*	SN	172	45
1.19	S	*	221	44	*	I*	I *	I*	*	171	43
1.26	S	SN	221	46	*	I*	I *	I*	*	169	42
1.33	S	SN	220	45	*	SN	I *	I*	*	168	41
1.40	S	*	222	44	*	SN	IS N	I*	*	168	41
1.47	S	SN	220	44	*	SN	ISN	SN	*	166	39
1.54	S	*	222	42	*	*	I*	I*	SN	168	39
1.61	S	*	222	44	*	*	*	NS	SN	169	39
1.68	S	*	221	43	*	*	NS	*	*	170	37
1.75	S	NSI	221	43	*	*I	*I	*	*	170	36
1.82	S	*	221	43	*	*I	*I	*I	*	168	34
1.89	S	SN	220	44	NS	*I	* I	*I	*	167	34
1.96	S	*	222	44	SN	*I	* I	*I	*	166	38
2.03	S	*	221	44	NS	*I	* I	SN	*	169	38
2.10	S	SN	220	44	NS	*I	* I	*	*	170	35
2.17	S	*	221	43	*	*I	NSI	*	*	169	31
2.24	S	*	221	42	*	*	*I	*	*	171	35
2.31	S	*I	221	43	*	*	NS	*	*	171	43
2.38	S	SN	220	42	*	*	I*	*	*	171	44
2.45	S	I*	220	42	*	*	I*	SN	*	171	43
2.52	S	*	220	44	*	*	ISN	I*	*	173	42
2.59	S	*	220	43	*	SN	ISN	I*	*	175	44
2.66	S	*	217	44	*	SN	I *	I*	SN	173	42
2.73	S	SN	218	43	SN	I*	ISN	I*	*I	172	40
2.80	S	*	217	44	*	I*	INS	I*	*	170	38
2.87	IS	*	216	43	*	I*	INS	SN	*	170	37
2.94	IS	*	215	44	*	*	I*	NS	*	170	35
3.01	S	*	214	45	*	NS	SN	*	*	171	34
3.08	S	*	214	43	*	*I	NS	*	*	171	34
3.15	S	SN	214	45	NS	SN	*I	SN	*	173	33

Figure 5. ACCPLT Output One

RECORD/ TIME	A11 0.0 .3	A12-A13 0.0 .06	W1 DIR	W1 VEL	A1-A2 0.0 .03	A3-A4 0.0 .03	A5-A6 0.0 .03	A7-A8 0.0 .03	A9-A10 0.0 .03	W5 DIR	W5 VEL
3.22	SI	*	215	45	NS	*I	* I	*	*	175	30
3.29	S	*	215	45	SN	*I	* I	*	*	181	26
3.36	S	*I	216	44	*	*I	NSI	*I	*	187	26
3.43	S	NS	217	45	NS	*I	NSI	*I	*	186	31
3.50	S	*	217	45	*	*I	*I	*I	*	186	36
3.57	S	NS	218	46	SN	*I	NS	SN	*	184	37
3.64	S	*	217	45	NS	*	*	*	*	182	35
3.71	IS	SN	217	45	NS	SN	SN	*	*	179	32
3.78	IS	*	217	45	*	I*	I*	SN	*	182	28
3.85	IS	SN	218	44	SN	NS	INS	I*	SN	186	27
3.92	S	SN	218	44	NS	*	INS	I*	NS	188	28
3.99	S	SN	216	46	*	NS	I *	I*	SN	189	29
4.06	S	SN	215	46	SN	NS	I *	I*	*	185	30
4.13	S	SN	215	46	*	*	I*	I*	*	182	30
4.20	S	*	213	46	*	*	I*	SN	*	184	29
4.27	SI	*	214	47	*	*	I*	*	*	185	31
4.34	S	*	214	47	*	*	*	*	SN	186	34

Figure 5. ACCPLT Output One (continued)

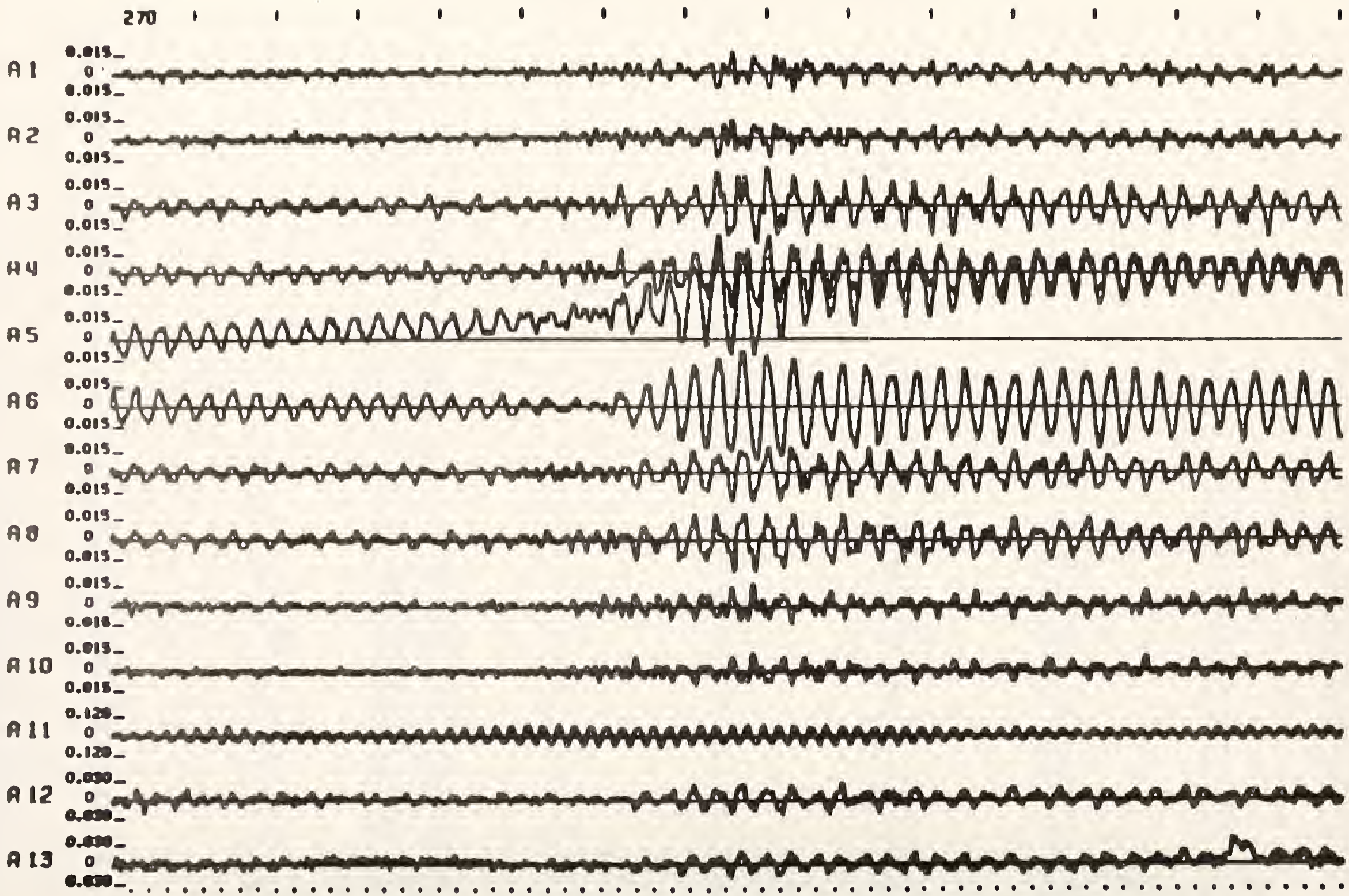


Figure 6. ACCPLT Output Two

Table 3. ACCPLT Variable Name List

Name	Com	Type	Dimension	Usage
ACLM		R	1	Output trace number
ALAST		R	13	Stores last point of previous rec.
AMEAN		R	13	Mean Values
AN		I	1	Literal N
AS		I	1	Literal S
BEGREC		I	1	Starting record of request
BLNK		I	1	Literal blank
CARDIN		I	1	Card input device
CCSIZE		R	1	Calcomp plot scaling desired
DT		R	1	Sampling interval
ENDREC		I	1	Ending record of request
FPF		I	1	Need-to-print 1st-pt-of rec. flag
I		I	1	General index
IBUF		I	4000	Plot buffer storage
IDATE		I	1	Date of input tape data
IFF		I	1	SITKA function flag
II		I	1	General index
IPAGE		I	1	Current page being plotted
IREC		I	1	Current record number
IREK		I	1	Current record being plotted
IRF		I	1	Read status flag
J		I	1	General index
KAC		I	1	Output trace index
LSREC		I	1	RECNO-1
LTRI		I	1	Literal I
LTRN		I	1	Literal N
LTRS		I	1	Literal S
MCF		I	1	Means-need-calibrating flag
NDIF		I	1	Flag for sum-&-difference option
NP		I	1	Number of points
NPAGES		I	1	Number of pages (integer)

Table 3. ACCPLT Variable Name List (continued)

Name	Com	Type	Dimension	Usage
NREC		I	1	Number of records to plot
NSEC		I	1	Number of Secs/Page
P		I	1	General index
PAGES		R	1	No. of plot pgs in current request
PLEN		R	1	Length of data axis on plot
PSIZE		R	1	Final plot factor
PRNTRI		I	1	Printer assignment
RADCON		R	1	Radians-to-degrees conver. factor
REC		R	1	Current record number
RECNO		R	1	Current record number
RELTIM		R	1	Elapsed time since start of request
SENS		R	64, 37	Array containing 1 record raw data
SKALE		R	1	Scaling factor for time trace plot
STAR		I	1	Literal asterik
T		I	1	General index
TAPENO		I	2	Tape number
TEKFAC		R	1	Tektronix/calcomp adjustment factor
TIMEHI		R	1	Height of tick mark traces
TINC		R	1	Plotting increment between data pts
TINCM		R	1	Plotting increment per minute
TINCS		R	1	Plot spacing for 1 sec of time
TRACE		R	7, 11	Print line array
VSCAL		R	1	Vertical scale of time trace
WIDIR		R	1	Direction of wind on W1
WIVEL		R	1	Velocity of wind 1
W5DIR		R	1	Direction of wind on W5
W5VEL		R	1	Velocity of wind 5
X		R	1	X location of data within a record
XLOC		R	1	X coordinate for plotter start
XI		R	1	X location of minute mark
XX		R	1	starting X location for data

Table 3. ACCPLT Variable Name List (continued)

Name	Com	Type	Dimension	Usage
Y		R	1	Vert offset of plot data from zero baseline
Y2		R	1	Offset for other side of bridge
YHI		R	1	Height of a data trace
THI		R	1	Height of VSCAL from baseline

```
C     ****************    PROGRAM ACCPLT    ****************
C
C-----PLOTS BRIDGE ACCELERATIONS AND 2 RESULTANT WINDS
C------FOR EACH RECORD BETWEEN SPECIFIED BEGINNING AND ENDING RECORDS
C------AS ONE CONTINUOUS PRINTER PLOT.
C------ ALSO PLOTS ALL 13 ACCELEROMETERS ON CALCOMP/TEXTRONIX PLOT
C------OF 15 RECORDS PER PAGE.
C
C     ROUTINES CALLED: SITKA
C
C     PROG. BY CHUCK GERHARDT   S.T.A.   1976
C     MODIFIED BY DUANE NELSON DURING 1976 - 1977.
C
      DIMENSION IBUF(4000),ALAST(13)
      REAL RADCON,SENS(64,37),RELTIM,AMEAN(13),W1DIR,W5DIR,W1VEL,W5VEL
      INTEGER CARDIN,PRNTR1,IFF,RECNO,IRF,BEGREC,ENDREC,MCF,FPF,J,I,
     -II,T,P,BLNK,TRACE(7,11),LTRI,LTRN,LTRS,STAR,LSREC,AS,AN
      INTEGER TAPENO(2)
C
C-----INITIALIZE PROGRAM AND DEVICES
C       ALPHANUMERIC CHARACTERS STORED LEFT JUSTIFIED
C
      DATA BLNK/' '/,LTRS/'S'/,LTRN/'N'/,LTRI/'I'/,STAR/'*'/
      CARDIN=5
      PRNTR1=7
      RADCON=180.0/3.14159
      DT=.07
      CCSIZE=.40
      TEKFAC=1.74
      PSIZE=CCSIZE*TEKFAC
      CALL PLOTS (IBUF,4000,6)
      CALL NEWPEN (1)
      CALL FACTOR (PSIZE)
      CALL PLOT (0.,0.,-3)
C
C       READ TAPE NUMBER CARD AND INITIALIZE SENSOR TABLE
C
      IFF=1
      CALL SITKA(IFF,RECNO,IRF,SENS,TAPENO,IDATE)
      PRINT 9001
9001  FORMAT(1H1,'PROCESSING LOG'/)
C
C-----READ DATA REQUEST CARD AND INITIALIZE COUNTERS FOR ITS REQUEST
C
1000  READ(CARDIN,9100,END=8000) BEGREC,ENDREC,NDIF
9100  FORMAT(I5,T11,I5,T21,I5)
      RECNO=BEGREC
      NREC=ENDREC-BEGREC+1
      PAGES=NREC/15.
      NPAGES=PAGES+.99
      NP=NREC*64
      IREC=0
      RELTIM=0.0
      MCF=1
```

ACCPLT Listing 1 (1 of 5)

```
      PRINT 85,BEGREC,ENDREC,NP,NPAGES,TAPENO,IDATE,NDIF
   85 FORMAT (' PLOTTING RECORDS',I5,' THRU',I5,' (',I5,' POINTS FOR ',
     1I2,' PLOT PAGES)  FROM TAPE ',2A4,' DATED',I6,5X,'NDIF=',I1)
C
C     SETUP EACH 15 RECORD PAGE STARTING WITH TIMING MARKS
C       EVERY RECORD (4.54 SEC) AT TOP, EVERY 1.0 SECONDS AT BOTTOM
C
      DO 600 IPAGE=1,NPAGES
      TINC=.020
      TINCM=TINC*64
      TIMEHI=13.3
      CALL PLOT (2.,TIMEHI,+3)
      REC=BEGREC +15*(IPAGE-1)
      CALL NUMBER (2.2,TIMEHI-.1,.18,REC,0.,-1)
      XT=2.0
      DO 130 I=1,15
      XT=XT+TINCM
  130 CALL SYMBOL (XT,TIMEHI,.14,13,0.,-1)
      CALL PLOT (2.,0.,+3)
      TIMEHI=0.0
      NSEC=4.54*15.
      TINCS=TINCM/4.54
      XT=2.0
      DO 140 I=1,NSEC
      XT=XT+TINCS
  140 CALL SYMBOL (XT,TIMEHI,.07,13,0.,-1)
      PLEN=TINC*64.*15.
      THI=.125/PSIZE
      XLOC=0.0
C
C       PLOT HEADERS AND BASELINES FOR ALL 13 ACCEL
C       ADD VERTICAL AXIS SCALE VALUES (1 INCH=.05 G)
C       FOR A12/A13 , 1 INCH=.10G        FOR A11, 1 INCH=.20G
C       VSCAL= SCALE-PER-INCH * THI
C
      VSCAL=.015
      DO 200 KAC=1,13
      ACLM=KAC
      YHI=13.4-KAC
      IF (KAC.EQ.11)   VSCAL=.120
      IF (KAC.EQ.12.OR.KAC.EQ.13)   VSCAL=.030
      CALL NUMBER (1.3,YHI+THI,.14,VSCAL,0.,3)
      CALL SYMBOL (2.1,YHI+THI,.14,13,90.,-1)
      CALL SYMBOL (0.4,YHI,.21,1HA,0.,1)
      CALL NUMBER (0.7,YHI,.21,ACLM,0.,-1)
      CALL SYMBOL (1.6,YHI,.14,1H0,0.,1)
      CALL NUMBER (1.3,YHI-THI,.14,VSCAL,0.,3)
      CALL SYMBOL (2.1,YHI-THI,.14,13,90.,-1)
      CALL PLOT (2.0,YHI,+3)
      CALL PLOT (PLEN+2.,YHI,+2)
      CALL PLOT (2.0,YHI,+3)
  200 CONTINUE
      CALL PLOT (2.,YHI,+3)
      DO 550 IREK=1,15
```

ACCPLT Listing 1 (2 of 5)

```
C
C-----READ DATA RECORD
C
 00   IFF=3
      CALL SITKA(IFF,RECNO,IRF,SENS,TAPENO,IDATE)
      IREC=IREC+1
      IF(IRF.NE.1) GC TO 7000
      FPF=1
      IF (MCF.EQ.0)   GC TO 2030
C
C-----CALCULATE MEANS FOR A1-A13
C
      J=0
      DO 2020I=1,13
      J=J+2
      AMEAN (I)=0.0
      DO 2010II=1,64
      AMEAN(I)=AMEAN(I)+SENS(II,J)
2010  CONTINUE
      AMEAN(I)=AMEAN(I)/64.0
2020  CONTINUE
C
C------PRINT HEADER FCR PRINTER-PLOT OF DATA
C        AND SET MEANS CALIBRATION FLAG TC ZERO
C
2026  IF (MCF.EQ.0)   GC TO 2030
      WRITE (PRNTR1,9200)
9200  FORMAT(1H1,2X,'RECORD/',7X,'A11',9X,'A12-A13',8X,'W1',8X,'A1-A2',
     -  9X,'A3-A4',9X,'A5-A6',9X,'A7-A8',9X,'A9-A10',8X,'W5'/
     -  4X,'TIME',9X,'0.0  .3',7X,'0.0  .06',2X,'DIR VEL ',
     -  5(6X,'0.0  .03'),2X,'DIR VEL'/
     -  3X,7('-'),2(3X,'I----I----I'),3X,7('-'),5(3X,'I----I----I'),
     -  3X,7('-'))
      MCF=0
C
C------FOR EACH SCAN:
C
2030  DO 2100 I=1,64
       RELTIM=RELTIM+DT
C
C-----CALCULATE RESULTANT HORIZONTAL WIND
C
      IF (SENS(I,1).EQ.0.)    SENS(I,1)=.000001
      IF (SENS(I,3).EQ.0.)    SENS(I,3)=.000001
      IF (SENS(I,25).EQ.0.)    SENS(I,25)=.C00001
      IF (SENS(I,27).EQ.0.)    SENS(I,27)=.000001
      W1DIR=(RADCON*ATAN2(SENS(I,1),SENS(I,3)))+85.0
      W1VEL=SQRT(SENS(I,1)*SENS(I,1)+SENS(I,3)*SENS(I,3))
      W5DIR=(RADCON*ATAN2(SENS(I,25),SENS(I,27)))+85.0
      W5VEL=SQRT(SENS(I,25)*SENS(I,25)+SENS(I,27)*SENS(I,27))
      IW1DIR=IFIX(W1DIR)
      IW1VEL=IFIX(W1VEL)
      IW5DIR=IFIX(W5DIR)
      IW5VEL=IFIX(W5VEL)
```

ACCPLT Listing 1 (3 of 5)

```
C
C      INITIALIZE TRACES
C
       DO 2050 T=1,7
       DO 2040 P=1,11
       TRACE(T,P)=BLNK
2040   CONTINUE
       TRACE(T,6)=LTRI
2050   CONTINUE
C
C-----SET-UP TRACES FOR A1-A10 REMOVING EACH MEAN AND SCALING
C
       DO 2070 T=1,5
       AS=(SENS(I,T*4-2)-AMEAN(T*2-1)+0.036)/0.006+0.5
       AN=(SENS(I,T*4)-AMEAN(T*2)+0.036)/0.006+0.5
       IF ((AS.LT.1).OR.(AS.GT.11)) GO TO 2060
       TRACE (T,AS)=LTRS
2060   IF ((AN.LT.1).OR.(AN.GT.11)) GO TO 2070
       TRACE (T,AN)=LTRN
       IF (AS.EQ.AN) TRACE (T,AS)=STAR
2070   CONTINUE
C
C-----SET-UP TRACE FOR A11, THEN A12-A13
C
       AS=(SENS(I,22)-AMEAN(11)+0.36)/0.06+0.5
       IF((AS.LT.1).OR.(AS.GT.11)) GO TO 2072
       TRACE(6,AS)=LTRS
2072   AN=(SENS(I,24)-AMEAN(12)+0.072)/0.012+0.5
       AS=(SENS(I,26)-AMEAN(13)+0.072)/0.012+0.5
       IF((AS.LT.1).OR.(AS.GT.11)) GO TO 2074
       TRACE(7,AS)=LTRS
2074   IF((AN.LT.1).OR.(AN.GT.11)) GO TO 2080
       TRACE(7,AN)=LTRN
       IF(AS.EQ.AN) TRACE(7,AS)=STAR
C
C-----PRINT DATA (FIRST POINT OF THE RECORD THEN OTHER 63 POINTS)
C         PRINT 64 PTS/REC OR 1 PT/REC
C
2080   IF (FPF.EQ.0) GO TO 2090
C2080  IF (FPF.EQ.0) GO TO 2100      (PRINT ONLY FIRST POINT OF A RECORD)
       LSREC=RECNO-1
       WRITE(PRNTR1,9201) LSREC, (TRACE(6,J),J=1,11),(TRACE(7,J),J=1,11),
     -   IW1DIR,IW1VEL,((TRACE(T,J),J=1,11),T=1,5),IW5DIR,IW5VEL
9201   FORMAT (1X,'*',I8,2(3X,11A1),3X,I3,1X,I3,5(3X,11A1),3X,I3,1X,I3)
       FPF=0
       GO TO 2100
2090   WRITE(PRNTR1,9202) RELTIM,(TRACE(6,J),J=1,11),(TRACE(7,J),J=1,11),
     -   IW1DIR,IW1VEL,((TRACE(T,J),J=1,11),T=1,5),IW5DIR,IW5VEL
9202   FORMAT (3X,F7.2,2(3X,11A1),3X,I3,1X,I3,5(3X,11A1),3X,I3,1X,I3)
2100   CONTINUE
C
C         PLOT THE 13 ACCEL 1.0 INCH APART (FULL SCALE)
C         SKALE=1/SCALE PER INCH
C
```

ACCPLT Listing 1 (4 of 5)

```
      XX=2.0 +TINCM*(IREK-1)
      SKALE=THI/.015
      DO 400 KAC=1,13
      YHI=13.4-KAC
      IF (KAC.EQ.11)   SKALE=THI/.120
      IF (KAC.EQ.12.OR.KAC.EQ.13)   SKALE=THI/.030
      CALL PLOT (XX,YHI,+3)
      IF (IREC.GT.1)   CALL PLOT (XX,ALAST(KAC),+3)
      X=0.
      DO 350 I=1,64
      X=X+TINC
      Y=(SENS(I,KAC*2)-AMEAN(KAC))*SKALE
      IF (KAC.GE.11.OR.NDIF.EQ.0)   GO TO 340
      IF (MOD(KAC,2).EQ.0)   GO TO 330
C
C        SETUP ODD TRACES AS SUMS AND EVEN TRACES AS DIFFERENCES
C
      Y2=(SENS(I,KAC*2+2)-AMEAN(KAC+1))*SKALE
      Y=Y+Y2
      GO TO 340
  330 Y2=(SENS(I,KAC*2-2)-AMEAN(KAC-1))*SKALE
      Y=Y2-Y
  340 IF (Y.GT.1.2)   Y=1.2
      CALL PLOT (XX+X,YHI+Y,+2)
  350 CONTINUE
      ALAST(KAC)=Y +YHI
  400 CONTINUE
  550 CONTINUE
C
C        SET NEW ORIGIN FOR NEXT PAGE OF 15 RECORDS
C
      CALL PLOT (24.,0.,-3)
  600 CONTINUE
      REWIND 10
      IFF=2
      GO TO 1000
C
C-----ERROR AND END PROCESSING
C
7000  PRINT 9700
9700  FORMAT('ABNORMAL DATA READ')
      GO TO 2000
8000  PRINT 9800
9800  FORMAT (' PROCESSING COMPLETE')
      CALL PLOT(0.,0.,999)
      STOP
      END
```

ACCPLT Listing 1 (5 of 5)

PROGRAM ACCSPC

INTRODUCTION

Program ACCSPC produces multi-channel acceleration power spectra from data recorded at the Sitka, Alaska harbor bridge.

Program ACCSPC inputs 512 points (approximately 35 seconds) of acceleration data from the 10 roadbed sensors as well as towers A12 and A13 along with calibration data.

Output from each sensor is given in both printed form and a separate Tektronix plot page as a scaled time trace and frequency spectrum.

In addition to acceleration values and spectra, the printout contains values for variance of the acceleration time data and the sum of all the spectral amplitudes (SUMAMP) for a channel as verification of spectral scaling for one-sided PSD:

SUMAMP = VARIANCE *TSPAN as VARIANCE and TIMESPAN are parameters of the time series data. For the case of Sitka data, the sampling interval of .07 seconds means 512 points represents a time span of approximately 36 seconds. This SUMAMP then is a rough measure of the energy observed by that sensor during the 8 record interval (36 second time span).

A modified version of ACCSPC called STPSPC was also developed to display spectra from one channel for many successive records to look for time variations in the frequency components of an acceleration event. It is documented immediately following ACCSPC.

See Figures 7 through 15, Table 4 and Listings 2, 3 and 4.

OPERATIONAL NOTES

The maximum amplitudes for both the time traces and power spectra may be set by the card input values 'VSCAL' and 'AMPMAX' respectively. For small events values of .015g and .0003 are commonly used while for larger events values of .03g and .0012 are more appropriate. A default value is provided for each in case the card input value is left blank.

The routine SPCPWA has provision to input the title for the vertical axis of the spectrum so titles other than 'ACCEL SPECTRUM' may be labeled (if used for displacement data, for example).

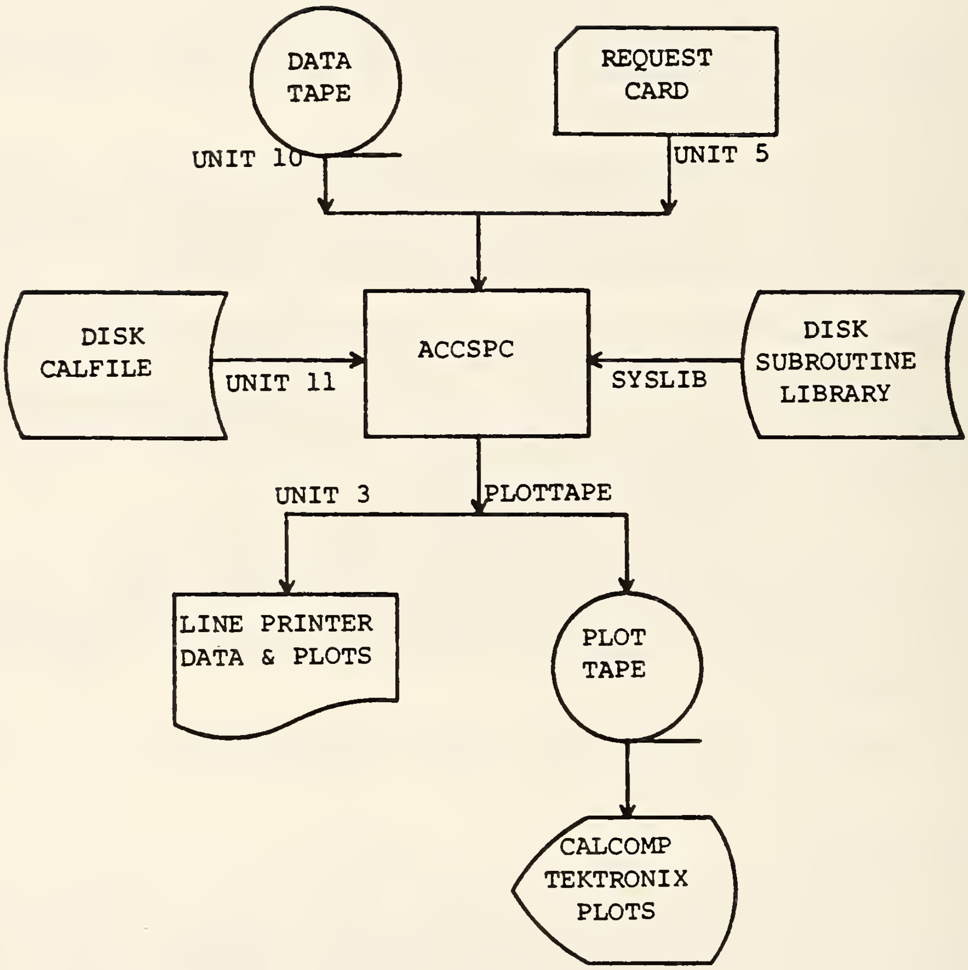


Figure 7. Program ACCSPC Setup

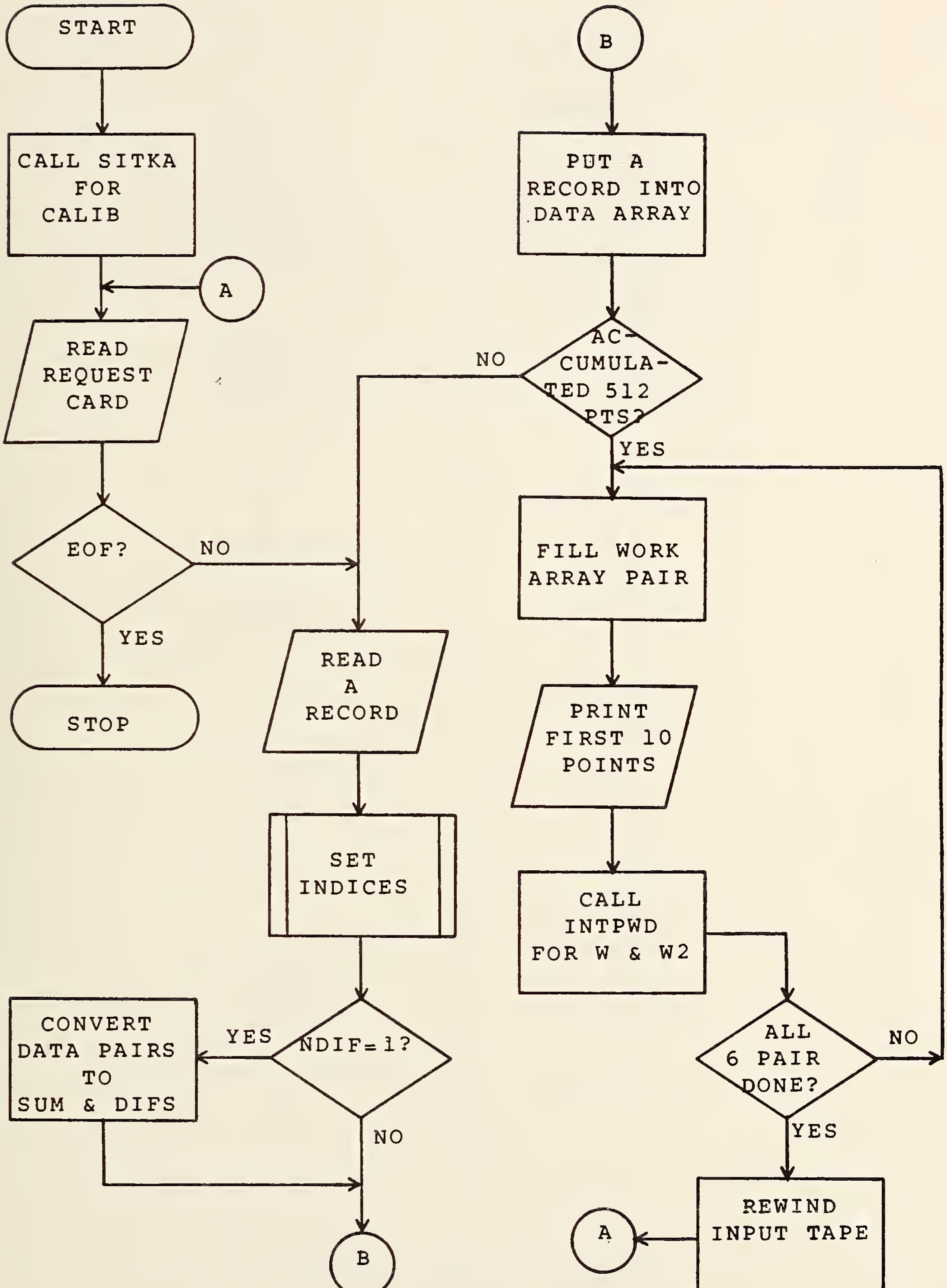


Figure 8. ACCSPC Flow Chart

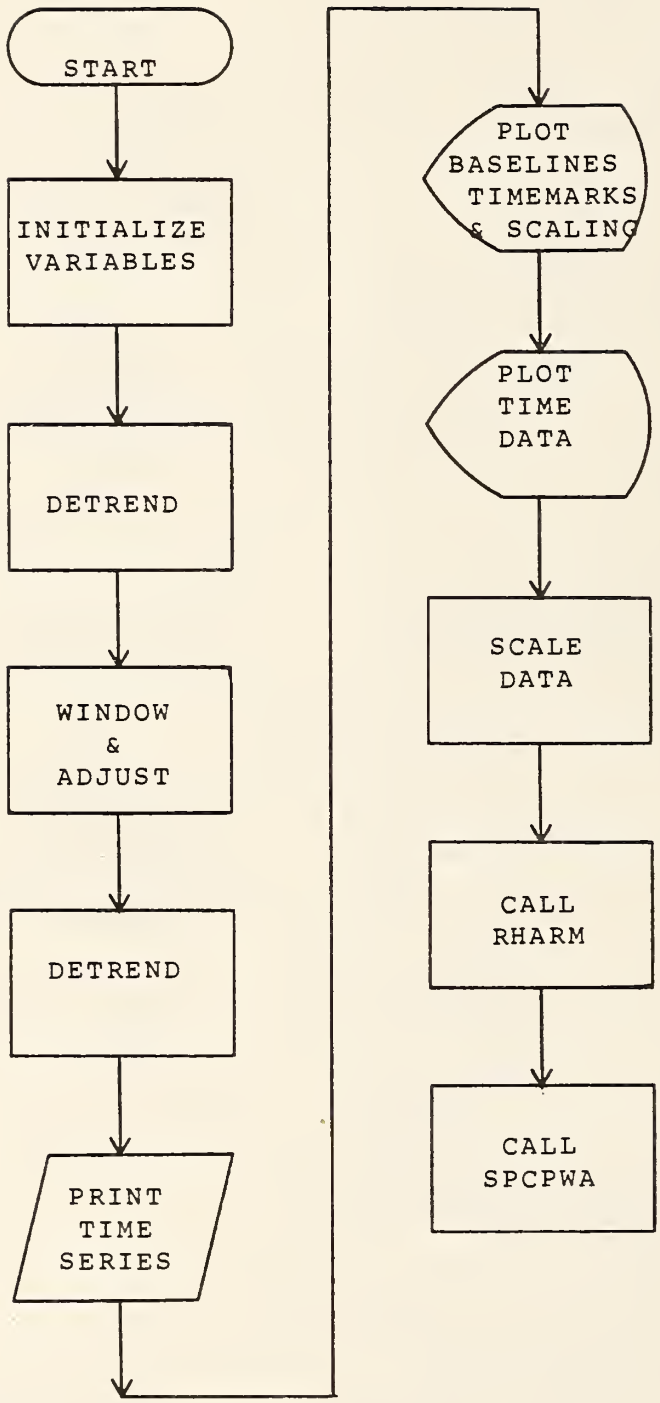


Figure 9. INTPWA Flow Chart

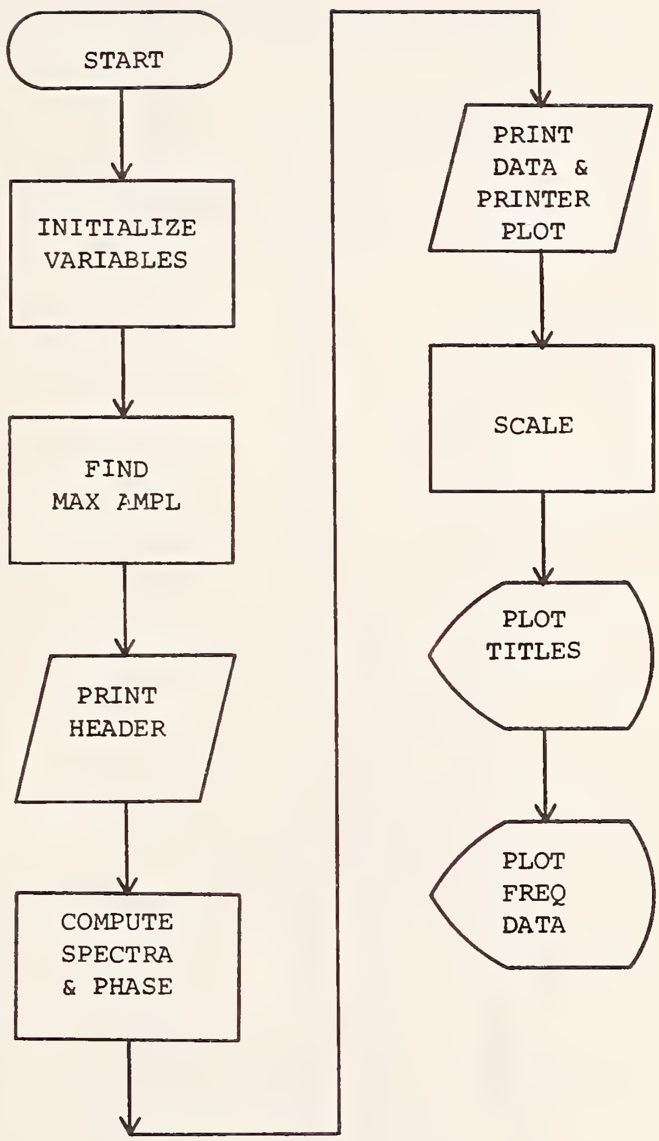


Figure 10. SPCPWA Flow Chart

00010436   76300

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	---	Tape Number	2A4	1-8
2	70300 - 72161 (Newport) 72274 - Present (Sitka)	Recording date	15	11-15

Figure 11. ACCSPC Tape Number Card Format

```
10436    1265     0     .0010.025                    ACCEL SPECTRUM
```

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	1-9999	Tape number	I5	1-5
2	1-9999	Beginning record	I5	6-10
3	0,1	Regular traces or sum-and-differences?	I5	11-15
4	$\geqslant$.00001	AMPMAX for spectra	F5.4	21-25
5	$\geqslant$.001	Vertical scale for time traces	F5.4	26-30
6	--	TITLE (usually ' ACCEL SPECTRUM')	4A4	41-56

Figure 12. ACCSPC Request Card Format

Table 4. ACCSPC Variable Name List

Name	Com	Type	Dimension	Usage
A		R	(2,½ passed)	Fourier coefficients array
AA1		R	1	First fourier coefficient of a pair
AA2		R	1	2nd fourier coefficient of pair
ABEG		R	1	Window height at start of data
AEND		R	1	Window height at end of data
AINC		R	1	Printer increment
AMP		R	1	Amplitude
AMP2		R	1	Current amplitude to test for max
AMPMAX	X	R	1	Max value of spectral plot
ARG		R	1	Number of points in freq spectrum
XX		R	2060	Array of wave numbers
AZERO		R	1	First term of fourier coefficient
BBEG		R	1	Fraction of window to taper onset
BEGREC	X	I	1	Requested record to start processing
BEND		R	1	Fraction of window to taper off
BLANK		I	1	Literal blank
BPER		R	1	Number of points from end to start last taper
BPRR		R	1	Number of points in to end 1st taper
CCSIZE		R	1	Cal comp plot size factor
DASH		I	1	Literal -
DATA		R	1	A data point scaled to textwork plot
DT		R	1	Sampling interval (here .07 sec)
EM		R	1	Log (base2) of ARG
EYE		I	1	Literal I
FACTOR		R	1	Amplitude compensation factor
FREQ		R	1	An individual frequency
FREMAX		R	1	Max frequency
I		I	1	General index
IBUF		I	2000	Plot buffer storage
IDATE		I	1	Date of input tape

Table 4. ACCSPC Variable Name List (continued)

Name	Com	Type	Dimension	Usage
JERR		I	1	Error flag return
IFF		I	1	Tape reading function flag
IM		I	1	NP + 4
INV		I	512	Work array for fourier transform
IPR		I	1	Trace pair being processed
IRF		I	1	Tape reading read status flag
ISENSR		I	1	Channel number of desired sensor
ISR		I	1	Cross bridge channel to match ISENSR
ISUB		I	1	Channel index
ITAPE	X	I	1	Integer tape number from request cd
JP		I	1	Position within lyne of a printer plot data point
K		I	1	Index of total points in request
KOL		R	1	Number of increments across the printer plot = 73
L		I	1	Data point counter
LENG		I		Number of points in the time trace
LL		I	1	Data point counter
LSENS	X	I	1	Instrument label
LYNE		I	73	Line array for printer plot
M		I	1	EM truncated
N		I	1	Number of points
NDEG		I	1	Degree of polynomial to remove
NN		I	1	Number of freq points per spectrum
NOREC		I	1	Number of records to process
NP		I	1	Number of points to process
SNUM	X	I	1	Sum and difference flag
NTIK		I	1	Number of record tik marks
NUMLIN		I	1	Number of lines to pint
P		R	2060	Array of data points
PSIZE		R		Final textronix plot size
REC		R	1	Record number

Table 4. ACCSPC Variable Name List (continued)

Name	Com	Type	Dimension	Usage
RECNO		I	1	Current record being processed
S		R	512	Work array for fourier transform
SAVEM		R	1	Save mean value
SAVEV		R	1	Save raw valance
SENS		R	64,37	Array containing 1 rcd of raw data
SENSR		R	1	Sensor number
SKALE		R	1	Scaling factor for time trace plot
STAR		I	1	Literal *
SUMAMP		R	1	Sum of amplitudes within a spectrum
TAPE		R	1	Tape number
TAPENO		I	2	Tape number literal
TAPR		R	1	Fraction tapered at each end
TEKFAC		R	1	Tektronix plot size compensation
TINC		R	1	Plotter increment for time trace
TINCR		R	1	Plotter spacing per rcd of data
TITLE	X	I	4	Spectrum title literal
TLEN		R	1	Length of time trace
THI		R	1	Height of VSCAL from baseline
TMEAN	X	R	1	Mean value of data time trace
TSPAN		R	1	Time spanned by time trace
VARI	X	R	1	Variance of time trace
VSCAL	X	R	1	Vertical scale for time trace
W1		R	516	1st of current trace pair to process
W2		R	516	2nd of trace pair to process
WORK		R	512,12	Temporary work array
X		R	1	Counter for X axis while plotting time trance
XLOC		R	1	X offset for Tektronix
XO		R	1	Horizontal offset from plot origin
Y		R	1	An individual scaled trace value
XT		R	1	Counter to plot record tik marks

Table 4. ACCSPC Variable Name List (continued)

Name	Com	Type	Dimension	Usage
YLOC		R	1	Y offset for Tektronix
YO		R	1	Vertical offset from plot origin
ZEREO		R	1	Frequency increment
TTIME		R	1	TSPAN/2

```
C       ****************    PROGRAM ACCSPC    ***************
C-----------------------------------------------------------------------
C
C       THIS PROGRAM  INPUTS 512 POINTS OF ACCELERATION DATA FROM
C       TEN ROADBED SENSORS AND TOWERS A12,A13 PLUS CALIBRATION DATA.
C       EACH SENSORS DATA IS OUTPUT ON A SEPARATE TEKTRONIX PLOT PAGE
C       AS A SCALED TIME TRACE AND ACCELERATION POWER SPECTRUM.
C
C       ROUTINES CALLED: SITKA, INTPWA, SPCPWA
C
C       PROG. BY RAY SOTOUDEH  S.T.A.  12/12/72
C       MODIFIED BY DUANE NELSON DURING 1975-1977.
C-----------------------------------------------------------------------
C
        COMMON/EXPARM/ITAPE,BEGREC,NSUM,AMPMAX,VSCAL,TITLE
        COMMON/INPARM/CCSIZE,DT,LSENS,TMEAN,VARI
        DIMENSION DATA(512,12),W1(516),W2(516),IBUF(2000)
        REAL SENS(64,37)
        INTEGER TITLE(4),TAPEND(2),RECNO,BEGREC
C
C       INITIALIZE PROGRAM AND DEVICES
C
        CALL PLOTS (IBUF,2000,6)
        CALL NEWPEN (1)
        CCSIZE=.80
        TEKFAC=1.74
        PSIZE=CCSIZE*TEKFAC
        CALL FACTOR (PSIZE)
        CALL PLOT (0.0,27.0,-3)
        CALL PLOT(0.,0.,-3)
        DO 20 I=1,64
        DO 20 J=1,37
     20 SENS(I,J)=0.
        DT=.07
        NOREC=8
        NP=64*NOREC
C
C         READ TAPE NUMBER CARD AND INITIALIZE SENSOR TABLE
C
        IFF=1
        CALL SITKA(IFF,RECNO,IRF,SENS,TAPEND,IDATE)
C
C       READ DATA REQUEST CARD
C
        READ 50,ITAPE,BEGREC,NSUM,AMPMAX,VSCAL,(TITLE(I),I=1,4)
     50 FORMAT (3I5,5X,2F5.4,T41,4A4)
        IF (AMPMAX.LT..0001)   AMPMAX=.0003
        IF (VSCAL.LT..001)   VSCAL=.025
        PRINT 75,ITAPE,BEGREC,NSUM,AMPMAX,VSCAL
     75 FORMAT (' TAPE=',I5,' STARTING REC',I5,10X,'NSUM=',I1,' AMPMAX=',
       1F6.4,' VSCAL=',F6.4)
C
C         SKIP INTO TAPE THEN READ 36 SEC OF 12 CHAN OF ACCEL INTO WORK
C
```

```
      RECNC=BEGREC
      IFF=3
      CALL SITKA(IFF,RECNO,IRF,SENS,TAPEND,IDATE)
      K=0
C
      DO 250 J=1,NOREC
      IFF=3
      CALL SITKA(IFF,RECNO,IRF,SENS,TAPEND,IDATE)
C
C        PUT ALL 6 PAIRS OF ACCEL DATA INTO WORK ARRAY
C        64 PTS/REC * .071 SEC/PT = 4.544 SEC/RECORD
C
      DO 240 IPR=1,6
      ISUB=2*IPR-1
      ISENSR=2*ISUB
      ISR=ISENSR+2
      IF (IPR.EQ.6)   ISENSR=26
      IF (IPR.EQ.6)   ISR=24
      DO 220 I=1,64
      K=K+1
      IF (K.GT.NP)   GO TO 260
      IF (NSUM.NE.0)   GO TO 212
      DATA(K,ISUB)=SENS(I,ISENSR)
      DATA(K,ISUB+1)=SENS(I,ISR)
      GO TO 214
C
C        SETUP SITKA ACCEL SUM & DIFS (1-2,3-4,5-6,7-8,9-10,13-12)
C
212   DATA(K,ISUB)=SENS(I,ISENSR)+SENS(I,ISR)
      DATA(K,ISUB+1)=SENS(I,ISENSR)-SENS(I,ISR)
  214 IF (DATA(K,ISUB).EQ.0.)   DATA(K,ISUB)=0.000001
      IF (DATA(K,ISUB+1).EQ.0.)   DATA(K,ISUB+1)=0.000001
  220 CONTINUE
      K=K-64
  240 CONTINUE
      K=K+64
  250 CONTINUE
C
  260 CONTINUE
C
C     PROCESS 1 PAIR OF CHANNELS AT A TIME FOR SPECTRA
C
      XLOC=1.0
      YLOC=1.0
      DO 400 IPR=1,6
      ISUB=IPR*2-1
C
C        SETUP ISR FOR THE EVEN-NUMBER ACCELS (NORTHSIDE)
C
      ISENSR=ISUB*2
      ISR=ISENSR+2
      IF (IPR.EQ.6)   ISENSR=26
      IF (IPR.EQ.6)   ISR=24
      DO 350 I=1,NP
```

ACCSPC Listing 2 (2 of 3)

```
      W1(I)=DATA(I,ISUB)
  350 W2(I)=DATA(I,ISUB+1)
      PRINT 375,ISENSR,NP,BEGREC,(W1(I),I=1,10)
  375 FORMAT ('1CHAN',I4,' READY FOR INTPWA FOR',I5,' PTS STARTING AT RE
     1CNO=',I5,4X,'FIRST 10 POINTS OF RAW DATA FOLLOW',/10E12.4)
C
C     CALL INTPHA TO PLOT TIME TRACE AND SETUP FOURIER TRANSFORM
C
      CALL INTPWA (XLOC,YLOC,ISENSR,W1,NP)
      CALL PLOT (8.5,0.,-3)
      CALL INTPWA (XLOC,YLOC,ISR,W2,NP)
      CALL PLOT (-8.5,-5.0,-3)
  400 CONTINUE
      REWIND 10
  900 CALL PLOT(0.0,0.0,999)
      STOP         99
      END
```

ACCSPC Listing 2 (3 of 3)

```
C     SUBROUTINE  I N T P W A
C-----------------------------------------------------------------------
C
C     THIS IS THE INTERMEDIATE ROUTINE TO PLOT ACCEL POWER SPECTRA.
C     RCUTINES CALLED ARE: DETRND, WINDOW, RHARM, SPCPWA.
C
C     PARAMETERS
C        XLOC,YLOC- STARTING LOCATION FOR THE PLOT ON PAPER
C        ISENSR- CHANNEL NUMBER OF DESIRED SENSOR
C        WORK- WORK ARRAY. THIS ARRAY MUST BE DIMENSIONED  10 LOCATIONS
C              LARGER THAN LENG.
C        LENG- # OF DATA PNTS. TO BE USED.
C
C     MODIFIED BY DUANE NELSON S.T.A. (1976) FROM WIND SPECTRA VERSION
C-----------------------------------------------------------------------
C
      SUBROUTINE INTPWA (XLOC,YLOC,ISENSR,WORK,LENG)
      COMMON/EXPARM/ITAPE,BEGREC,NSUM,AMPMAX,VSCAL,TITLE
      COMMON/INPARM/CCSIZE,CT,LSENS,TMEAN,VARI
      DIMENSION WORK(1)
      DIMENSION INV(512),S(512)
      INTEGER TITLE(4)
      DATA ABEG,AEND,BBEG,BEND/.10,.10,.10,.10/
      LSENS=ISENSR/2
      TAPR=BBEG
      NP=LENG
      NNP=LENG
C       M=8 (256)  FOR 36 SEC SPECTRA  (IM=516)
      ARG=NP/2
      EM=(ALOG10(ARG))/(ALOG10(2.))       +.1
      PRINT 165,NNP,EM,LSENS
  165 FORMAT (///' NNP=',I5,' EM=',F4.1,' FOR CHAN',I3)
      M=EM
      IM=2*(2**M)+4.49
      NDEG=1
      CALL DTRND2 (WORK(1),NNP,NDEG,TMEAN,VARI)
      SAVEM=TMEAN
      SAVEV=VARI
C
C     WINDOW THE DATA ARRAY
C       READJUST AMPLITUDE FOR LOSS TO WINDOW FUNCTION
C
      BPRR=BBEG*NP+.5
      BPER=BEND*NP+.5
      CALL WINDOW (WORK,WORK,NP,ABEG,BPRR,AEND,BPER)
      FACTOR=1./(1.-TAPR)
      DO 300 I=1,NNP
  300 WORK(I)=WORK(I)*FACTOR
      CALL DTRND2 (WORK(1),NNP,NDEG,TMEAN,VARI)
      TMEAN=SAVEM
C     VARI=SAVEV
C
C     PRINT WINDOWED TIME SERIES AND SETUP TO PLOT IT
C       TRACE OFFSETS FROM LOWER LEFT CORNER OF SPECTRUM PLOT
```

INTPWA Listing 3 (1 of 3)

```
C         XO = 0.75 INCHES    YO = 3.6 INCHES
C
      PRINT 305
  305 FORMAT (' THE FOLLOWING DATA IS THE ACCELEROMETER TIME TRACE IN G
     X AFTER WINDOWING AND READY FOR FOURIER TRANSFORMING')
      NUMLIN=NNP/10+1
      L=1
      DO 310 K=1,NUMLIN
      LL=L+9
      PRINT 315,(WORK(I),I=L,LL)
  310 L=L+10
  315 FORMAT (' ',10F10.4)
      XO=.75+XLOC
      YO=3.6+YLOC
      TINC=.010/CCSIZE *512/LENG  *DT/.07
      TINCR=TINC*64
      TLEN=TINC*NNP
      THI=.25/CCSIZE
C
C        DRAW FRAME AROUND TIME TRACE AND ADD RECORD TIK MARKS
C
      CALL PLOT (TLEN+XO,YO,+3)
      CALL PLOT (XO,YO,+2)
      CALL PLOT (XO,YO+THI,+3)
      CALL PLOT (XO+TLEN,YO+THI,+2)
      CALL PLOT (XO+TLEN,YO-THI,+3)
      CALL PLOT (XO,YO-THI,+2)
      CALL PLOT (XO,YO,+3)
      XT=0.
      NTIK=8
      DO 330 I=1,NTIK
      XT=XT+TINCR
  330 CALL SYMBOL (XO+XT,YO-THI,.14,13,0.,-1)
      CALL PLOT (XO,YO,+3)
C
C        ADD VERTICAL AXIS SCALE VALUES AND SCALE DATA ACCORDINGLY
C        USE .25 INCH = VSCAL   (DECK DATA USUALLY .025 G)
C
      IF (ISENSR.GT.20)   VSCAL=VSCAL*2.
      CALL NUMBER (XO-.5,YO+THI,.10,VSCAL,0.,3)
      CALL NUMBER (XO-.5,YO-THI,.10,VSCAL,0.,3)
      CALL SYMBOL (XO-.3,YO,.10,1HG,0.,1)
      CALL PLOT (XO,YO,+3)
      SKALE=THI/VSCAL
      X=0.
      DO 350 I=1,NNP
      X=X+TINC
      Y=WORK(I)*SKALE
      CALL PLOT (XO+X,YO+Y,+2)
  350 CONTINUE
      CALL PLOT (XO,YLOC,+3)
C
  450 CONTINUE
  500 CONTINUE
```

INTPWA Listing 3 (2 of 3)

```
C
C     COMPUTE FOURIER COEF. THEN CALL TO PLOT SPECTRUM.
C
      CALL RHARM (WORK(1),M,INV,S,IERR)
      IF (IERR.NE.0)   PRINT 555,IERR
  555 FORMAT (1H1,20HINTPWR--RHARM IERR=    ,I2)
  600 CALL SPCPWA (XLOC,YLOC,WORK(1),IM)
      RETURN
      END
```

INTPWA Listing 3 (3 of 3)

```
C     SUBROUTINE  S P C P W A
C-----------------------------------------------------------------------
C
C     COMPUTES AND PLOTS ACCEL OR DISPLACEMENT POWER SPECTRUM
C
C     ROUTINES CALLED; NONE
C
C     PARAMETERS
C        XLOC,YLOC- STARTING LOCATION ON PAPER
C        A- DATA ARRAY AS RETURNED BY 'RFARM'
C             CONTAINING N/2-2 UNIQUE COMPLEX POINTS
C       FOR 35 SECOND SPECTRA WITH DT=.07SEC, N=516   SO NN=256
C
C     PROG. BY RAY SOTOUDEH   S.T.A.    3/7/74
C     MODIFIED BY DUANE NELSON DURING 1976,1977
C-----------------------------------------------------------------------
C
      SUBROUTINE SPCPWA (XLOC,YLOC,A,N)
      COMMON/EXPARM/ITAPE,BEGREC,NSUM,AMPMAX,VSCAL,TITLE
      COMMON/INPARM/CCSIZE,DT,LSENS,TMEAN,VARI
      DIMENSION A(2,1),LYNE(73),P(2060),AXX(2060)
      INTEGER TITLE(4)
      INTEGER LYNE,BLANK,EYE,DASH,STAR,JF
      INTEGER BEGREC
      DATA BLANK,EYE,DASH,STAR,KOL/1H ,1HI,1H-,1H*,73/
      AZERO=A(1,1)
      NN=N/2-2
C       ZEROF=.0279 FOR 512 PT (36 SEC) SPECTRA
      ZEROF=1.0/((N-4)*DT)
      FREMAX=NN*ZEROF
      TSPAN=(N-4)*DT
      TTIME=TSPAN/2.
      PRINT 75,N,DT,VARI
   75 FORMAT (' N=',I4,' DT=',F7.3,' VARI=',F8.5)
C
C     FIND MAX. AMPLITUDE AND SUM OF P.S.D.
C     BUT LIMIT TO INPUT AMPMAX IF CONSTANT SCALING FOR ALL SPECTRA.
C
      AMP=(A(1,2)*A(1,2)+A(2,2)*A(2,2))*TTIME
      SUMAMP=AMP
      DO 100 I=3,NN
      AMP2=(A(1,I)*A(1,I)+A(2,I)*A(2,I) )*TTIME
      SUMAMP=SUMAMP+AMP2
      IF(AMP2.GT.AMP)  AMP=AMP2
  100 CONTINUE
      AINC=(KOL-1)/AMP
C
C     PRINT HEADING
C
      DO 150 I=1,KOL
      LYNE(I)=DASH
  150  CONTINUE
      LYNE(1)=EYE
      LYNE(KOL)=EYE
```

SPCPWA Listing 4 (1 of 3)

```
      PRINT 155,ITAPE,BEGREC,LSENS,AMP,LYNE
  155 FORMAT (1H1,'TAPE=',I6,' STARTING REC=',I4,/,88X,'POWER SPECTRUM',
     1/,' INDEX  A COEF   B COEF    F.S.',6X,'PHASE     FREQ',5X,
     21H0,37X,I3,27X,F9.6,/,55X,73A1)
C
C     BLANK OUT LYNE
C
      DO 190 I=1,KOL
      LYNE(I)=BLANK
  190 CONTINUE
C
C     COMPUTE SPEC. AND PHASE
C
      DO 300 I=1,NN
      FREQ=I*ZEROF
      AA1=A(1,I+1)
      AA2=A(2,I+1)
      A(1,I)=(AA1*AA1+AA2*AA2)*TTIME
      IF (AA1.EQ.0.0)   AA1=.001
      IF (AA2.EQ.0.0)   AA2=.001
      A(2,I)=ATAN2(AA1,AA2)*57.2956
      LYNE(1)=EYE
      LYNE(KOL)=DASH
      JP=AINC*A(1,I)+1.4999
      IF (JP.GT.72)   JP=72
      LYNE(JP)=STAR
C
C     PRINT A AND B COEFS, AMPLITUDE AND PHASE,FREQ AND A PLOT VALUE
C
      PRINT 255,I,(A(LL,I+1),LL=1,2),(A(LL,I),LL=1,2),FREQ,LYNE
  255 FORMAT (1X,I4,2(2X,F7.4),1X,F9.6,1X,F8.1,1X,F9.4,3X,73A1)
      LYNE(JP)=BLANK
  270 P(I)=A(1,I)
  300 CONTINUE
C
  310 PRINT 315,AZERO,SUMAMP,TMEAN,VARI,BEGREC
  315 FORMAT ('0AZERO=',F9.6,' SUMAMP=',F11.5,25X,' TMEAN=',F10.6,
     X' G     VARI=',F10.6,' G STARTING AT RECNO',I5)
  350 CONTINUE
      AMP=AMPMAX
      IF (LSENS.GT.10)   AMP=AMP*2.
      IF (NSUM.GE.1)   AMP=AMP*4.
      DO 500 I=1,NN
      FREQ=I*ZEROF
      IF (P(I).LE.0.0)   P(I)=0.00001
      IF (P(I).GT.AMP)   P(I)=AMP
      AXX(I)=FREQ
  500 CONTINUE
      IF (XLOC.LT.0.)   XLOC=0.
C
C     SET SCALE FACTORS (FIRST VALUE, DELTAV) FOR CONSTANT PLOT SIZE
C       FULL SCALE ACROSS= 7 INCH = 7.14 HZ  SO SET 1 INCH = 1.0 HZ
C         3 INCHES HIGH  (FULL SCALE)  =  INPUT AMPMAX
C
```

SPCPWA Listing 4 (2 of 3)

```
      P(NN+1)=0.0
      P(NN+2)=AMP/3.
      AXX(NN+1)=.0
      AXX(NN+2)=1.0
      IF (ICOL.LT.4)   GO TO 600
      NUMLIN=NN/10+1
      L=1
      DO 575 K=1,NUMLIN
      LL=L+9
      PRINT 565, (P(I),I=L,LL)
  565 FORMAT (' ',10F10.6)
  575 L=L+10
  600 CONTINUE
C
C     PLOT TITLES THEN SPECTRUM DATA
C
      CALL SYMBOL (XLOC,YLOC-0.4,.14,1HA,0.,1)
      SENSR=LSENS
      CALL NUMBER(999.0,999.0,.14,SENSR,0.0,-1)
      CALL SYMBOL (XLOC,YLOC-0.7,.10,5HTAPE=,0.0,5)
      TAPE=ITAPE
      CALL NUMBER (999.0,999.0,.10,TAPE,0.,-1)
      CALL SYMBOL (999.0,999.0,.10,10H     REC #,0.0,10)
      REC=BEGREC
      CALL NUMBER(999.0,999.0,.10,REC,0.0,-1)
      CALL AXIS (XLOC,YLOC,TITLE,16,3.0,90.,P(NN+1),P(NN+2))
      CALL AXIS (XLOC,YLOC,4HFREC,-4,+7.,0.,AXX(NN+1),AXX(NN+2))
      CALL PLOT (XLOC,YLOC,+3)
      DO 800 I=1,NN
      DATA=P(I)*3./AMP
      IF (DATA.GT.3.0)   DATA=3.0
      CALL PLOT (XLOC+AXX(I),YLOC+DATA,+2)
  800 CONTINUE
      CALL PLOT (0.,0.,+3)
  900 RETURN
      END
```

SPCPWA Listing 4 (3 of 3)

```
CHAN   2 READY FOR INTPWA FOR  512 PTS STARTING AT RECNC= 1255    FIRST 10 POINTS OF RAW DATA FOLLOW
 0.3141E-01  0.2827E-01  0.3141E-01  0.2512E-01  0.2827E-01  0.3455E-01  0.2827E-01  0.1884E-01  0.2827E-01  0.3455E-01


NNP=  512 EM= 8.1 FOR CHAN  1

THEAN=  0.029504    VARI=  0.000014

THEAN=  0.000032    VARI=  0.000014
THE FOLLOWING DATA IS THE ACCELEROMETER TIME TRACE IN G  AFTER WINDOWING AND READY FOR FOURIER TRANSFORMING
   0.0002  -0.0001   0.0002  -0.0005  -0.0002   0.0007  -0.0002  -0.0017  -0.0002   0.0009
  -0.0009  -0.0003  -0.0003   0.0005   0.0032   0.0015  -0.0004  -0.0016  -0.0029  -0.0031
  -0.0019   0.0009  -0.0022   0.0010   0.0011   0.0030   0.0089   0.0033  -0.0008  -0.0009
  -0.0078  -0.0081   0.0015   0.0016  -0.0010   0.0044   0.0017   0.0047   0.0018  -0.0042
  -0.0012  -0.0012  -0.0045  -0.0013   0.0054  -0.0013   0.0021   0.0021   0.0056  -0.0048
  -0.0048   0.0021   0.0021  -0.0083   0.0056  -0.0013  -0.0013   0.0056   0.0056  -0.0013
  -0.0048  -0.0048  -0.0013   0.0021   0.0056  -0.0013  -0.0048  -0.0013   0.0021  -0.0048
  -0.0048   0.0056  -0.0048  -0.0048   0.0091  -0.0013   0.0056  -0.0048  -0.0048   0.0021
  -0.0013   0.0056  -0.0014  -0.0014   0.0056  -0.0083  -0.0014   0.0021  -0.0014   0.0021
  -0.0014   0.0056  -0.0014  -0.0048   0.0021  -0.0014   0.0021  -0.0014   0.0021   0.0021
  -0.0014   0.0021  -0.0048  -0.0048   0.0056  -0.0014   0.0021   0.0021  -0.0048  -0.0014
  -0.0014  -0.0014   0.0056   0.0056  -0.0049  -0.0014   0.0021  -0.0049   0.0021   0.0056
  -0.0014  -0.0014  -0.0014   0.0021  -0.0049  -0.0083   0.0056  -0.0014  -0.0014   0.0056
  -0.0014  -0.0014  -0.0014  -0.0014  -0.0014  -0.0014  -0.0014   0.0021   0.0021  -0.0014
  -0.0083  -0.0014   0.0021   0.0021   0.0021  -0.0014  -0.0049  -0.0014   0.0021   0.0021
   0.0021  -0.0014  -0.0084   0.0021   0.0091  -0.0049  -0.0049   0.0021  -0.0049   0.0021
   0.0091  -0.0014  -0.0084   0.0021  -0.0014  -0.0014   0.0056  -0.0014   0.0021   0.0021
  -0.0014  -0.0014  -0.0084  -0.0014   0.0091  -0.0014   0.0056   0.0021  -0.0049  -0.0014
   0.0021   0.0021  -0.0014  -0.0049  -0.0049   0.0021   0.0091  -0.0014  -0.0014  -0.0014
   0.0056   0.0056   0.0021  -0.0014  -0.0084  -0.0084   0.0056   0.0021   0.0056   0.0021
  -0.0049   0.0021   0.0021   0.0021  -0.0014  -0.0049   0.0021  -0.0014   0.0021   0.0056
  -0.0049  -0.0014  -0.0014   0.0021  -0.0014   0.0021   0.0021  -0.0014  -0.0014   0.0021
  -0.0049   0.0091   0.0021  -0.0014   0.0056   0.0021  -0.0049   0.0021  -0.0014  -0.0014
  -0.0014   0.0021  -0.0049  -0.0014   0.0056  -0.0049   0.0021   0.0056  -0.0049   0.0021
   0.0056   0.0021  -0.0084  -0.0084   0.0091  -0.0014   0.0091   0.0056  -0.0049   0.0056
  -0.0049  -0.0014   0.0091  -0.0014   0.0021  -0.0049   0.0056  -0.0014  -0.0049   0.0091
  -0.0014  -0.0014   0.0056  -0.0014   0.0021  -0.0049   0.0021   0.0021  -0.0049   0.0056
  -0.0014   0.0091   0.0091  -0.0084  -0.0014   0.0021  -0.0014   0.0021   0.0021   0.0091
  -0.0119  -0.0014   0.0056  -0.0014   0.0021  -0.0014  -0.0049  -0.0014  -0.0084   0.0021
  -0.0014  -0.0049  -0.0084   0.0021   0.0021  -0.0014   0.0056   0.0056  -0.0154   0.0021
   0.0021   0.0056  -0.0014  -0.0014   0.0056  -0.0084   0.0021   0.0125  -0.0049  -0.0014
   0.0021  -0.0049  -0.0014   0.0021  -0.0014  -0.0049   0.0021   0.0056  -0.0014   0.0021
  -0.0014  -0.0014  -0.0014  -0.0014   0.0021  -0.0049  -0.0014   0.0090  -0.0014  -0.0014
  -0.0014   0.0021   0.0021   0.0021   0.0055  -0.0049  -0.0084   0.0021   0.0021   0.0055
  -0.0014  -0.0014  -0.0014  -0.0014   0.0055   0.0021  -0.0014  -0.0014  -0.0049   0.0020
   0.0055   0.0020  -0.0014  -0.0049   0.0020   0.0020   0.0020   0.0020  -0.0014  -0.0049
  -0.0049   0.0020   0.0055  -0.0014  -0.0014   0.0020   0.0020  -0.0014  -0.0014   0.0055
  -0.0014  -0.0014   0.0020   0.0020   0.0020  -0.0014  -0.0014   0.0020  -0.0014   0.0020
  -0.0015   0.0020   0.0020  -0.0049  -0.0015  -0.0015   0.0020   0.0055  -0.0015   0.0020
```

Figure 13. INTPWA Output

TAPE= 11322 STARTING REC=1255

INDEX	A COEF	B COEF	P.S.	PHASE	FREQ
1	0.0000	-0.0000	0.000000	117.2	0.0279
2	-0.0000	0.0000	0.000000	-62.6	0.0558
3	0.0001	0.0000	0.000000	84.0	0.0837
4	-0.0000	0.0001	0.000000	-7.5	0.1116
5	0.0000	-0.0000	0.000000	147.3	0.1395
6	-0.0002	0.0001	0.000001	-62.1	0.1674
7	-0.0002	-0.0001	0.000001	-132.4	0.1953
8	0.0001	-0.0001	0.000000	132.9	0.2232
9	0.0001	-0.0001	0.000000	119.4	0.2511
10	-0.0000	0.0000	0.000000	-51.2	0.2790
11	0.0001	0.0000	0.000000	73.0	0.3069
12	-0.0001	0.0001	0.000000	-51.7	0.3348
13	-0.0001	0.0000	0.000000	-73.0	0.3627
14	-0.0000	-0.0000	0.000000	-152.0	0.3906
15	-0.0000	-0.0001	0.000000	-143.2	0.4185
16	0.0002	-0.0000	0.000001	103.3	0.4464
17	-0.0000	-0.0000	0.000000	-111.3	0.4743
18	-0.0001	0.0001	0.000000	-51.4	0.5022
19	0.0001	-0.0001	0.000000	137.9	0.5301
20	-0.0001	0.0000	0.000000	-56.5	0.5580
21	0.0001	0.0000	0.000000	66.1	0.5859
22	-0.0001	0.0001	0.000000	-46.5	0.6138
23	0.0001	-0.0001	0.000001	134.3	0.6417
24	-0.0000	-0.0000	0.000000	-115.3	0.6696
25	0.0000	-0.0001	0.000000	177.0	0.6975
26	-0.0001	0.0000	0.000000	-74.9	0.7254
27	0.0001	-0.0001	0.000000	115.1	0.7533
28	0.0000	0.0001	0.000000	11.1	0.7813
29	0.0000	0.0002	0.000001	10.1	0.8092
30	0.0000	-0.0001	0.000000	171.9	0.8371
31	-0.0001	0.0001	0.000000	-34.6	0.8650
32	-0.0003	-0.0001	0.000002	-115.1	0.8929
33	0.0001	-0.0000	0.000000	118.3	0.9208
34	-0.0001	-0.0000	0.000000	-92.7	0.9487
35	0.0001	-0.0000	0.000000	110.2	0.9766
36	0.0000	-0.0000	0.000000	135.0	1.0045
37	0.0001	-0.0002	0.000001	147.8	1.0324
38	0.0001	0.0001	0.000000	52.5	1.0603
39	-0.0001	0.0001	0.000000	-27.0	1.0882
40	-0.0001	0.0001	0.000000	-25.5	1.1161
41	-0.0002	0.0002	0.000002	-49.9	1.1440
42	0.0000	-0.0001	0.000000	167.1	1.1719
43	0.0001	0.0009	0.000016	7.4	1.1998
44	0.0002	-0.0012	0.000028	172.5	1.2277
45	0.0002	0.0001	0.000001	71.1	1.2556

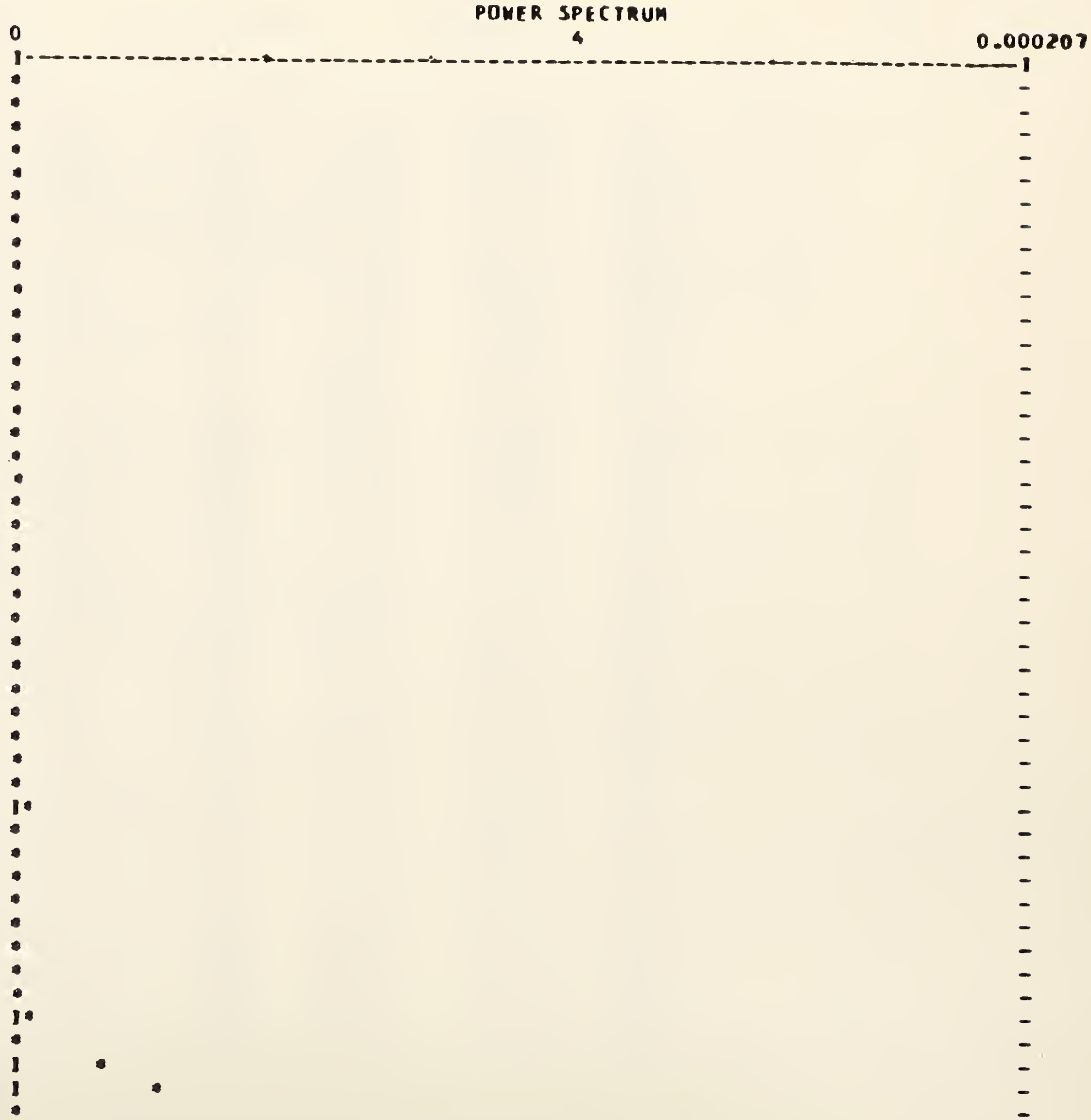


Figure 14. ACCSPC Output

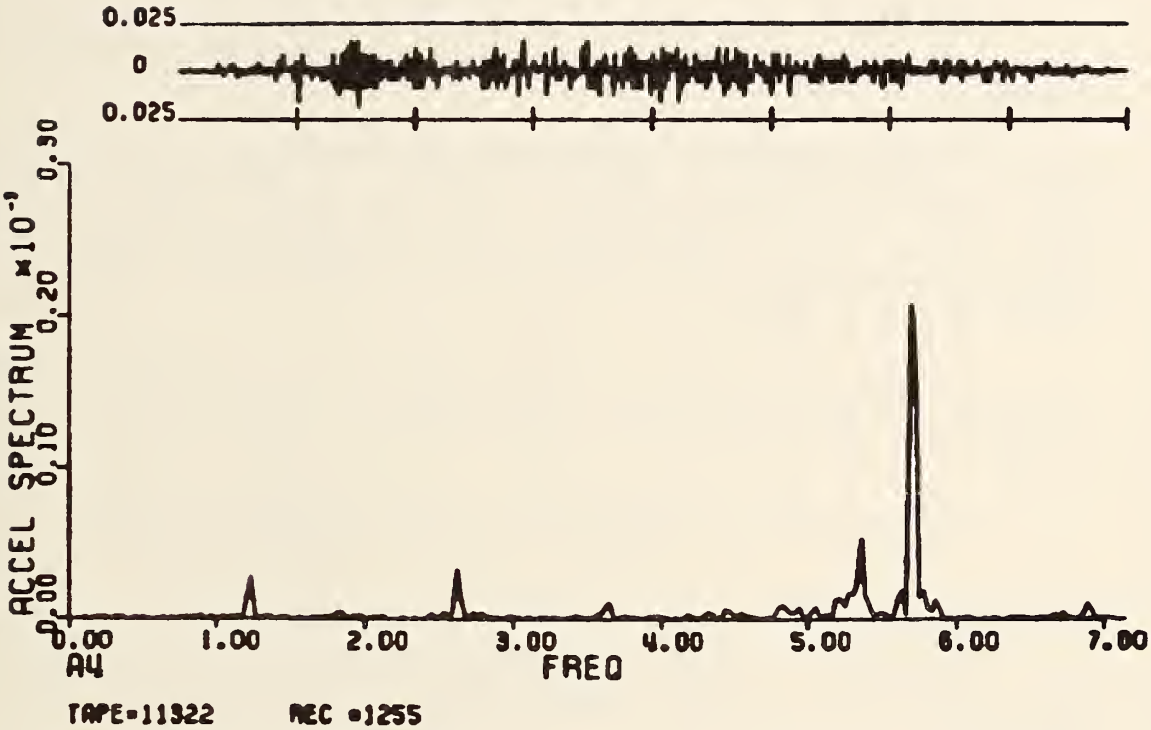


Figure 15. ACCSPC Output

PROGRAM STPSPC

INTRODUCTION

This program is a modified early version of ACCSPC that shows spectra from only one accelometer per run but displays successive spectra, each starting several seconds later in time although overlapping information with previous ones. This is to show how frequency components at a specific point on the bridge change over a period of approximately two minutes.

Although trials of this program have shown these changes to be must slower than anticipated, it is documented here as an extension of ACCSPC.

Output displays include Calcomp plots of three time traces and three sets of acceleration spectra plus printer spectra. The first trace of three represents the individual sensor chosen while the next two time traces and spectral sets represent the sum and difference data when that instrument is compared to its cross-bridge sensor.

To keep the printed output from being usually large, a parameter 'NTH' allows only every 8th or every 4th spectra to be printed out in full.

See Figures 16 through 18, Table 5 and Listings 5 through 7.

OPERATIONAL NOTES

Advance = 1 record (64 pts.) = 12% overlap so 1024 pts. total data (71.7 seconds) per segment.

00010436 76300

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	---	Tape Number	2A4	1-8
2	70300 - 72161 (Newport) 72274 - present (Sitka)	Recording date	I5	11-15

Figure 16. STPSPC Tape Number Card Format

```
10436    1265    24    64    3.0003
```

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	1-9999	Tape number	I5	1-5
2	1-9999	Beginning record number	I5	6-10
3	$\leqslant$ 24	Number of frames to do	I5	11-15
4	Normally 64	Points to advance for next frame	I5	16-20
5	1-10	Sensor number	I5	21-25
6	$\geqslant$.0001	Ampmax for spectra	F5.4	26-30

Figure 17. STPSPC Request Card Format

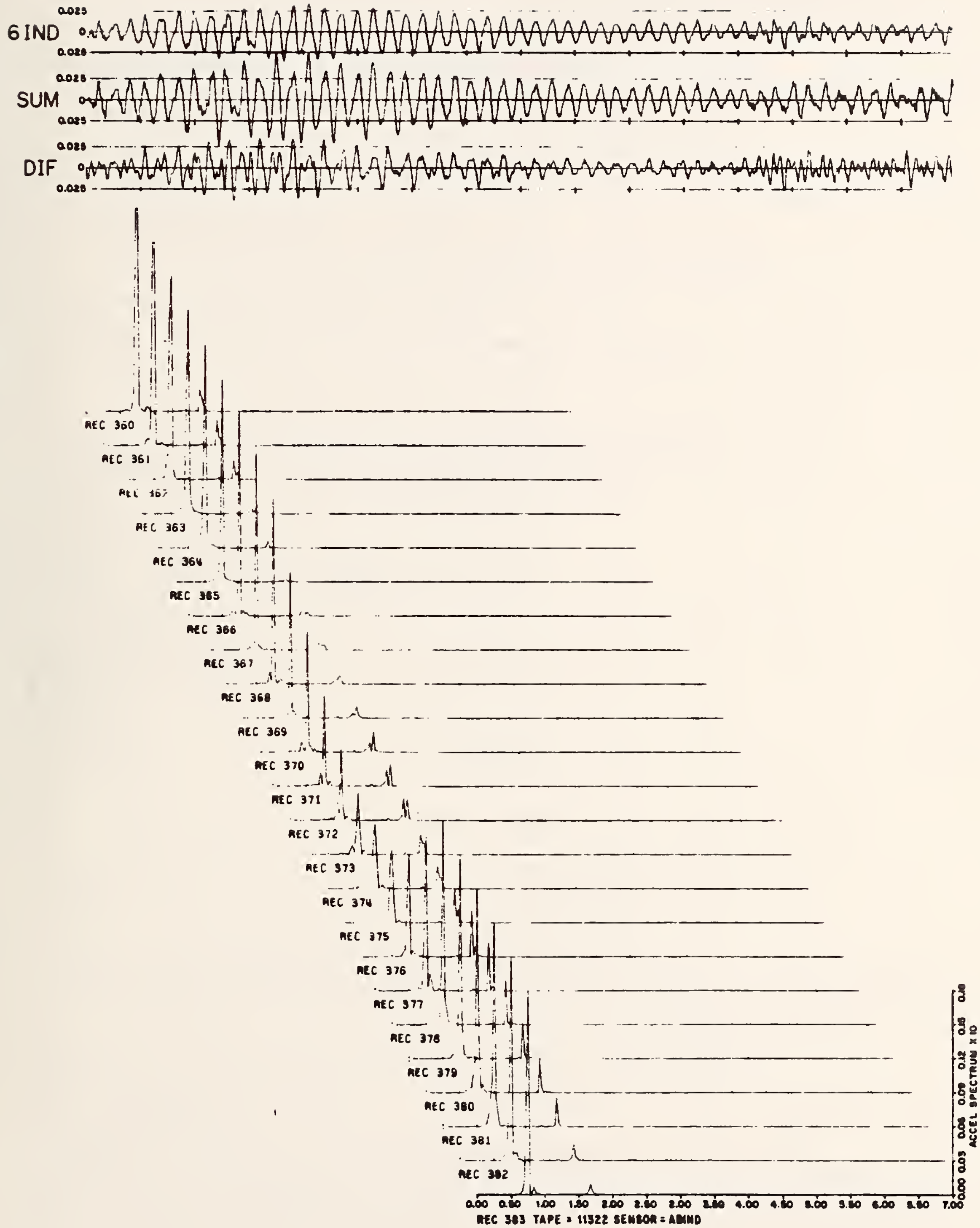


Figure 18. STPSPC Output

Table 5. STPSPC Variable Name List
(New Variables not in ACCSPC)

Name	Com	Type	Dimension	Usage
AC1		R	4100	Raw data for individual trace
AC2		R	4100	Raw data for sum trace
AC3		R	4100	Raw data for difference trace
ADIF		R	516	Work array of difference data
AIND		R	516	Work array of individual data
ASUM		R	516	Work array of sum data
COMPN		R	3	Individual, sum or difference
DELX		R	1	Plotter X offset between spectra
ICOL		I	1	Current plot column processing
IFR		I	1	Current frame number
ISUB		I	1	Starting point within large arrays
J		I	1	Counter of records read in
NADV		I	1	Number of points to advance next step
NFR		I	1	Number of spectral frame to plot
NPT		I	1	Total number of points to read
NTH		I	1	Only print spectra for every Nth frame
XLOK		R	1	X offset for a time trace
YLOK		R	1	Height of a time trace

```
C      ***************     PROGRAM STPSPC     ***************
C-------------------------------------------------------------------------
C
C      GET SPECTRUM OF 1 ACCEL CHANNEL FOR NFR FRAMES
C       AS WELL AS SPECTRUM OF ITS SUM AND DIF FROM OPPOSITE SENSOR.
C        EACH FRAME ADVANCES NADV PTS IN TIME
C
C      ROUTINES CALLED: SITKA, DTRND2, INTPW2, SPCPW2,BLOCK DATA
C
C      FOR FIRST TEST -
C        ADVANCE=1 RECORD (64 PTS) = 12% OVERLAP
C        SO 1024 PTS TOTAL DATA (71.7 SEC) PER SEGMENT
C
C      PROG. BY DUANE NELSON   S.T.A.   1976
C        MODIFIED FROM AN EARLY VERSION OF ACCSPC.
C-------------------------------------------------------------------------
C
      COMMON/EXPARM/ITAPE,BEGREC,NADV,AMPMAX,NFR,LSENS,NTH
      COMMON/INPARM/COMPN(3),IFR,ICOL,TMEAN,VARI
      DIMENSION AC1(4100),AC2(4100),AC3(4100),IBUF(2000)
      DIMENSION AIND(516),ASUM(516),ADIF(516)
      REAL SENS(64,37)
      INTEGER TAPENO(2),RECNO,BEGREC
      CALL PLOTS (IBUF,2000,6)
      CALL NEWPEN (1)
      CCSIZE=.30
      CALL FACTOR(CCSIZE)
      DT=.07
      NDEG=0
      NFR=24
      NADV=64
      NTH=8
C
C        READ TAPE NUMBER CARD AND INITIALIZE SENSOR TABLE
C
      IFF=1
      CALL SITKA (IFF,RECNO,IRF,SENS,TAPENO,IDATE)
C
C      READ DATA REQUEST CARD FOR A1,A3, OR A5
C       (USE ODD NUMBERED ACCELS FROM SOUTH SIDE OF SITKA BRIDGE)
C       FOR NOW,USE ISENSR FOR TAPE CHAN LOCATION, LSENS FOR ACCEL TITLE
C
      READ (5,75)ITAPE,BEGREC,NFR,NADV,LSENS,AMPMAX
   75 FORMAT (5I5,F5.4)
      IF (AMPMAX.LT..0001)   AMPMAX=.0003
      ISENSR=LSENS*2
      PRINT 85,ITAPE,BEGREC,NFR,NADV,LSENS
   85 FORMAT (' TAPE=',I5,' BEGREC=',I4,9X,' NFR=',I2,' NADV=',I3,
     1' PTS PER FRAME ON A',I2)
C
C      EACH FRAME USES 512 PTS (35 SEC)
C       FOR NADV=64 (1.0 REC), DELX=0.5 INCHES
      NOREC=NFR +8
      NPT=64*NOREC
```

STPSPC Listing 5 (1 of 4)

```
      DELX=0.
      DELX=0.5*NADV/64
C
  150 CONTINUE
C
C        SKIP INTO TAPE THEN READ 4096 PTS (5MIN) INTO LARGE ARRAYS
C
      RECNO=BEGREC
      IFF=3
      CALL SITKA (IFF,RECNO,IRF,SENS,TAPEND,IDATE)
      DO 180 I1=1,64
      DO 180 I2=1,37
  180 SENS(I1,I2)=0.
C
C        SETUP ISR FOR THE EVEN-NUMBER ACCELS (NORTHSIDE)
C        64 PTS/REC * .071 SEC/PT = 4.544 SEC/RECORD
C
      ISR=ISENSR+2
      K=0
      DO 250 J=1,NOREC
      CALL SITKA (IFF,RECNO,IRF,SENS,TAPEND,IDATE)
      DO 220 I=1,64
      K=K+1
      IF (K.GT.NPT)   GO TO 260
      AC1(K)=SENS(I,ISENSR)
        SETUP SITKA ACCEL SUM & DIFS (1+2,1-2 OR 3+4,3-4 OR 5+6,5-6)
      AC2(K)=SENS(I,ISENSR)+SENS(I,ISR)
      AC3(K)=SENS(I,ISENSR)-SENS(I,ISR)
      IF (AC1(K).EQ.0.)  AC1(K)=0.000001
      IF (AC2(K).EQ.0.)  AC2(K)=0.000001
      IF (AC3(K).EQ.0.)  AC3(K)=0.000001
  220 CONTINUE
  250 CONTINUE
C
  260 CONTINUE
      REWIND 10
      PRINT 265,NPT,BEGREC
  265 FORMAT (' READ IN AND DETRND',I5,' POINTS STARTING AT',I5)
C
C        DTREND THEN PLOT THE 3 ACCEL TIME TRACES
C
      NDEG=1
      CALL DTRND2 (AC1(1),NPT,NDEG,TMEAN,VARI)
      CALL DTRND2 (AC2(1),NPT,NDEG,TMEAN,VARI)
      CALL DTRND2 (AC3(1),NPT,NDEG,TMEAN,VARI)
      DO 500 ICOL=1,3
      XLOK=0.0
C
C     PLOT BASELINES AND RECORD TIK MARKS FOR EACH OF THE 3 TRACES
C       TINC IS SPACING BETWEEN DATA PTS - TINCH IS 1 RECORDS WORTH
      TIME AXIS = 100 PTS/INCH  (7.1 SEC/IN, 2.8 SEC/CM ON REDUCED PLOT)

      YLOK=38. +2.*(3-ICOL)
      CALL PLOT (XLOK,YLOK,-3)
```

STPSPC Listing 5 (2 of 4)

```
      TINC=.010*2.5
      TINCR=TINC*64
      TLEN=TINC*NPT
      THI=.25/CCSIZE
      CALL PLOT (TLEN,0.,+2)
      CALL PLOT (0.,0.,+2)
      CALL PLOT (0.,THI,+3)
      CALL PLOT (TLEN,THI,+2)
      CALL PLOT (TLEN,-THI,+3)
      CALL PLOT (0.,-THI,+2)
      CALL PLOT (0.,0.,+3)
      XT=0.
      NTIK=NOREC
      DO 330 I=1,NTIK
  330 CALL SYMBOL (XT,-THI,.14,13,0.,-1)
      CALL PLOT (0.,0.,+3)
C
C       ADD VERTICAL AXIS SCALE VALUES AND SCALE DATA ACCORDINGLY
C       USE .25 INCH = VSCAL    (DECK DATA USUALLY .025 G)
C
      XT=XT+TINCR
      VSCAL=.025
      IF (ISENSR.GT.20)   VSCAL=VSCAL*2.
      CALL NUMBER (-.6,THI,.14,VSCAL,0.,3)
      CALL NUMBER (-.6,-THI,.14,VSCAL,0.,3)
      CALL SYMBOL (-.3,0.,.14,1H0,0.,1)
      IF (ICOL.GT.1)   GO TO 338
      SENSR=LSENS
      CALL NUMBER (-2.5,0.,.42,SENSR,0.,-1)
  338 CALL SYMBOL (-2.0,0.,.42,COMPN(ICOL),0.,3)
      CALL PLOT (0.,0.,+3)
      SKALE=THI/VSCAL
  340 X=0.
      IF (ICOL.EQ.2)   GO TO 360
      IF (ICOL.EQ.3)   GO TO 380
C
C      SCALE AND PLOT THE TIME TRACES
C
      DO 350 I=1,NPT
      X=X+TINC
      Y=AC1(I)*SKALE
      CALL PLOT (X,Y,+2)
  350 CONTINUE
      GO TO 400
  360 DO 370 I=1,NPT
      X=X+TINC
      Y=AC2(I)*SKALE
      CALL PLOT (X,Y,+2)
  370 CONTINUE
      GO TO 400
  380 DO 390 I=1,NPT
      X=X+TINC
      Y=AC3(I)*SKALE
      CALL PLOT (X,Y,+2)
```

STPSPC Listing 5 (3 of 4)

```
  390 CONTINUE
C         RESTORE ORIGINAL ORIGIN
  400 CALL PLOT (-XLOK,-YLOK,-3)
C
  500 CONTINUE
C
C         TRANSFER A 512-PT SEGMENT AT A TIME INTO SMALL ARRAYS
C
      NP=512
      DO 700 IFR=1,NFR
      XLOC=DELX*(IFR-1)
      YLOC=30.-(IFR*1.0)
      DO 570 I=1,NP
      ISUB=NADV*(IFR-1)
      AIND(I)=AC1(I+ISUB)
      ASUM(I)=AC2(I+ISUB)
  570 ADIF(I)=AC3(I+ISUB)
      PRINT 575,ISENSR,NP,BEGREC,ISUB
  575 FORMAT ('1CHAN',I4,' READY FOR INTPWA FOR',I5,' PTS STARTING AT RE
     1CND=',I5,9X,'ISUB=',I4)
      ICOL=1
      CALL INTPW2 (XLOC,YLOC,ISENSR,AIND,NP)
      ICOL=2
      CALL INTPW2 (XLOC+27.,YLOC,ISENSR,ASUM,NP)
      ICOL=3
      CALL INTPW2 (XLOC+54.,YLOC,ISENSR,ADIF,NP)
      BEGREC=BEGREC+(NADV/64)+.01
  700 CONTINUE
C
  900 CALL PLOT(0.0,0.0,999)
      STOP        99
      END
```

STPSPC Listing 5 (4 of 4)

```
C      SUBROUTINE  I N T P W 2
C-----------------------------------------------------------------------
C
C      THIS ROUTINE DETRENDS AND WINDOWS ACCEL TIME DATA IN PREPARATION
C        FOR FOURIER TRANSFORM TO FREC DOMAIN BY RHARM AND PLOT BY SPCPWA
C        (THIS IS A LIGHTLY MODIFIED VERSION OF INTPWA)
C
C      ROUTINES CALLED ARE: DETRND, WINDOW, RHARM, SPCPW2.
C
C      PARAMETERS
C         XLOC,YLOC- STARTING LOCATION FOR THE PLOT ON PAPER
C         ISENSR- SENSOR NUMBER
C         WORK- WORK ARRAY. THIS ARRAY MUST BE DIMENSIONED  10 LOCATIONS
C           LARGER THAN LENG
C         LENG- # OF DATA POINTS TO BE USED.
C
C-----------------------------------------------------------------------
C
      SUBROUTINE INTPW2 (XLOC,YLOC,ISENSR,WORK,LENG)
      COMMON/EXPARM/ITAPE,BEGREC,NADV,AMPMAX,NFR,LSENS,NTH
      COMMON/INPARM/COMPN(3),IFR,ICOL,TMEAN,VARI
      DIMENSION WORK(1),P(8C)
      DIMENSION INV(512),S(512)
      INTEGER BEGREC
      DATA ABEG,AEND,BBEG,BEND/.10,.10,.10,.10/
      NP=LENG
    6 TAPR=BBEG
C
C        M=8 (256)  FOR 36 SEC SPECTRA  (IM=516)
      ARG=NP/2
      EM=(ALOG10(ARG))/(ALOG10(2.))      +.1
      PRINT 75,LSENS,COMPN(ICOL),XLOC,YLOC
   75 FORMAT (///' CHANNEL ',I3,A3,' BEING PROCESSED',5X,'XLOC=',F6.2,
     1' YLOC=',F6.2)
      M=EM
      IM=2*(2**M)+4.49
C
C      DETREND TIME DATA AND SAVE THE MEAN
C
      NDEG=1
      CALL DTRND2 (WORK(1),NP,NDEG,TMEAN,VARI)
      SAVEM=TMEAN
      SAVEV=VARI
C
C      WINDOW DATA, THEN READJUST AMPLITUDE FOR LOSS TO WINDOW FUNCTION
C
      BPRR=BBEG*NP+.5
      BPER=BEND*NP+.5
      CALL WINDOW (WORK,WORK,NP,ABEG,BPRR,AEND,BPER)
      FACTOR=1./(1.-TAPR)
      DO 300 I=1,NP
  300 WORK(I)=WORK(I)*FACTOR
      CALL DTRND2 (WORK(1),NP,NDEG,TMEAN,VARI)
      TMEAN=SAVEM
```

INTPW2 Listing 6 (1 of 2)

```
C     VARI=SAVEV
      PRINT 305
  305 FORMAT (' THE FOLLOWING DATA IS THE ACCELEROMETER TIME TRACE IN G
     X AFTER WINDOWING AND READY FOR FOURIER TRANSFORMING')
C
C     ONLY PRINT TIME TRACE EVERY NTH FRAME
C
      IF (MOD(IFR,NTH).NE.0)   GO TO 320
      NUMLIN=NP/10+1
      L=1
      DO 310 K=1,NUMLIN
      LL=L+9
      PRINT 315,(WORK(I),I=L,LL)
  310 L=L+10
  315 FORMAT (' ',10F10.4)
  320 CONTINUE
C
  500 CONTINUE
C
C     COMPUTE FOURIER COEF. THEN CALL TO PLOT A SPECTRUM.
C
      CALL RHARM (WORK(1),M,INV,S,IERR)
      IF (IERR.NE.0)   PRINT 555,IERR
  555 FORMAT (1H1,20HINTPWR--RHARM IERR=    ,I2)
  600 CALL SPCPW2 (XLOC,YLOC,WORK(1),IM)
      RETURN
      END
```

INTPW2 Listing 6 (2 of 2)

```
C       SUBROUTINE  S P C P W 2
C-----------------------------------------------------------------------
C
C       THIS PROG. COMPUTES AND PLOTS POWER SPECTRUM FOR ACCEL DATA
C         (THIS IS A LIGHTLY MODIFIED VERSION OF SPCPWA)
C
C       ROUTINES CALLED; NONE
C
C       PARAMETERS
C          XLOC,YLOC- STARTING LOCATION ON PAPER
C          A- DATA ARRAY AS RETURNED BY 'RHARM'
C               CONTAINING N/2-2 UNIQUE COMPLEX POINTS
C         FOR 35 SECOND SPECTRA WITH DT=.07SEC, N=516    SO NN=256
C
C-----------------------------------------------------------------------
C
      SUBROUTINE SPCPW2 (XLOC,YLOC,A,N)
      COMMON/EXPARM/ITAPE,BEGREC,NADV,AMPMAX,NFR,LSENS,NTH
      COMMON/INPARM/COMPN(3),IFR,ICOL,TMEAN,VARI
      DIMENSION A(2,1),INAME(1),LYNE(73) ,P(2060),AXX(2060)
      INTEGER LYNE,BLANK,EYE,DASH,STAR, JP
      INTEGER BEGREC
      DATA BLANK,EYE,DASH,STAR,KOL/1H ,1HI,1H-,1H*,73/
      DATA XL,YL,YL2,FREMAX/25.0,6.0,4.0,5.0/
      DATA PMIN,PMAX,FREMIN,AMAX,AMIN/-180.0,180.0,0.0,6.0,0.0/
C
C       INITIALIZE
C         ZEROF=.0279 FOR 512 PT (36 SEC) SPECTRA
C
      DT=.07
      AZERO=A(1,1)
      NN=N/2-2
      ZEROF=1.0/((N-4)*DT)
      FREMAX=NN*ZEROF
      TSPAN=(N-4)*DT
      TTIME=TSPAN/2.
      PRINT 75,N,DT,VARI
   75 FORMAT (' N=',I4,' DT=',F7.3,' VARI=',F8.5)
C
C       FIND MAX. AMPLITUDE AND SUM OF P.S.D.
C       BUT LIMIT TO INPUT AMPMAX IF CONSTANT SCALING FOR ALL SPECTRA.
C
      AMP=(A(1,2)*A(1,2)+A(2,2)*A(2,2))*TTIME
      SUMAMP=AMP
      DO 100 I=3,NN
      AMP2=(A(1,I)*A(1,I)+A(2,I)*A(2,I) )*TTIME
      SUMAMP=SUMAMP+AMP2
      IF(AMP2.GT.AMP)  AMP=AMP2
  100 CONTINUE
      AINC=(KOL-1)/AMP
C
C       PRINT HEADING
C
      DO 150 I=1,KOL
```

SPCPW2 Listing 7 (1 of 4)

```
      LYNE(I)=DASH
  150  CONTINUE
      LYNE(1)=EYE
      LYNE(KOL)=EYE
      PRINT 155,ITAPE,BEGREC,LSENS,COMPN(ICOL),AMP,LYNE
  155 FORMAT (1H1,'TAPE=',I6,' STARTING REC=',I4,/,88X,'POWER SPECTRUM',
     1/,' INDEX  A COEF    B COEF     P.S.',6X,'PHASE      FREQ',5X,
     21H0,34X,I3,A3,27X,F9.6,/,55X,73A1)
C
C     BLANK OUT LYNE
C
      DO 190 I=1,KOL
      LYNE(I)=BLANK
  190 CONTINUE
C
C     COMPUTE SPEC. AND PHASE
C
      DO 300 I=1,MN
      FREQ=I*ZEROF
      AA1=A(1,I+1)
      AA2=A(2,I+1)
      IF (AA1.EQ.0.0)    AA1=.001
      IF (AA2.EQ.0.0)    AA2=.001
      A(1,I)=(AA1*AA1+AA2*AA2)*TTIME
      A(2,I)=ATAN2(AA1,AA2)*57.2958
      LYNE(1)=EYE
      LYNE(KOL)=DASH
      JP=AINC*A(1,I)+1.4999
      IF (JP.GT.72)    JP=72
C
C     ONLY PRINT SPECTRUM EVERY NTH FRAME
C
      IF (MOD(IFR,NTH).NE.0)    GO TO 270
      LYNE(JP)=STAR
C       PRINT A,B,SPECAMPL,PHASE
      PRINT 255,I,(A(LL,I+1),LL=1,2),(A(LL,I),LL=1,2),FREQ,LYNE
  255 FORMAT (1X,I4,2(2X,F7.4),1X,F9.6,1X,F8.1,1X,F9.4,3X,73A1)
      LYNE(JP)=BLANK
  270 P(I)=A(1,I)
  300 CONTINUE
C
  310 PRINT 315,AZERO,SUMAMP,THEAN,VARI,BEGREC
  315 FORMAT ('0AZERO=',F9.6,' SUMAMP=',F11.5,25X,' THEAN=',F10.6,
     X' G      VARI=',F10.6,' G STARTING AT RECNO',I5)
  350 CONTINUE
      AMP=AMPMAX
      IF (LSENS.GT.10)    AMP=AMP*2.
C     IF (NSUM.EQ.1)    AMP=AMP*4.
      DO 500 I=1,MN
      FREQ=I*ZEROF
      IF (P(I).LE.0.0)    P(I)=0.00001
      IF (P(I).GT.AMP)    P(I)=AMP
      AXX(I)=FREQ
  500 CONTINUE
```

SPCPW2 Listing 7 (2 of 4)

```
      IF (XLOC.LT.0.)   XLOC=0.
C
C     SET SCALE FACTORS (FIRST VALUE, DELTAV) FOR CONSTANT PLOT SIZE
C       FULL SCALE ACROSS= 14 INCH= 7.14 HZ  SO SET 1 INCH = .50HZ
C         6 INCHES HIGH  (FULL SCALE)  = INPUT AMPMAX
C
      P(NN+1)=0.0
      P(NN+2)=AMP/6.
      AXX(NN+1)=.0
      AXX(NN+2)=.50
      IF (ICOL.LT.4)   GO TO 600
      NUMLIN=NN/10+1
      L=1
      DO 575 K=1,NUMLIN
      LL=L+9
      PRINT 565, (P(I),I=L,LL)
  565 FORMAT (' ',10F10.6)
  575 L=L+10
  600 CONTINUE
C
C     PLOT TITLES AND AXES
C
      CALL SYMBOL (XLOC,YLOC-0.5,.21,4HREC ,0.,4)
      REC=BEGREC
      CALL NUMBER(999.0,999.0,.21,REC,0.0,-1)
      IF (IFR.LT.NFR)   GO TO 640
      CALL SYMBOL (999.,999.,.21,6H TAPE=,0.0,6)
      TAPE=ITAPE
      CALL NUMBER (999.0,999.0,.21,TAPE,0.,-1)
      CALL SYMBOL(999.0,999.0,.21,9H SENSOR=A ,0.0,9)
      SENSR=LSENS
      CALL NUMBER(999.0,999.0,.21,SENSR,0.0,-1)
      CALL SYMBOL (999.,999.,.21,COMPN(ICOL),0.,3)
      GO TO 660
  640 YT=-1.0
      DO 650 I=1,7
      YT=YT+1.0
  650 CALL SYMBOL (XLOC+14.,YLOC+YT,.14,13,90.,-1)
      GO TO 664
  660 CALL AXIS (XLOC+14.,YLOC,14HACCEL SPECTRUM,-14,6.0,90.0,P(NN+1),
     /P(NN+2))
  664 IF (IFR.EQ.NFR)   GO TO 680
      XT=-1.0
      DO 670 I=1,14
      XT=XT+1.0
  670 CALL SYMBOL (XLOC+XT,YLOC,.14,13,0.,-1)
      GO TO 690
  680 CALL AXIS (XLOC,YLOC,4HFREQ,-4,14.,0.,AXX(NN+1),AXX(NN+2))
C       MAYBE LINE NEEDS XLOC,YLOC=0.
  690 CALL PLOT(XLOC,YLOC,-3)
      CALL LINE (AXX(1),P(1),NN,1,0,0)
      CALL PLOT (-XLOC,-YLOC,-3)
  900 RETURN
      END
```

SPCPW2 Listing 7 (3 of 4)

```
      BLOCK DATA
      COMMON/INPARM/COMPN(3),IFR,ICOL,TMEAN,VAR)
      DATA COMPN/3HIND,3HSUM,3HDIF/
      END
```

SPCPW2 Listing 7 (4 of 4)

PROGRAM CALFIL

INTRODUCTION

This program creates a channel calibration file for the Newport and Sitka instrumentation configurations. Other processing programs using bridge data may then access this file on the FHRS disk library in conjunction with the tape reading routines SITKA or NEWPORT so that each record read then provides calibrated acceleration or wind data.

Each channel has its set-up cards in chronological order showing each time a calibration value changes or a replacement or repair was done to its circuit. Any particular user run then picks up the card appropriate to that particular date for each channel.

See Figures 19 and 20, Table 6 and Listing 8.

OPERATIONAL NOTES

Essentially, once this file is placed onto the DOT disk library, it is only rerun when new channel calibration update cards need to be added.

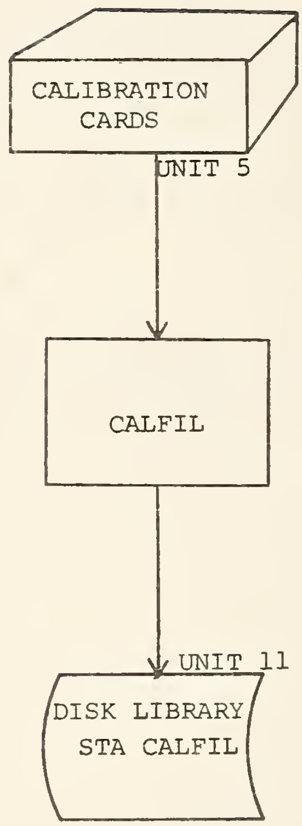


Figure 19. Program CALFIL Setup

0	1U	-11.9568	0.0	N	70300	
0	1U	-11.9568	0.0	S	72274	
0	1U	-11.9568	0.0	S	75137	OVERHAULED
1	1V	-11.9568	0.0	N	70300	
1	A1	-0.0253	0.0	S	72274	GULTON
1	A1	1.0000	0.0	S	74231	DISCONNECTED
1	A1	-0.0402	0.0	S	74356	KISTLER
1	A1	-0.0402	0.0	S	75137	CABLE REPAIRED
2	1W	-11.9568	0.0	N	70300	
2	1V	-11.9568	0.0	S	72274	
2	1V	-11.9568	0.0	S	75137	OVERHAULED
2	1V	-11.9568	0.0	S	76038	REPLACED PROP.
3	2U	-11.9568	0.0	N	70300	
3	A2	-0.0253	0.0	S	72274	GULTON
3	A2	1.0000	0.0	S	74231	DISCONNECTED
3	A2	-0.0402	0.0	S	74356	KISTLER
3	A2	1.0000	0.0	S	75137	DISCONNECTED
3	A2	-0.0402	0.0	S	75237	REPLACED
4	A1	1.0000	0.0	N	70300	
4	1W	-11.9568	0.0	S	72274	
4	1W	-11.9568	0.0	S	75137	OVERHAULED
5	2V	-11.9568	0.0	N	70300	
5	A3	-0.0253	0.0	S	72274	GULTON
5	A3	1.0000	0.0	S	74110	DISCONNECTED
5	A3	-0.0402	0.0	S	74231	KISTLER
6	2W	-11.9568	0.0	N	70300	
6	2U	-11.9568	0.0	S	72274	
6	2U	-11.9568	0.0	S	75137	OVERHAULED
6	2U	-11.9568	0.0	S	75303	REPLACED
6	2U	-11.9568	0.0	S	76082	REPLACED PROP
7	3U	-11.9568	0.0	N	70300	
7	A4	-0.0253	0.0	S	72274	GULTON
7	A4	1.0000	0.0	S	74110	DISCONNECTED
7	A4	-0.0402	0.0	S	74231	KISTLER
7	A4	-0.0402	0.0	S	75137	CABLE REPAIRED
7	A4	-0.0402	0.0	S	75237	REPLACED
8	3V	-11.9568	0.0	N	70300	
8	2V	-11.9568	0.0	S	72274	
8	2V	-11.9568	0.0	S	75137	OVERHAULED
8	2V	-11.9568	0.0	S	75303	REPLACED
8	2V	-11.9568	0.0	S	76082	REPLACED
9	A2	1.0000	0.0	N	70300	
9	A5	-0.0402	0.0	S	72274	KISTLER
9	A5	1.0000	0.0	S	75281	DISCONNECTED
9	A5	-0.0402	0.0	S	75303	CABLE REPLACED

Figure 20. CALFIL Output

Table 6. CALFIL Variable Name List

Name	Com	Type	Dimension	Usage
CALFIL		I	1	Calibration file unit number
CARDIN		I	1	Card input unit number
CTTANO		I	70	Channel
DATE		I	1	User date
I		I	1	General Index
II		I	1	I & 35
INCHAN		I	1	Calib channel number
INDATE		I	1	Calib card date
INNAM		I	1	Calib name of instrument
INRMKS		I	5	Input remarks
INSITE		I	1	North or South side of Bridge
INSLOP		R	1	Calibration slope
INYINT		R	1	Calibration Y intercept
LINES		I	1	Line counter
NAME		I	7	Sensor name
SLOPE		R	70	Slope
TAPENO		I	2	User tape number
YINT		R	70	Y Intercept

```
C*****PROGRAM CALFIL*****************************************************************************:
C
C-----CREATES CHANNEL CALIBRATION FILE FOR NEWPORT AND SITKA
C-----INSTRUMENTATION CONFIGURATIONS
C
C-----LOCAL VARIABLES
C
      REAL INSLOP,INYINT,SLOPE(70),YINT(70)
      INTEGER CARDIN,CALFIL,I,II,LINES,INCHAN,INNAM,INSITE,INDATE,
     -  INRMKS(5),CHANO(70),NAME(70),TAPENO(2),DATE
      DATA TAPENO/'CALT','ST  '/
      CARDIN=5
      CALFIL=11
      DATE=0
      I=0
      PRINT 9000
9000  FORMAT (1H1)
      LINES=0
10    READ(CARDIN,9001,END=30) INCHAN,INNAM,INSLOP,INYINT,INSITE,
     -  INDATE,INRMKS
9001  FORMAT (I2,T11,A4,T21,F8.4,T31,F8.4,T41,A1,T51,I5,T61,5A4)
      WRITE(CALFIL,9001) INCHAN,INNAM,INSLOP,INYINT,INSITE,INDATE,
     -  INRMKS
      IF(INDATE.GT.DATE) DATE=INDATE
      IF(INCHAN.EQ.I) GO TO 20
      PRINT 9002
9002  FORMAT (1H )
      LINES=LINES+1
      I=I+1
      IF(LINES.LE.50) GO TO 20
      PRINT 9000
      LINES=0
20    PRINT 9003,INCHAN,INNAM,INSLOP,INYINT,INSITE,INDATE,INRMKS
9003  FORMAT (1X,I2,2X,A4,2X,F8.4,2X,F8.4,2X,A1,2X,I5,2X,5A4)
      LINES=LINES+1
      GO TO 10
30    ENDFILE CALFIL
      REWIND CALFIL
C
C-----SET-UP CHANNEL CALIBRATION TABLE
C
      I=0
40    READ(CALFIL,9001,END=50) INCHAN,INNAM,INSLOP,INYINT,INSITE,
     -  INDATE,INRMKS
      IF(INCHAN.GT.I) I=I+1
      IF(INDATE.GT.DATE) GO TO 40
      CHANO(I+1)=INCHAN
      NAME(I+1)=INNAM
      SLOPE(I+1)=INSLOP
      YINT(I+1)=INYINT
      GO TO 40
C
C-----PRINT CHANNEL CALIBRATION TABLE
C
```

CALFIL Listing 8 (1 of 2)

```
      PRINT 9004, TAPENO,DATE
9004  FORMAT(1H1,   //T26,'---CHANNEL CALIBRATION TABLE---'/T32,
     1'TAPE NUMBER ',2A4/T34,'RECORDED ',I5,  ///2(5X,'CHAN',2X,
     2'SENSOR',4X,'SLOPE',5X,'Y-INT')/2X,74('-')//)
      DO 55 I=1,35
      II=I+35
      PRINT 9005,CHANO(I),NAME(I),SLOPE(I),YINT(I),CHANO(II),NAME(II),
     1 SLOPE(II),YINT(II)
9005  FORMAT(2X,2(4X,I2,4X,A4,3X,F8.4,3X,F8.4))
55    CONTINUE
      STOP
      END
```

CALFIL Listing 8 (2 of 2)

PROGRAM COPY

INTRODUCTION & OPERATIONAL NOTES

This program copies specified records of an entire file from one tape to another. The file numbers for both tapes are specified in the JCL cards for program copy while specified start and stop record numbers for the copied tape are given on the copy data request card.

See Figures 21 and 22, Table 7 and Listings 9 and 10.

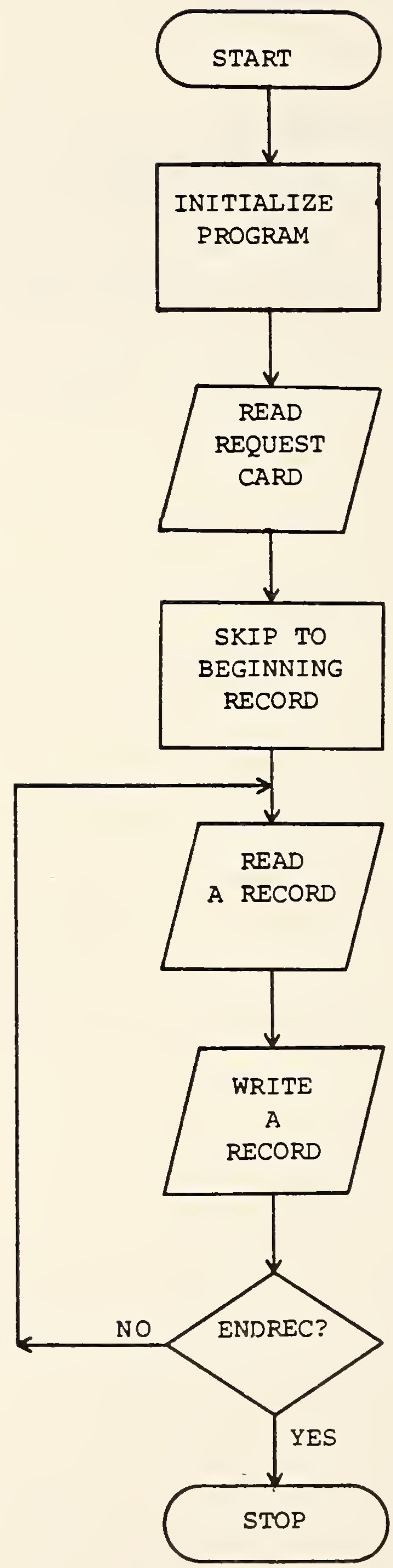


Figure 21. COPY Flow Chart

0001   03000

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	1-9999	Beginning record	I5	1-5
2	1-9999	Ending record	I5	11-15

Figure 22. COPY Request Card Format

Table 7. COPY Variable Name List

Name	Com	Type	Dimension	Usage
BEGREC		I	1	Beginning record of request
DATA		I	562	Data array
DUM		I	1	Dummy variable for read
ENDREC		I	1	Ending record number
I		I	1	General index
NDATA		I	1	1 record past ending record
NSKP		I	1	Number of records to skip
NULL		I	562	Null array for dummy record
TAPIN		I	1	Tape unit for input
TAPOUT		I	1	Tape unit for output

```
C*****PROGRAM COPY****(SITKA VERSION)**********************************
C
C-----COPIES SPECIFIED RECORDS FORM ONE DEVICE TO ANOTHER.  IF COPY
C-----REQUEST IS BLANK, ENTIRE FILE IS COPIED.
C
C-----LOCAL VARIABLES
C
      INTEGER TAPIN,TAPOUT,BEGREC,ENDREC,DUM,I,DATA(562),NULL(562)
C
C-----INITIALIZE
C
      NREC=1
      TAPIN=10
      TAPOUT=12
      DO 5 I=1,562
      NULL(I)=0
5     CONTINUE
C
C-----READ COPY REQUEST
      READ 9000, BEGREC,ENDREC
C
9000  FORMAT (I5,T11,I5)
      IF(BEGREC.LE.1) GO TO 40
C
C-----SKIP TO BEGINNING RECORD.
C
      NSKP=BEGREC-1
      DO 30 I=1,NSKP
      READ (TAPIN,9001,END=10,ERR=20) DUM
9001  FORMAT (A1)
      GO TO 30
10    PRINT 9002,I
9002  FORMAT (' EOF ENCOUNTERED WHILE SKIPPING.  RECORD NO. ',I5,
     -  ' PROGRAM TERMINATED.')
      STOP
20    READ (TAPIN,9001) DUM
      PRINT 9003,I
9003  FORMAT (' I/O ERROR ENCOUNTERED WHILE SKIPPING. RECORD NO. ',I5,
     -  ' PROGRAM CONTINUING.')
30    CONTINUE
C
C-----COPY SPECIFIED RECORDS
C
40    PRINT 9008,BEGREC
9008  FORMAT (' COPY BEGINNING. RECORD NO. ',I5,' FIRST RECORD.')
      IF(ENDREC.EQ.0) ENDREC=99999
      NDATA=ENDREC+1
      DO 90 I=BEGREC,NDATA
      READ(TAPIN,9004,END=70,ERR=80) DATA
9004  FORMAT (56(10A4),A4,A3)
      WRITE (TAPOUT,9004) DATA
      GO TO 90
70    ENDFILE TAPOUT
      REWIND TAPOUT
```

COPY Listing 9 (1 of 2)

```
      REWIND TAPIN
      PRINT 9005,I
9005  FORMAT (' EOF ENCOUNTERED WHILE COPYING. RECORD NO. ',
     -  I5,' PROGRAM TERMINATED.')
      STOP
   80 WRITE (TAPOUT,9004) NULL
      READ(TAPIN,9001) DUM
      PRINT 9006,I
9006  FORMAT (' I/O ERROR ENCOUNTERED WHILE COPYING. RECORD NO. '
     - ,I5,' NULL RECORD INSERTED; PROGRAM CONTINUING.')
90    CONTINUE
      PRINT 9007,I
9007  FORMAT (' COPY COMPLETE. RECORD NO. ',I5,' LAST RECORD.')
      ENDFILE TAPOUT
      REWIND TAPOUT
      REWIND TAPIN
      STOP
      END
```

COPY Listing 9 (2 of 2)

```
COPY BEGINNING. RECORD NO.   608 FIRST RECORD.
COPY COMPLETE. RECORD NO.  2084 LAST RECORD.
```

COPY Listing 10

PROGRAM DBLINT

INTRODUCTION

Program DBLINT reads acceleration data from Sitka tapes and converts it to velocity and displacement data by filtering and demeaning to remove bias to allow proper integration by the trapezoidal rule. This data may optionally be plotted as full length time traces before being fourier transformed for plotting as frequency spectra 8 records (36 seconds) at a time.

See Figures 23 through 30, Table 8 and Listings 11-16.

OPERATIONAL NOTES

To test the useability of the acceleration data an option is available to print out many pages of the running mean for each trace. Because of the many pages of extra printout this option is only used occasionally when deemed necessary on a particular event. To have this running mean printed set the input parameter 'OSPEC' = 0 instead of the normal value of 1.

The sensor number requested is the tape channel itself, not the instrument designation. For example, a request for '22' gives All data but remained printed out as '22.' Similarly for A6 data request ISENS = 12.

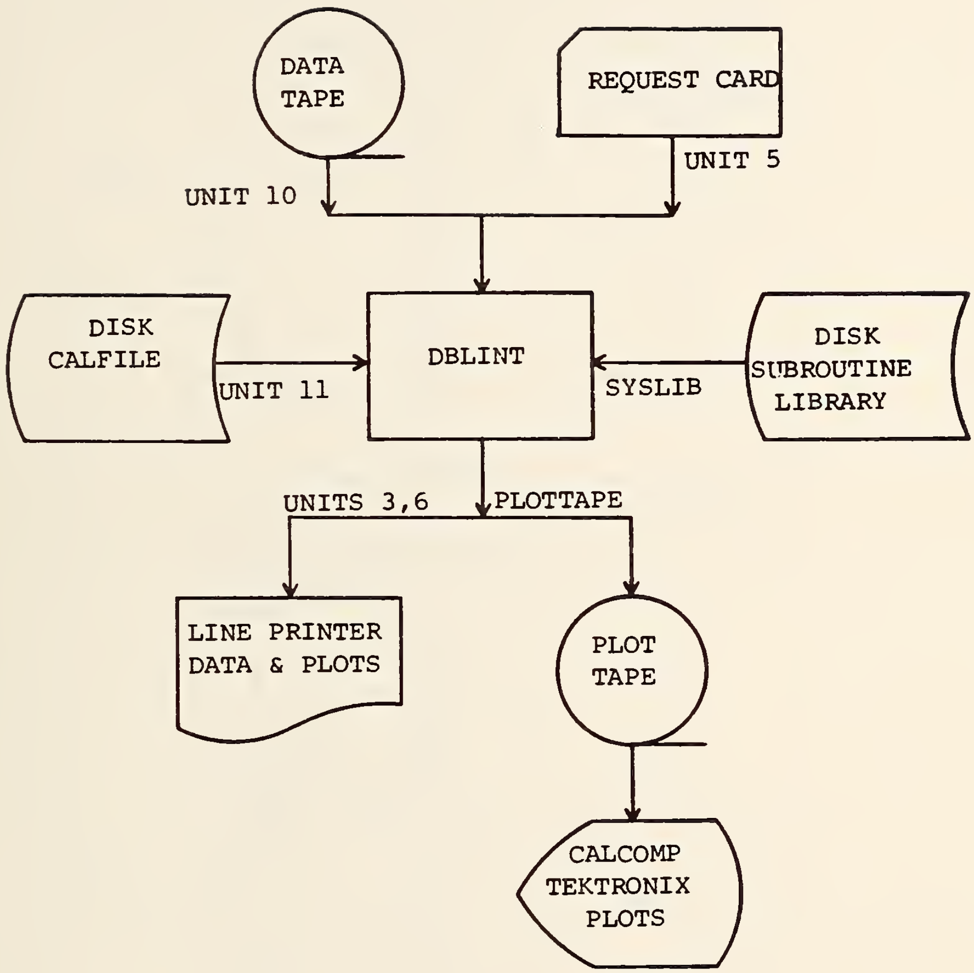


Figure 23. Program DBLINT Setup

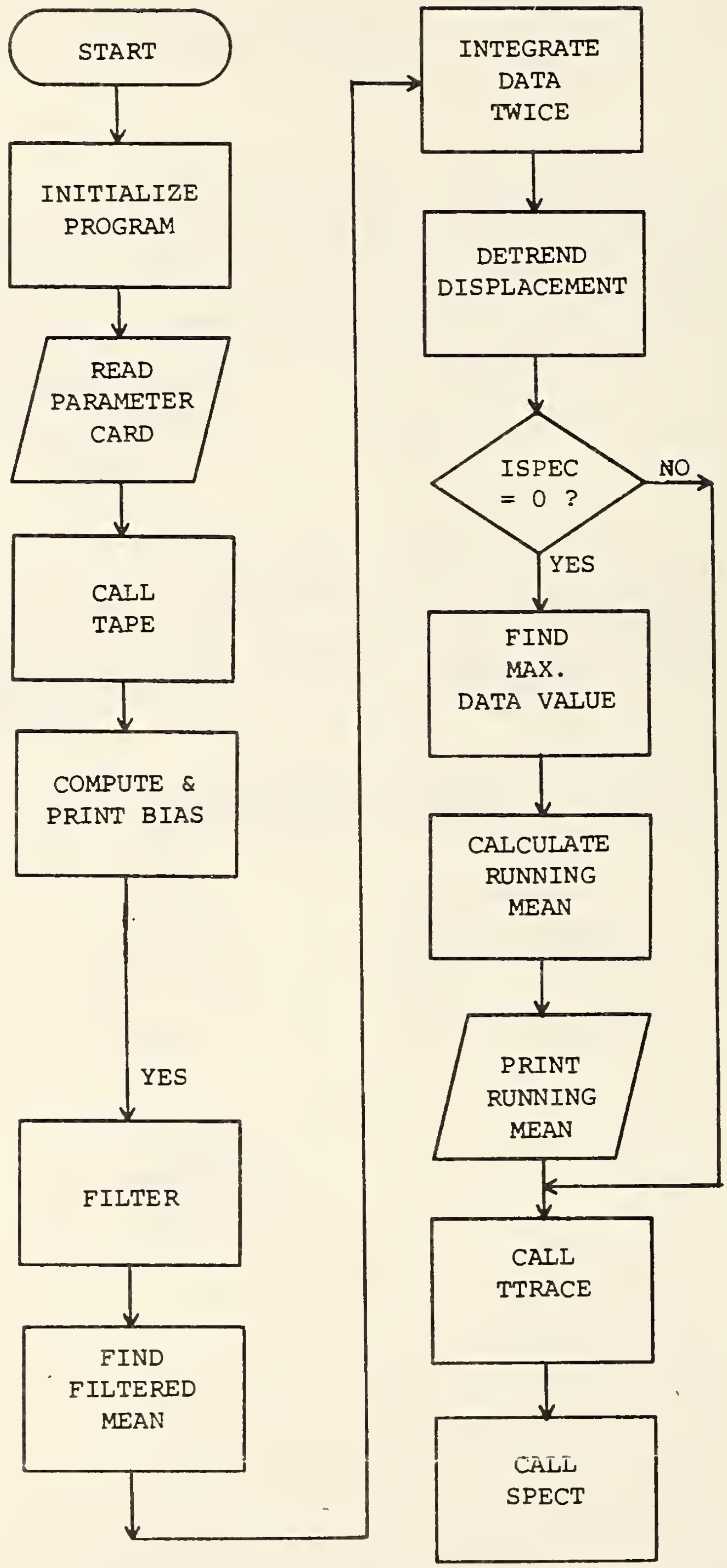


Figure 24. DBLINT Flow Chart

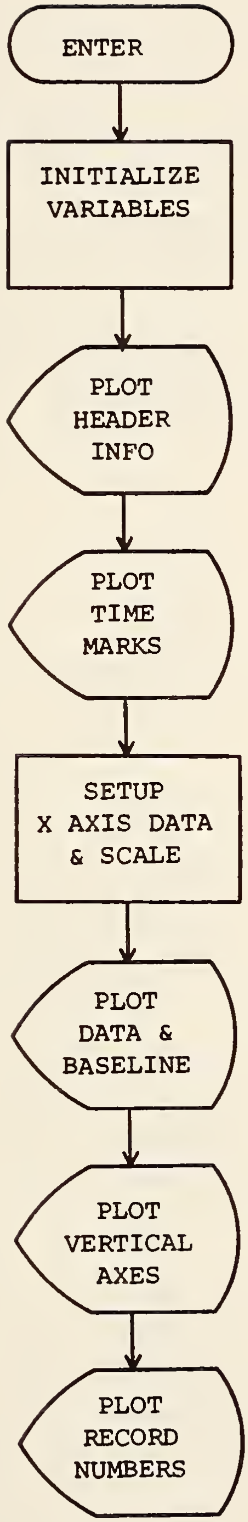


Figure 25. TTRACE Flow Chart

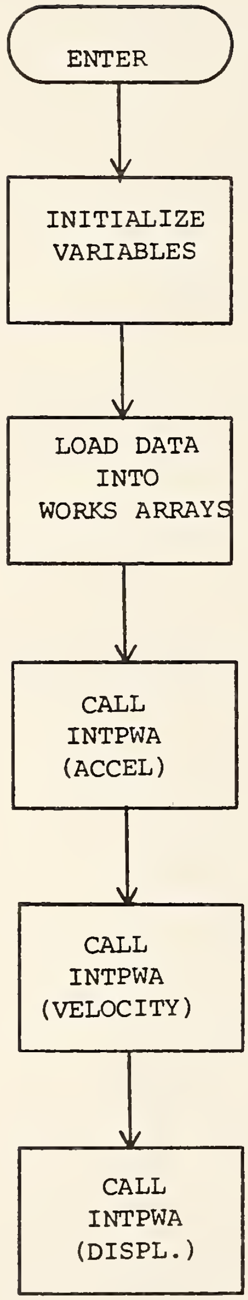


Figure 26. SPECT Flow Chart

```
0010436    76300
```

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	---	Tape number	2A4	1-8
2	72274 - present (Sitka)	Recording date	I5	11-15

Figure 27. DBLINT Tape Number Card Format

```
10436    1    12  1250  1302    3    6.5    0.5
```

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	1-99999	Tape number	I5	1-5
2	1-9	File number	I5	6-10
3	1-30	Sensor number	I5	11-15
4	1-9999	Beginning record	I5	16-20
5	1-9999	Ending record	I5	21-25
6	usually 1	Output option	I5	26-30
7	usually 0.5	Low cut filter setting	F5.2	31-35
8	usually 6.2	High cut filter setting	F5.2	36-40

Figure 28. DBLINT Request Card

```
1335    2   12    1    46    1 0.50 6.20
RECORD NO.:    1 TO    46
CHANNEL:     12
NO. OF POINTS:  2944
 BIAS ESTIMATE FOR INPUT DATA  0.012371
```

Figure 29. DBLINT Output 1

TAPE= 11322 STARTING REC= 227

POWER SPECTRUM

0 6 0.189249

INDEX	A COEF	B COEF	P.S.	PHASE	FREQ
1	0.0000	-0.0004	0.000003	178.4	0.0279
2	0.0001	-0.0001	0.000000	133.2	0.0558
3	0.0002	0.0000	0.000001	74.6	0.0837
4	0.0002	0.0001	0.000001	58.9	0.1116
5	0.0002	0.0001	0.000001	57.6	0.1395
6	0.0001	0.0001	0.000000	48.4	0.1674
7	0.0002	0.0002	0.000001	46.9	0.1953
8	0.0001	-0.0000	0.000000	112.4	0.2232
9	0.0002	0.0004	0.000004	32.2	0.2511
10	0.0002	-0.0001	0.000001	127.3	0.2790
11	0.0001	0.0003	0.000002	26.5	0.3069
12	0.0002	0.0000	0.000000	73.8	0.3348
13	-0.0003	-0.0003	0.000004	-130.7	0.3627
14	0.0005	0.0003	0.000007	58.0	0.3906
15	-0.0004	-0.0010	0.000020	-157.2	0.4185
16	0.0015	0.0012	0.000063	51.8	0.4464
17	-0.0011	0.0010	0.000039	-47.3	0.4743
18	-0.0008	-0.0014	0.000045	-149.8	0.5022
19	0.0018	0.0005	0.000065	74.6	0.5301
20	-0.0018	0.0009	0.000073	-63.1	0.5580
21	0.0012	-0.0025	0.000141	154.2	0.5859
22	0.0023	0.0009	0.000106	68.2	0.6138
23	-0.0016	-0.0001	0.000048	-94.5	0.6417
24	-0.0014	-0.0006	0.000040	-114.9	0.6696
25	0.0013	0.0014	0.000065	41.1	0.6975
26	-0.0014	0.0016	0.000078	-40.8	0.7254
27	0.0005	-0.0008	0.000017	148.7	0.7533
28	0.0014	0.0003	0.000038	79.4	0.7813
29	0.0013	0.0010	0.000049	53.4	0.8092
30	-0.0001	-0.0012	0.000028	-174.0	0.8371
31	0.0014	-0.0008	0.000045	118.1	0.8650
32	-0.0010	-0.0002	0.000018	-103.0	0.8929
33	-0.0013	-0.0006	0.000040	-122.7	0.9208
34	-0.0022	-0.0003	0.000091	-97.2	0.9487
35	-0.0033	-0.0003	0.000197	-94.9	0.9766
36	-0.0058	-0.0015	0.000641	-105.0	1.0045
37	-0.0069	-0.0021	0.000941	-106.7	1.0324
38	-0.0085	0.0014	0.001329	-80.7	1.0603
39	-0.0058	0.0060	0.001253	-44.3	1.0882

Figure 30. DBLINT Output 2

TAPE= 11322 STARTING REC= 227

POWER SPECTRUM

INDEX	A COEF	B COEF	P.S.	PHASE	FREQ
40	0.0073	0.0063	0.001657	49.4	1.1161
41	0.0375	-0.0050	0.025651	97.5	1.1440
42	0.0946	-0.0401	0.189249	113.0	1.1719
43	-0.0370	0.0346	0.045962	-46.9	1.1998
44	-0.0165	0.0028	0.005009	-80.2	1.2277
45	-0.0182	0.0006	0.005938	-88.0	1.2556
46	-0.0117	0.0011	0.002486	-84.9	1.2835
47	-0.0069	-0.0019	0.000921	-105.1	1.3114
48	-0.0050	0.0004	0.000445	-85.0	1.3393
49	-0.0008	0.0009	0.000027	-43.0	1.3672
50	0.0007	0.0013	0.000039	29.1	1.3951
51	0.0003	-0.0005	0.000007	148.0	1.4230
52	0.0004	-0.0007	0.000012	150.2	1.4509
53	0.0005	0.0008	0.000015	30.6	1.4788
54	0.0005	-0.0000	0.000005	94.7	1.5067
55	-0.0002	0.0004	0.000005	-29.1	1.5346
56	0.0002	-0.0001	0.000001	116.9	1.5625

0 6 0.189249

Figure 30. DBLINT Output 2 (continued)

Table 8. DBLINT Variable Name List

Name	Com	Type	Dimension	Usage
A		R	Passed	Input Data Array
AO		R*8	1	Final Filter Coefficient
A1		R*8	1	Final Filter Coefficient
A2		R*8	1	Final Filter Coefficient
A3		R*8	1	Final Filter Coefficient
A4		R*8	1	Final Filter Coefficient
A5		R*8	1	Final Filter Coefficient
AA		R*8	1	Normalization Factor
AAO		R*8	1	Initial Value Filter Coefficient
AA1		R*8	1	Initial Value Filter Coefficient
AA2		R*8	1	Initial Value Filter Coefficient
AA3		R*8	1	Initial Value Filter Coefficient
AA4		R*8	1	Initial Value Filter Coefficient
AA5		R*8	1	Initial Value Filter Coefficient
AFS		R	1	Running Average of FS
AMPMAX	X	R	1	Max Value of Spectral Plot
AS		R	1	Absolute Value of S(I)
AVGFS		R	1	Average Value of FS Data
B1		R*8	1	Final Filter Coefficient
B2		R*8	1	Final Filter Coefficient
B3		R*8	1	Final Filter Coefficient
B4		R*8	1	Final Filter Coefficient
B5		R*8	1	Final Filter Coefficient
BBO		R*8	1	Initial Value Filter Coefficient
BB1		R*8	1	Initial Value Filter Coefficient
BB2		R*8	1	Initial Value Filter Coefficient
BB3		R*8	1	Initial Value Filter Coefficient
BB4		R*8	1	Initial Value Filter Coefficient
BB5		R*8	1	Initial Value Filter Coefficient
BEGREC		I	1	Beginning Record
BIAS		R	1	Data Bias

Table 8. DBLINT Variable Name List (continued)

Name	Com	Type	Dimension	Usage
BLNK		I	1	Literal ' '
C		R*8	1	Polynomial Argument
CCSIZE	X	R	1	Cal Comp Plot Size Factor
CHANO		I	1	Channel Number
D		R*8	4000	Work Array
DELTAV		R	1	Plotter Increment
DS		R	Passed	Displacement Data Array
DT	X	R	1	Sampling Interval
ENDREC		I	1	Ending Record
FC1		R	1	Low Cutoff Frequency
FC2		R	1	High Cutoff Frequency
FILE		R	1	File Number
FIRSTV		R	1	First Value to Plot
FS		R	3200	Filtered Data
FXLOC		R	1	Plotter X Avis Offset
FYLOC		R	1	Plotter Y Axis Offset
I		I	1	General Index
IBEG		I	1	Beginning Record
IBUF		I	4000	Plot Buffer Storage
IEND		I	1	Ending Record
IFILE		I	1	File Number
II		I	1	General Index
IM		I	1	Counter
INC		I	1	Increment
INT		I	1	Integration Counter
INTEG		I	1	Plotting Parameter
IP		I	1	Printer Position of Data
IRF		I	1	Read Status Flag
ISENS		I	1	Sensor Number
ISF		I	1	DDTRND Intial Entry Flag
ISPEC		I	1	Processing Options Flag

Table 8. DBLINT Variable Name List (continued)

Name	Com	Type	Dimension	Usage
ITAPE		I	1	Tape Number
K		I	1	General Index
KK		I	1	General Index
LAST		R	1	Last Value Processed
LENGTH		I	1	Sub Internal For Integration
LINTYP		I	1	Plotting Parameter
LOW		I	1	Low Cut Filter Option
LSENS	X	I	1	Sensor Number
LSTRT		I	1	Start of Integration Interval
LTRI		I	1	Literal 'I'
M		I	1	General Index
N		I	1	Number of Points to Process
N2		I	1	N/2
N6		I	1	N+5
NDEG		I	1	Degree of Polynomial to Remove
NF		I	1	Number of Points
NSEC		I	1	Number of Seconds
NT		I	1	Ending Point
NTIMES		I	1	Number of Times to Integrate
PI		R	1	3.14159
PLT1		I	10	First Printer Plot Array
PLT2		I	10	Second Printer Plot Array
PLT3		I	10	Third Printer Plot Array
PLT4		I	10	Fourth Printer Plot Array
PPR		I	1	Number of Points Per Record
REC		R	1	Beginning Record
RLRGST		R	1	Largest Value of S Data
S		R	3200	Main Data Array
S12		R	3200	Acceleration Data
SCL		R	1	Scaling Factor
SENS		R	64,37	1 Record of Raw Data

Table 8. DBLINT Variable Name List (continued)

Name	Com	Type	Dimension	Usage
SINC		R	1	Plotter Increment Between Seconds
SMAX		R	1	Max Data Value
STAR		I	1	Literal '*'
SUMI		R	1	Sum of Velocity Data
SUM2		R	1	Sum of Displacement Data
TAPE		R	1	Tape Number
TAPENO		I	2	Tape Number
TEMP		R	1	Temporary Max Value
TICK		R	1	X Location of 1-Second Marks
TITLE	X	I	4	Spectrum Title Literal
TMEAN	X	R	1	Mean Value of Time Trace Data
TTL		I	8	Input Spectrum Titles
VARI	X	R	1	Variance of Time Trace
VAXIS		R	1	Distance Between Data Traces
VS		R	Passed	Velocity Data Array
VSCAL	X	R	1	Vertical Scale for Time Trace
W1		R	516	Velocity Data Work Array
W2		R	516	Displacement Data Work Array
W3		R	516	Acceleration Data Work Array
X		R	4000	Array of X Axis Plotter Value
XEND		R	1	Last Value of X
XINC		R	1	Plotter Increment Between Data Pts.
XLOC		R	1	Plotter X Location
YLOC		R	1	Plotter Y Location

```
C      **************      PROGRAM DBLINT     ****************
C
C      THIS PROGRAM READS ACCELERATION DATA FROM SITKA TAPES AND CONVERTS
C      IT TO VELOCITY AND DISPLACEMENT DATA BY FILTERING AND DEMEANING
C      TO REMOVE BIAS FOR PROPER INTEGRATION BY TRAPEZOIDAL RULE.
C      THIS DATA MAY BE PLOTTED AS TIME TRACES OR FOURIER TRANSFORMED
C      THEN PLOTTED AS FREQUENCY SPECTRA.
C
C      ROUTINES CALLED: TAPE,CLEAN,DDTRND,SPECT,TTRACE
C                       (ALSO NEEDED: INTPWA,SPCPWA,SITKA)
C
C      PROG. BY DOLLY GREENE  S.T.A.  1976-1977
C
       DIMENSION IBUF(2000)
       REAL S(3200),FS(3200),S12(3200),LAST
       INTEGER STAR,BLNK,LTRI,PLT1(10),PLT2(10),PLT3(10),PLT4(10)
       INTEGER BEGREC
       DATA STAR,BLNK,LTRI/'*',' ','I'/
       COMMON/EXPARM/ITAPE,BEGREC,NSUM,AMPMAX,VSCAL,TITLE
       COMMON/INPARM/CCSIZE,DT,ISENS,TMEAN,VAR1
C
       CALL PLOTS(IBUF,2000,6)
       CALL NEWPEN(1)
       CCSIZE=1.3
       CALL FACTOR(CCSIZE)
       CALL PLOT(0.,27.,-3)
       DO 11 I=1,10
       PLT1(I)=BLNK
       PLT2(I)=BLNK
       PLT3(I)=BLNK
       PLT4(I)=BLNK
11     CONTINUE
       PLT1(5)=LTRI
       PLT2(5)=LTRI
       PLT3(5)=LTRI
       PLT4(5)=LTRI
       PI=3.1415926536
       READ (5,9000) ITAPE,IFILE,ISENS,IBEG,IEND,ISPEC,FC1,FC2
       WRITE(6,9000) ITAPE,IFILE,ISENS,IBEG,IEND,ISPEC,FC1,FC2
 9000  FORMAT (6I5,2F5.2)
9101   FORMAT(5X,'VEL.MEAN IS',F10.6,5X,I4)
C
C-----ISPEC=0 GIVE RUNNING MEAN OUTPUT AND PRINTER PLOTS ONLY
C-----ISPEC=1 PRODUCE PRINTER AND TEKTRONIX SPECTRA
C
       INT=1
       BEGREC=IBEG
2000   CONTINUE
C
C
C-----READ DATA FROM TAPE INTO S (48 RECS)
C
2500   CALL TAPE(IBEG,IEND,ISENS,S)
       L=(IEND-IBEG+1)*64
```

```
3000  CONTINUE
C
      BIAS=0.
      DO 98 I=1,N
98    BIAS=BIAS+S(I)
      BIAS=BIAS/N
      WRITE(6,9128) BIAS
9128  FORMAT(1X,' BIAS ESTIMATE FOR INPUT DATA',F10.6)
      DO 99 I=1,N
99    S(I)=S(I)-BIAS
C
C     USE HI-PASS FILTER FIRST TO CUT OUT LOW FREQS
C-----LOW = 0   :  PRODUCES LOW PASS FILTER (HI CUT)
C         = 1   :  PRODUCES HIGH PASS FILTER (LOW CUT)
C
      LOW=1
      CALL CLEAN(S,N,LOW,FC1,FS)
      LOW=0
      CALL CLEAN (FS,N,LOW,FC2,FS)
      N2=N/2
      AVGFS=0.
      DO 888 I=1,N
      IF(I.LT.N-2) AVGFS=AVGFS+FS(I)
888   S12(I)=S(I)
C
C
C-----ESTIMATE A MEAN FOR FS
C
      AVGFS=AVGFS/(N-3)
      WRITE(6,9129) AVGFS
9129  FORMAT(1X,' MEAN ESTIMATE FOR FILTERED DATA',F10.6)
      DO 29 I=1,N
29    FS(I)=FS(I)-AVGFS
C
C-----INTEGRATE, IF INT = 1
C
      NTIMES=2
      WRITE(6,9102) NTIMES
9102  FORMAT(5X,'INTEGRATING',I4,'  TIMES')
      IF(INT.EQ.0) GO TO 6000
      LENGTH=512
300   CONTINUE
      DO 31 II=LENGTH,N,LENGTH
      LAST=0.
      LSTRT=II-LENGTH+1
      IF(II.EQ.LNGTH2) LSTRT=LSTRT+1
      LSTRT=II-LENGTH+2
      DO 32 I=LSTRT,II
      S(I)=LAST+(FS(I)+FS(I-1))/2.0
32    LAST=S(I)
C
C-----NOW DETREND DISPLACEMENT
C
      NDEC=1
```

DBLINT Listing 11 (2 of 4)

```
      ISF=0
      NT=N-LENGTH+1
C     DO 40 I=1,NT,LENGTH
40    CONTINUE
      CALL DDTRND(S(LSTRT),LENGTH,NDEG,ISF)
      DO 33 I=LSTRT,II
      IF(INT+1.LE.NTIMES) FS(I)=S(I)
   33 CONTINUE
31    CONTINUE
      INT=INT+1
C
      IF(INT.LE.NTIMES) GO TO 300
C-----PRINT RESULTS
C
      IF(ISPEC.EQ.0) GO TO 6000
      IF(ISPEC.EQ.1) GO TO 7000
C
6000  CONTINUE
      SUM1=0.0
      SUM2=0.0
      N6=N+5
      RLRGST=ABS(S(1))
      DO 499 I=2,N6
      AS=ABS(S(I))
499   IF(AS.GT.RLRGST) RLRGST=AS
      SCL=5./RLRGST
      WRITE(6,9199) RLRGST,SCL
C
C-----CALCULATE RUNNING MEANS
C
      WRITE(6,9601)
9601  FORMAT(1H1,'  RAW ACC.',T27,'ACCELERATION',T52,' FILTERED ',T77,
     1   ' FILTERED '/T27,'RUN.MEAN',T52,'ACCLERATION',T77,'RUN.MEAN'/)
      IM=0
      DO 600 I=1,N
      IM=IM+1
      SUM1=SUM1+FS(I)
      SUM2=SUM2+S(I)
      AFS=SUM1/I
      AS=SUM2/IM
      IP=S(I)*SCL+5.
      IF(IP.LT.11.AND.IP.GT.0) PLT1(IP)=STAR
      IP=AS*SCL+5.
      IF(IP.LT.11.AND.IP.GT.0) PLT2(IP)=STAR
      IP=FS(I)*SCL+5.
      IF(IP.LT.11.AND.IP.GT.0) PLT3(IP)=STAR
      IP=AFS*SCL+5.
      IF(IP.LT.11.AND.IP.GT.0) PLT4(IP)=STAR
9999  FORMAT(1X)
      WRITE(6,9600) S(I),(PLT1(M),M=1,10),AS,(PLT2(M),M=1,10),FS(I),
     1   (PLT3(M),M=1,10),AFS,(PLT4(M),M=1,10),I
9600  FORMAT(1X,4(F10.6,10A1,5X),T120,I6)
      DO 60 J=1,10
      PLT1(J)=BLNK
```

DBLINT Listing 11 (3 of 4)

```
      PLT2(J)=BLNK
      PLT3(J)=BLNK
60    PLT4(J)=BLNK
      PLT1(5)=LTRI
      PLT2(5)=LTRI
      PLT3(5)=LTRI
      PLT4(5)=LTRI
      IF(MOD(I,LENGTH).NE.0) GO TO 600
      WRITE(6,9999)
      SUM2=0.
      IM=0
9199  FORMAT(1H1,2F12.6)
600   CONTINUE
C
C-----CALCULATE SPECTRA ,
C
7000  CONTINUE
      INT=3
C
      CALL TTRACE(ISENS,IBEG,ITAPE,IFILE,N,S,FS,S12,INT)
      CALL PLOT (0.,0.,-3)
      CALL FACTOR (1.56)
C     CALL FACTOR (4.00)
      CALL SPECT(FS,S,N,1,S12)
 8000  CALL PLOT(0.,0.,999)
C
      STOP
      DEBUG SUBCHK(S,S12,FS)
      END
```

DBLINT Listing 11 (4 of 4)

```
      SUBROUTINE TAPE(BEGREC,ENDREC,CHANC,A)
C     SUBROUTINE TAPE(BEGREC,ENDREC,CHANC,A,B)
C     REAL B(1)
C
C-----THIS ROUTINE READS DATA FROM TAPE FROM CHANNEL CHANO,
C     RECORDS BEGREC TO ENDREC AND STORES IN A.
C-----IFF = FUNCTION FLAG:
C-----           1 - INITIALIZE CALIBRATICN TABLE
C-----           2 - READ TAPE AFTER REWINDING (CURREC RESET=0)
C-----           3 - READ TAPE STARTING FROM WHERE LAST CALL LEFT OFF
C
      REAL A(1),SENS(64,37)
      INTEGER TAPEND(2)
      INTEGER BEGREC,ENDREC,CHANO
      KK=0
      IFF=1
      I=0
      CALL SITKA (IFF,I,IRF,SENS,TAPEND,IDATE)
      I=BEGREC
 1000 IFF=3
      CALL SITKA (IFF,I,IRF,SENS,TAPEND,IDATE)
      IF(IRF.NE.1) WRITE(6,9800) IRF,I
      DC 2 K=1,64
      KK=KK+1
C     B(KK)=SENS(K,CHANO+2)
2     A(KK)=SENS(K,CHANO)
      IF(I.LE.ENDREC) GO TO 1000
      WRITE(6,9000) BEGREC,ENDREC,CHANC,KK
9000  FORMAT(' RECORD NO.:',I5,' TO',I5/' CHANNEL:     ',I3/
     1   'NO. OF POINTS: ',I5)
9800  FCRMAT(' IRF IS: ',I4,10X,'RECORD NO. IS',I5)
      RETURN
      END
```

TAPE Listing 12

```
      SUBROUTINE CLEAN(S,N,LOW,FC,FS)
      REAL S(1),FS(1)
      REAL*8 D(4000),AA0,AA1,AA2,AA3,AA4,AA5,BB0,BB1,BB2,BB3,BB4,
     1   BB5,C,AA,A0,A1,A2,A3,A4,A5,B1,B2,B3,B4,B5
C
C-----COMPUTES FIVE-POLE BUTTERWORTH FILTER
C
C-----PARAMETERS
C
C         S     :  INPUT SIGNAL TO BE FILTERED
C         N     :  NUMBER OF POINTS IN S
C         LOW   :  0 - FOR LOW PASS FILTER
C               :  1 - FOR HIGH PASS FILTER
C         FC    :  CUTOFF FREQUENCY  (FREQ. AT GAIN OF 1/(SQRT(2)))
C         FS    :  FILTERED OUTPUT SIGNAL
C
C-----NOTE:  DIMENSION OF S AND FS MUST BE N+5.
C
C-----PROGRAMMER:  D.GREENE, STA 12/8/76.
C
C     DATA AA0,AA1,AA2,AA3,AA4,AA5/1.,5*0./
      DATA AA0,AA1,AA2,AA3,AA4,AA5/1.D0,5*0.D0/
      DATA BB0,BB1,BB2,BB3,BB4,BB5/1.D0,3.236068D0,5.236068D0,
     1   5.236068D0,3.326068D0,1.D0/
      DATA BB0,BB1,BB2,BB3,BB4,BB5/1.,3.236068,5.236068,5.236068,
C    1   3.236068,1./
      DATA PI/3.1415926536/
C
      DO 1 I=1,N
      K=N-I+6
      II=N-I+1
      D(K)=S(II)
1     S(K)=S(II)
C
      DO 2 I=1,5
      FS(I)=0.0
      D(I)=0.D0
2     S(I)=0.0
C
      IF(LOW.EQ.0) C=COTAN(.07*PI*FC)
      IF(LOW.EQ.1) C=TAN(.07*PI*FC)
C
      AA=BB0+BB1*C+BB2*C**2+BB3*C**3+BB4*C**4+BB5*C**5
      A0=(AA0+AA1*C+AA2*C**2+AA3*C**3+AA4*C**4+AA5*C**5)/AA
      A1=(5.*AA0+3.*AA1*C+AA2*C**2-AA3*C**3-3.*AA4*C**4-5.*AA5*
     1   C**5)/AA
      A2=(10.*AA0+2.*AA1*C-2.*AA2*C**2-2.*AA3*C**3+2.*AA4*C**4+10.*
     1   AA5*C**5)/AA
      A3=(10.*AA0-2.*AA1*C-2.*AA2*C**2+2.*AA3*C**3+2.*AA4*C**4-10.*
     1   AA5*C**5)/AA
      A4=(5.*AA0-3.*AA1*C+AA2*C**2+AA3*C**3-3.*AA4*C**4+5.*AA5*
     1   C**5)/AA
      A5=(AA0-AA1*C+AA2*C**2-AA3*C**3+AA4*C**4-AA5*C**5)/AA
C
```

CLEAN Listing 13 (1 of 2)

```
      B1=(5.*BB0+3.*BB1*C+BB2*C**2-BB3*C**3-3.*BB4*C**4-5.*BB5*C**5)/AA
      B2=(10.*BB0 +2.*BB1*C-2.*BB2*C**2-2.*BB3*C**3+2.*BB4*C**4+10.*
     1  BB5*C**5)/AA
      B3=(10.*BB0-2.*BB1*C-2.*BB2*C**2+2.*BB3*C**3+2.*BB4*C**4-10.*
     1   BB5*C**5)/AA
      B4=(5.*BB0-3.*BB1*C+BB2*C**2+BB3*C**3-3.*BB4*C**4+5.*BB5*C**5)/AA
      B5=(BB0-BB1*C+BB2*C**2-BB3*C**3+BB4*C**4-BB5*C**5)/AA
      IF(LOW.EQ.0) GO TO 5000
      A1=-A1
      A3=-A3
      A5=-A5
      B1=-B1
      B3=-B3
      B5=-B5
C
C-----NOW FILTER S
C
5000  DO 100 I=1,N
      FS(I+5)=A0*D(I+5)+A1*D(I+4)+A2*D(I+3)+A3*D(I+2)+A4*D(I+1)+
     1   A5*D(I)-B1*FS(I+4)-B2*FS(I+3)-B3*FS(I+2)-B4*FS(I+1)-B5*FS(I)
C     FS(I+5)=A0*S(I+5)+A1*S(I+4)+A2*S(I+3)+A3*S(I+2)+A4*S(I+1)+
C    1   A5*S(I)-B1*FS(I+4)-B2*FS(I+3)-B3*FS(I+2)-B4*FS(I+1)-B5*FS(I)
100   CONTINUE
C
      WRITE(6,9500) A0,A1,A2,A3,A4,A5,B1,B2,B3,B4,B5
9500  FORMAT(1H1,'FOLLOWING ARE A AND B COEFFICIENTS: '/6F15.6/5F15.6)
      RETURN
      DEBUG SUBTRACE
      END
```

CLEAN Listing 13 (2 of 2)

```
LEVEL  21                    DDTRND                  DATE = 77131              19/35/55

      SUBROUTINE DDTRND(Y,N,NDEG,ISF)
      REAL*8 X(520 ),SD,SUM,SUMM,S1,S2,TMEAN,XN,AVEI,SLOPE
      REAL Y(1)
      IF(N.LE.3076) GO TO 1000
      WRITE(6,9800) N
9800  FORMAT(' CANNOT DETREND. REDIMENSION X(N) TO: ',I5)
      RETURN
1000  DO 100 I=1,N
100   X(I)=Y(I)*1.0D0
      IF(ISF.GE.1)GO TO 24
      SD=0.0D0
      SUM=0.0D0
      SUMM=0.0D0
      S1=0.0D0
      S2=0.0D0
C
C-----IF NDEG=1 REMOVE BOTH MEAN AND LINEAR TRAND
C
      IF(NDEG.GT.0) GO TO 20
      DO 8 I=1,N
      SUM=SUM+X(I)
8     CONTINUE
      XN=N
      TMEAN=SUM/XN
      SUM=0.0D0
      DO 10 I=1,N
      X(I)=X(I)-TMEAN
      SUM=SUM+X(I)
      SUMM=SUMM+X(I)*X(I)
10    CONTINUE
      RETURN
C
C-----REMOVE MEAN AND LINEAR TREND
C
20    DO 22 I=1,N
      S1=S1+X(I)
22    S2=S2+S1
      AVEI=(N+1)*0.5D0
      XN=N
      TMEAN=S1/XN
      SLOPE=-12.0D0*(S2-AVEI*S1)/(N*(N*N-1))
24    CONTINUE
      DO 28 I=1,N
23    X(I)=X(I)-TMEAN-SLOPE*(I-AVEI)
28    Y(I)=X(I)
      WRITE(6,9999) SLOPE
9999  FORMAT(' SLOPE IS',F10.4)
      RETURN
      END
```

DDTRND Listing 14

```
      SUBROUTINE TTRACE(ISENS,IBEG,ITAPE,IFILE,N,DS,VS,S,INT)
      DIMENSION DS(1),VS(1),S(1),X(3200)
      INTEGER PPR
C
C-----THIS PROGRAM PLOTS THREE CALCOMP PLOTS FOR UP TO 48 RECORDS
C
C-----INITIALIZE
C
      CALL FACTOR(.25)
C
      TAPE=ITAPE
      REC=IBEG
      FILE=IFILE
      SENS=ISENS
      INC=1
      VAXIS=2.
      LINTYP=0
      INTEG=0
      PPR=64
      XLOC=0.
      YLOC=0.
      XINC=1./PPR
      SINC=1./4.48
      NSEC=.07*N
      FXLOC=XLOC+.5
      WRITE(6,9000) ITAPE,IFILE,ISENS,IBEG
9000  FORMAT(1H1,' TAPE NO.',I5,'-',I2/' SENSOR',I3/' BEGREC',I5//)
      WRITE(6,9111) TAPE,FILE,SENS,REC
9111  FORMAT(1X,T8,4(F6.0,5X))
C
C-----SET ORIGIN
C
      CALL PLOT(XLOC,YLOC+1.,-3)
C
C-----PLOT TAPE INFORMATION
C
      CALL SYMBOL(FXLOC,YLOC,.42,9HTAPE NO   ,0.,9)
      CALL NUMBER(999.,999.,.42,TAPE,0.,-1)
      CALL SYMBOL(999.,999.,.42,1H-,0.,1)
      CALL NUMBER(999.,999.,.42,FILE,0.,-1)
      CALL SYMBOL(FXLOC,YLOC+.5,.42,11HSTART REC   ,0.,11)
      CALL NUMBER(999.,999.    ,.42,REC,0.,-1)
      CALL SYMBOL(FXLOC,YLOC+1.,.42,7HSENSOR ,0.,7)
      CALL NUMBER(999.,999.    ,.42,SENS,0.,-1)
C
      FYLOC=2.
      CALL PLOT(FXLOC,FYLOC,3)
10    CONTINUE
C
C-----PLOT SECOND MARKS
C
      DO 100 I=1,NSEC
      TICK=SINC*I
100   CALL SYMBOL(FXLOC+TICK,FYLOC,.07,13,0.,-1)
```

TTRACE Listing 15 (1 of 3)

```
C
         FYLOC=FYLOC+(VAXIS    )+.5
C
C-----CONSTRUCT X-AXIS ARRAY
C
         DO 200 I=1,N
 200     X(I)=I*XINC
        X(N+1)=0.
        X(N+2)=1.
        XEND=X(N)
C
C-----FIND SCALING FACTORS
C
         SMAX=ABS(DS(1))
        N2=N-2
        DO 300 I=2,N2
         TEMP=ABS(DS(I))
         IF(TEMP.GT.SMAX) SMAX=TEMP
 300    CONTINUE
         DELTAV=SMAX/2.
         FIRSTV=0.
         WRITE(6,9100) DELTAV,FIRSTV
 9100   FORMAT(1X,'DELTAV',F10.3/' FIRSTV',F10.3//)
C
         DS(N+1)=FIRSTV
         VS(N+1)=FIRSTV
          S(N+1)=FIRSTV
         DS(N+2)=DELTAV
         VS(N+2)=DELTAV
          S(N+2)=DELTAV
C
C-----PLOT DATA
C
 1000    IF(INT.LT.3) GO TO 2000
        DO 1111 I=1,N
        X(I)=X(I)+FXLOC
 1111   DS(I)=DS(I)+FYLOC*DELTAV
         CALL LINE(X,DS,N,INC,LINTYP,INTEG)
         CALL SYMBOL(XEND+.5,FYLOC,.35,12HDISPLACEMENT,0.,12)
         WRITE(6,9010)
 9010   FORMAT(1X,'DISPLACEMENT HAS BEEN PLOTTED')
         GO TO 4000
C
 2000   IF(INT.LT.2) GO TO 3000
        DO 2222 I=1,N
 2222   VS(I)=VS(I)+FYLOC*DELTAV
         CALL LINE(X,VS,N,INC,LINTYP,INTEG)
         CALL SYMBOL(XEND+.5,FYLOC,.35,8HVELOCITY,0.,8)
         WRITE(6,9020)
 9020   FORMAT(1X,'VELOCITY HAS BEEN PLOTTED'/)
        GO TO 4000
C
 3000   IF(INT.LT.1) GO TO 4000
        DO 3333 I=1,N
```

TTRACE Listing 15 (2 of 3)

```
3333  S(I)=S(I)+FYLOC*DELTAV
       CALL LINE(X,S,N,INC,LINTYP,INTEG)
       CALL SYMBOL(XEND+.5,FYLOC,.35,12HACCELERATION,0.,12)
       WRITE(6,9030)
9030  FORMAT(1X,'ACCELERATION HAS BEEN PLOTTED'//)
C
C-----DRAW REFERENCE LINE AND VERTICAL AXIS
C
4000  CALL PLOT(XEND,FYLOC,3)
       CALL PLOT(FXLOC,FYLOC,2)
       CALL NUMBER(XLOC,FYLOC+1.,.28,DELTAV,0.,2)
      CALL PLOT(FXLOC,FYLOC+1.,3)
       CALL PLOT(FXLOC,FYLOC-1.,2)
       CALL NUMBER(XLOC,FYLOC-1.,.28,-DELTAV,0.,2)
       FYLOC=FYLOC+VAXIS+2.
       INT=INT-1
       IF(INT.GT.0) GO TO 1000
C
C-----PLOT RECORD REFERENCE MARKS
C
5000  CONTINUE
       FYLOC=FYLOC-2
       CALL PLOT(FXLOC,FYLOC,3)
      REC=REC-1.
       DO 500 I=1,N,PPR
       TICK=XINC*I
       REC=REC+1.
      CALL SYMBOL(FXLOC+TICK,FYLOC,.28,13,0.,-1)
500   CALL NUMBER(FXLOC+TICK+XINC,FYLOC,.28,REC,0.,-1)
C
C      CALL PLOT(0.,0.,999)
       END
```

TTRACE Listing 15 (3 of 3)

```
      SUBROUTINE SPECT(VS,DS,N,IBEG,AS)
C
C-----THIS ROUTINE CALLS INTPWA TO COMPUTE THE SPECTRA OF
C     ARRAYS DS AND VS, DIMENSIONED DO N, BEGINNING WITH POINT
C     IBEG.  IT PLOTS SPECTRA IN 8 RECORD GROUPS.
C
      COMMON/EXPARM/ITAPE,BEGREC,NSUM,AMPMAX,VSCAL,TITLE
      COMMON/INPARM/CCSIZE,DT,ISENS,TMEAN,VARI
C
      DIMENSION VS(1),DS(1),W1(516),W2(516),W3(516),AS(1)
C     DIMENSION VS(1),DS(1),W1(516),W2(516),IBUF(2000),W3(516),AS(1)
      INTEGER TTL(8)
      INTEGER TITLE(4)
      INTEGER BEGREC
      DATA TTL/'  AC','CEL ','SPEC','TRUM','    ','VEL ',' DI','SPL '/
C
      DT=.071
      CCSIZE=1.3
      AMPMAX=.001
      NSUM=0
      NTEST=0
C
      XLOC=1.
      YLOC=1.
      NP=512
      IPR=0
      IEND=IBEG+NP
C
      DO 1 ~~I~~ II=IEND,N,NP
      ISTRT=~~I~~ II-NP+1
      JJ=1
      IPR=IPR+1
      IF(IPR.GT.6) GO TO 900
9990  CONTINUE
      DO 2 J=ISTRT,~~I~~ II
      W1(JJ)=VS(J)
      W2(JJ)=DS(J)
      W3(JJ)=AS(J)
    2 JJ=JJ+1
C
9991  CONTINUE
      PRINT 375,IEND,NP,ISTRT
375   FORMAT(1X,'VEL/DISP',I4,'READY FOR INTPWA FOR',I5,' START AT ',
     1    'PT',I5)
C
      BEGREC=BEGREC+8
      AMPMAX=.002
      VSCAL=.050
      DO 500 I=1,4
  500 TITLE(I)=TTL(I)
      CALL INTPWA(XLOC,YLOC,ISENS,W3,NP)
      CALL PLOT(8.5,0.,-3)
      AMPMAX=.010
      VSCAL=.100
```

SPECT Listing 16 (1 of 2)

```
      DO 600 I=1,2
  600 TITLE(I)=TTL(I+4)
      CALL INTPWA(XLOC,YLOC,ISENS,W1,NP)
      CALL PLOT(8.5,0.,-3)
      AMPMAX=.040
      VSCAL=.20
      DO 700 I=1,2
  700 TITLE(I)=TTL(I+6)
      CALL INTPWA(XLOC,YLOC,ISENS,W2,NP)
      CALL PLOT(-17.,-5.,-3)
1     CONTINUE
C
  900 CONTINUE
C 900 CALL PLOT(0.,0.,999)
90    STOP
      END
```

SPECT Listing 16 (2 of 2)

SUBROUTINE DTRND2

INTRODUCTION

This routine removes either the mean or mean and linear trend from an input time series. The mean and variance values for the input series are also returned.

The primary use of DTRND2 is to remove the mean and linear trend before the fourier transform is performed in programs ACCSPC or WNDSPC. The standard method is to call DTRND2 then window the data to taper the ends, readjust amplitudes, then call DTRND2 again to remove any slight mean or trend in the data after windowing.

See Figure 31, Table 9 and Listing 17.

OPERATIONAL NOTES

This routine removes either the mean or mean and linear trend from an input time series. The mean and variance values for the input series are also returned.

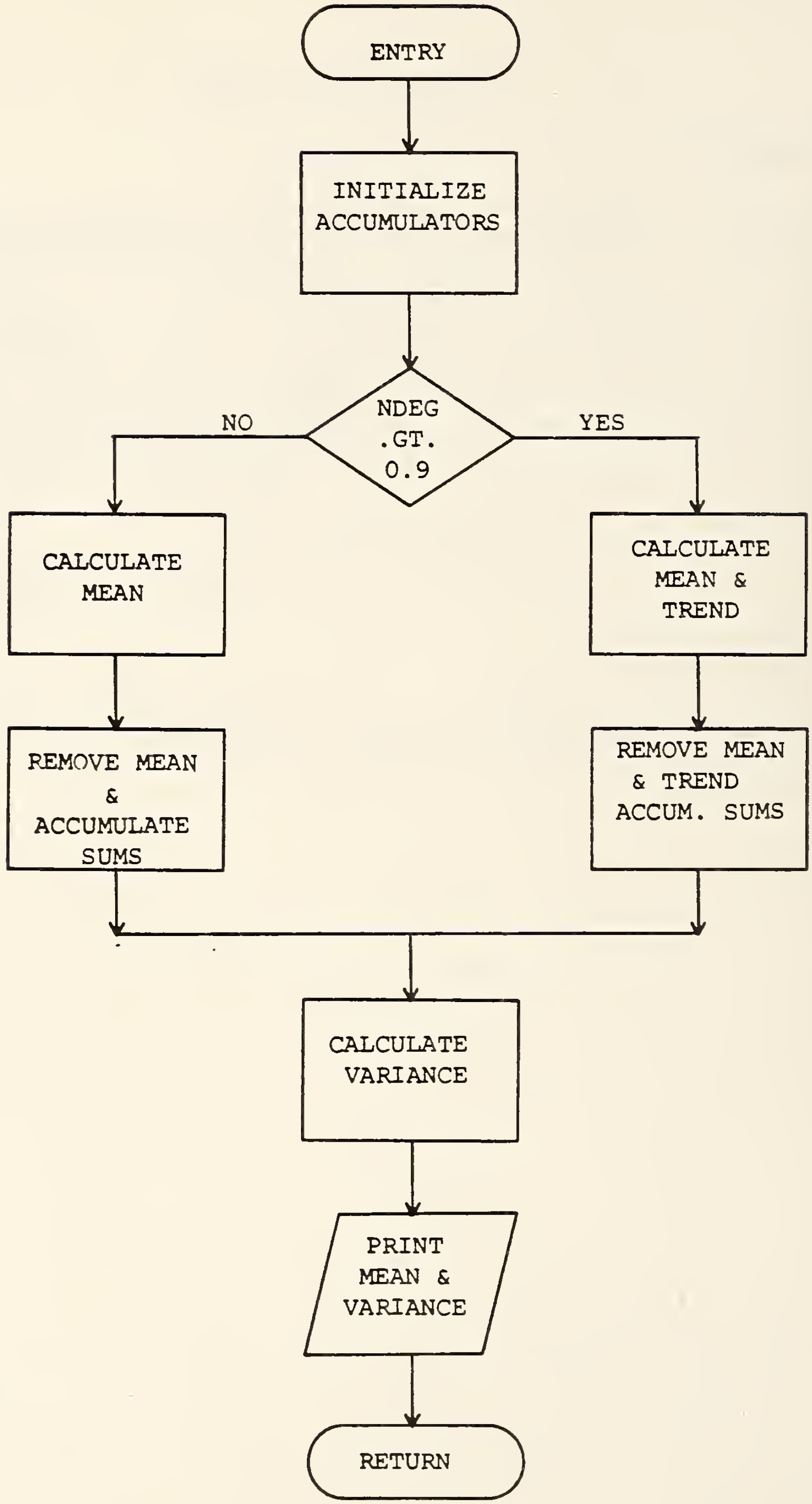


Figure 31. Subroutine DTRND2 Flow Chart

Table 9. DTRND2 Variable Name List

Name	Com	Type	Dimension	Usage
AVEI		R	1	N/2 + ½
I		I	1	General Index
N		I	1	Number of points to detrend
NDEG		I	1	Degree of polynomial to remove
S1		R	1	Sum of data values
S2		R	1	Another sum
SD		R	1	Standard deviation
SLOPE		R	1	Trend of the data
SUM		R	1	Sum of all data values
SUMM		R	1	Sum of data values equared
TMEAN		R	1	Mean value of X
VARI		R	1	Variance of X
X		R	Passed	Data array

```
      SUBROUTINE DTRND2 (X,N,NDEG,TMEAN,VARI)
      DIMENSION X(1)
      SD=0.0
      SUM=0.0
      SUMM=0.0
      S1=0.
      S2=0.
C      IF NDEG=1  REMOVE BOTH MEAN AND LINEAR TREND
      IF (NDEG.GT.0)    GO TO 20
      DO 8 I=1,N
      SUM=SUM+X(I)
 8    CONTINUE
      TMEAN=SUM/N
      SUM=0.0
      DO 10 I=1,N
      X(I)=X(I)-TMEAN
      SUM=SUM+X(I)
      SUMM=SUMM+X(I)*X(I)
 10   CONTINUE
      GO TO 100
C      REMOVE MEAN AND LINEAR TREND
   20 DO 22 I=1,N
      S1=S1+X(I)
   22 S2=S2+S1
      AVEI=0.5*(N+1.0)
      TMEAN=S1/N
      SLOPE=-12.*(S2-AVEI*S1)/(N*(N*N-1.0))
      DO 28 I=1,N
      X(I)=X(I)-TMEAN-SLOPE*(I-AVEI)
      SUM=SUM+X(I)
   28 SUMM=SUMM+X(I)*X(I)
C
C      COMPUTE S.D. AND VARI
  100 TEMP=SUMM/N-(SUM/N)*(SUM/N)
      VARI=TEMP
      IF(TEMP.GT.0.0)   SD=SQRT(TEMP)
C     VEL=TMEAN*.447
      PRINT 160,TMEAN,VARI
  160 FORMAT ('DTMEAN=',F10.6,'    VARI=',F10.6)
      RETURN
      END
```

DTRND2 Listing 17

ROUTINE INTRPN OPERATIONAL NOTES

This routine used four points from each end of a data record to interpolate NUMI missing points between using Newton's divided difference form.

In the case of old wind data to be decimated to .28 seconds sampling interval for anlysis use, NUMI=1 missing point needed to be supplied.

Table 10. INTRPN Variable Name List

Name	Com	Type	Dimension	Usage
DATA		R	Passed	Input Array
I		I	1	General Index
I2		R	1	General Index
IK		I	1	General Index
IKK		I	1	General Index
ISF		I	1	Initialization Flag
J		I	1	General Index
K		I	1	General Index
K2		I	1	General Index
KK		I	1	General Index
L1		I	1	Normalization Factor
L2		I	1	Normalization Factor
M		I	1	General Index
N		I	1	Number of Points Used From Each Record
NI		I	1	HUM2-N
N2		R	1	NUM1+1
NK		I	1	Number of Original Data Points/ Record
NN		I	1	N+1
NP		I	1	NK-3
NUM1		I	1	Number of Points to Interpolate
POLY		R	40	Polynomial

```
      SUBROUTINE INTRPN(NUM1,DATA,NK,ISF) ——INF
C     SUBROUTINE INTERP(N,NUM1,DATA,NK,ISF)
C
C-----VARIABLES
C           N:        NUMBER OF POINTS TO BE USED FROM EACH RECORD
C           NUM1:     NUMBER OF POINTS TO BE INTERPOLATED
C           DATA:     INPUT ARRAY, NK POINTS INPUT,NK+NUM1 OUTPUT
C                      MUST BE DIMENSIONED (NK+NUM1+4)
C
C-----USES NEWTON'S DIVIDED DIFFERENCE FORM FOR EQUALLY SPACED
C     POINT INTERPOLATION; FINDS POLYNOMIAL OF DEGREE N-1
C     (FOR N=NUM2-NUM1) AND INTERPOLATES POINTS BETWEEN
C     POLY(N/2) AND POLY(N/2+1) AT INTERVALS OF 1/(NUM1+1).
C
C-----LOCAL VARIABLES
C
      REAL DATA(1),POLY(40),I2,N2
      INTEGER NUM1,NUM2,I,K,K2,L1,L2,M,N
C
C-----INITIALIZE PROGRAM
      N=4
      M=N*2-1
      L1=1
      NF=NK-N+1
      PEND=2*N+NUM1
C
C-----STORE  LAST POINTS IN BEGINNING OF POLY
C
      IF (ISF.EQ.0)   GO TO 8000
C     RECALL STORED POINTS OF PREVIOUS RECORD
C
      DO 1 I=1,N
      K=NK+NUM1+I
1     POLY(I)=DATA(K)
C     PUT BEGINNING POINTS IN POLY
      DO 42 I=1,N
      K=N+I
   42 POLY(K)=DATA(I)
1000  CONTINUE
      DO 40 I=1,NK
      IK=NK-I+1
      IKK=NK-I+NUM1+1
40    DATA(IKK)=DATA(IK)
C
C-----CALCULATE POLYNOMIAL COEFFICENTS
C
10    K=N*2
      DO 2 I=1,M
      K=K-1
      L2=-L1
      POLY(K+1)=(POLY(K)-POLY(K+1))/L2
2     CONTINUE
      IF(M.EQ.1) GO TO 20
      M=M-1
```

```
      L1=L1+1
      GO TO 10
C
C-----CALCULATE INTERPOLATING POINTS FROM POLY
C
20    N1=NUM2-N
      NN=N+1
      I2=N
      M=N*2-1
      N2=NUM1+1
C
      DO 3 J=1,NUM1
      I2=I2+(1/N2)
      DATA(J)=POLY(N*2)
      K2=M
      DO 4 I=1,M
      DATA(J)=DATA(J)*(I2-K2)+POLY(K2)
      K2=M-1
4     CONTINUE
3     CONTINUE
C     STORE LAST POINTS IN END OF DATA ARRAY
 8000 DO 30 I=1,N
      K=NP+NUM1+I-1
      KK=K+N
   30 DATA(KK)=DATA(K)
      RETURN
      END
```

INTRPN Listing 18 (2 of 2)

PROGRAM MODE3D

INTRODUCTION

This program produces a small three dimensional view of the bridge at each recorded time increment. Each record requested in the main program uses one call to subroutine MODE3D which outputs 64 of the 3D bridge plots (16 down by 4 across) through the Calcomp plotter. A printout of data values is also output.

Using the Calcomp plotter to output the plots sets a practical limit of about four records per request. However, a test movie was created from a slightly modified deck in which more records were output continuously onto a filmed CRT screen.

See Figures 32 through 38, Table 11 and Listing 19.

OPERATIONAL NOTES

To keep a constant scaling from record to record a value of ASCALE is input for each run. A value of .030 will handle most events.

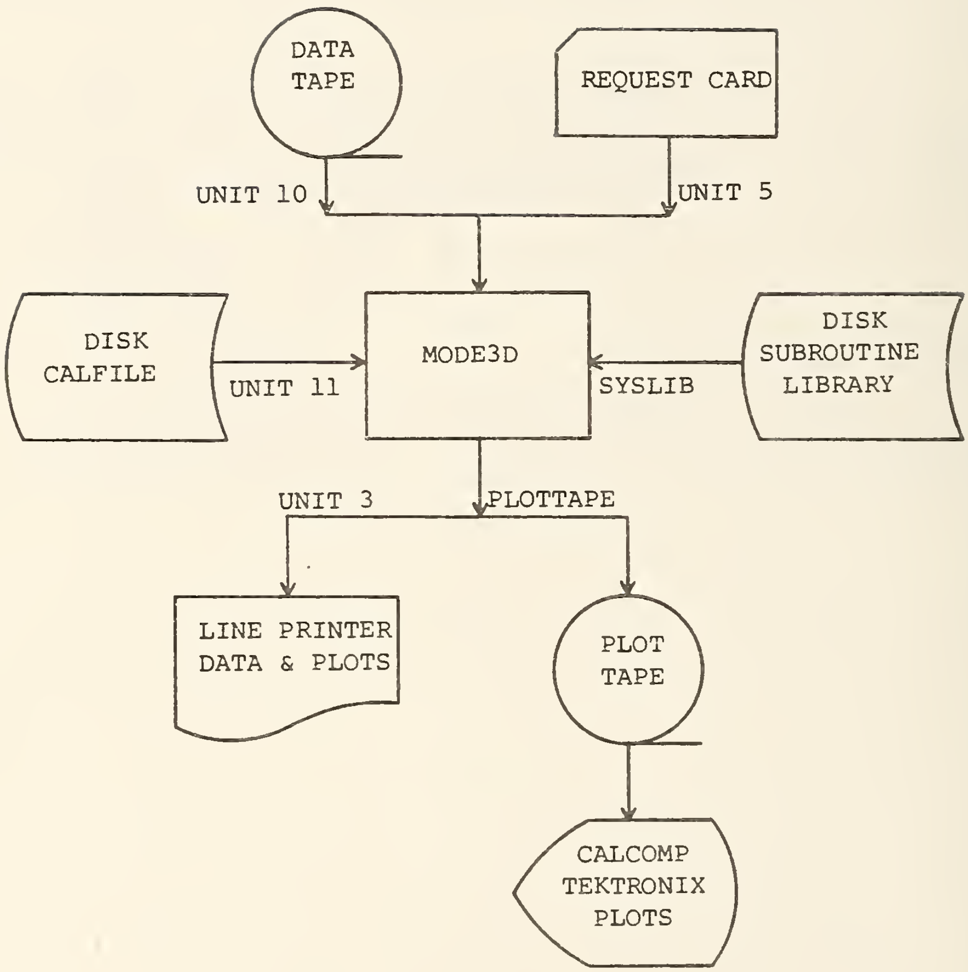


Figure 32. Program MODE3D Setup

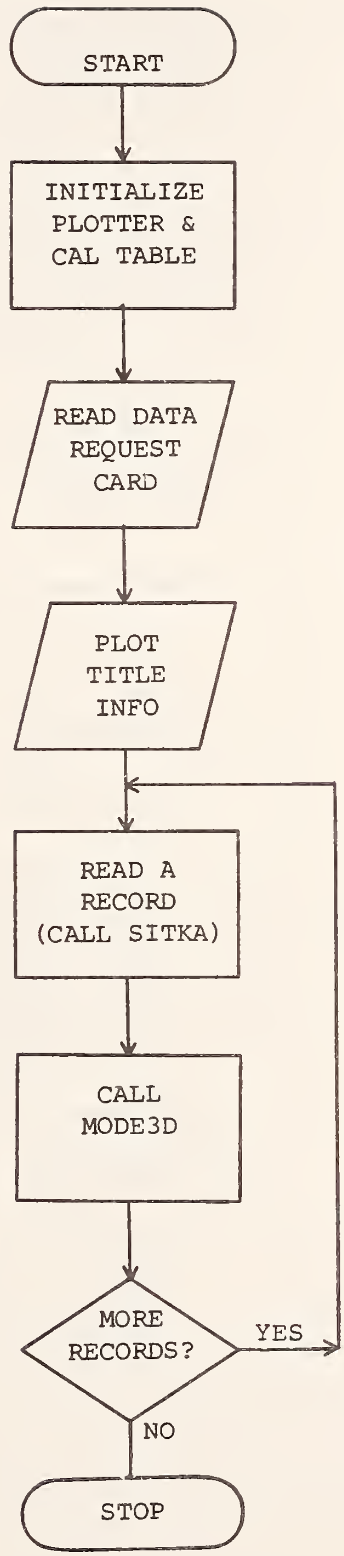


Figure 33. MODE3D Driver Flow Chart

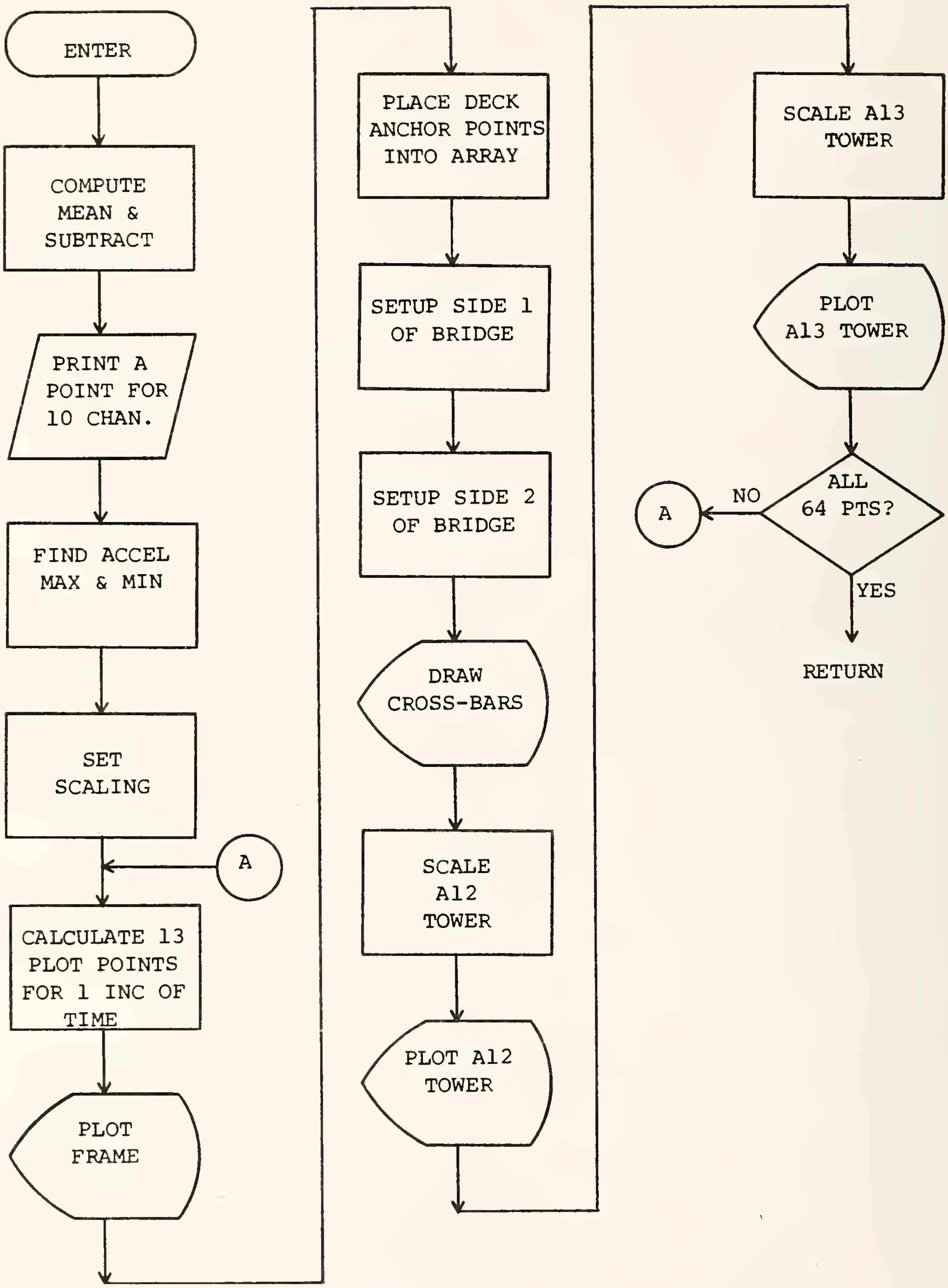


Figure 34. MODE3D Subroutine Flow Chart

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	---	Tape number	2A4	1-8
2	72274 - present (Sitka)	Recording date	I5	11-15

Figure 35. MODE3D Tape Number Card Format

10436   1255   1257   .03

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	1-9999	Tape number	I5	1-5
2	1-9999	Beginning record number	I5	6-10
3	1-4	Number of records to process	I5	11-15
4	Usually .03	ASCALE	F5.3	16-20

Figure 36. MODE3D Request Card

1	0.00893	-0.01163	0.00785	0.00466	0.00000	0.01089	0.01011	-0.00672	0.00844	-0.01031	0.01860
2	-0.00363	0.00407	0.00157	-0.00162	0.00000	-0.00481	-0.00245	0.00584	-0.00726	0.01226	-0.01595
3	-0.00991	0.00721	-0.01099	0.00780	0.00000	-0.00481	-0.00559	-0.00044	-0.00412	0.00226	-0.00339
4	0.01207	-0.00849	0.00157	-0.00162	0.00000	0.00461	0.00069	-0.00672	0.00530	-0.00716	-0.00553
5	0.00893	-0.00221	0.00785	-0.00790	0.00000	0.00147	-0.00245	-0.00044	-0.00098	0.00226	0.01546
6	-0.01619	0.01664	-0.01099	0.00466	0.00000	-0.00795	-0.00245	0.00584	-0.00412	0.00540	0.00290
7	0.00265	-0.00221	-0.00157	-0.00162	0.00000	-0.00167	-0.00245	-0.00358	0.00530	-0.00402	-0.00339
8	0.01521	-0.01477	0.00785	-0.00476	0.00000	0.00461	0.00697	-0.00672	-0.00098	-0.00088	-0.00967
9	-0.00991	0.01349	-0.00471	-0.00162	0.00000	-0.00481	-0.00245	0.00584	-0.01040	0.00226	0.00604
10	-0.00991	0.01035	-0.00157	-0.00162	0.00000	-0.00167	-0.00245	0.00584	0.00530	-0.00402	0.00290
11	0.01521	-0.01477	0.00157	-0.00162	0.00000	0.00461	0.01011	-0.00044	0.00530	-0.00402	-0.00967
12	-0.00049	0.00093	-0.00471	-0.00162	0.00000	-0.00481	-0.00559	0.00270	-0.00726	0.00854	-0.00339
13	-0.01619	0.01349	-0.00471	0.00466	0.00000	0.00461	-0.00245	-0.00044	0.00216	-0.01098	0.03630
14	0.00893	-0.00849	0.00785	-0.00162	0.00000	0.00461	0.00383	-0.00044	0.00530	-0.00716	-0.00967
15	0.00893	-0.01163	0.00157	-0.00162	0.00000	-0.00167	-0.00245	0.00584	-0.00412	0.01226	-0.03165
16	-0.01619	0.01349	-0.00471	0.00466	0.00000	-0.00167	-0.00245	0.00270	-0.00412	0.01226	-0.00653
17	-0.00363	0.00093	0.00785	-0.00162	0.00000	0.00461	0.00383	-0.00672	0.00530	-0.00402	0.02174
18	0.01521	-0.01477	0.00785	-0.00162	0.00000	0.00147	-0.00245	-0.00044	-0.00412	0.01226	0.03534
19	-0.00991	0.00721	-0.01099	0.00466	0.00000	-0.00795	-0.00245	0.00584	-0.00412	0.00854	-0.01595
20	-0.00991	0.01035	0.00157	-0.00162	0.00000	0.00461	0.00383	-0.00044	0.00844	-0.00716	-0.00339
21	0.00893	-0.01163	0.00471	-0.00790	0.00000	0.00461	0.00383	-0.00358	0.00216	-0.00402	-0.00339
22	0.00265	0.00093	-0.00785	0.00466	0.00000	-0.00481	-0.00873	0.00584	-0.01040	0.00854	0.00290
23	-0.00991	0.01035	-0.00471	0.00466	0.00000	0.00147	0.00383	-0.00044	0.00216	-0.00402	0.00918
24	0.00265	-0.00221	0.00471	-0.00790	0.00000	0.00461	0.01011	-0.00672	0.00530	-0.00716	-0.01281
25	0.00579	-0.00535	0.00157	0.00466	0.00000	-0.00167	-0.00559	0.00270	-0.00726	0.00854	0.00604
26	-0.00363	0.01035	-0.00785	0.00466	0.00000	-0.00795	-0.00245	0.00270	-0.00412	-0.00088	-0.00025
27	-0.00049	-0.00221	0.00785	-0.00476	0.00000	0.00147	0.00383	-0.00672	0.01472	-0.01031	-0.00339
28	0.00579	-0.00535	0.00785	-0.00162	0.00000	0.00147	-0.00245	-0.00044	-0.00412	0.00854	-0.00339
29	-0.00363	0.00721	-0.01099	0.00780	0.00000	-0.00795	-0.00559	-0.00044	-0.01354	0.00854	-0.00339
30	-0.00049	-0.00221	0.00157	-0.00162	0.00000	0.00461	0.00069	-0.00358	0.01158	-0.01659	0.00290
31	0.00579	-0.00535	0.00471	-0.00476	0.00000	0.00461	0.00383	-0.00044	0.01158	-0.00402	-0.00339
32	-0.00991	0.00407	-0.00471	0.00466	0.00000	-0.00481	-0.00559	0.00584	-0.01558	0.02110	0.00290
33	-0.00363	0.00093	0.00157	-0.00162	0.00000	-0.00167	0.00383	-0.00044	-0.00098	-0.00402	0.00290
34	0.00579	-0.00535	0.00785	-0.00162	0.00000	0.00461	0.00383	-0.00672	0.01786	-0.01659	-0.01595
35	-0.00363	0.00407	-0.00471	0.00466	0.00000	-0.00481	-0.00559	0.00584	-0.01340	0.01482	0.03534
36	-0.00363	0.00407	-0.00785	0.00466	0.00000	-0.00167	0.00383	-0.00044	-0.01658	0.00854	0.00918
37	0.00579	-0.00849	0.00785	-0.00476	0.00000	0.01089	0.00697	-0.00672	0.02100	-0.01659	-0.00967
38	-0.00363	0.00093	0.00157	0.00152	0.00000	-0.00167	-0.00873	0.00584	-0.00412	0.01226	-0.00339
39	-0.00991	0.00407	-0.01099	0.00780	0.00000	-0.00795	-0.00559	-0.00044	-0.01983	0.01482	0.00918
40	0.00893	-0.00849	0.00785	-0.00476	0.00000	0.01089	0.01011	-0.00358	0.01472	-0.01031	0.00604
41	0.00265	-0.00221	0.00785	-0.00476	0.00000	-0.00167	0.00069	-0.00044	0.01158	-0.00402	-0.00967
42	-0.00991	0.01349	-0.01099	0.01094	0.00000	-0.01109	-0.00873	0.00584	-0.01983	0.01482	-0.00339
43	0.00579	-0.00535	0.00157	-0.00162	0.00000	0.00147	0.00697	-0.00358	0.01158	-0.00402	0.00290
44	0.00893	-0.00849	0.00785	-0.00790	0.00000	0.00461	0.00383	-0.00358	0.01472	-0.00402	0.00918
45	-0.00991	0.01349	-0.01099	0.00466	0.00000	-0.00795	-0.00559	0.01212	-0.01040	0.01482	0.00290
46	-0.00049	0.00093	-0.00471	0.00466	0.00000	-0.00167	0.00069	-0.00358	0.00216	-0.00402	-0.01595
47	0.01521	-0.01477	0.00785	-0.00790	0.00000	0.00461	0.00383	-0.00672	0.01158	-0.01031	0.00290
48	-0.00991	0.01035	-0.00785	-0.00162	0.00000	-0.00481	-0.00559	0.00584	-0.01040	0.00854	0.02174
49	-0.00991	0.01035	-0.00471	0.00466	0.00000	-0.00167	0.00069	-0.00044	-0.00098	0.01226	0.00290
50	0.01835	-0.01477	0.01099	-0.00476	0.00000	0.00775	0.00383	-0.00672	0.01158	-0.01031	-0.02223

Figure 37-1. Raw Data

51	-0.00049	-0.00221	0.00157	-0.00162	0.00000	-0.00481	-0.00559	-0.00044	-0.00098	0.00226	0.00604
52	-0.02247	0.01664	-0.00785	0.00780	0.00000	-0.00157	-0.00245	0.00584	-0.00726	0.00854	0.01232
53	0.00893	-0.01163	0.00785	-0.00790	0.00000	0.00461	0.00383	-0.00672	0.00530	-0.00402	-0.00553
54	0.01521	-0.01163	0.00157	0.00152	0.00000	0.00461	-0.00245	-0.00044	0.00216	-0.00088	-0.00025
55	-0.01619	0.01664	-0.00471	0.00466	0.00000	-0.00157	-0.00559	0.00584	-0.00726	0.00226	-0.00325
56	-0.00363	0.00093	0.00157	-0.00162	0.00000	0.00461	0.00383	-0.00044	0.00844	-0.00402	0.00290
57	0.01521	-0.01477	0.00157	-0.00476	0.00000	0.00147	0.00383	-0.00044	-0.00398	0.00226	0.00604
58	-0.00991	0.01035	-0.00471	0.00466	0.00000	-0.00481	-0.00559	0.00584	-0.01340	0.00854	0.00290
59	-0.00991	0.01035	0.00157	-0.00162	0.00000	0.00147	0.00383	-0.00672	0.00844	-0.01031	-0.00325

Figure 37-1. Raw Data (continued)

```
ACC MAX     0.01835   0.01664   0.01099   0.01094   0.00000   0.01089   0.01011   0.01212   0.02100   0.02110

ACC MIN    -0.02247  -0.01477  -0.01099  -0.00790   0.00000  -0.01109  -0.00873  -0.00672  -0.01983  -0.01659


OVERALL MAX.=     0.02110          OVERALL MIN.=    -0.02247 FOR RECNO=   36
   1       -0.17863   0.23260  -0.15703  -0.09324  -0.00006  -0.21733  -0.20218   0.13446  -0.16891   0.29610  -0.37197
FIRST FRAME (1,3,5,7,9) X,Y ARRAYS
0.0    1.0000 1.5000 2.0000 3.0000 4.0000 4.5000 5.0000 6.0000
0.0   -0.1786 0.0   -0.1570-0.0001-0.2022 0.0   -0.1688 0.0
FIRST FRAME (1,3,5,7,9) X,Y ARRAYS
0.5000 1.5000 2.0000 2.5000 3.5000 4.5000 5.0000 5.5000 6.5000
1.0000 1.2326 1.0000 0.9068 0.7821 1.1345 1.0000 1.2061 1.0000
X,Y ARRAY FOR A13 TOWER DATA 4.500000 4.500000 4.435225 0.0      1.000000-0.330000 0.0      1.400000 0.0      1.000000
   2        0.07262  -0.08146  -0.03141   0.03239  -0.00006   0.09618   0.04907  -0.11679   0.14525  -0.04515   0.31897
   3        0.19824  -0.14427   0.21984  -0.15605  -0.00006   0.09513   0.11189   0.00883   0.08244  -0.04515   0.06772
   4       -0.24144   0.16979  -0.03141   0.03239  -0.00006  -0.09226  -0.01374   0.13446  -0.10600   0.14329   0.13053
   5       -0.17863   0.04416  -0.15703   0.15801  -0.00006  -0.02944   0.04907   0.00883   0.01953  -0.04515  -0.30916
   6        0.32387  -0.33271   0.21984  -0.09324  -0.00006   0.15899   0.04907  -0.11579   0.08244  -0.21796  -0.05791
   7       -0.05301   0.04416   0.03141   0.03239  -0.00006   0.03337   0.04907   0.07165  -0.10600   0.08048   0.06772
   8       -0.30426   0.29561  -0.15703   0.09520  -0.00006  -0.09226  -0.13936   0.13446   0.01953   0.01767   0.19334
   9        0.19824  -0.26990   0.09422   0.03239  -0.00006   0.09618   0.04907  -0.11579   0.22837  -0.04515  -0.12072
  10        0.19824  -0.20708   0.03141   0.03239  -0.00006   0.03337   0.04907  -0.11679  -0.10600   0.08048  -0.05791
  11       -0.30426   0.29561  -0.03141   0.03239  -0.00006  -0.09226  -0.20218   0.00883  -0.17600   0.08048   0.19334
  12        0.00981  -0.01865   0.09422   0.03239  -0.00006   0.09618   0.11189  -0.05398   0.14525  -0.17077   0.06772
  13        0.32387  -0.26990   0.09422  -0.09324  -0.00006  -0.09226   0.04907   0.00883  -0.04318   0.01767  -0.68603
  14       -0.17863   0.16979  -0.15703   0.03239  -0.00006  -0.09226  -0.07655   0.00883  -0.17600   0.14329   0.19334
  15       -0.17863   0.23260  -0.03141   0.03239  -0.00006   0.03337   0.04907  -0.11679   0.08244  -0.04515   0.63303
  16        0.32387  -0.26990   0.09422  -0.09324  -0.00006   0.03337   0.04907  -0.05398   0.08244  -0.04515   0.13053
   1        0.07262  -0.01865  -0.15703   0.03239  -0.00006  -0.09226  -0.07655   0.13446  -0.17600   0.08048  -0.43478
X,Y ARRAY FOR A13 TOWER DATA 4.500000 4.500000 4.403818 0.0      1.000000-0.330000 0.0      1.400000 0.0      1.000000
   2       -0.30426   0.29541  -0.15703   0.03239  -0.00006  -0.02944   0.04907   0.00883   0.08244  -0.04515  -0.12072
   3        0.19824  -0.14427   0.21984  -0.09324  -0.00006   0.15899   0.04907  -0.11679   0.08244  -0.17077   0.31897
   4        0.19824  -0.20708  -0.03141   0.03239  -0.00006  -0.09226  -0.07655   0.00883  -0.16891   0.14329   0.06772
   5       -0.17863   0.23260  -0.09422   0.15801  -0.00006  -0.09226  -0.07655   0.07165  -0.04318   0.08048   0.06772
   6       -0.05301  -0.01865   0.15703  -0.09324  -0.00006   0.09613   0.17470  -0.11679   0.22837  -0.17077  -0.05791
   7        0.19824  -0.20708   0.09422  -0.09324  -0.00006  -0.02944  -0.07655   0.00883  -0.04318   0.08048  -0.18353
   8       -0.05301   0.04416  -0.09422   0.15801  -0.00006  -0.09226  -0.20218   0.13446  -0.10600   0.14329   0.25616
   9       -0.11582   0.10698  -0.03141  -0.09324  -0.00006   0.03337   0.11189  -0.05398   0.14525  -0.17077  -0.12072
  10        0.07262  -0.20708   0.15703  -0.09324  -0.00006   0.15899   0.04907  -0.05398   0.08244   0.01767   0.00491
  11        0.00981   0.04416  -0.15703   0.09520  -0.00006  -0.02944  -0.07655   0.13446  -0.29443   0.20610   0.06772
  12       -0.11582   0.10698  -0.15703   0.03239  -0.00006  -0.02944   0.04907   0.00883   0.08244  -0.17077   0.06772
  13        0.07262  -0.14427   0.21984  -0.15605  -0.00006   0.15899   0.11189   0.00883   0.27088  -0.17077   0.06772
  14        0.00981   0.04416  -0.03141   0.03239  -0.00006  -0.09226  -0.01374   0.07165  -0.23162   0.33173  -0.05791
  15       -0.11582   0.10698  -0.09422   0.09520  -0.00006  -0.09226  -0.07655   0.00883  -0.23162   0.08048   0.06772
  16        0.19824  -0.08146   0.09422  -0.09324  -0.00006   0.09618   0.11189  -0.11679   0.33369  -0.42202  -0.05791
   1        0.07262  -0.01865  -0.03141   0.03239  -0.00006   0.03337  -0.07655   0.00883   0.01963   0.08048  -0.05791
X,Y ARRAY FOR A13 TOWER DATA 4.500000 4.500000 4.592256 0.0      1.000000-0.330000 0.0      1.400000 0.0      1.000000
   2       -0.11582   0.10698  -0.15703   0.03239  -0.00006  -0.09226  -0.07655   0.13446  -0.35725   0.33173   0.31897
   3        0.07262  -0.08146   0.09422  -0.09324  -0.00006   0.09618   0.11189  -0.11679   0.20807  -0.29640  -0.12072
   4        0.07262  -0.08146   0.15703  -0.09324  -0.00006   0.03337  -0.07655   0.00883   0.33369  -0.17077  -0.18353
   5       -0.11582   0.16979  -0.15703   0.09520  -0.00006  -0.21788  -0.13936   0.13446  -0.42006   0.33173   0.19334
```

Figure 37-2. MODE3D Data

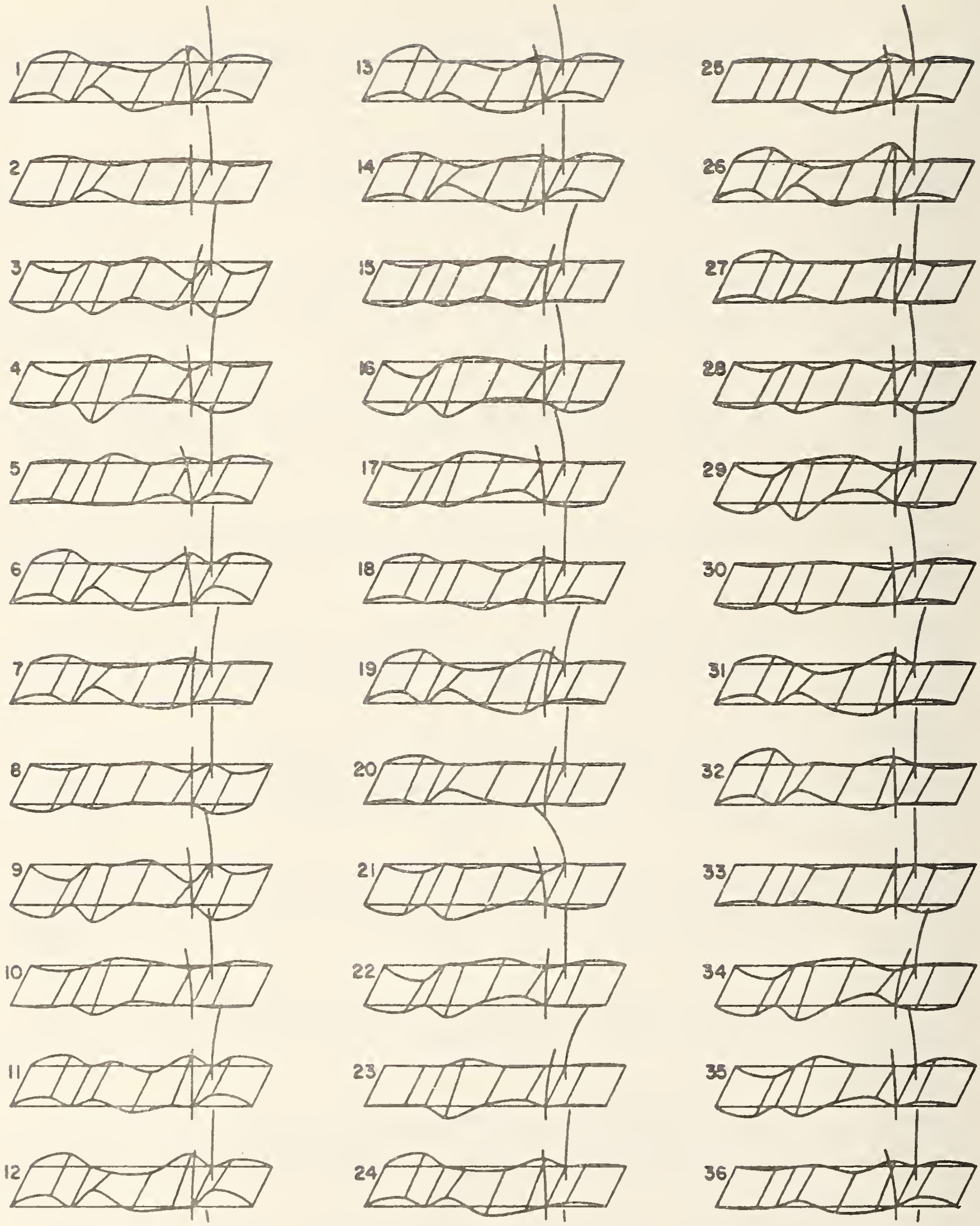


Figure 38. Example MODE3D Program Display

Table 11. MODE3D Variable Name List

Name	Com	Type	Dimension	Usage
ACCMAX		R	10	Max acceleration for ea deck channel
ACCMIN		R	10	Min Acceleration for ea deck channel
ALLMAX		R	1	Overall maximum data value
ALLMIN		R	1	Overall minimum data value
AMAX		R	1	Temporary accelaration maxima
AMIN		R	1	Temporary acceleration minima
ASCALE		R	1	Scale factor
CENTER		R	1	Firstv/deltav
DATE		R	1	Date
DELTAV		R	1	Increment
FIRSTV		R	1	First value
FMEAN		R	1	Mean value
I		I	1	General index
IBUF		I	2000	Plot buffer storage
ID		I	1	General index
IDATE		I	1	Date (yr, jul date)
IFF		I	1	Function flag
IFRM		I	1	Current frame being processed
IRF		I	1	Read status flag
ISIDE		I	1	Side of bridge
ITAPE		I	1	Tape number (integer)
J		I	1	General index
JJ		I	1	General index
K		I	1	General index
NN		I	1	General index
NP		I	1	Number of points per record
NREC		I	1	Number of records
P		R	80, 13	Array of acceleration data
REC		R	1	Record number
RECNO		I	1	Record number
SENS		R	64, 37	1 raw data record

Table 11. MODE3D Variable Name List (continued)

Name	Com	Type	Dimension	Usage
SKALE		I	1	Scaling factor
TAPE		R	1	Tape number
TAPENO		I	2	Tape number literal
TOTAL		R	1	Sum of accelerations on 1 channel
X		R	11	X coordinate of bridge data points
XCFR		R	1	X location of current bridge frame
XL		R	1	X location of a sensor in a frame
XLOC		R	1	X coordinate for plotter
Y		R	11	Y coordinate of bridge data points
YCFR		R	1	Y location of current bridge frame
YLOC		R	1	Y coordinate for plotter
KAC		R	1	Kth accelerometer

```
C       PROGRAM M3D
C
C       THIS DRIVER PROGRAM PLOTS A SCALED 3D VIEW OF THE SITKA BRIDGE
C       AT EACH RECORDED TIME INCREMENT.
C       EACH RECORD TO PLOT USES 1 CALL TO MODE3D WHICH OUTPUTS 64 OF THE
C       3D BRIDGE PLOTS (16 DOWN BY 4 ACROSS).
C
C       ROUTINES CALLED: SITKA, MODE3D
C
C       PROG. BY RAY Z. SOTOUDEH    S.T.A.    11/2/73
C       MODIFIED BY DUANE NELSON    S.T.A.    1977
C
        DIMENSION SENS(64,37)
        DIMENSION IBUF(2000)
        INTEGER TAPENO(2),RECNO
        CALL PLOTS(IBUF,2000,6)
        CALL NEWPEN(1)
        CALL FACTOR (.50)
        CALL PLOT(0.0,0.0,-3)
        IFF=1
C
C       READ TAPE NUMBER CARD (TO INIT SENSOR TABLE) THEN REQUEST CARD
C
        CALL SITKA(IFF,RECNO,IRF,SENS,TAPENO,IDATE)
        READ 25,ITAPE,RECNO,NREC,ASCALE
     25 FORMAT (3I5,F5.3)
C
C       PLOT TITLE INFORMATION
C
        TAPE=ITAPE
        REC=RECNO
        DATE=IDATE
        CALL SYMBOL (0.0,39.0,.21,5HTAPE=,0.,5)
        CALL NUMBER(999.,999.,.21,TAPE,0.,-1)
        CALL SYMBOL (999.,999.,.21,4HREC=,0.,4)
        CALL NUMBER(999.,999.,.21,REC,0.,-1)
        CALL SYMBOL (999.,999.,.21,5HDATE=,0.,5)
        CALL NUMBER(999.,999.,.21,DATE,0.,-1)
C
        IFF=3
        DO 100 I=1,NREC
        CALL SITKA(IFF,RECNO,IRF,SENS,TAPENO,IDATE)
        XLOC=0.
        YLOC=0.
        PRINT 95,RECNO
     95 FORMAT ('1RAW DATA FOR RECNO=',I4,//)
        CALL MODE3D (XLOC,YLOC,SENS,ASCALE)
        CALL PLOT (10.0,0.,-3)
    100 CONTINUE
C
        CALL PLOT(0.0,0.0,999)
        STOP
        END
```

MODE3D Listing 19 (1 of 5)

```
C      SUBROUTINE  M U D E 3 D
C-----------------------------------------------------------------------
C      SUBROUTINE MODE3D (XLOC,YLOC,SENS,ASCALE)
C      THIS ROUTINE PLOTS THE MODE OF THE SITKA BRIDGE IN 3-D VIEWS.
C      EACH CALL PRODUCES 64 BRIDGE FRAMES (16 DOWN BY 4 ACROSS).
C
C      ROUTINES CALLED: NONE
C
C      PARAMETERS:
C         XLOC,YLOC- STARTING LOCATION FOR THE PLOT ON PAPER
C         SENS- ARRAY CONTAINING 1 FULL RECORD OF RAW ACCEL DATA.
C         ASCALE- MANUAL SCALING FACTOR (USUALLY SET=.036)
C
C      PROG. BY RAY Z. SOTOUDEH   S.T.A.   11/2/73
C      MODIFIED BY DUANE NELSON   S.T.A.   1977
C-----------------------------------------------------------------------
C
       SUBROUTINE MODE3D (XLOC,YLOC,SENS,ASCALE)
       DIMENSION P(80,13),ACCMAX(10),ACCMIN(10)
       DIMENSION SENS(64,37)
       DIMENSION X(11),Y(11)
       NP=64
       DO 30 J=1,13
       DO 15 I=1,64
       JJ=J*2
    15 P(I,J)=SENS(I,JJ)
       TOTAL=0.0
       DO 20 I=1,NP
       TOTAL=TOTAL+P(I,J)
 20    CONTINUE
C
C      COMPUTE MEAN AND SUBTRACT IT FROM EACH PT.
C
       FMEAN=TOTAL/NP
       DO 25 I=1,NP
       P(I,J)=P(I,J)-FMEAN
       IF(J.NE.12)  GO TO 25
       PRINT 2000,I,(P(I,JJ),JJ=1,10),P(I,12)
 2000  FORMAT(1X,I4,4X,11(1X,F9.5))
 25    CONTINUE
 30    CONTINUE
C
C      FIND ACC. MAX & MIN AND ALSO OVERALL MAX & MIN
C
       ALLMAX=P(1,1)
       ALLMIN=P(1,1)
       XL=1.0
       DO 40 J=1,10
       AMAX=P(1,J)
       AMIN=P(1,J)
       DO 35 I=1,NP
       IF(P(I,J).GT.AMAX)  AMAX=P(I,J)
       IF(P(I,J).LT.AMIN)  AMIN=P(I,J)
 35    CONTINUE
```

MODE3D Listing 19 (2 of 5)

```
      ACCMAX(J)=AMAX
      ACCMIN(J)=AMIN
      IF(AMAX.GT.ALLMAX)  ALLMAX=AMAX
      IF(AMIN.LT.ALLMIN)  ALLMIN=AMIN
      FJ=J
      XL=XL+1.5
 40   CONTINUE
      PRINT 2500,(ACCMAX(JJ),JJ=1,10),(ACCMIN(LL),LL=1,10),ALLMAX,ALLMIN
 2500 FORMAT(1H0,7HACC MAX,2X,10F10.5,/,1H0,7HACC MIN,2X,10F10.5,//,
     11H0,14HOVERALL MAX.=  ,F10.5,10X,14HOVERALL MIN.=  ,F10.5)
      IF(ALLMAX.EQ.ALLMIN)  GO TO 99
      IF(ABS(ALLMAX).GT.ABS(ALLMIN))  ALLMIN=-1.0*ALLMAX
      IF(ABS(ALLMAX).LT.ABS(ALLMIN))  ALLMAX=-1.0*ALLMIN
C
C     SET SCALING FACTORS
C       MANUALLY SET SCALING CONSTANT OVER ALL RECORDS
C     ALLMIN=-.06  ON OLD RUNS OF SMALL ROADBED EVENTS
C
      ALLMIN=-ASCALE
      ALLMAX=-ALLMIN
      FIRSTV=ALLMIN
      DELTAV=(ALLMAX-ALLMIN)/1.2
      CENTER=-FIRSTV/DELTAV
C
      DO 70 I=1,4
      DO 60 J=1,16
      IFRM=(I-1)*16+J
      DO 42 K=1,13
      P((I-1)*16+J,K)=(P((I-1)*16+J,K)-FIRSTV)*(-1.0/DELTAV) +CENTER
      IF(K.EQ.12)  PRINT 2000,J,(P(IFRM,KL),KL=1,10),P(IFRM,12)
 42   CONTINUE
C
C       RESET ORIGIN FOR THIS FRAME (TO LOWER LEFT CORNER OF BRIDGE)
C
      XCFR=0.
      IF (J.EQ.1.AND.I.GE.2)   XCFR=7.0
      YCFR=-2.5
      IF (J.EQ.1.AND.I.GE.2)   YCFR=37.5
      CALL PLOT (XCFR,YCFR,-3)
C
C     PLOT THREE DIMENSIONAL FRAME OF BRIDGE
C
      CALL PLOT(XLOC,YLOC,3)
      CALL PLOT(XLOC+6.0,YLOC,2)
      CALL PLOT(XLOC+6.5,YLOC+1.0,2)
      CALL PLOT(XLOC+.5,YLOC+1.0,2)
      CALL PLOT(XLOC,YLOC,2)
      CALL PLOT(XLOC+1.5,YLOC,3)
      CALL PLOT(XLOC+2.0,YLOC+1.0,2)
      CALL PLOT(XLOC+5.0,YLOC+1.0,3)
      CALL PLOT(XLOC+4.5,YLOC,2)
      CALL PLOT(XLOC,YLOC,3)
C
C       ENTER FIRSTV AND DELTAV (ASSUME DATA ALREADY SCALED FOR PLOT)
```

MODE3D Listing 19 (3 of 5)

```
C
      X(10)=0.0
      Y(10)=0.0
      X(11)=1.0
      Y(11)=1.0
      KAC=-1
      DO 50 ISIDE=1,2
C
C       PLACE DECK ANCHOR POINT LOCATIONS INTO ARRAY
C
      X(1)=XLOC-.5+(ISIDE*.5)
      Y(1)=YLOC+ISIDE-1
      X(3)=XLOC+1.0+(ISIDE*.5)
      Y(3)=YLOC+ISIDE-1
      X(7)=XLOC+4.0+(ISIDE*.5)
      Y(7)=YLOC+ISIDE-1
      X(9)=XLOC+5.5+ISIDE*.5
      Y(9)=YLOC+ISIDE-1
C
C       FIRST SETUP DATA FOR SIDE 1 OF BRIDGE - ACCEL(KAC)=1,3,5,7,9
C
      DO 45 K=2,8
      IF (K.EQ.3.OR.K.EQ.7)   GO TO 45
      KAC=KAC+2
C
C       XL IS ACCEL LOCATION ON PLOT RELATIVE TO SW CORNER OF DECK
C
      XL=XL+1.0
      X(K)=XLOC+XL
      Y(K)=YLOC+ISIDE-1+P((I-1)*16+J,KAC)
   45 CONTINUE
      IF (J.EQ.1.AND.I.EQ.1)   PRINT 46,(X(ID),ID=1,9),(Y(ID),ID=1,9)
   46 FORMAT (' FIRST FRAME (1,3,5,7,9) X,Y ARRAYS',/,9F7.4,/,9F7.4)
      CALL FLINE (X,Y,-9,1,0,3)
      IF (ISIDE.EQ.2)   GO TO 50
C
C       NOW SETUP FOR SIDE 2 OF BRIDGE - ACCEL(KAC)=2,4,6,8,10
C
      KAC=0
      XL=.5
      CALL PLOT (XLOC+.5,YLOC+1.0,3)
 50   CONTINUE
      XL=0.0
C
C       DRAW DATA CROSS-BARS
C
      DO 55 K=1,10,2
      XL=XL+1.0
      CALL PLOT(XLOC+XL,YLOC+P((I-1)*16+J,K),3)
      CALL PLOT(XLOC+XL+.5,YLOC+1.0+P((I-1)*16+J,K+1),2)
 55   CONTINUE
      SKALE=1.0/DELTAV
C
C       SETUP FOR A12 TOWER DATA
```

```
C
      X(3)=P(IFRM,13) +5.0
      X(1)=5.0
      X(2)=5.0
      X(3)=P(IFRM,12)*.5 +5.0
C     X(3)=SENS((I-1)*16+J,26)*SKALE +5.C
      Y(1)=0.67
C     Y(1)=0.5
      Y(2)=1.0
      Y(3)=2.4
C
C       ENTER FIRSTV AND DELTAV
C
      X(4)=0.0
      X(5)=1.0
      Y(4)=0.0
      Y(5)=1.0
      CALL PLOT (X(1),Y(1),3)
      CALL FLINE (X,Y,-3,1,C,2)
C
C       SETUP A13 TOWER DATA
C
      X(1)=4.5
      X(2)=4.5
      X(3)=P(IFRM,13)*.5 +4.5
C     X(3)=SENS((I-1)*16+J,24)*SKALE +4.5
      Y(1)=-0.33
      Y(2)=0.0
      Y(3)=1.4
      CALL PLOT (X(1),Y(1),3)
      CALL FLINE (X,Y,-3,1,0,2)
      IF (J.EQ.1)   PRINT 54,(X(ID),ID=1,5),(Y(ID),ID=1,5)
   54 FORMAT (' X,Y ARRAY FOR A13 TOWER DATA',10F9.6)
  60  CONTINUE
  70  CONTINUE
C
  500 CONTINUE
      CALL PLOT (C.,40.0,-3)
      RETURN
C
  99  PRINT 5000,ALLMAX
 5000 FORMAT(1H1,35HMODE3D--NO MOTION, CONSTANT DATA =    ,F9.6)
      STOP 99
      END
```

MODE3D Listing 19 (5 of 5)

SUBROUTINE NEWPRT

INTRODUCTION

Subroutine NEWPRT provides access to data recorder on magnetic tapes by an instrumentation system installed on the Narragansett Bay bridge in Newport, Rhode Island. Separate documentation describes the instrumentation configuration at that site.

The general use, device assignments, and flow of the subroutine are shown in the set up and flow chart provided herein. Essentially, the subroutine has two functional modes: Initialization, and Read. This subroutine must be executed in the initialization mode only once before the first execution in the read mode. In the initialization mode, a tape number card is read from the normal system input device. Using the Julian recording date on the card, a calibration file is accessed and channel calibration constants, in effect as of the recording date, are selected for each channel. A channel calibration table is printed to indicate channel/sensor assignments and calibration constants.

In the read mode, each call to the subroutine causes a record to be read from tape and sensor data to be unpacked, calibrated and returned to the calling routine. The record number to be read must be provided to the routine for each call in the read mode; however, the record number is incremented by one after each read operation and therefore, when processing sequential records, only the record number of the first record to be processed is required as a calling parameter. A status flag indicates the results of each read attempt.

See Figures 39 and 40 and Listing 20.

OPERATIONAL NOTES

The following notes describe operating considerations for the subroutine:

1. The program is written in FORTRAN IV for IBM 360/370 computers under OS using a G level compiler.

2. Partial word (byte) manipulations are required to unpack data from uncoded binary data records. This was accomplished by equivalencing LOGICAL*1 and INTEGER*4 words in the IBM 360. More direct approaches may be used on other systems. A detailed tape format is included in this document.

3. Note that explicit declarations of variable type are used, i.e., RECNO is an INTEGER.

4. I/O errors encountered using FORTRAN under OS/360 must be cleared. This is accomplished in the subroutine by branching to a dummy read statement via the ERR = option in the original read statement. If clearing is not required in the object system, the dummy READ statement should be removed.

5. The program reads copies of original data tapes. A flag in byte 2248 of each record indicates the status of the original tape record. The read status flag, IRF, indicates the status of the read operation as follows:

   0 - record not read
   1 - successful read
   2 - I/O error on copy tape
   3 - EOF encountered
   4 - I/O error on original tape

6. The subroutine will skip ahead to required record numbers. If access to earlier records is required, the calling routine must rewind or backspace the tape to the record preceding the required record, reset RECNO to the required record number, Set IFF=2 to Reset CURREC = 0; Set IFF=3 to Continue incrementing CURREC and call the subroutine in the read mode.

7. Data for each record are returned in the SENS array.

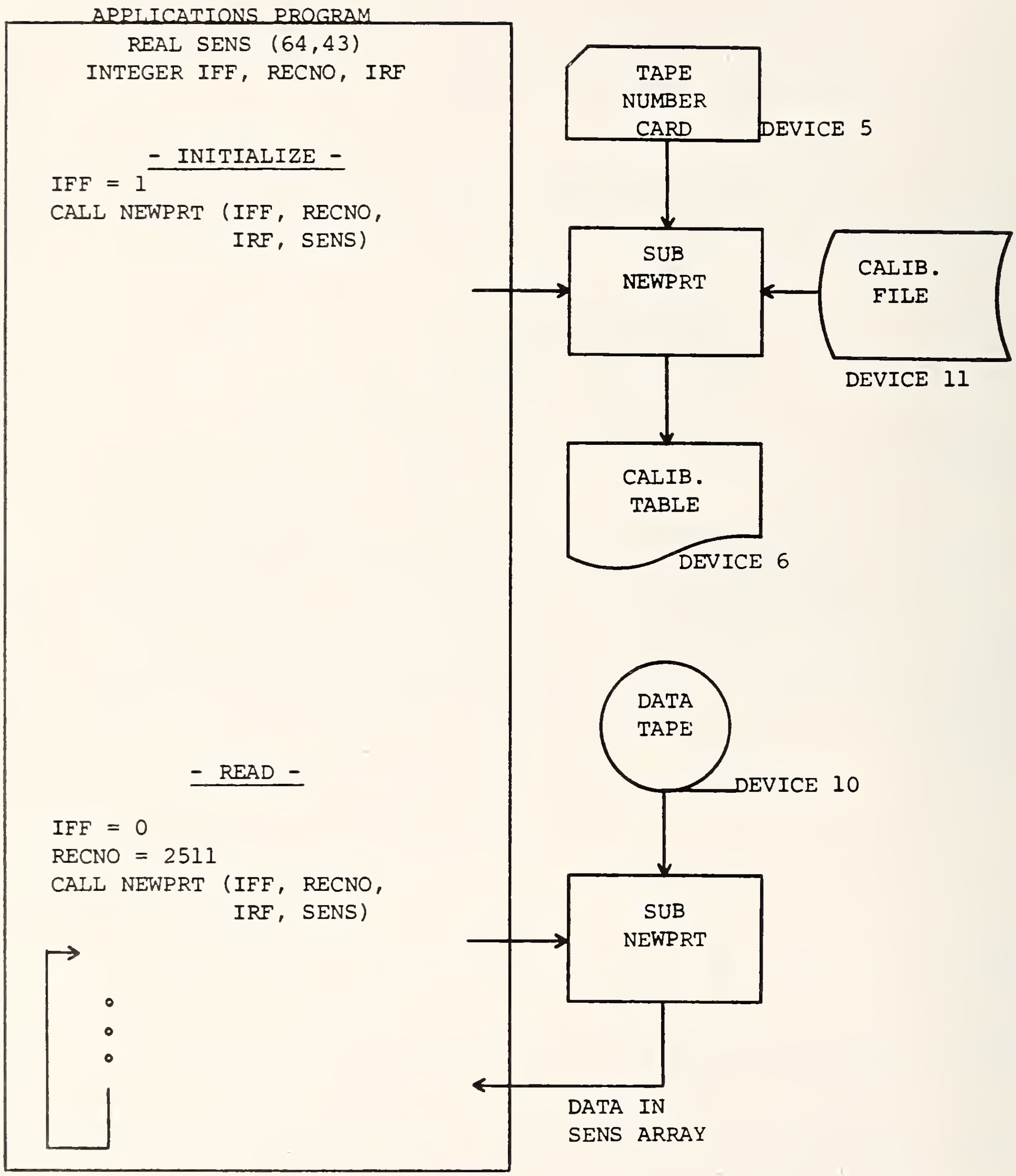


Figure 39. Subroutine NEWPRT Setup

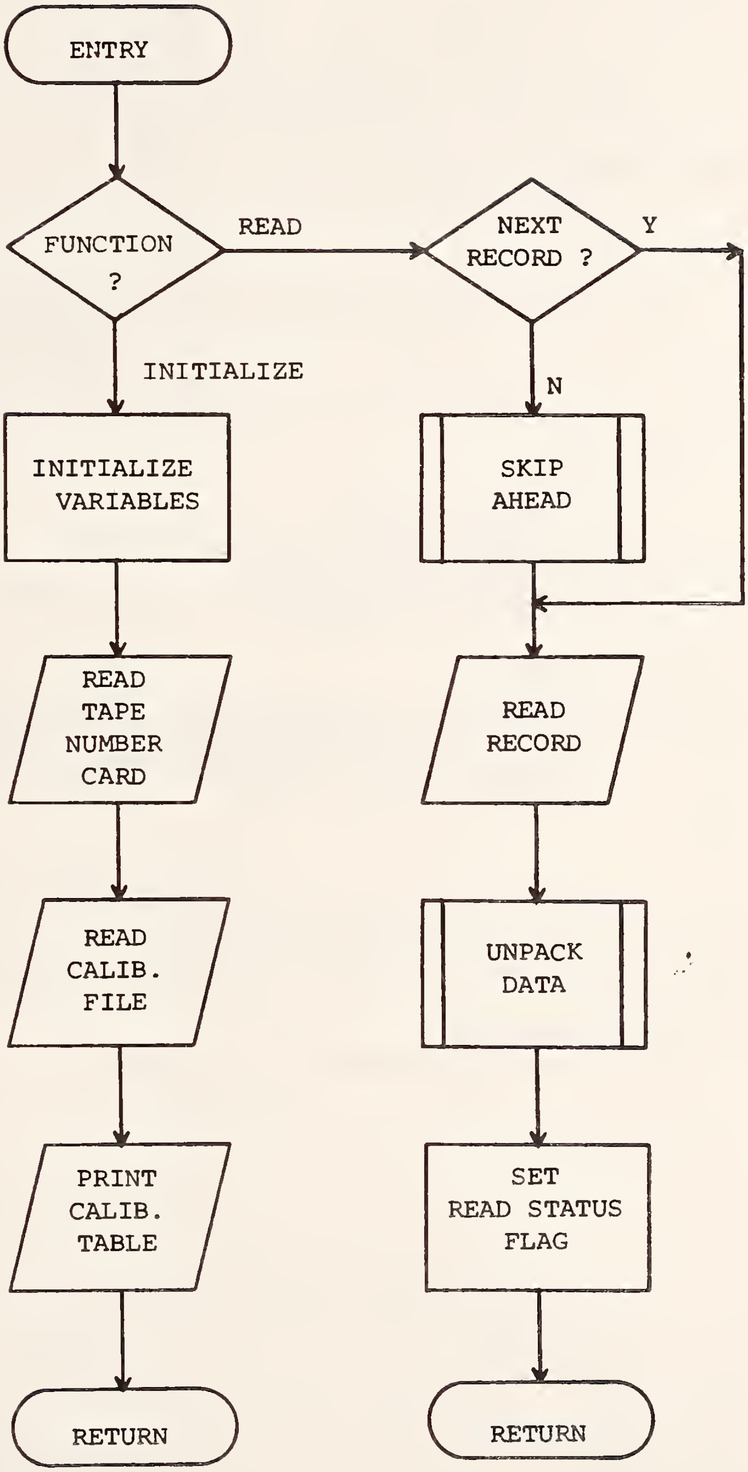


Figure 40. Subroutine NEWPRT General Flow Diagram

```
      SUBROUTINE NEWPRT(IFF,RECNO,IRF,SENS,TAPENO,DATE)
C-----INITIALIZES AND READS NEWPORT DATA TAPE RECORDS
C
C-----REQUIRES TAPE ON UNIT 10, CALFIL ON UNIT 11 AND
C-----STANDARD TAPE NUMBER CARD AFTER SYSIN DD CARD
C
C     ROUTINES CALLED: NONE
C
C-----IFF = FUNCTION FLAG:
C                    1 - INITIALIZE
C-----           2 - READ TAPE AFTER REWINDING (CURREC RESET=0)
C-----           3 - READ TAPE STARTING FROM WHERE LAST CALL LEFT OFF
C
C-----RECNO = REQUIRED RECORD NUMBER, AUTO-INCREMENTED FOR EACH READ
C
C-----IRF = READ STATUS FLAG:
C                   0 - RECORD NOT READ
C                   1 - SUCCESSFUL READ
C                   2 - I/O ERROR READ AND CLEARED
C                   3 - EOF ENCOUNTERED
C                   4 - ORIGINAL TAPE ERROR
C
C-----SENS = SENSOR DATA ARRAY:
C           64 VALUES OF WIND SENSOR CHANNEL DATA STORED IN
C           LOCATIONS 1-27 OF SENS.  32 VALUES OF ACCELEROMETER
C           CHANNEL DATA STORED IN SENS LOCATIONS 28-37.  CHANNELS
C           34,55,60,65,69,70 ARE STORED IN SENS 38-43.
C
C-----LOCAL VARIABLES
C
      REAL SENS(64,43),INSLOP,INTINT,SLOPE(70),VINT(70),VOLTS,VALUE
      INTEGER IFF,IRF,CALFIL,TAPIN,RECNO,TAPENO(2),DATE,I,INCHAN,
     1   INNAME,INDATE,NAME(70),IDATA(562),CHANO(70),NOSKP,CURREC,
     1   CONVRT,DUM,PRNTR1
      LOGICAL*1 BURST(4),LOGD(2248)
      EQUIVALENCE (LOGD(1),IDATA(1)),(BURST(1),CONVRT)
C
C     INITIALIZE PROGRAM
C
      CONVRT=0
      IRF=0
      PRNTR1=6
      TAPIN=10
      CALFIL=11
      IF (IFF.EQ.2)   GO TO 950
      IF (IFF.EQ.3)   GO TO 1000
C
C     READ DATA TAPE NUMBER CARD
C
      READ 9000,TAPENO,DATE
9000  FORMAT(2A4,T11,I5)
      IF(DATE.GE.70300.AND.DATE.LE.72161) GO TO 1
      PRINT 9901
9901  FORMAT(1H1,'INVALID TAPE DATE')
```

NEWPRT Listing 20 (1 of 4)

```
      STOP
C
C-----SET UP CHANNEL CALIBRATION TABLE
C
1     I=0
    2 READ(CALFIL,9001,END=3) INCHAN,INNAME,INSLOP,INYINT,INDATE
9001  FORMAT(I2,T11,A4,T21,F8.4,T31,F8.4,T51,I5)
      IF(INCHAN.GT.I) I=I+1
      IF(INDATE.GT.DATE) GO TO 2
      CHANO(I+1)=INCHAN
      NAME(I+1)=INNAME
      SLOPE(I+1)=INSLOP
      YINT(I+1)=INYINT
      GO TO 2
C
C-----PRINT CHANNEL CALIBRATION TABLE
C
3     WRITE(PRNTR1,9002) TAPENO,DATE
9002  FORMAT(1H1,  //T26,'---CHANNEL CALIBRATION TABLE---'/T32,
     1    'TAPE NUMBER ',2A4/T34,'RECORDED ',I5, //2(5X,'CHAN',2X,
     1    'SENSOR',4X,'SLOPE',5X,'Y-INT')/2X,74('-')//)
      DO 5 I=1,35
      II=I+35
      WRITE(PRNTR1,9003) CHANO(I),NAME(I),SLOPE(I),YINT(I),CHANO(II),
     1    NAME(II),SLOPE(II),YINT(II)
9003  FORMAT(2X,2(4X,I2,4X,A4,3X,F8.4,3X,F8.4))
5     CONTINUE
C
C-----INITIALIZE PROGRAM VALUES
C
      RECNO=0
      CURREC=0
      VOLTS=20.0/256.0
      IFF=2
      RETURN
C
C-----SKIP TO REQUESTED RECORD
C
  950 CURREC=0
1000  NOSKP=(RECNO-1)-CURREC
      IF(NOSKP) 1010,2000,1020
1010  PRINT 9100
9100  FORMAT(1H1,'TAPE BEYOND REQUESTED RECORD ')
      STOP
1020  DO 1030 I=1,NOSKP
      READ(TAPIN,9110,END=1040,ERR=1021)DUM
9110  FORMAT(A1)
      GO TO 1030
1021  READ(TAPIN,9111)DUM
 9111 FORMAT(A1)
1030  CONTINUE
      CURREC=CURREC+NOSKP
      GO TO 2000
1040  PRINT 9102
```

NEWPRT Listing 20 (2 of 4)

```
9102  FORMAT(1H1,'EOF ENCOUNTERED')
      STOP
C
C-----READ DATA TAPE RECORD
C
2000  READ(TAPIN,9200,END=8000,ERR=7000)IDATA
9200  FORMAT(56(10A4),2A4)
2001  RECNO=RECNO+1
      CURREC=CURREC+1
C
C-----CHECK LAST BYTE
C
      BURST(4)=LOGD(2248)
      IF(CONVRT.NE.0) GO TO 6000
C
C-----UNPACK CHANNEL DATA, CONVERT TO VOLTS, ENGINEERING UNITS,
C-----THEN BUILD SENSOR GROUP ARRAY
      JJ=1
      I=1
      CHK=1
      DO 2010 J2=1,32
      K=1
      K2=28
      DO 2012 J=1,70
      BURST(4)=LOGD(I)
      IF(J.NE.36) GO TO 2011
      K=K-27
      JJ=JJ+1
2011  VALUE=(CONVRT-128.0)*VOLTS*SLOPE(J)+YINT(J)
      I=I+1
      IF(CHK.EQ.5) GO TO 2020
      IF(J.EQ.34.OR.J.EQ.69) GO TO 2030
      SENS(JJ,K)=VALUE
      K=K+1
      CHK=CHK+1
      GO TO 2012
2030  IF(J.EQ.34) SENS(J2,42)=VALUE
      SENS(J2,43)=VALUE
      CHK=CHK+1
      GO TO 2012
2020  SENS(J2,K2)=VALUE
      K2=K2+1
      CHK=1
2012  CONTINUE
      JJ=JJ+1
2010  CONTINUE
      IRF=1
      RETURN
6000  IRF=4
      RETURN
7000  READ(TAPIN,9111) DUM
      RECNO=RECNO+1
      CURREC=CURREC+1
      IRF=2
```

NEWPRT Listing 20 (3 of 4)

```
      RETURN
 8000 IRF=3
      RETURN
      END
```

NEWPRT Listing 20 (4 of 4)

PROGRAM RBMPLT

INTRODUCTION

Given a requested interval of taped bridge data this program outputs a listing of maximum roadbed accelerations and resultant wind.

In addition at least one of two plot options is output to either a Calcomp plotter or Tektronix CRT hardcopy.

The first option (if NCORL =0) plots up to 200 points (records) of six traces of acceleration versus wind data. The traces include max acceleration per record for accelerometers A2 and A6 plus average wind values per record for U velocity U azimuth lift angle and lift velocity for a wind sensor. (set up for center of bridge wind instrument)

The second option (if NPOLAR ≠0) produce a polar plot of wind direction and velocity at sensor three for the 8192 data points contained in a 9½ minute long interval as used to produce a wind spectrum.

This program can process multiple requests from one given tape file but is limited to 200 records per request card for correlation plots or 128 records per polar wind plot request.

See Figures 41 through 48, Table 12 and Listings 21 and 22.

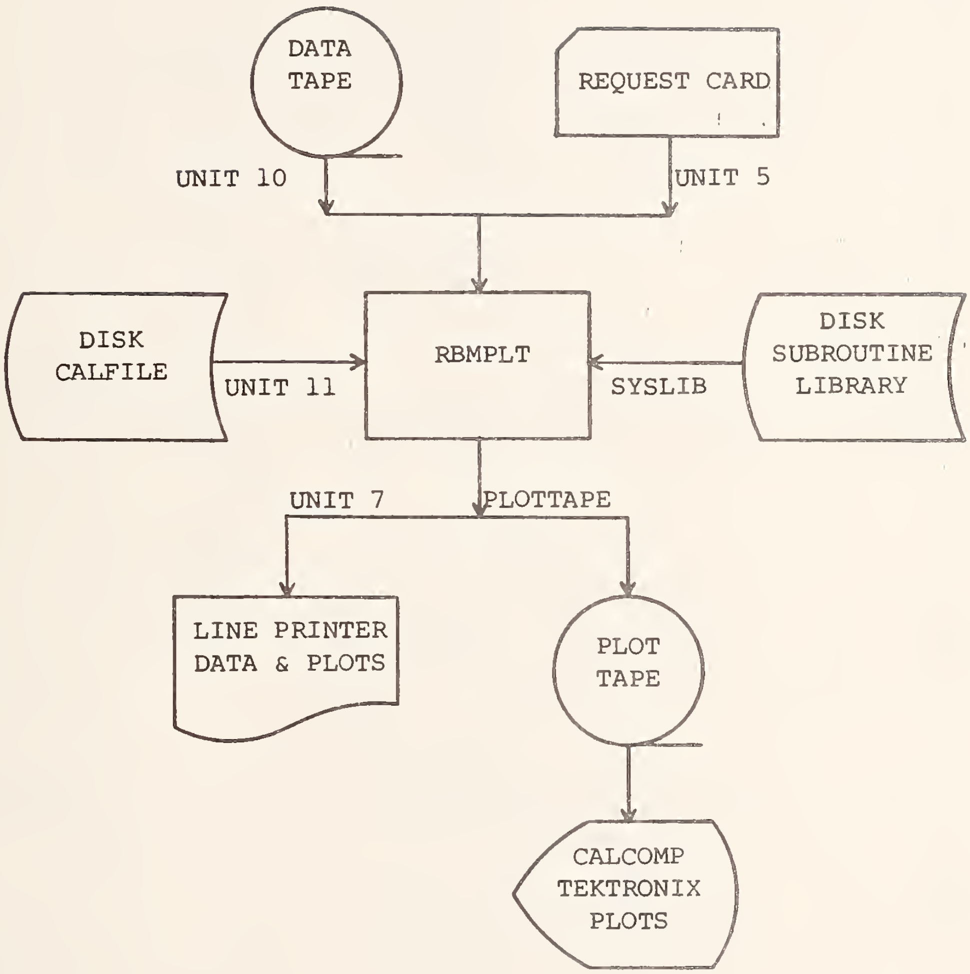


Figure 41. Program RBMPLT Setup

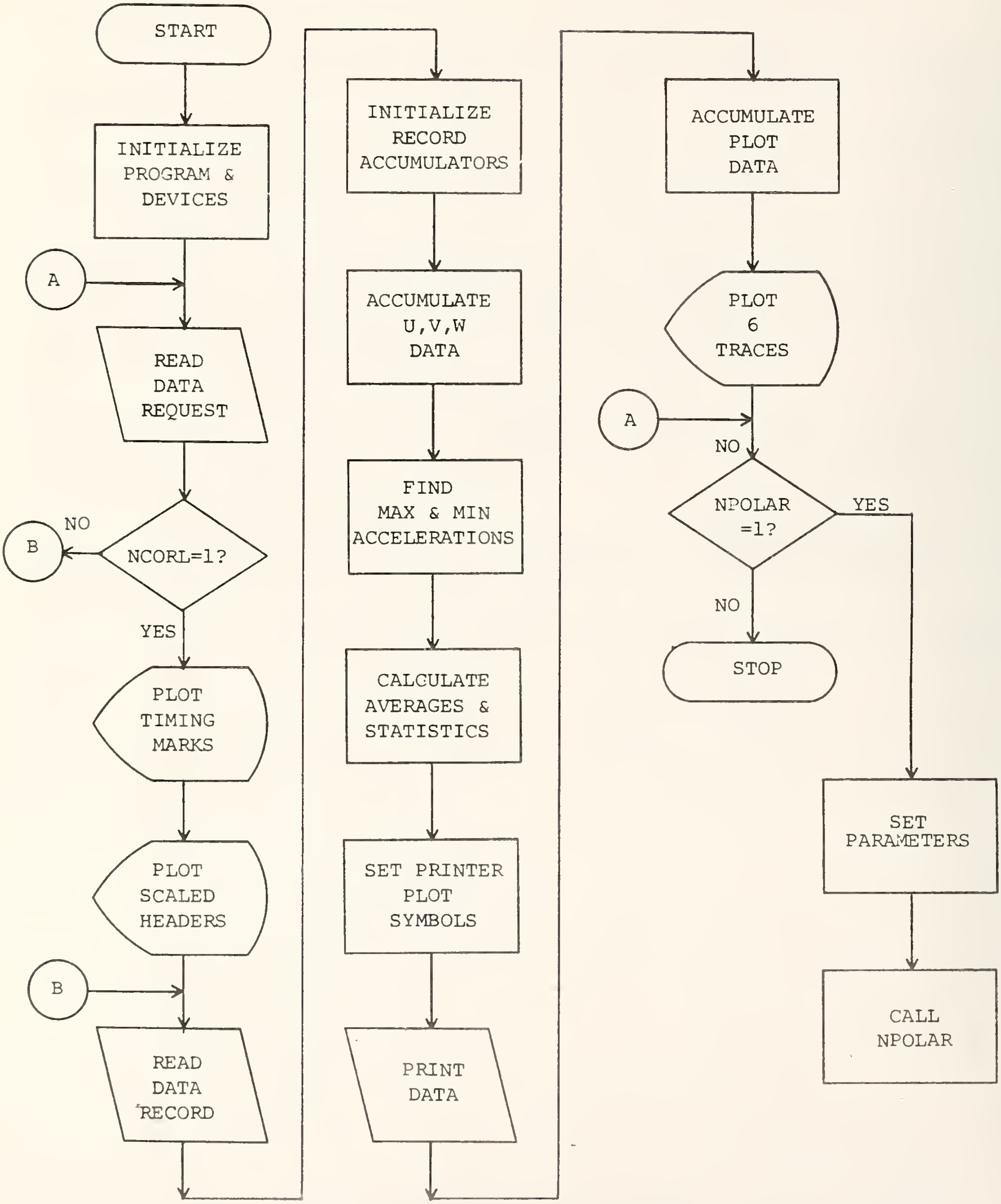


Figure 42. RBMPLT Flow Chart

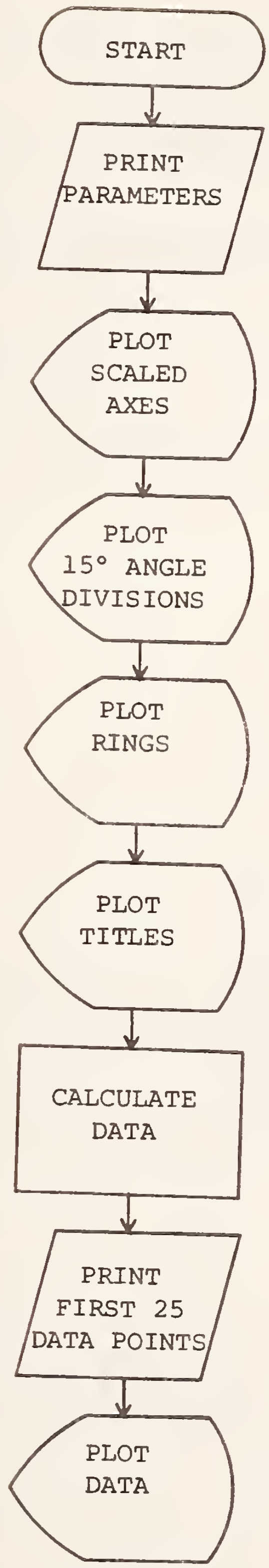


Figure 43. Subroutine Polar Flow Chart

0010436 76300

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	---	Tape number	2A4	1-8
2	72274 - present (Sitka)	Recording date	15	11-15

Figure 44. RBMPLT Tape Number Card Format

10436 21250 1270 1 0

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	1-9999	Tape number	I5	1-5
2	1-9	File number	I5	6-10
3	1-9999	Beginning record	I5	11-15
4	1-9999	Ending record	I5	16-20
5	0,1	Correlation plot flag	I5	21-25
6	0,1	Polar, plot flag	I5	26-30

Figure 45. RBMPLT Request Card

REC	HORIZ WIND U	AZM	VEL	LIFT VECT ELEV	VEL	MAX ACCELERATION DIFFERENCE A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
1	***	130.	***	35.	***	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	***	130.	***	35.	***	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	22.	152.	24.	15.	6.	.013*	.013*	.016*	.019*	.0	.013*	.013*	.009	.009	.013*
4	22.	152.	24.	17.	7.	.019*	.022*	.016*	.016*	.0	.006	.016*	.013*	.019*	.019*
5	22.	175.	22.	12.	5.	.035**	.028*	.019*	.022*	.0	.016*	.022*	.016*	.031**	.031**
6	24.	153.	26.	7.	3.	.025*	.025*	.025*	.019*	.0	.016*	.016*	.016*	.022*	.022*
7	39.	168.	39.	-4.	-3.	.028*	.025*	.025*	.022*	.0	.038**	.022*	.019*	.025*	.025*
8	30.	178.	30.	1.	0.	.022*	.019*	.035**	.035**	.0	.031**	.035**	.031**	.022*	.019*
9	32.	203.	36.	6.	4.	.019*	.019*	.041**	.028*	.0	.025*	.025*	.025*	.025*	.016*
10	34.	192.	35.	1.	1.	.022*	.016*	.028*	.031**	.0	.031**	.022*	.025*	.019*	.016*
11	20.	186.	20.	24.	9.	.019*	.013*	.019*	.028*	.0	.038**	.019*	.022*	.016*	.013*
12	25.	194.	27.	21.	10.	.016*	.013*	.022*	.028*	.0	.035**	.025*	.025*	.019*	.019*
13	32.	170.	32.	-3.	-1.	.016*	.016*	.028*	.028*	.0	.031**	.022*	.022*	.019*	.019*
14	20.	163.	20.	14.	5.	.019*	.016*	.019*	.022*	.0	.025*	.019*	.019*	.016*	.016*
15	14.	156.	14.	27.	7.	.009	.013*	.019*	.019*	.0	.025*	.016*	.016*	.013*	.009
16	18.	160.	18.	27.	9.	.006	.009	.019*	.013*	.0	.019*	.013*	.016*	.009	.009
17	16.	180.	16.	34.	11.	.013*	.013*	.019*	.025*	.0	.019*	.013*	.019*	.009	.013*
18	11.	170.	11.	36.	6.	.009	.013*	.016*	.016*	.0	.019*	.013*	.016*	.009	.006
19	8.	141.	10.	34.	7.	.009	.013*	.013*	.016*	.0	.013*	.009	.013*	.009	.006
20	18.	207.	21.	18.	7.	.006	.006	.013*	.013*	.0	.013*	.009	.009	.009	.009
21	33.	178.	33.	16.	9.	.009	.009	.016*	.016*	.0	.022*	.013*	.013*	.013*	.009
22	35.	186.	36.	8.	5.	.009	.006	.016*	.016*	.0	.025*	.016*	.016*	.009	.009
23	22.	191.	23.	14.	6.	.009	.009	.016*	.016*	.0	.025*	.009	.013*	.009	.006
24	23.	205.	26.	7.	3.	.009	.013*	.016*	.016*	.0	.019*	.013*	.013*	.009	.009
25	20.	200.	23.	9.	3.	.006	.006	.013*	.016*	.0	.009	.013*	.013*	.009	.006
26	21.	200.	23.	21.	9.	.006	.006	.009	.009	.0	.006	.006	.013*	.009	.006
27	31.	188.	32.	9.	5.	.009	.009	.013*	.009	.0	.013*	.009	.009	.006	.009
28	29.	192.	30.	5.	3.	.009	.006	.009	.013*	.0	.006	.009	.009	.006	.006
29	22.	184.	23.	12.	5.	.006	.006	.009	.013*	.0	.006	.009	.009	.006	.006
30	26.	176.	26.	-5.	-2.	.009	.006	.013*	.009	.0	.006	.009	.009	.009	.009
31	21.	171.	21.	5.	2.	.006	.009	.009	.009	.0	.006	.009	.006	.006	.009
32	18.	151.	20.	12.	4.	.009	.006	.009	.009	.0	.006	.006	.006	.006	.006
33	24.	166.	24.	2.	1.	.006	.006	.009	.009	.0	.006	.003	.009	.006	.006
34	20.	144.	23.	8.	3.	.006	.006	.009	.009	.0	.009	.006	.009	.006	.006
35	24.	155.	25.	-1.	-0.	.003	.006	.006	.006	.0	.006	.006	.006	.006	.006
36	14.	168.	15.	6.	2.	.003	.006	.006	.009	.0	.006	.006	.005	.003	.006
37	13.	139.	16.	33.	10.	.003	.006	.006	.006	.0	.006	.006	.006	.006	.006
38	19.	144.	23.	18.	7.	.003	.006	.009	.006	.0	.006	.006	.005	.003	.003
39	22.	159.	23.	-7.	-3.	.003	.006	.009	.006	.0	.006	.006	.005	.009	.006
40	19.	164.	20.	10.	3.	.003	.003	.003	.009	.0	.006	.006	.005	.009	.006
41	11.	186.	11.	39.	9.	.003	.006	.009	.006	.0	.006	.006	.005	.006	.003
42	10.	182.	11.	15.	3.	.003	.006	.009	.009	.0	.006	.006	.006	.006	.006
43	8.	194.	8.	32.	5.	.003	.006	.009	.006	.0	.006	.006	.005	.006	.006
44	12.	183.	13.	11.	2.	.003	.006	.006	.006	.0	.006	.009	.006	.003	.003
45	21.	192.	22.	2.	1.	.003	.006	.009	.009	.0	.006	.006	.006	.003	.006

Figure 46. RBMPLT Output

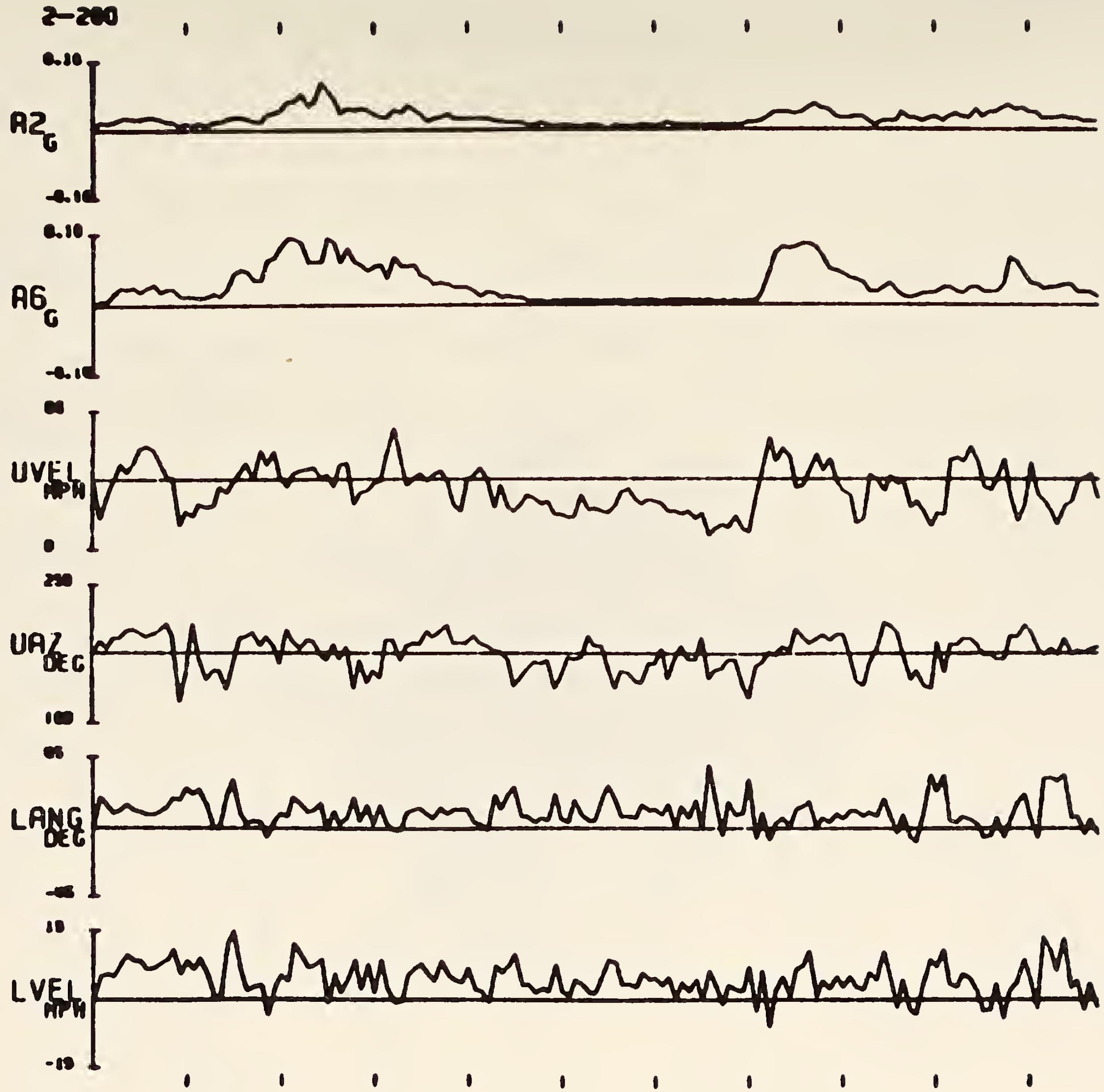


Figure 47. RBMPLT Output

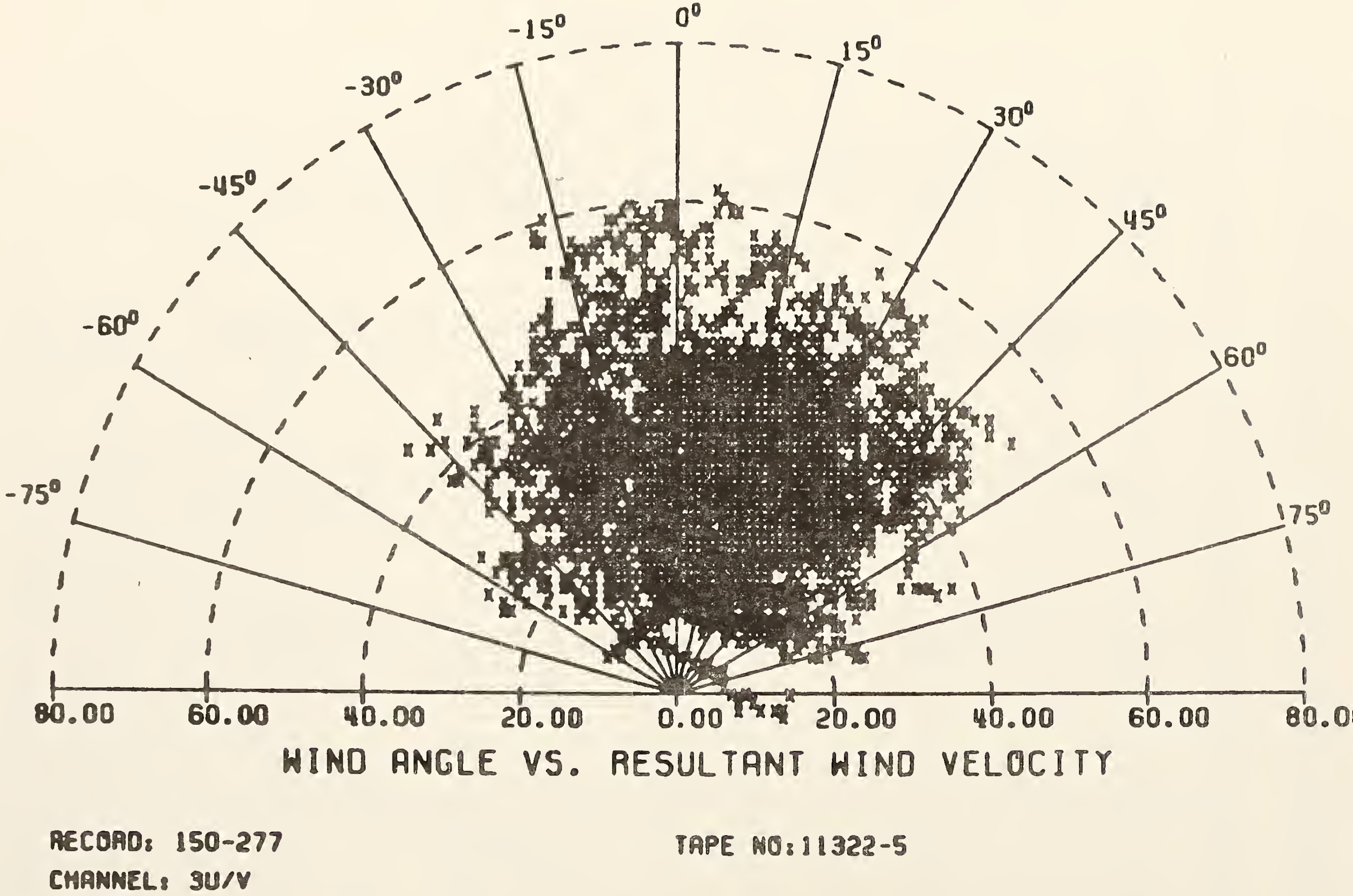


Figure 48. Polar Output

Table 12. RBMPLT Variable Name List

Name	Com	Type	Dimension	Usage
ACC		R	10	Acceleration change within a record
ACUMU		R	1	Accumulator for 'U' wind valves
ACUMV		R	1	Accumulator for 'V' wind valves
ACUMW		R	1	Accumulator for 'W' wind valves
ADD		R	1	Plotter angle increment
ALEV		I	10	Acceleration level flags
AMAX		R	10	Maximum acceleration per channel
AMIN		R	10	Minimum acceleration per channel
ANGLE		R	1	Horizontal wind angle (radiano)
AXLEN		R	1	Axis length
BEGREC		I	1	Starting record of request
BLNK		I	1	Literal blank
BREC		R	1	Beginning record
BVALVE		R	1	Lower valve of trace
CARDIN		I	1	Card input unit
DATA		R	6,200	Data array for correlation plot
DEGR		R	1	Angle for plot
DEGREE		R	1	Wind angle (degrees)
DELTAV		R	1	Velocity increase per plot ring
DI		R	1	Circle parameter
DIR1		R	1	Horizontal wind direction
DIR2		R	1	Vertical wind attack angle
ENDREC		I	1	Ending record of request
EREC		R	1	Ending record
FILE		R	1	File number for plotter
FILE NO		I	1	File number
FIRSTV		R	1	Lowest wind value to plot
FNO		R	1	File number
FXLOC		R	1	X offset for polar plot
FYLOX		R	1	Y offset for polar plot
I		I	1	General index

Table 12. RBMPLT Variable Name List (continued)

Name	Com	Type	Dimension	Usage
IBUF		I	4000	Plotter buffer storage
ICH		I	1	Current trace being plotted
IDATE		I	1	Date of tape
II		I	1	General index
IFF		I	1	Function flag
IPLR		I	1	Counter of polar data points
IREC		I	1	Record counter
IRF		I	1	Read status flag
ITAPE		I	1	Tape number
J		I	1	General index
LEV1		R	1	Low acceleration level
LEV2		R	1	Higher acceleration level
LEV3		R	1	Highest acceleration level
LINES		I	1	Line counter for each page
LSREC		I	1	Latest record processed
N		I	1	Number of data points to polar
NCORL		I	1	Correlation plot flag
NDECM		I	1	Number of places to right of dec.
NMIN		I	1	Number of minutes
NP		I	1	Number of points
NPOLAR		I	1	Polar plot flag
STAR1		I	1	Literal *
STAR2		I	1	Literal **
STAR3		I	1	Literal ***
PSIZE		R	1	Overall plot scaling factor
TAPENO		I	2	Tape number
RAD1		R	1	Radius 1
RAD2		R	1	Radius 2
PRNTR1		I	1	Printer unit assignment
R		R	1	Radius length to a data point
RADCON		R	1	Radians-to-degrees conversion fctr

Table 12. RBMPLT Variable Name List (continued)

Name	Com	Type	Dimension	Usage
SPEED		R	1	Resultant horizontal wind-velocity
REC		R	1	Record number for plotter
RECNO		I	1	Current record number
SENS		R	64,37	Array containing current raw data record
SENSR			1	Sensor number
THI		R	1	Max excu excursion from baseline
TINC		R	1	Plotter increment
TINCM		T	1	Plotter increment per minute
TITLE		R	6	Trace titles for correlation plot
TIMCHI		R	1	Height of tick mark traces
TLEN		R	1	Axis length
TNO		R	1	Tape number
TVALUE		R	1	Upper value of trace
UNITS		R	6	Trace units
VEL1		R	1	Resultant horizontal wind velocity
VEL2		R	1	Vertical wind velocity
VSCAL		R	6	Scale per reference excursion
W1		R	8192	Wind 'U' data array
W2		R	8192	Wind 'V' data array
X		R	1	X coordinate of a data point
LLOC		R	1	X offset for polar plot center
XT		R	1	Location of next tick meark
XV		R	1	X distance
Y		R	1	Y coordinate of a data point
YHI		R	1	Baseline height
YLOC		R	1	Y offset for polar plot
YV		R	1	Y distance

```
C      ***************    PRCGRAM REMPLT    ***************
C
C-----PRINTS MAXIMUM ROADBEC ACCELERATIONS AND RESULTANT WIND
C-----THEN ALSC PLOTS 200 PTS (RECS) OF A2,A6,UVEL,UAZ,LIFT ANG,LIFT VEL
C-----OR A POLAR PLOT OF WIRC (SENSOR 3) DIRECTION AND VELOCITY.
C
C     ROUTINES CALLED: SITKA, PCLAR
C
C     PROG. BY CHUCK GERHARCT   S.T.A.   1976
C     MODIFIED BY DUANE NELSON  S.T.A.   1977
C
C-----LOCAL VARIABLES
C
      DIMENSION IBUF(4000),DATA(6,200),VSCAL(6),TITLE(6),UNITS(6)
      REAL*8 RADCON,ACUMU,ACUMV,ACUMW,VEL1,VEL2,DIR1,DIR2
      REAL W1(8192),W2(8192)
      REAL SENS(64,37),ACC(10),AMIN(10),AMAX(10),LEV1,LEV2,LEV3
      INTEGER TAPEND(2),FILEND
      INTEGER CARDIN,PRNTR1,IFF,RECNC,IRF,BEGREC,ENDREC,LINES,LSREC,
     -  STAR1,STAR2,STAR3,BLNK,ALEV(10)
      DATA TITLE/'A2','A6','UVEL','UAZ','LANG','LVEL'/
      DATA UNITS/'G','G','MPH','DEC','DEC','MPH'/
      DATA STAR1/'*'/,STAR2/'**'/,STAR3/'***'/,BLNK/' '/
C
C-----INITIALIZE PROGRAM AND DEVICES
C
      CARDIN=5
      PRNTR1=7
      RADCON=180.0D0/3.14159D0
      LEV1=0.010
      LEV2=0.030
      LEV3=0.050
      VSCAL(1)=.1
      VSCAL(2)=.1
      VSCAL(3)=30.
      VSCAL(4)=75.
      VSCAL(5)=45.
      VSCAL(6)=15.
      IPLR=0
      CALL PLOTS(IBUF,4000,6)
      CALL NEWPEN(1)
      IFF=1
      CALL SITKA(IFF,RECND,IRF,SENS,TAPEND,IDATE)
C
C-----READ DATA REQUEST CARC
C     SET NCORL=0 TO SKIP WIND/ACCEL PLOT OR NPCLAR=0 TC SKIP POLAR WIND
C
1000  READ(CARDIN,9100,END=8000) ITAPE,FILEND,BEGREC,ENDREC,NCORL,NPOLAR
9100  FCRMAT(6I5)
      RECND=BEGREC
      NP=ENDREC-BEGREC
      IF (NP.GT.200)   NP=200
      IREC=0
      LINES=61
```

```
      REWIND 10
      IFF=2
      PRINT 105,NP,BEGREC,TAPEND,FILENO
  105 FORMAT(//' NP=',I5,' STARTING RECNO',I5,' OF TAPE',2A4,' FILE',I2)
C
C        INTIALIZE PLOTTER
C     USE FACTOR=0.67 FOR CORRELATION PLOT ON TEKTRONIX (FOR COPY=.40)
C          ORIGIN IS 2.0 INCHES (FULL SCALE) TO LEFT OF TRACE STARTS
C
      IF (NCORL.EQ.1)    PSIZE=0.67
      IF (NPOLAR.EQ.1)   PSIZE=1.74
      CALL FACTOR (PSIZE)
      CALL PLOT(0.,0.,-3)
C
C     PLOT TICK MARKS FOR CORRELATION PLOT, IF USED
C       HORZ SCALE =20 PTS/INCH (REDUCED)   TICK MARK=14 RECS
C
      IF (NCORL.EQ.0)    GO TO 2000
      TINC=.10
      TLEN=TINC*NP
      TINCM=TINC*14.
      NMIN=NP/14
      TIMEHI=15.5
      CALL PLOT (2.,TIMEHI,+3)
      FILE=FILENO
      CALL NUMBER (1.3,TIMEHI+.1,.21,FILE,0.,-1)
      CALL SYMBOL (1.6,TIMEHI+.20,.21,13,90.,-1)
      REC=BEGREC
      CALL NUMBER (1.8,TIMEHI+.1,.21,REC,0.,-1)
      DO 140 J=1,2
      XT=0.
      DO 130 I=1,NMIN
      XT=XT+TINCM
  130 CALL SYMBOL (XT+2.0,TIMEHI,.14,13,0.,-1)
      CALL PLOT (2.,0.,+3)
      TIMEHI=0.3
  140 CONTINUE
C
C
C     PLOT CORRELATION HEADERS (A2,A6,UVEL,UAZ,LIFT ANG,LIFT VEL)
C
      THI=1.0
      NDECM=+2
      DO 200 ICH=1,6
      YHI=16.5-(2.5*ICH)
      IF (ICH.GE.3)    NDECM=-1
      TVALUE=+VSCAL(ICH)
      BVALUE=-VSCAL(ICH)
C       UVEL BASE = 30. MPH
C       UAZ BASE = 175. DEGREES
      IF (ICH.EQ.3)    TVALUE=+VSCAL(3)+30.
      IF (ICH.EQ.3)    BVALUE=-VSCAL(3)+30.
      IF (ICH.EQ.4)    TVALUE=+VSCAL(4)+175.
      IF (ICH.EQ.4)    BVALUE=-VSCAL(4)+175.
```

```
      CALL NUMBER (1.3,YHI+THI,.14,TVALUE,0.,NDECM)
      CALL SYMBOL (2.0,YHI+THI,.14,13,90.,-1)
      CALL PLOT (2.0,YHI-THI,+2)
      CALL SYMBOL (0.8,YHI,.28,TITLE(ICH),0.,4)
      CALL SYMBOL (1.3,YHI-.25,.21,UNITS(ICH),0.,4)
      CALL PLOT (2.0,YHI,+3)
      CALL PLOT (2.0+TLEN,YHI,+2)
      CALL PLOT (2.0,YHI,+3)
      CALL NUMBER (1.3,YHI-THI,.14,BVALUE,0.,NDECM)
      CALL SYMBOL (2.0,YHI-THI,.14,13,90.,-1)
  200 CONTINUE
      CALL PLOT (2.0,0.,+3)
      PRINT 205
  205 FORMAT (' PLOTTED HEADERS,SCALES AND TIK MARKS')
C
C-----READ DATA RECORD
C
 2000 CALL SITKA(IFF,RECNO,IRF,SENS,TAPEND,IDATE)
      IFF=3
      IF(IRF.NE.1) GO TO 7000
C
C-----INITIALIZE RECORD ACCUMULATORS
C
      J=0
      DO 2010 I=1,10
      J=J+2
      AMIN(I)=SENS(1,J)
      AMAX(I)=SENS(1,J)
 2010 CONTINUE
      ACUMU=0.0D0
      ACUMV=0.0D0
      ACUMW=0.0D0
C
C-----ACCUMULATE U,V,W AND FIND MIN,MAX ACC
C
      DO 2020 I=1,64
      IPLR=IPLR+1
      IF (IPLR.GT.8192)   GO TO 215
      W1(IPLR)=SENS(I,13)
      W2(IPLR)=SENS(I,15)
  215 CONTINUE
      ACUMU=ACUMU+DBLE(SENS(I,13))
      ACUMV=ACUMV+DBLE(SENS(I,15))
      ACUMW=ACUMW+DBLE(SENS(I,17))
      II=0
      DO 2020 J=2,20,2
      II=II+1
      IF(SENS(I,J).LT.AMIN(II)) AMIN(II)=SENS(I,J)
      IF(SENS(I,J).GT.AMAX(II)) AMAX(II)=SENS(I,J)
 2020 CONTINUE
C
C-----CALCULATE RECORD STATISTICS
C
      ACUMU=ACUMU/64.0D0
```

```
      ACUMV=ACUMV/64.0D0
      ACUMW=ACUMW/64.0D0
      VEL1=DSQRT(ACUMU*ACUMU+ACUMV*ACUMV)
      DIR1=(RADCON*DATAN2(ACUMU,ACUMV))+85.0D0
      VEL2=ACUMW
      DIR2=(RADCON*DATAN2(ACUMW,VEL1))
      DO 2030 I=1,10
      ACC(I)=ABS(AMAX(I)-AMIN(I))
      ALEV(I)=BLNK
      IF(ACC(I).LT.LEV1) GO TO 2030
      ALEV(I)=STAR1
      IF(ACC(I).GE.LEV2) ALEV(I)=STAR2
      IF(ACC(I).GE.LEV3) ALEV(I)=STAR3
2030  CONTINUE
C
C-----PRINT DATA
C
3000  IF(LINES.LE.60) GO TO 3010
      WRITE(PRNTR1,9300)
9300  FORMAT(1H1,T7,'REC',T15,'HORIZ WIND',T30,'LIFT VECT',
     - T70,'MAX ACCELERATION DIFFERENCE'/T13,'U',T16,
C    - T70,'MAX ACCELERATION DIFFERENCE'/T7,'NO.',T16,
     - 'AZM    VEL',T30,'ELEV   VEL',T45,'A1',6X,'A2',6X,'A3',
     - 6X,'A4',6X,'A5',6X,'A6',6X,'A7',6X,'A8',6X,'A9',6X,
     - 'A10'/T5,120('-')/)
      LINES=5
3010  LSREC=RECNO-1
      WRITE(PRNTR1,9301) LSREC,ACUMU,DIR1,VEL1,DIR2,VEL2,
     - (ACC(I),ALEV(I),I=1,10)
 9301 FORMAT(T5,I5,T12,F3.0,T16,F4.0,2X,F3.0,T30,F4.0,2X,F3.0,T44,
     -10(F4.3,A3,1X))
      LINES=LINES+1
C
C       ACCUM PLOT DATA (A2,A6,UVEL,UAZ,LIFT ANG,LIFT VEL)
C
      IREC=IREC+1
      DATA(1,IREC)=ACC(2)/VSCAL(1)
      DATA(2,IREC)=ACC(6)/VSCAL(2)
      DATA(3,IREC)=(ACUMU-30.)/VSCAL(3)
      DATA(4,IREC)=(DIR1-175.)/VSCAL(4)
      DATA(5,IREC)=DIR2/VSCAL(5)
      DATA(6,IREC)=VEL2/VSCAL(6)
      IF(RECNO.LE.ENDREC) GO TO 2000
      IF (NCORL.EQ.0)   GO TO 1000
C
C       PLOT 6 TRACES 2.5 INCHES APART
C
      DO 400 ICH=1,6
      YHI=16.5-(2.5*ICH)
      CALL PLOT (2.,YHI,+3)
      X=0.
      DO 350 I=1,NP
      X=X+TINC
      Y=DATA(ICH,I)
```

RBMPLT Listing 21 (4 of 5)

```
      IF (Y.GT.1.0)   Y=1.0
      Y=Y+YHI
      CALL PLOT (2.*X,Y,+2)
  350 CONTINUE
  400 CONTINUE
      GO TO 1000
C
C-----ERROR AND END PROCESSING
C
7000  PRINT 9700
9700  FORMAT(' ABNORMAL DATA READ')
      GO TO 2000
8000  PRINT 9800
9800  FORMAT(' PROCESSING COMPLETE')
C
C     PLOT WIND DATA IN POLAR FORM
C
      IF (NPOLAR.EQ.0)   GO TO 9999
      CALL PLOT (0.,0.,-3)
      XLOC=1.0
      YLOC=1.
      FIRSTV=0.
      DELTAV=10.
      DELTAV=20.
      ICH=3
      ENDREC=BEGREC+127
      N=(ENDREC-BEGREC+1)*64
      N=8192
      CALL POLAR(FIRSTV,DELTAV,BEGREC,ENDREC,ITAPE,FILENO,ICH,XLOC,
     1   YLOC,W1,W2,N)
      WRITE(7,9900)
 9900 FORMAT (' POLAR PLOT ALSO COMPLETED')
 9999 CALL PLOT (0.,0.,999)
      STOP
      END
```

RBMPLT Listing 21 (5 of 5)

```
      SUBROUTINE POLAR(FIRSTV,DELTAV,BEGREC,ENDREC,ITAPE,FILENO,ISR,
     1   FXLOC,FYLOC,W1,W2,N)
C
C-----THIS ROUTINE PLOTS A 180 DEGREE HISTOGRAM OF RESULTANT
C     WIND VELOCITY AND ANGLE ON A 4-INCH RADIUS. (6"HI X 9"WIDE)
C
C     ROUTINES CALLED: NONE
C
C     W1   : ARRAY CONTAINING U-COMPONENT WIND
C     W2   : ARRAY CONTAINING V-COMPONENT WIND
C     FOR UP TO 40 MPH WINDS USE  DELTAV=10.
C     FOR UP TO 80 MPH WINDS USE  DELTAV=20.
C     FIRSTV SHOULD = 0.
C     ISR = WIND SENSOR OF U AND V COMPONENTS.
C
C     PROG. BY DOLLY GREENE   S.T.A.   1976
C
      REAL W1(1),W2(1)
      INTEGER IBUF(2000),BEGREC,ENDREC,TAPENO,FILENO
      AXLEN=4.
      SENSR=ISR
      BREC=BEGREC
      EREC=ENDREC
      TNO=ITAPE
      FNO=FILENO
C
C-----SCALE AXIS ACCORDING TO VALUE
C
      WRITE(7,9000) FIRSTV,DELTAV
9000  FORMAT(' POLAR PLOT FIRSTV:',F8.3/' DELTAV:',F8.3)
C
C     SET PLOT ORIGIN USING OFFSETS FOR TEKTRONIX
C
      XLOC=4.3
      YLOC=2.0
      CALL PLOT(FXLOC+AXLEN,FYLOC,-3)
      CALL AXIS(XLOC-AXLEN,YLOC,1H ,-1,AXLEN,0.,
     1   FIRSTV+AXLEN*DELTAV,-DELTAV)
      CALL AXIS(XLOC,YLOC,1H ,-1,AXLEN,0.,FIRSTV,DELTAV)
C
C-----DRAW ANGLE DIVISIONS AT EVERY 15 DEGREES
C       SIN (15 DEG)=.27,  COS(15 DEG)=.96
C
      ADD=.04
      DO 20 I=1,11
      CALL PLOT(XLOC,YLOC,3)
      CALL PLOT(XLOC,YLOC,3)
      RAD1=I*15*3.14159/180.
      RAD2=1.570795-RAD1
      XV=COS(RAD1)*AXLEN
      YV=SIN(RAD1)*AXLEN
      XV=XV+XLOC
      YV=YV+YLOC
      CALL PLOT (XV,YV,2)
```

POLAR Listing 22 (1 of 2)

```
      DEGR=90-I*15
      IF(I.GE.6) ADD=ADD+.07
      XV=XV+COS(RADI)*ADD
      YV=YV+SIN(RADI)*ADD
      CALL PLOT(XLOC,YLOC,3)
      CALL NUMBER(XV,YV,.105,DEGR,0.,-1)
20    CALL SYMBOL(999.,YV+.07 ,.07 ,1HO,0.,1)
C
C-----DRAW RINGS ON GRAPH
C
      CALL PLOT(XLOC,YLOC,3)
      DI=0.5
      CALL CIRCL (XLOC+1.,YLOC,0., 180.,1.,1.,DI)
      CALL CIRCL (XLOC-2.,YLOC, 180.,0.,2.,2.,DI)
      CALL CIRCL (XLOC+3.,YLOC,0., 180.,3.,3.,DI)
      CALL CIRCL (XLOC-4.,YLOC, 180.,0.,4.,4.,DI)
      CALL PLOT(XLOC,YLOC,3)
C
C-----DRAW TITLES FOR GRAPH
C
      CALL SYMBOL(XLOC-2.5,YLOC-0.5,.14,38HWIND ANGLE VS. RESULTANT WIND
     1 VELOCITY,0.,38)
      CALL SYMBOL(XLOC-AXLEN,YLOC-1.0,.10,8HRECORD: ,0.,8)
      CALL NUMBER(999.,999.,.10,BREC,0.,-1)
      CALL SYMBOL(999.,999.,.10,1H-,0.,1)
      CALL NUMBER(999.,999.,.10,EREC,0.,-1)
      CALL SYMBOL(XLOC,YLOC-1.0,.10,8HTAPE NO:,0.,8)
      CALL NUMBER(999.,999.,.10,TNL,0.,-1)
      CALL SYMBOL(999.,999.,.10,1H-,0.,1)
      CALL NUMBER(999.,999.,.10,FNL,0.,-1)
      CALL SYMBOL(XLOC-AXLEN,YLOC-1.25,.10,9HCHANNEL: ,0.,9)
      CALL NUMBER(999.,999.,.10,SENSR,0.,-1)
      CALL SYMBOL(999.,999.,.10,3HL/V,0.,3)
      CALL PLOT(XLOC,YLOC,3)
      WRITE(7,9200)
9200  FORMAT(1H1,' INDEX',T10,'RADIUS',T25,'RADIANS',T40,'U-COMPONENT',
     1   T55,'V-COMPONENT',T70,'RESULT.VEL',T85,'ANGLE'/)
C
C-----SETUP DATA POINTS FOR PLOTTING (WITH DATA OFFSET FOR TEKTRONIX)
C-----AND PRINT THE FIRST 25 POINTS.
C
      DO 300 I=1,N
      SPEED=SQRT(W2(I)**2+W1(I)**2)
      ANGLE=1.570795-( ATAN2(W2(I),W1(I)))
      DEGREE=ANGLE*180./3.14159
      R=SPEED/DELTAV
      X=R*COS(ANGLE)
      Y=R*SIN(ANGLE)
      IF (I.GT.25)   GO TO 280
      WRITE(7,9300) I,R,ANGLE,W1(I),W2(I),SPEED,DEGREE
9300  FORMAT(1X,I5,T10,6(F10.6,5X))
  280 X=X+XLOC
      Y=Y+YLOC
300   CALL SYMBOL(X,Y,.07,1HX,0.,1)
      RETURN
      END
```

POLAR Listing 22 (2 of 2)

PROGRAM RHARM

INTRODUCTION

RHARM gives the fourier coefficients for an input time series using the IBM subroutine HARM and then unscrambling indices.

See Figure 49, Table 13 and Listing 23.

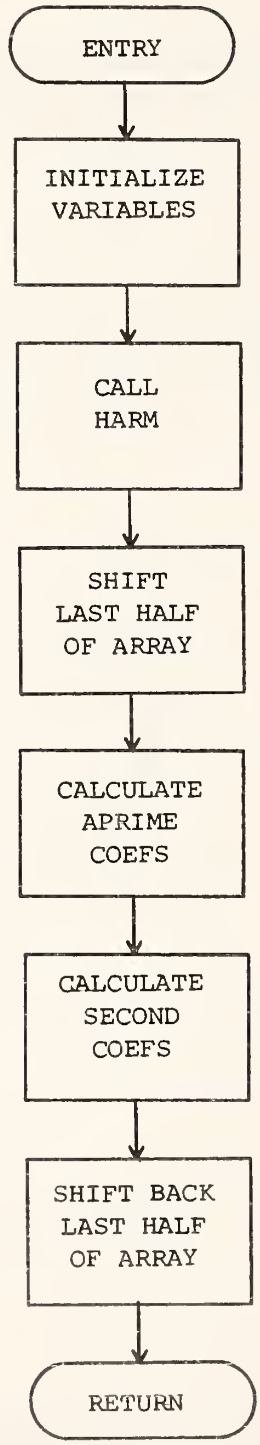


Figure 49. RHARM Flow Chart

Table 13. RHARM Variable Name List

Name	Com	Type	Dimension	Usage
A		R	Passed	Input data array
AP1IM		R	1	Coefficient for first stage
APIRE		R	1	Coefficient for first stage
AP2IM		R	1	Coefficient for first stage
AP2RE		R	1	Coefficient for first stage
CIIM		R	1	Coefficient for second stage
CIRE		R	1	Coefficient for second stage
CNIRE		R	1	Coefficient for second stage
CNIRM		R	1	Coefficient for second stage
CEE-OH		R	1	A trig function
DEL		R	1	II/number of points
FN		R	1	Number of frequency points
I		I	1	General index
IFERR		I	1	Returned error flag
IFSET		I	1	Parameter for HARM
INV		I	Passed	Work area
JO		I	1	General index
KO		I	1	NTOT+1
KI		I	1	General index
K6		I	1	General index
K8		I	1	General index
L		I	3	Sets HARM 3 dimensional array sizes
M		I	Passed	Size of A is 2* (2**M)+4
NT		I	1	NTO+1
NTO		I	1	Half of number freq points
NTOT		I	1	Number of frequency points
NTOT2		I	1	Number of time domain points
S		R	Passed	Work area
SC		R	1	Cos of del
SI		R	1	A triq function
SIS		R	1	0.0
SS		R	1	Sin of del

```
C        SUBROUTINE RHARM
C
C        PURPOSE
C           FINDS THE FOURIER COEFFICIENTS OF ONE DIMENSIONAL REAL DATA
C
C        USAGE
C           CALL RHARM (A,M,INV,S,IFERR)
C
C        DESCRIPTION OF PARAMETERS
C           A      - AS INPUT, CONTAINS ONE DIMENSIONAL REAL DATA. A IS
C                    2*N+4 CORE LOCATIONS, WHERE N = 2**M. 2*N REAL
C                    NUMBERS ARE PUT INTO THE FIRST 2*N CORE LOCATIONS
C                    OF A
C                    AS OUTPUT, A CONTAINS THE FOURIER COEFFICIENTS
C                    A0/2,B0=0,A1,B1,A2,B2,....,AN/2,BN=0 RESPECTIVELY IN
C                    THE FIRST 2N+2 CORE LOCATIONS OF A
C           M      - AN INTEGER WHICH DETERMINES THE SIZE OF THE VECTOR
C                    A. THE SIZE OF A IS 2*(2**M) + 4
C           INV    - A VECTOR WORK AREA FOR BIT AND INDEX MANIPULATION OF
C                    DIMENSION ONE EIGHTH THE NUMBER OF REAL INPUT, VIZ.,
C                    (1/8)*2*(2**M)
C           S      - A VECTOR WORK AREA FOR SINE TABLES WITH DIMENSION
C                    THE SAME AS INV
C           IFERR  - A RETURNED VALUE OF 1 MEANS THAT M IS LESS THAN 3 OR
C                    GREATER THAN 20. OTHERWISE IFERR IS SET = 0
C
C        REMARKS
C           THIS SUBROUTINE GIVES THE FOURIER COEFFICIENTS OF 2*(2**M)
C           REAL POINTS. SEE SUBROUTINE HARM FOR THREE DIMENSIONAL,
C           COMPLEX FOURIER TRANSFORMS
C
C        SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
C           HARM
C
C        METHOD
C           THE FOURIER COEFFICIENTS A0,B0=0,A1,B1,...,AN,BN=0 ARE
C           OBTAINED FOR INPUT XJ, J=0,1,2,...,2N-1 FOR THE FOLLOWING
C           EQUATION (PI = 3.14159...)
C
C                 N-1                                                 J
C     XJ=(1/2)A0+SUM (AK*COS(PI*J*K/N)+BK*SIN(PI*J*K/N))+(1/2)AN(-1)
C                 K=1
C
```

RHARM Listing 23 (1 of 2)

```
    3 A(I) = -A(I)
      DO    6 I = 1,NTOT2
    6 A(I) = A(I)/FN
      CALL HARM(A,L,INV,S ,IFSET,IFERR)
C
C     MOVE LAST HALF OF A(J)S DOWN ONE SLOT AND ADD A(N) AT BOTTOM TO
-     GIVE ARRAY FOR A1PRIME AND A2PRIME CALCULATION

   21 DO  52 I=1,NTOT,2
      JO=NTOT2+2-I
      A(JO)=A(JO-2)
   52 A(JO+1)=A(JO-1)
      A(NTOT2+3)=A(1)
      A(NTOT2+4)=A(2)
C
C     CALCULATE A1PRIMES AND STORE IN FIRST N SLOTS
C     CALCULATE A2PRIMES AND STORE IN SECOND N SLOTS IN REVERSE ORDER
      K0=NTOT+1
      DO 104 I=1,K0,2
      K1=NTOT2-I+4
      AP1RE=.5*(A(I)+A(K1))
      AP2RE=-.5*(A(I+1)+A(K1+1))
      AP1IM=.5*(-A(I+1)+A(K1+1))
      AP2IM=-.5*(A(I)-A(K1))
      A(I)=AP1RE
      A(I+1)=AP1IM
      A(K1)=AP2RE
  104 A(K1+1)=AP2IM
      NTO = NTOT/2
  110 NT=NTO+1
      DEL=3.1415927/FLOAT(NTOT)
      SS=SIN(DEL)
      SC=COS(DEL)
      SI=0.0
      CO=1.0
C
C     COMPUTE C(J)S FOR J=0 THRU J=N
  114 DO 116 I=1,NT
      K6=NTOT2-2*I+5
      AP2RE=A(K6)*CO+A(K6+1)*SI
      AP2IM=-A(K6)*SI+A(K6+1)*CO
      CIRE=.5*(A(2*I-1)+AP2RE)
      CIIM=.5*(A(2*I)+AP2IM)
      CNIRE=.5*(A(2*I-1)-AP2RE)
      CNIIM=.5*(A(2*I)-AP2IM)
      A(2*I-1)=CIRE
      A(2*I)=CIIM
      A(K6)=CNIRE
      A(K6+1)=-CNIIM
      SIS=SI
      SI=SI*SC+CO*SS
  116 CO=CO*SC-SIS*SS
C
C     SHIFT C(J)S FOR J=N/2+1 TO J=N UP ONE SLOT
      DO 117 I=1,NTOT,2
      K8=NTOT+4+I
      A(K8-2)=A(K8)
  117 A(K8-1)=A(K8+1)
      DO 500 I=3,NTOT2,2
      A(I) = 2. * A(I)
  500 A(I + 1) = -2. * A(I + 1)
      RETURN
      END
```

RHARM Listing 23 (2 of 2)

SUBROUTINE SITKA

INTRODUCTION

Subroutine SITKA provides access to data recorded on magnetic tapes by an instrumentation system installed on the Sitka harbor bridge in Sitka, Alaska.

Separate documentation describes the instrumentation configuration at that site.

The general use, device assignments and flow of the subroutine are all essentially the same as for subroutine NEWPRT and consequently are described in its section.

The only different consideration for SITKA besides different channels in different sequences is the fact that the record length of Sitka is 2247 bytes instead of 2248 NEWPRT.

The difference is record length which must also be accounted for in the JCL of the user programs.

See Figures 50 and 51, Table 14 and Listing 24.

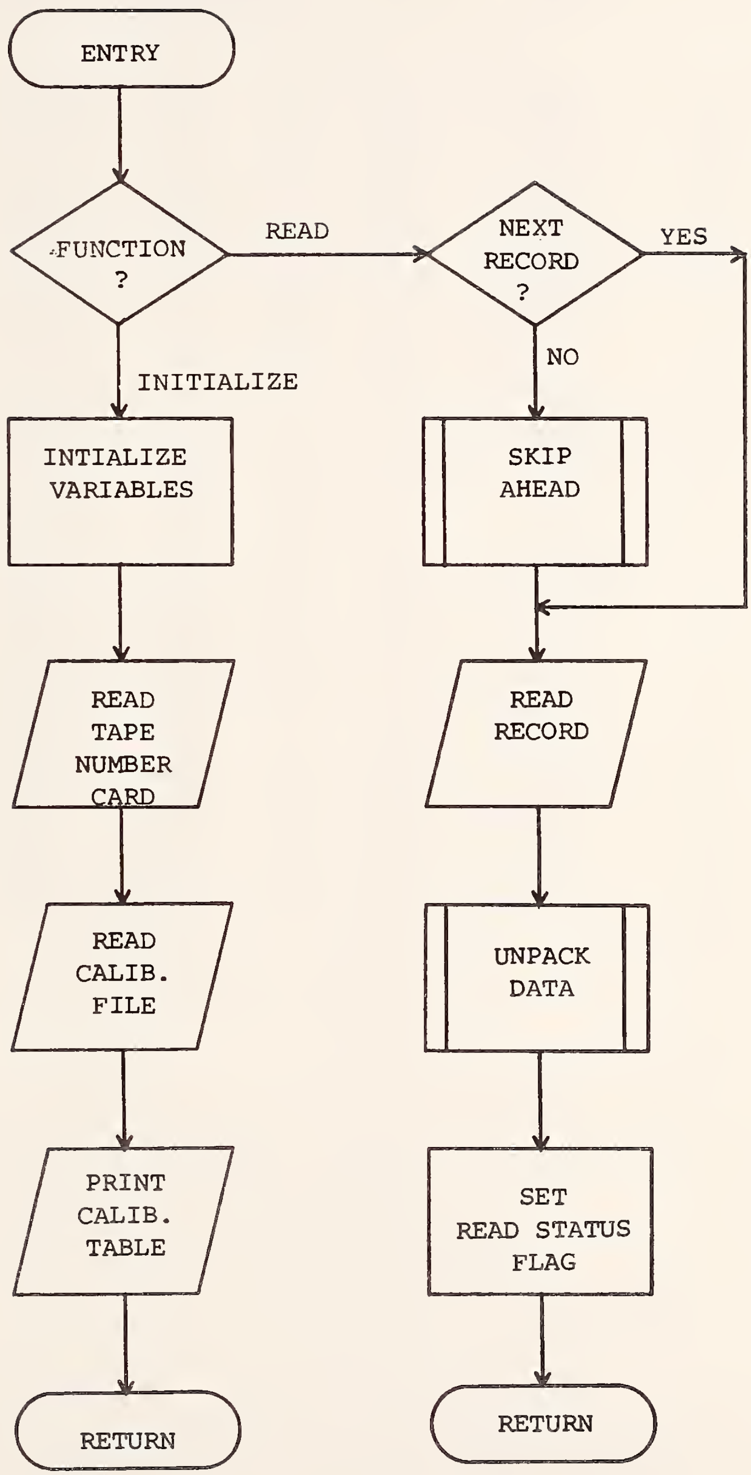


Figure 50. Subroutine SITKA General Flow Diagram

---CHANNEL CALIBRATION TABLE---
TAPE NUMBER 00TEST14
RECORDED 76300

CHAN	SENSOR	SLOPE	Y-INT	CHAN	SENSOR	SLOPE	Y-INT
0	1U	-11.9568	0.0	35	1U	-11.9568	0.0
1	A1	-0.0402	0.0	36	A1	-0.0402	0.0
2	1V	-11.9568	0.0	37	1V	-11.9568	0.0
3	A2	-0.0402	0.0	38	A2	-0.0402	0.0
4	1W	-11.9568	0.0	39	1W	-11.9568	0.0
5	A3	-0.0402	0.0	40	A3	-0.0402	0.0
6	2U	-11.9568	0.0	41	2U	-11.9568	0.0
7	A4	-0.0402	0.0	42	A4	-0.0402	0.0
8	2V	-11.9568	0.0	43	2V	-11.9568	0.0
9	A5	-0.0402	0.0	44	A5	-0.0402	0.0
10	2W	-11.9568	0.0	45	2W	-11.9568	0.0
11	A6	-0.0402	0.0	46	A6	-0.0402	0.0
12	3U	-11.9568	0.0	47	3U	-11.9568	0.0
13	A7	-0.0402	0.0	48	A7	-0.0402	0.0
14	3V	-11.9568	0.0	49	3V	-11.9568	0.0
15	A8	-0.0402	0.0	50	A8	-0.0402	0.0
16	3W	-11.9568	0.0	51	3W	-11.9568	0.0
17	A9	-0.0402	0.0	52	A9	-0.0402	0.0
18	4U	-11.9568	0.0	53	4U	-11.9568	0.0
19	A10	-0.0402	0.0	54	A10	-0.0402	0.0
20	4V	-11.9568	0.0	55	4V	-11.9568	0.0
21	A11	-0.0402	0.0	56	A11	-0.0402	0.0
22	4W	-11.9568	0.0	57	4W	-11.9568	0.0
23	A12	-0.0402	0.0	58	A12	-0.0402	0.0
24	5U	-11.9568	0.0	59	5U	-11.9568	0.0
25	A13	-0.0402	0.0	60	A13	-0.0402	0.0
26	5V	-11.9568	0.0	61	5V	-11.9568	0.0
27	SEIS	1.0000	0.0	62	SEIS	1.0000	0.0
28	5W	-11.9568	0.0	63	5W	-11.9568	0.0
29	SPAR	1.0000	0.0	64	SPAR	1.0000	0.0
30	SPAR	1.0000	0.0	65	SPAR	1.0000	0.0
31	TEMP	-4.6400	0.0	66	TEMP	-4.6400	0.0
32	CL:F	1.0000	0.0	67	CL:F	1.0000	0.0
33	LVM	1.0000	0.0	68	CL:Z	1.0000	0.0
34	PUM	1.0000	0.0	69	CL:M	1.0000	0.0

Figure 51. SITKA Calibration Table Output

Table 14. SITKA Variable Name List

Name	Com	Type	Dimension	Usage
BURST		L*1	4	Byte work array
CALFIL		I	1	Calibration file unit number
CHAN		R	32, 70	Channel
CHANO		I	70	Channel number
CONVRT		I	1	Data amplitude word
DATE		I	1	Date of tape
I		I	1	General index
IFF		I	1	Calibrate/read function flag
IDATA		I	560	Work array for 1 record of data
II		I	1	I+35
INCHAN		I	1	Calib channel number
INDATE		I	1	Calib card date
INNAME		I	1	Calib name
INSLOP		R	1	Calib slope
INYINT		R	1	Calib Y intercept
IRF		I	1	Read status flag
J		I	1	General index
K		I	1	General index
LOGD		L*1	2240	Equivalent bytes from IDATA array
NAME		I	70	Sensor name
NOSKP		I	1	Number of records to skip
RECNO		I	1	Requested record number
SENS		R	64, 37	Array holding 1 record of raw data
SLOPE		R	70	Slope
TAPENO		I	1	Tape number
TAPIN		I	1	Tape input unit number
VALUE		R	1	Calibrated data value
VOLTS		R	1	Volts per bit
YINT		R	70	Y intercept
CURREC		I	1	Current record number

5/10/77

```
C       SUBROUTINE SITKA (IFF,RECNO,IRF,SENS,TAPENO,DATE)
C
C-----INITIALIZES AND READS A SITKA DATA TAPE RECORD
C        VERSION 05/10/77
C
C-----REQUIRES TAPE ON UNIT 10,  CALFIL ON UNIT 11 AND
C-----     STANDARD TAPE NUMBER CARD AFTER      SYSIN DD *
C
C-----IFF = FUNCTION FLAG:
C-----              1 - INITIALIZE
C-----              2 - READ TAPE AFTER REWINDING (CURREC RESET=0)
C-----              3 - READ TAPE STARTING FROM WHERE LAST CALL LEFT OFF
C
C-----RECNO = REQUIRED RECORD NUMBER.AUTO-INCREMENTED FOR EACH READ.
C
C-----IRF = READ STATUS FLAG:
C-----                    0 - RECORD NOT READ
C-----                    1 - SUCCESSFUL READ
C-----                    2 - I/O ERROR READ AND CLEARED
C-----                    3 - EOF ENCOUNTERED
C
C-----SENS = SENSOR DATA ARRAY:
C-----                    64 VALUES OF 37 CHANNELS IN ORDER OF
C-----                    CHANNEL CAL TABLE. NOTE: SENS(I,J)=CHAN(I,J-1) FOR
C-----                    J=1-33.  J=34-37 CORRESPOND TO CHANS 34,35,69,70.
C-----                    THERE ARE ONLY 32 VALUES OF EACH OF THE LATTER FOUR
C    --                   CHANNELS.
C
      SUBROUTINE SITKA (IFF,RECNO,IRF,SENS,TAPENO,DATE)
C
C-----LOCAL VARIABLES
C
      REAL SENS(64,37),INSLOP,INYINT,SLOPE(70),YINT(70),VOLTS,VALUE,
     -  CHAN(32,70)
      INTEGER IFF,CALFIL,TAPIN,RECNO,IRF,TAPENO(2),DATE,I,INCHAN,
     -  INNAME,INDATE,NAME(70),II,CONVRT,IDATA(560),J,K,I1,I2,I3,
     -  CHANO(70),NOSKP,CURREC
      LOGICAL*1 BURST(4),LOCD(2240)
      EQUIVALENCE (LOCD(1),IDATA(1)),(CONVRT,BURST(1))
C
      IRF=0
      TAPIN = 10
      CALFIL = 11
      IF (IFF.EQ.2)   GO TO 950
      IF (IFF.EQ.3)   GO TO 1000
C
C-----READ TAPE NUMBER CARD
C
      READ 9000,TAPENO,DATE
9000  FORMAT (2A4,T11,I5)
      IF(DATE.GE.72274) GO TO 1
      PRINT 9901
      FORMAT (1H1,' INVALID TAPE DATE')
      STOP
```

```
C-    -SET-UP CHANNEL CALIBRATION CONSTANTS
C
1       I=0
        READ(CALFIL,9001,END=3)INCHAN,INNAME,INSLOP,INYINT,INDATE
9001    FORMAT(I2,T11,A4,T21,F8.4,T31,F8.4,T51,I5)
        IF(INCHAN.GT.I)I=I+1
        IF(INDATE.GT.DATE) GO TO 2
        CHANS(I+1)=INCHAN
        NAME(I+1)=INNAME
        SLOPE(I+1)=INSLOP
        YINT(I+1)=INYINT
        GO TO 2
C
C-----PRINT CHANNEL CALIBRATION TABLE
C
3       PRINT 9002,TAPENO,DATE
9002    FORMAT(1H1,    //T26,'---CHANNEL CALIBRATION TABLE---'/T32,
       1'TAPE NUMBER ',2A4/T34,'RECORDED ',I5,  ///2(5X,'CHAN',2X,
       2'SENSOR',4X,'SLOPE',5X,'Y-INT')/2X,74('-')///)
        DO 5 I=1,35
        II=I+35
        PRINT9003,CHANS(I),NAME(I),SLOPE(I),YINT(I),CHANS(II),
       3NAME(II),SLOPE(II),YINT(II)
9003    FORMAT(2X,2(4X,I2,4X,A4,3X,F8.4,3X,F8.4))
5       CONTINUE
C
C   ---INITIALIZE PROGRAM VALUES
C
        RECNO=0
        CURREC=0
        VOLTS=20.0/256.0
        CONVRT=0
        IFF=2
        RETURN
C
C-----SKIP TO REQUESTED RECORD
C
  950   CURREC=0
1000    NOSKP=(RECNO-1)-CURREC
        IF(NOSKP) 1010,2000,1020
1010    PRINT 9100
9100    FORMAT (1H1,' TAPE BEYOND REQUESTED RECORD')
        STOP
1020    DO 1030 I=1,NOSKP
        READ(TAPIN,9101,ERR=1025,END=1040) DUM
9101    FORMAT (A1)
        GO TO 1030
1025    READ(TAPIN,9101) DUM
1030    CONTINUE
        CURREC=CURREC+NOSKP
        GO TO 2000
  40    PRINT 9102
9102    FORMAT (1H1,' EOF ENCOUNTERED DURING SKIP')
```

SITKA Listing 24 (2 of 3)

```
      STOP
C
C    --READ DATA TAPE RECORD
C
2000  READ (TAPIN,9004,END=8000,ERR=7000) IDATA
9004  FORMAT (56(10A4))
C
C-----UNPACK DATA: CONVERT TO VOLTS AND ENG. UNITS
C
      I=1
      DO 2010 J=1,32
      DO 2010 K=1,70
      BURST(4)=LCGD(I)
      VALUE=(CONVRT-128.0)*VOLTS
      CHAN(J,K)=VALUE*SLOPE(K)+YINT(K)
      I=I+1
2010  CONTINUE
C
C-----BUILD SENSOR ARRAY
C
      I=1
      DO 2030 II=1,32
C       UNPACK DATA FOR THE 2-VALUE-PER-SCAN CHANNELS
      DO 2020 J=1,33
      SENS(I,J)=CHAN(II,J)
      SENS(I+1,J)=CHAN(II,J+35)
2020  CONTINUE
C       HANDLE SINGLE VALUE CHANNELS
      SENS(II,34)=CHAN(II,34)
      SENS(II,35)=CHAN(II,35)
      SENS(II,36)=CHAN(II,69)
      SENS(II,37)=CHAN(II,70)
      I=I+2
2030  CONTINUE
      RECNO=RECNO+1
      CURREC=CURREC+1
      IRF=1
      RETURN
C       READ A RECORD AS DUMMY THEN RETURN
7000  RECNO=RECNO+1
      CURREC=CURREC+1
      READ (TAPIN,9005) DUM
9005  FORMAT (A1)
      IRF=2
      RETURN
8000  IRF=3
      RETURN
      END
```

SITKA Listing 24 (3 of 3)

PROGRAM TAPSUM

INTRODUCTION

This program reads SITKA data tapes and prints summary reports of the contents by individual wind or seismic events. Within an event, interval summaries are printed every 30 minutes, 10 minutes or every INTRVL seconds as requested by parameter card.

Within each interval summary, the maximum value, minimum, mean and standard deviation are displayed for each channel. Each interval summary has the channels arranged in order of the accelerometers first, then the 'U' wind channels, 'V' winds, 'W' winds, and miscellaneous channels.

The tape summary displays beginning and ending record numbers and time for each interval, record numbers that have I/O or time errors plus total records and errors for the whole tape.

See Figures 52 through 59, Table 15 and Listings 25 through 30.

OPERATIONAL NOTES

Besides inputting tape number and date, several other parameters must be set by the data request card for a run. First the number of files to summarize must be set and the appropriate JCL cards for each file set up.

The length of the interval to summarize must also be chosen. Normally this parameter is set for 600 seconds (10 minutes) the first time run on a tape, although short 120 second runs are sometimes more appropriate to help narrow down the start of acceleration events for further detailed runs by such programs as RBMPLT. The parameter ISECF is set to 0 or 1 depending on if seconds were recorded on a specific input tape. Finally if for any reason processing on a file is to terminate without reading all of that file, an ending record number may be input for this purpose (default value is 9999).

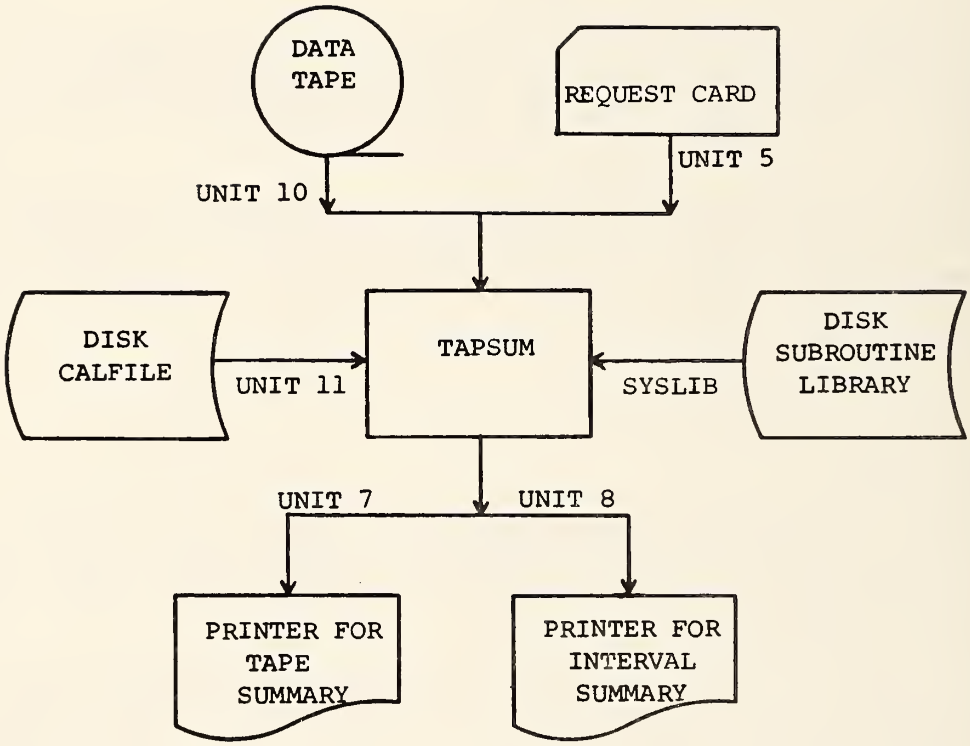


Figure 52. Program TAPSUM Setup

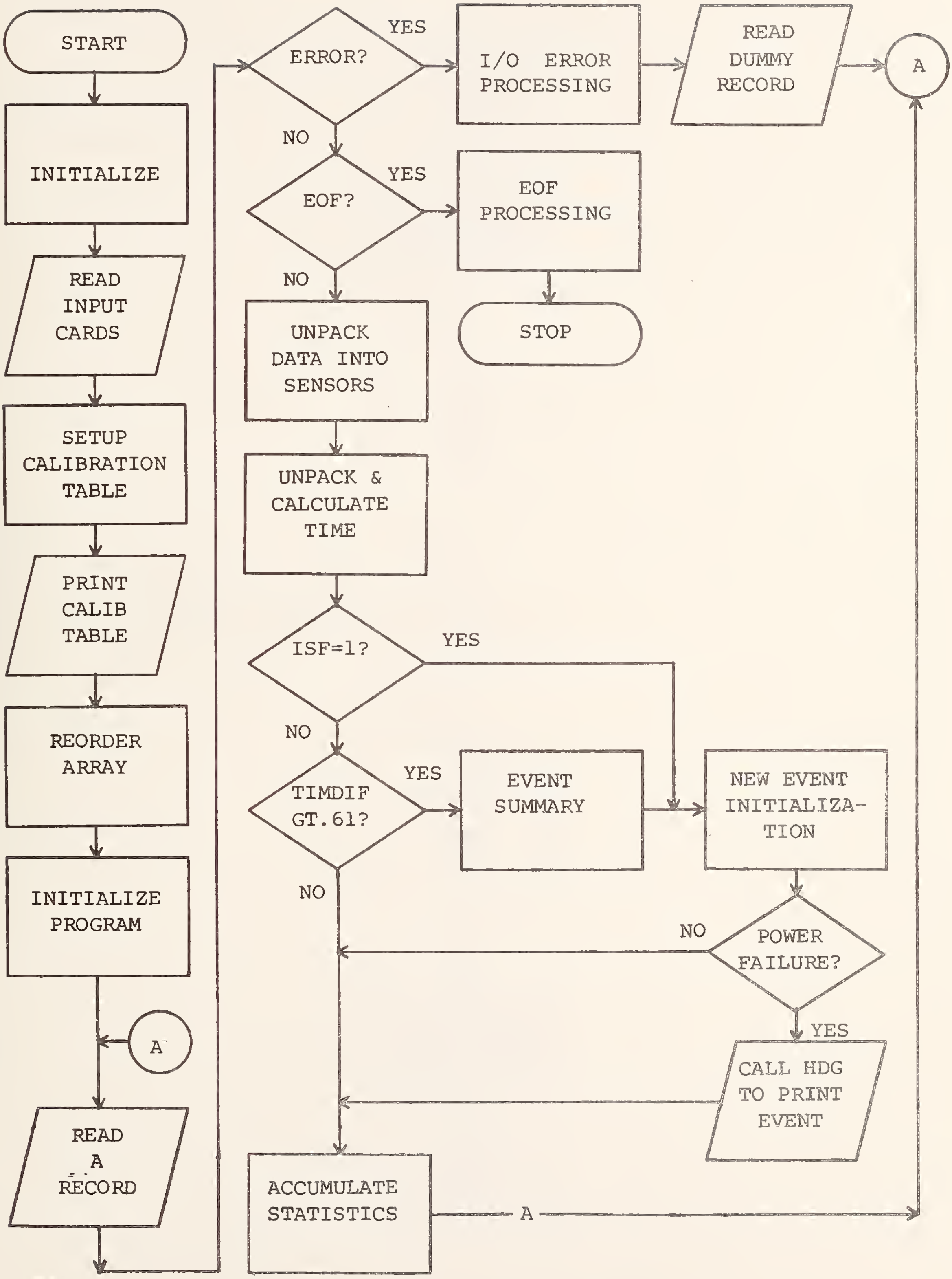


Figure 53. TAPSUM Flow Chart

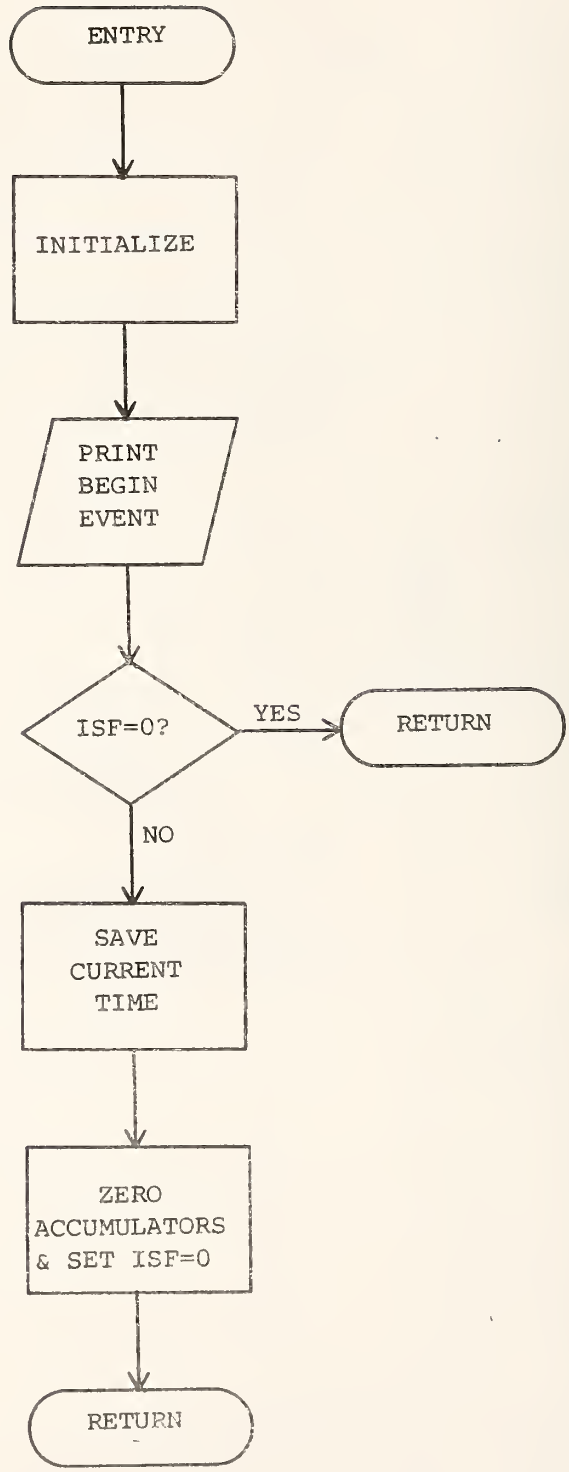


Figure 54. EVINIT Flow Chart

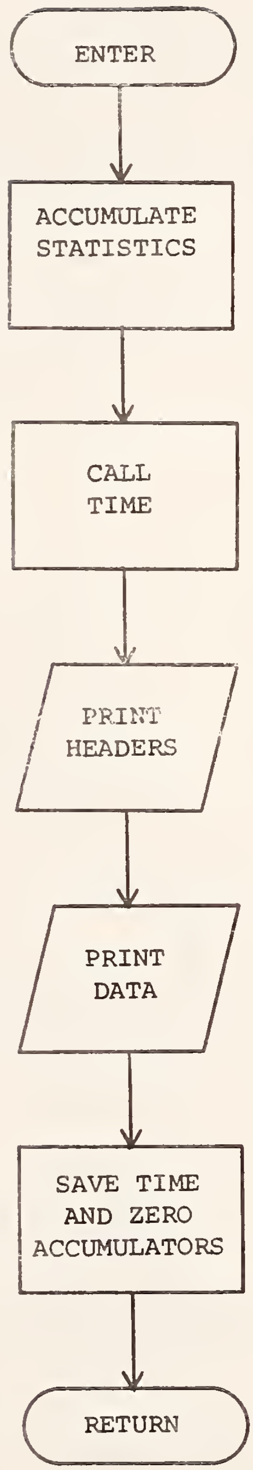


Figure 55. INTSUM Flow Chart

0010436 76300

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	---	Tape number	2A4	1-8
2	72274 - present (Sitka)	Recording date	15	11-15

Figure 56. TAPSUM Tape Number Card Format

```
1    600    1    4000
```

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	1-5	Number of files to process	I5	1-5
2	Usually 120,600	Length of summary (seconds)	I5	6-10
3	0,1	Seconds available flag	I5	11-15
4	2-9999	Ending record number	I5	16-20

Figure 57. TAPSUM Request Card

```
                    ---TAPE SUMMARY---                    PAGE  1
                    TAPE NUMBER 007983
                     RECORDED 73180


RECORD       TIME
  NO       D  H  M  S              COMMENT
---------------------------------------------------------------------

    1      47: 6:47:30      BEGIN EVENT  1  (WIND)
   80      47: 6:54:32      TIME ERROR. LAST TIME- 47: 6:53:49
 2429                       I/O ERROR. LAST TIME- 47:10: 4:29
 2430                       I/O ERROR. LAST TIME- 47:10: 4:29
 2430      47:10: 4:29      INTERVAL SUMMARY  1- 1
 2430      47:10: 4:29      END EVENT  1
 -----     -----------
 2430       0: 3:16:59      EVENT TOTALS

 2431      47:10: 6:23      BEGIN EVENT  2  (WIND)
 2665      47:10:25:18      INTERVAL SUMMARY  2- 1
 2665      47:10:25:18      END EVENT  2
 -----     -----------
  235       0: 0:18:55      EVENT TOTALS

 2665       0: 3:35:54      TAPE TOTALS
    2                       I/O ERRORS
    1                       TIME ERRORS
```

Figure 58. Program TAPSUM Tape Summary Output

TAPE NO. 007983
EVENT NO. 1
INTERVAL SUMMARY 1- 1

START 47: 6:47:30
STOP 47:10: 4:29
DURATION 3:16:59

SENSOR	MINIMUM	MAXIMUM	MEAN	STD.DEV.
A1	-0.006	0.014	0.0035	0.0031
A2	-0.004	0.010	0.0024	0.0009
A3	-0.008	0.006	-0.0016	0.0012
A4	0.002	0.022	0.0115	0.0015
A5	-0.028	0.006	-0.0123	0.0015
A6	-0.003	0.019	0.0093	0.0009
A7	-0.019	0.013	-0.0043	0.0017
A8	-0.019	0.009	-0.0061	0.0011
A9	0.057	0.190	0.1023	0.0129
A10	-0.022	0.003	-0.0094	0.0008
A11	-0.251	0.229	-0.0092	0.0427
A12	-0.003	0.003	-0.0004	0.0012
A13	0.402	0.402	0.4020	0.0000
1U	-12.144	14.946	3.2700	2.4247
2U	-6.539	17.748	4.0908	2.6142
3U	-47.640	14.012	3.0675	2.4857
4U	-11.209	14.012	2.6995	2.5212
5U	-3.736	14.012	7.0260	2.9899
1V	0.0	43.904	21.5187	4.5368
2V	2.802	41.101	22.3343	4.3809
3V	4.671	41.101	22.8829	4.3096
4V	1.868	42.036	22.6454	4.4385
5V	0.934	37.365	12.8486	4.3795
1W	-9.341	13.078	2.3736	1.7374
2W	-6.539	10.275	2.5782	1.6023
3W	-7.473	12.144	2.0069	1.6184
4W	-10.275	10.275	0.4108	1.7225
5W	-12.144	12.144	0.7595	2.0289
SEIS	0.078	0.156	0.1534	0.0146
SPAR	-1.250	0.391	-0.4604	0.1438
SPAR	-1.797	-0.313	-1.1176	0.1296
TEMP	5.800	8.337	7.0183	0.3876
CLSF	9.844	9.922	9.8598	0.0315
CLSZ	0.0	0.0	0.0	0.0000
CLSM	5.000	5.000	5.0000	0.0000
SPAR	9.219	9.375	9.2931	0.0167
SPAR	8.281	8.438	8.3621	0.0145
IRG	0.0	5308.000	275.6652	110.3725

Figure 59. Program TAPSUM Interval Summary Output

Table 15. TAPSUM Variable Name List

Name	Com	Type	Dimension	Usage
ACUM1	x	R*8	38	Accumulator
ACUM2	x	R*8	1	Accumulator
ARG		I*2	1	Actual IRG read from tape
BURST		L*1	4	Byte work array
CALFIL		I	1	Calibration file unit assignment
CHAN		R	32,70	Channel
CHANO		I	70	Channel number
CONVRT		I	1	Data amplitude word
CURSEC	x	R*8	1	Current seconds
CURTIM	x	I	4	Current time
DATE	x	I	1	Date from tape number card
DAYS		R	1	Days
DHMS		I	4	Days-hours-mins-secs array
ENDREC		I	1	Last record to process
EVBREC	x	I	1	Event beginning record
EVBSEC	x	R*8	1	Event beginning seconds
EVENT	x	I	1	Recording event number
EVINCT	x	I	1	Event initialization counter
EVRECS		I	1	Number of records in latest event
HRS		R	1	Hours
I		I	1	General index
I1		I	1	General index
I2		I	1	General index
I3		I	1	General index
IBLNK		I*2	1	Blank
IDATA		I	560	Work array for 1 record of data
IDAYH		I	1	Hundreds of days
IDAYT		I	1	Tens of days
IHRT		I	1	Tens of hours
IDAYU		I	1	Days
IFLE		I	1	File counter

Table 15. TAPSUM Variable Name List (continued)

Name	Com	Type	Dimension	Usage
IHRU		I	1	Hours
II		I	1	I + 35
IMINT		I	1	Temporary minutes
IMINU		I	1	Minutes
INBSEC	x	R*8	1	Time at start of interval
ICHAN		I	1	Cal file channel
IDATE		I	1	Cal file date
INNAME		I	1	Cal file name
INTCNT	x	I	1	Interval counter
INTRVL		I	1	Length of data summaries
INTSEC	x	R*8	1	Time elapsed within present interval
INSLOP		R	1	Calibration slope
INSPLS	x	R	1	Interval samples counter
INYINT		R	1	Calib Y intercept
IPWR		I	1	Power failure flag
IRG		I	1	Inter record gap
ISECF		I	1	Data-timing-contains-seconds flag
ISECT		I	1	Tens of seconds
ISECU		I	1	Seconds (units)
ISF	x	I	1	Ready-for-new-event flag
ITM		I	4	Time
J		I	1	General index
JJ		I	1	General index
K		I	1	General index
LASSEC	x	R*8	1	Last seconds
LASTIM	x	I	4	Time of last record
LITIRG		I	1	Literal 'IRG'
LOGD		L*1	2240	Byte array for data record
LOGT		L*I	16	Byte array for time
LSREC	x	I	1	Last record number
MAX	x	R	38	Maximum values array

Table 15. TAPSUM Variable Name List (continued)

Name	Com	Type	Dimension	Usage
MIN	x	R	38	Minimum values array
MINS		R	1	Minutes
NAME	x	I	70	Sensor name
NFLE		I	1	Number of files to process
NLINES	x	I	1	Line counter
PAGE	x	I	1	Page counter
PRNTIM		I	4	Time printed at end of an interval
PRNTRI	x	I	1	Printer 1 unit assignment
PRNTR2	x	I	1	Printer 2 unit assignment
RECNO	x	I	1	Record number
SECNDS		R*8	1	Seconds
SECS	x	R*8	1	Seconds
SEIS		R	1	Title 'seis'
SENS	x	R	64,37	Array holding 1 raw record
SLOPE		R	1	Slope
TAPENO	x	R	2	Tape number literal
TAPIN		I	1	Tape unit assignment
TEMP		R	1	Temporary variable
TIERRS		I	1	I/O error counter
TIMDIF		R*8	1	Time difference
TOTSEC		R*8	2	Total seconds
TPBSEC	x	R*8	1	Tape seconds
TTERRS		I	1	Timing error counter
TYPE		R	1	Type of event (wind or seismic)
VALUE		R	1	Calibrated data value
VARI		R*8	1	Variance
VOLTS		R	1	Volts per bit
WIND		R	1	Title 'WIND'
YINT		R	1	Y intercept
IBNTIM	x	I	4	Interval begin time

```
C*****PROGRAM TAPSUM*************************************************************
C
C-----READ SITKA DATA TAPES AND PRINT SUMMARY
C-----REPORT OF TAPE CONTENTS BY INDIVIDUAL
C-----SEISMIC OR WIND EVENTS.
C
C     PROG. BY CHUCK GERHARDT   S.T.A. 1976
C
C-----COMMON VARIABLES
C
      COMMON ACUM1,ACUM2,CURSEC,INTSEC,INBSEC,EVBSEC,TPBSEC,LASSEC,
     1  TAPENO,SENS,MIN,MAX,INSPLS,PRNTR2,DATE,EVENT,ISF,RECNO,PAGE,
     1  NLINES,LASTIM,NAME,CURTIM,EVINCT,INBTIM,INTCNT,EVBREC,PRNTR1,
     1  LSREC
      REAL*8 ACUM1(38),ACUM2(38),CURSEC,INTSEC,INBSEC,EVBSEC,TPBSEC,
     1  LASSEC
      REAL TAPENO(2),SENS(64,37),MIN(38),MAX(38),INSPLS
      INTEGER PRNTR2,DATE,EVENT,ISF,RECNC,PAGE,NLINES,LASTIM(4),
     1  NAME(70),CURTIM(4),EVINCT,INBTIM(4),INTCNT,EVBREC,PRNTR1,LSREC
C
C-----LOCAL VARIABLES
C
      REAL*8 TOTSEC,TIMDIF
      REAL VOLTS,SLOPE(70),YINT(70),VALUE,CHAN(32,70),
     1 INSLOP,INYINT
      INTEGER TAPIN,TIERRS,TTERRS,CHANO(70),I,II,I1,I2,I3,LITIRG,
     1IDATA(560),ITM(4),J,K,CONVRT,IMINT,IMINU,IPWR,IHRT,IHRU,IDAYT,
     2IDAYU,ISECT,ISECU,  IRG,PRNTIM(4),CALFIL,ENDREC,ISECF
      INTEGER*2 IBLNK,ARG
      LOGICAL*1 BURST(4),LOGT(16),LOGD(2240)
      EQUIVALENCE (LOGT(1),ITM(1)),(LOGD(1),IDATA(1)),
     6(CONVRT,BURST(1))
      DATA LITIRG/'IRG'/
C
C-----INITIALIZE DEVICES
C
      TAPIN=10
      CALFIL=11
      PRNTR1=7
      PRNTR2=8
C
C-----READ TAPE NUMBER CARD AND DATA REQUEST CARD
C
      READ 9000,TAPENO,DATE
9000  FORMAT (2A4,T11,I5)
      READ 9100,NFLE,INTRVL,ISECF,ENDREC
 9100 FORMAT (4I5)
      IF (ENDREC.LE.0)   ENDREC=9999
      IF (INTRVL.LE.60)   INTRVL=120
      IF(DATE.GE.72274) GO TO 1
      WRITE(PRNTR1,9901)
9901  FORMAT (1H1,'INVALID TAPE DATE')
      STOP
C
```

TAPSUM Listing 25 (1 of 6)

```
C-----SET-UP CHANNEL CALIBRATION TABLE
C
1      I=0
2      READ(CALFIL,9001,END=3) INCHAN,INNAME,INSLOP,INYINT,INDATE
9001   FORMAT(I2,T11,A4,T21,F8.4,T31,F8.4,T51,I5)
       IF(INCHAN.GT.I)I=I+1
       IF(INDATE.GT.DATE) GO TO 2
       CHANO(I+1)=INCHAN
       NAME(I+1)=INNAME
       SLOPE(I+1)=INSLOP
       YINT(I+1)=INYINT
       GO TO 2
C
C-----PRINT CHANNEL CALIBRATION TABLE
C
3      WRITE(PRNTR1,9002)TAPENO,DATE
9002   FORMAT(1H1,    //T26,'---CHANNEL CALIBRATION TABLE---'/T32,
      1'TAPE NUMBER ',2A4/T34,'RECORDED ',I5,  ///2(5X,'CHAN',2X,
      2'SENSOR',4X,'SLOPE',5X,'Y-INT')/2X,74('-')//)
       DO 5 I=1,35
       II=I+35
       WRITE(PRNTR1,9003)CHANO(I),NAME(I),SLOPE(I),YINT(I),CHANO(II),
      1NAME(II),SLOPE(II),YINT(II)
9003   FORMAT (2X,2(4X,I2,4X,A4,3X,F8.4,3X,F8.4))
5      CONTINUE
C
C-----PUT NAME ARRAY IN SENS GROUP ARRAY ORDER
C
       I2=2
       I3=2
       DO 6 I1=1,33
       IF(I1.EQ.14)I2=1
       IF(I1.EQ.29)I2=28
       IF(I1.GE.30)I3=1
       NAME(I1)=NAME(I2+35)
       I2=I2+I3
6      CONTINUE
       NAME(36)=NAME(34)
       NAME(37)=NAME(35)
       NAME(34)=NAME(69)
       NAME(35)=NAME(70)
       NAME(38)=LITIRG
C
C-----INITIALIZE PROGRAM
C
       IFLE=1
10000  CONTINUE
       PAGE=1
       NLINES=60
       CALL HDG
       EVENT=0
       ISF=1
       RECNO=0
       TIERRS=0
```

```
      TTERRS=0
      CONVRT=0
      VOLTS=20.0/256.0
      DO 10 I=1,4
      LASTIM(I)=0
      CURTIM(I)=0
10    CONTINUE
      LASSEC=0.0D0
      IBLNK=0
C
C-----READ DATA TAPE RECORD
C
 1000 READ (TAPIN,9004,END=8000,ERR=7000)
     2IDATA,(ITM(I),I=2,4),ARG,ITM(1),IBLNK
C9004 FORMAT (56(10A4),3A1,A2,A1,A2)
9004  FORMAT (56(10A4),3A1,A2,2A1)
C     IF(IBLNK.NE.0) GO TO 700C
2000  RECNO=RECNO+1
      LSREC=RECNO-1
      IF (RECNO.GE.ENDREC)   GO TO 8000
C
C-----UNPACK CHANNEL DATA; CONVERT TO VOLTS
C-----THEN TO ENGINEERING UNITS

      I=1
      DO 2010 J=1,32
      DO 2010 K=1,70
      BURST(4)=LOGD(I)
      VALUE=CONVRT-128.0
      CHAN(J,K)=VALUE*VOLTS
      CHAN(J,K)=CHAN(J,K)*SLOPE(K)+YINT(K)
      I=I+1
2010  CONTINUE
C
C-----BUILD SENSOR GROUP ARRAY
C
      I=1
      DO 2030 II=1,32
      I2=2
      I3=2
      DO 2020 I1=1,33
      IF(I1.EQ.14)I2=1
      IF(I1.EQ.29)I2=28
      IF(I1.GE.30)I3=1
      SENS(I,I1)=CHAN(II,I2)
      SENS(I+1,I1)=CHAN(II,I2+35)
      I2=I2+I3
2020  CONTINUE
      SENS(II,34)=CHAN(II,69)
      SENS(II,35)=CHAN(II,70)
      SENS(II,36)=CHAN(II,34)
      SENS(II,37)=CHAN(II,35)
      I=I+2
2030  CONTINUE
```

```
C-----CONVERT TIME FROM ALPHA TO INTEGER
C
      J=1
      DO 2040 I=1,13,4
      BURST(4)=LOGT(I)
      ITM(J)=CONVRT
      J=J+1
2040  CONTINUE
      IF(ISECF.EQ.0)ITM(4)=0.0
C
C-----UNPACK TIME
C
      IMINT=ITM(1)/16
      IMINU=ITM(1)-IMINT*16
      IPWR=0
      IF(IMINT.LT.8)GO TO 2050
      IPWR=1
      IMINT=IMINT-8
2050  IHRT=ITM(2)/64
      IHRU=ITM(2)/4-IHRT*16
      IDAYH=ITM(2)-(ITM(2)/4)*4
      IDAYT=ITM(3)/16
      IDAYU=ITM(3)-IDAYT*16
      ISECT=ITM(4)/16
      ISECU=ITM(4)-ISECT*16
      IF(ISECT.LT.8)GO TO 2060
      ISECT=ISECT-8
C
C-----COMPUTE CURRENT RECORD TIME
C
2060  CURTIM(1)=IDAYH*100+IDAYT*10+IDAYU
      CURTIM(2)=IHRT*10+IHRU
      CURTIM(3)=IMINT*10+IMINU
      CURTIM(4)=ISECT*10+ISECU
C
C-----TIME CHECKS
C
2065  CURSEC=CURTIM(4)*1.D0+CURTIM(3)*60.D0+CURTIM(2)*3600.D0+
     1CURTIM(1)*86400.D0
      TIMDIF=CURSEC-LASSEC
C
C-----CHECK FOR NEW EVENT
C
      IF(ISF.EQ.1) GO TO 5010
      IF (TIMDIF.GT.61.D0)    GO TO 5000
C     IF(TIMDIF.LT.0.0D0.OR.TIMDIF.GT.15.0D0.AND.ISECF.GT.0) GO TO 5000
C
C-----CHECK FOR END OF SUMMARY INTERVAL (EITHER 30 MINUTES OR 10 MIN)
C
      INTSEC=CURSEC-INBSEC
      IF(INTSEC.LT.0.0D0.OR.INTSEC.GE.INTVRL)   CALL INTSUM
C
C-----CHECK FOR TIME SEQUENCE ERROR
```

```
C
2070  IF(ISECF.EQ.0) GO TO 4000
      IF(TIMDIF.GE.3.9D0.AND.TIMDIF.LE.5.1D0) GO TO 4000
      TTERRS=TTERRS+1
      WRITE(PRNTR1,9006)RECNO,CURTIM,LASTIM
9006  FORMAT(T11,I5,T21,I3,3(':',I2),T38,
     4'TIME ERROR. LAST TIME-',I3,3(':',I2))
      NLINES=NLINES+1
      CALL HDG
C
C-----ACCUMULATE STATISTICS
C
4000  N=64
      DO 4011 J=1,37
      IF(J.GE.34)N=32
      IF (INSPLS.GT.63.0)  GO TO 4005
      MIN(J)=SENS(1,J)
      MAX(J)=SENS(1,J)
4005  CONTINUE
      DO 4010 I=1,N
      ACUM1(J)=ACUM1(J)+SENS(I,J)
      ACUM2(J)=ACUM2(J)+(SENS(I,J)*SENS(I,J))
      IF(SENS(I,J).LT.MIN(J))MIN(J)=SENS(I,J)
      IF(SENS(I,J).GT.MAX(J))MAX(J)=SENS(I,J)
4010  CONTINUE
4011   CONTINUE
      IRG=ARG
      IF(INSPLS.EQ.0.0) IRG=0
      ACUM1(38)=ACUM1(38)+IRG
      ACUM2(38)=ACUM2(38)+(IRG*IRG)
      IF(IRG.LT.MIN(38))MIN(38)=IRG
      IF(IRG.GT.MAX(38))MAX(38)=IRG
      IF (INSPLS.LT.63.0)   MIN(38)=MAX(38)
      DO 4020 I=1,4
      LASTIM(I)=CURTIM(I)
4020  CONTINUE
      LASSEC=CURSEC
      INSPLS=INSPLS+64.0
      GO TO 1000
C
C-----NEW EVENT PROCESSING
C
5000  CALL INTSUM
      IF (EVENT.GT.30)   STOP 5000
      CALL EVTERM
5010  CALL EVINIT
C
C-----POWER FAILURE CHECK
C
      IF(IPWR.EQ.0)GO TO 4000
      WRITE(PRNTR1,9005)RECNO,CURTIM,LASTIM
9005  FORMAT(T11,I5,T21,I3,3(':',I2),T38,'POWER FAILURE. LAST TIME-',
     3I3,3(':',I2))
      NLINES=NLINES+1
```

TAPSUM Listing 25 (5 of 6)

```
      CALL HDG
      GO TO 4000
C
C-----I/O ERROR PROCESSING
C
7000  RECNO=RECNO+1
      IF(TIERRS.GT.200) STOP 7000
      TIERRS=TIERRS+1
      WRITE(PRNTR1,9007)RECNO,LASTIM
9007  FORMAT(T11,I5,T38,'I/O ERROR. LAST TIME-',I3,3(':',I2))
      NLINES=NLINES+1
      CALL HDG
      READ (TAPIN,9010) DUM
9010  FORMAT (A1)
      GO TO 1000
C
C-----EOF/EOT PROCESSING
C
8000  IF(ISF.EQ.1) GO TO 9998
      LSREC=RECNO
      CALL INTSUM
      CALL EVTERM
      TOTSEC=TPBSEC
      CALL TIME(TOTSEC,PRNTIM)
      WRITE(PRNTR1,9008)RECNO,PRNTIM
9008  FORMAT(T11,I5,T21,I3,3(':',I2),T38,'TAPE TOTALS')
      WRITE(PRNTR1,9009)TIERRS,TTERRS
9009  FORMAT(T11,I5,T38,'I/O ERRORS'/T11,I5,T38,'TIME ERRORS')
9998  PRINT 9011
9011  FORMAT (1X,'PROCESSING COMPLETE.')
      IF(IFLE.GE.NFLE) GO TO 9999
      IFLE=IFLE+1
      GO TO 10000
9999  STOP
      END
```

TAPSUM Listing 25 (6 of 6)

```
      SUBROUTINE TIME (SECS, DHMS)
C
C-----COMPLTES TIME IN INTEGER DAYS,
C-----HOJRS, MINJTES, AND SECONDS, FROM REAL SECONDS
C
      REAL*8 SECS
      REAL DAYS,TEMP,HRS,MINS
      INTEGER DHMS(4)
      DAYS=SECS/86400.0
      DHMS(1)=DAYS
      TEMP=DHMS(1)*86400.0
      HRS=(SECS-TEMP)/3600.0
      DHMS(2)=HRS
      TEMP=TEMP+DHMS(2)*3600.0
      MINS=(SECS-TEMP)/60.0
      DHMS(3)=MINS
      TEMP=TEMP+DHMS(3)*60.0
      SECS=SECS-TEMP
      DHMS(4)=SECS
      RETURN
      END
```

TIME Listing 26

```
      SUBROUTINE HDG
C
C-----PRINTS TAPE SUMMARY AND COLUMN HEADINGS
C
C-----COMMON VARIABLES
C
      COMMON ACUM1,ACUM2,CURSEC,INTSEC,INBSEC,EVBSEC,TPBSEC,LASSEC,
     1  TAPENO,SENS,MIN,MAX,INSPLS,PRNTR2,DATE,EVENT,ISF,RECNO,PAGE,
     1  NLINES,LASTIM,NAME,CURTIM,EVINCT,INBTIM,INTCNT,EVBREC,PRNTR1,
     1  LSREC
      REAL*8 ACUM1(38),ACUM2(38),CURSEC,INTSEC,INBSEC,EVBSEC,TPBSEC,
     1  LASSEC
      REAL TAPENO(2),SENS(64,37),MIN(38),MAX(38),INSPLS
      INTEGER PRNTR2,DATE,EVENT,ISF,RECNO,PAGE,NLINES,LASTIM(4),
     1  NAME(70),CURTIM(4),EVINCT,INBTIM(4),INTCNT,EVBREC,PRNTR1,LSREC
      IF(NLINES.LT.55) RETURN
      WRITE(PRNTR1,9000)PAGE,TAPENO,DATE
9000  FORMAT(1H1    //T31,'---TAPE SUMMARY---',T65,'PAGE ',I2/T31,
     1'TAPE NUMBER ',2A4/T33,'RECORDED ',I5///)
      WRITE(PRNTR1,9001)
9001  FORMAT(T11,'RECORD',T25,'TIME'/T13,'NO',T22,'D   H   M   S',T45,
     2'COMMENT'/T11,60('-')/)
      PAGE=PAGE+1
      NLINES=12
      RETURN
      END
```

HDG Listing 27

```
      SUBROUTINE EVINIT
C
C-----INITIALIZES FOR NEW EVENT, AND PRINTS BEGIN EVENT ENTRY
C
C-----COMMON VARIABLES
C
      COMMON ACUM1,ACUM2,CURSEC,INTSEC,INBSEC,EVBSEC,TPBSEC,LASSEC,
     1  TAPEND,SENS,MIN,MAX,INSPLS,PRNTR2,DATE,EVENT,ISF,RECNO,PAGE,
     1  NLINES,LASTIM,NAME,CURTIM,EVINCT,INBTIM,INTCNT,EVBREC,PRNTR1,
     1  LSREC
      REAL*8 ACUM1(38),ACUM2(38),CURSEC,INTSEC,INBSEC,EVBSEC,TPBSEC,
     1  LASSEC
      REAL TAPEND(2),SENS(64,37),MIN(38),MAX(38),INSPLS
      INTEGER PRNTR2,DATE,EVENT,ISF,RECNO,PAGE,NLINES,LASTIM(4),
     1  NAME(70),CURTIM(4),EVINCT,INBTIM(4),INTCNT,EVBREC,PRNTR1,LSREC
C
C-----LOCAL VARIABLES
C
      REAL SEIS,WIND,TYPE
      DATA SEIS/'SEIS'/,WIND/'WIND'/
      EVINCT=0
      EVBREC=RECNO
      EVBSEC=CURSEC
      EVENT=EVENT+1
      TYPE=WIND
      IF(SENS(1,29).GT.4.0) TYPE=SEIS
      WRITE(PRNTR1,9000)RECNO,CURTIM,EVENT,TYPE
9000  FORMAT(T11,I5,T21,I3,3(':',I2),T38,'BEGIN EVENT ',I2,2X,
     5'(',A4,')')
      NLINES=NLINES+1
      IF(ISF.EQ.0)RETURN
      DO 10 I=1,38
      ACUM1(I)=0.0D0
      ACUM2(I)=0.0D0
      MIN(I)=0.0
      MAX(I)=0.0
10    CONTINUE
      DO 20 I=1,4
      INBTIM(I)=CURTIM(I)
20    CONTINUE
      INBSEC=CURSEC
      INSPLS=0.0
      INTCNT=0
      TPBSEC=0.0D0
      ISF=0
      RETURN
      END
```

EVINIT Listing 28

```
      SUBROUTINE EVTERM
C
C-----TERMINATES EVENT, PRINTS END EVENT ENTRY
C
C-----COMMON VARIABLES
C
      COMMON ACUM1,ACUM2,CURSEC,INTSEC,INBSEC,EVBSEC,TPBSEC,LASSEC,
     1  TAPENO,SENS,MIN,MAX,INSPLS,PRNTR2,DATE,EVENT,ISF,RECNO,PAGE,
     1  NLINES,LASTIM,NAME,CURTIM,EVINCT,INBTIM,INTCNT,EVBREC,PRNTR1,
     1  LSREC
      REAL*8 ACUM1(38),ACUM2(38),CURSEC,INTSEC,INBSEC,EVBSEC,TPBSEC,
     1  LASSEC
      REAL TAPENO(2),SENS(64,37),MIN(38),MAX(38),INSPLS
      INTEGER PRNTR2,DATE,EVENT,ISF,RECNO,PAGE,NLINES,LASTIM(4),
     1  NAME(70),CURTIM(4),EVINCT,INBTIM(4),INTCNT,EVBREC,PRNTR1,LSREC
C
C-----LOCAL VARIABLES
C
      REAL*8 SECNDS
      INTEGER EVRECS,PRNTIM(4)
      WRITE(PRNTR1,9000)LSREC,LASTIM,EVENT
9000  FORMAT(T11,I5,T21,I3,3(':',I2),T38,'END EVENT ',I2/T11,5('-'),
     1T21,12('-'))
      EVRECS=LSREC-EVBREC+1
      SECNDS=LASSEC-EVBSEC
      TPBSEC=TPBSEC+SECNDS
      CALL TIME(SECNDS,PRNTIM)
      WRITE(PRNTR1,9001)EVRECS,PRNTIM
9001  FORMAT(T11,I5,T21,I3,3(':',I2),T38,'EVENT TOTALS'/)
      NLINES=NLINES+4
      CALL HDG
      RETURN
      END
```

EVTERM Listing 29

```
      SUBROUTINE INTSUM
C
C-----COMPUTES FINAL TIME INTERVAL STATISTICS
C-----AND OUTPUTS INTERVAL SUMMARY
C
C-----COMMON VARIABLES
C
      COMMON ACUM1,ACUM2,CURSEC,INTSEC,INBSEC,EVBSEC,TPBSEC,LASSEC,
     1 TAPEND,SENS,MIN,MAX,INSPLS,PRNTR2,DATE,EVENT,ISF,RECNO,PAGE,
     1 NLINES,LASTIM,NAME,CURTIM,EVINCT,INBTIM,INTCNT,EVBREC,PRNTR1,
     1 LSREC
      REAL*8 ACUM1(38),ACUM2(38),CURSEC,INTSEC,INBSEC,EVBSEC,TPBSEC,
     1 LASSEC
      REAL TAPEND(2),SENS(64,37),MIN(38),MAX(38),INSPLS
      INTEGER PRNTR2,DATE,EVENT,ISF,RECNO,PAGE,NLINES,LASTIM(4),
     1 NAME(70),CURTIM(4),EVINCT,INBTIM(4),INTCNT,EVBREC,PRNTR1,LSREC
C
C-----LOCAL VARIABLES
C
      INTEGER I,PRNTIM(4),J,JJ
      REAL*8 VARI
      DO 10 I=1,38
      IF(I.EQ.34)INSPLS=INSPLS/2.0
      IF(I.EQ.38)INSPLS=INSPLS/32.0
      ACUM1(I)=ACUM1(I)/INSPLS
      VARI=ACUM2(I)/INSPLS-(ACUM1(I)*ACUM1(I))
      IF(VARI.LE.0.0D0) VARI=1.0D-9
      ACUM2(I)=DSQRT(VARI)
10    CONTINUE
      INTCNT=INTCNT+1
      EVINCT=EVINCT+1
      INTSEC=LASSEC-INBSEC
      CALL TIME(INTSEC,PRNTIM)
      WRITE(PRNTR2,9010) TAPEND,INBTIM,EVENT,LASTIM,EVENT,EVINCT,
     2(PRNTIM(I),I=2,4)
9010  FORMAT(1H1,T11,'TAPE NO. ',2A4,T55,'START   ',I3,
     33(':',I2)/T11,'EVENT NO. ',I2,T55,'STOP    ',I3,3(':',I2)/T11,
     4'INTERVAL SUMMARY ',I2,'-',I2,T55,'DURATION    ',I2,2(':',I2)///)
      WRITE (PRNTR2,9011)
9011  FORMAT(T11,'SENSOR',T22,'MINIMUM',T36,'MAXIMUM',T52,'MEAN',T64,
     5'STD.DEV.'/T10,64('-')/)
      DO 8020 J=1,13
      WRITE (PRNTR2,9012) NAME(J),MIN(J),MAX(J),ACUM1(J),ACUM2(J)
9012  FORMAT(T13,A4,T22,F8.3,T36,F8.3,T50,F8.4,T64,F8.4)
8020  CONTINUE
      WRITE (PRNTR2,9013)
9013  FORMAT(/)
      DO 8040 JJ=1,3
      DO 8030 J=13,25,3
      WRITE (PRNTR2,9012) NAME(JJ+J),MIN(JJ+J),MAX(JJ+J),ACUM1(JJ+J),
     6ACUM2(JJ+J)
8030  CONTINUE
      WRITE (PRNTR2,9013)
8040  CONTINUE
```

INTSUM Listing 30 (1 of 2)

```
      DO 8050 J=29,38
      WRITE (PRNTR2,9012) NAME(J),PIA(J),MAX(J),ACUM1(J),ACUM2(J)
      IF(J.EQ.32)WRITE(PRNTR2,9013)
8050  CONTINUE
      WRITE(PRNTR1,9000)LSREC,LASTIM,EVENT,EVINCT
9000  FORMAT(T11,I5,T21,I3,3(':',I2),T38,'INTERVAL SUMMARY ',I2,'-',I2)
      NLINES=NLINES+1
      CALL HDG
      INBSEC=CURSEC
      DO 20 I=1,4
      INBTIM(I)=CURTIM(I)
20    CONTINUE
      INSPLS=0.0
      DO 30 I=1,38
      ACUM1(I)=0.0D0
      ACUM2(I)=0.0D0
      MIN(I)=0.0
   30 MAX(I)=0.0
      RETURN
      END
```

INTSUM Listing 30 (2 of 2)

SUBROUTINE WINDOW

INTRODUCTION

This subroutine applies split-cosine-bell tapering to the input time series. The number of points out of the full length (LENG2) which is tapered is given by BBEG2 for the beginning taper and BEND2 for the ending taper. Both of these parameters are normally set up in the calling programs for 10%. The height of the window at the very start (ABEG) and end (AEND) are also normally set up for 10%.

This routine also has the capability to process complex data which is utilized by inputting the length (LENG2) as a negative value.

See Figure 60, Table 16 and Listing 31.

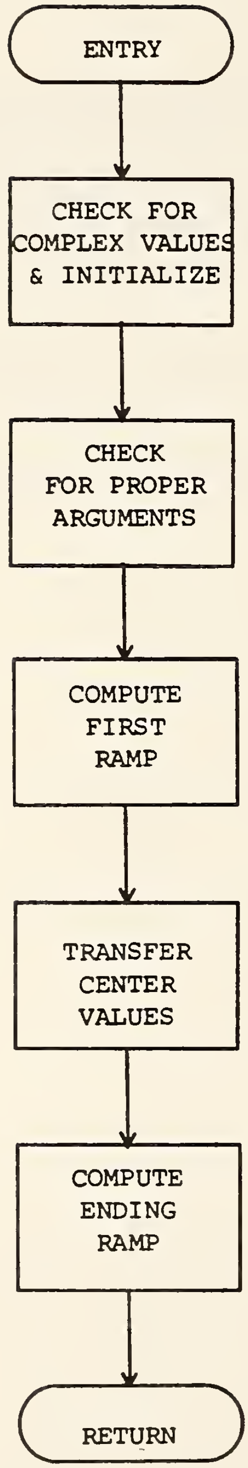


Figure 60. Program WINDOW Flow Chart

Table 16. WINDOW Variable Name List

Name	Com	Type	Dimension	Usage
ABEG		R	1	Height of window at X(1)
AMP		R	1	Amplitude
AEND		R	1	Height of window at end of data
BBEG		R	1	Length of taper onset if complex
BBEG2		R	1	Number of points before window reaches max
BEND		R	1	Length of tapering off if complex
BEND2		R	1	Number of points tapering at end of data
COEF		R	1	AMP * SINP + OFF
COSNW		R	1	COSP*CPTB - SINP*SPIB
COSP		R	1	O. or COSNW
CPIB		R	1	Cos (PI/BBEG2)
IFLAG		I	1	Complex data flag
LAST		I	1	End of a window section
LENG		I	1	Length of data if complex
SIMP		R	1	1. or SINNW
LFRST		I	1	Start of a window section
OFF		R	1	Offset
PI		R	1	3.141593
SINNW		R	1	SINP * CPIB + COSP * SPIB
SINP		R	1	1. or SINNW
SPIB		R	1	Sin (PI/BBEG2)
X		R	passed	Raw data input
Y		R	passed	windowed data returned

```
C     ...  VERSION 2  RONALD J. REINER  2/9/73
C     ...    MODIFIED TO HANDLE COMPLEX DATA ARRAYS.  IF LENG2 IS
C     ...    LESS THAN 0 THEN X IS ASSUMED TO BE A COMPLEX ARRAY
C     ...    WITH -LENG2 COMPLEX ELEMENTS
C     ...........................................................
C     ...
C     ...  THIS ROUTINE WILL FORM A COSINE BELL WINDOW AROUND
C     ...   ELEMENTS 1 TO LENG2 OF X AND STORE THE RESULTANTANT
C     ...  ARRAY IN Y.  THE MEANING OF THE FOUR OTHER ARGUMENTS IS
C     ...  DESCRIBED BELOW.
C     ...
C     ...  ABEG- HEIGHT OF WINDOW AT X(1)
C     ...  BBEG2-NUMBER OF POINTS BETWEEN BEGINNING OF WINDOW AND ITS
C     ...       MAXIMUM ONSET OF 1
C     ...  BEND2-NUMBER OF POINTS BETWEEN END OF MAXIMUM ONSET AND
C     ...       THE END OF THE WINDOW
C     ...  AEND-HEIGHT OF WINDOW AT X(LENG)
C     ...  THE ABOVE FOUR VALUES ARE ASSUMED TO BE FLOATING POINT
C     ...  AND ARE CHECKED ON ENTRY FOR THE FOLLOWING
C
C     ...  0.0  GE  BBEG2,BEND2
C     ...  BBEG2+BEND2  LE  LENG2
C     ...  LENG2  GE  1
C     ...  0.0  GE  ABEG  LE  1.0
C     ...  0.0  GE  AEND  LE  1.0
C     ...  Y IS ONLY ARGUMENT RETURNED
C     ...  TRANSFORM MAY BE DONE IN PLACE I.E. X AND Y MAY BE SAME
C     ...    ARRAY
C
C     ...... AUTHOR RONALD J REINER STA 11/6/72
      SUBROUTINE WINDOW(X,Y,LENG2,ABEG,BBEG2,AEND,BEND2)
      DIMENSION X(1),Y(1)
      DATA PI /3.141593/
C     ...
C     ...   CHECK FOR COMPLEX X AND SET APPROPRIATE VALUES
C     ...
      LENG=LENG2
      BBEG=BBEG2
      BEND=BEND2
      IFLAG=1
      IF(LENG2.GT.0) GO TO 5
      LENG=-2.0*LENG2
      BBEG=2.0*BBEG2
      BEND=2.0*BEND2
      IFLAG=2
    5 CONTINUE
C     ...
C     ...  CHECK LEGALITY OF ARGUMENTS
C     ...
      IF(LENG.GE.1) GO TO 10
      PRINT 1000,LENG
 1000 FORMAT(1H1,30X,21HWINDOW-LENG ILLEGAL=    ,I5)
      STOP 10
   10 IF(BBEG.GE.0.0.AND.BEND.GE.0.0.AND.BBEG+BEND.LE.LENG) GO TO 20
```

```
      PRINT 1001,BBEG,BEND
 1001 FORMAT(1H1,30X,35HWINDOW-EITHER BBEG OR BEND ILLEGAL=
     1,2(G10.4,5X))
      STOP 20
   20 IF(ABEG.GE.0.0.AND.ABEG.LE.1.0) GO TO 30
      PRINT 1002,ABEG
 1002 FORMAT(1H1,30X,21HWINDOW-ABEG ILLEGAL=   ,G10.4)
      STOP 30
   30 IF(AEND.GE.0.0.AND.AEND.LE.1.0) GO TO 40
      PRINT 1003,AEND
 1003 FORMAT(1H1,30X,21HWINDOW-AEND ILLEGAL=   ,G10.4)
      STOP 40
C     ...
C     ...  FIRST COMPUTE Y(1) TO Y(BBEG)
C     ...  INITIALIZE FOR IN-LINE SINE COMPUTATION
C     ...
   40 IF(BBEG.LE.0.0) GO TO 55
      SPIB=SIN(PI/BBEG2)
      CPIB=COS(PI/BBEG2)
      COSP=0.0
      SINP=-1.0
C     ...
C     ...  COMPUTE AMPLITUDE AND OFFSET
      AMP=(1.0-ABEG)/2.0
      OFF=(1.0+ABEG)/2.0
C     ...
C     ...  NOW COMPUTE
      LFRST=1
      LAST=BBEG
      DO 50 J=LFRST,LAST,IFLAG
      COEF=AMP*SINP+OFF
      Y(J)=COEF*X(J)
      IF(IFLAG.EQ.2) Y(J+1)=COEF*X(J+1)
      SINNW=SINP*CPIB+COSP*SPIB
      COSNW=COSP*CPIB-SINP*SPIB
      SINP=SINNW
      COSP=COSNW
   50 CONTINUE
C     ...
C     ...  COMPUTE Y(BBEG+1) TO Y(LENG-BEND)
C     ...  THIS AMOUNTS TO A SIMPLE TRANSFER
   55 IF(BBEG+BEND.GE.LENG) GO TO 65
      LAST=LENG-BEND
      LFRST=BBEG+1
      DO 60 J=LFRST,LAST
      Y(J)=X(J)
   60 CONTINUE
C     ...
C     ...  COMPUTE Y(LENG-BEND+1) TO Y(LENG)
C     ...  SIMILAR TO CONSTRUCTION OF Y(1) TO Y(BBEG)
C     ...  INILTIALIZE
   65 IF(BEND.LE.0.0) GO TO 75
      SPIB=SIN(PI/BEND2)
      CPIB=COS(PI/BEND2)
```

WINDOW Listing 31 (2 of 3)

```
      SINP=1.0
      COSP=0.0
      AMP=(1.0-AEND)/2.0
      OFF=(1.0+AEND)/2.0
C     ...
C     ...   AT THIS END, BEGIN WITH SECOND POINT ON CURVE
C     ...
      SINNW=SINP*CPIB+COSP*SPIB
      COSNW=COSP*CPIB-SINP*SPIB
      SINP=SINNW
      COSP=COSNW
C     ...
C     ...  COMPUTE
      LAST=LENG
      LFRST=LENG-BEND+1
      DO 70 J=LFRST,LAST,IFLAG
      COEF=AMP*SINP+OFF
      Y(J)=COEF*X(J)
      IF(IFLAG.EQ.2) Y(J+1)=COEF*X(J+1)
      SINNW=SINP*CPIB+COSP*SPIB
      COSNW=COSP*CPIB-SINP*SPIB
      SINP=SINNW
      COSP=COSNW
   70 CONTINUE
   75 RETURN
      END
```

WINDOW Listing 31 (3 of 3)

PROGRAM WNDSPC

INTRODUCTION

Program WNDSPC provides power spectra of wind gusts given approximately ten minutes of wind data from U, R, W directions of up to five different sensor locations.

Each run using the full five channels then outputs a large Calcomp plot containing 18 spectra with their associated windowed time traces and printer spectra. These 18 are in the three columns (U. R. W) by five down plus an average spectrum at the bottom of each column. Optionally, the data values for these three average spectra are also output on punched cards to provide input for program WNDPRM.

For Sitka and Newport data the input wind data is by a factor of four from a sampling rate of .07 second to .28 seconds. The spectra each go up to approximately 1.8 hz (although the X axis is actually wave number). Each spectra is smoothed with a 19 pt. running average to provide a statistically more significant representation of the underlying stochastic process (probalistic distribution of wave numbers from 10 minutes of wind gust data).

See Figures 61 through 68, Table 17 and Listings 32 through 39.

OPERATIONAL NOTES

To produce punched card output of the three average spectra, set request parameter NPUNCH equal to 1.

Since cards for all three average spectra are all run together without printing on the cards, they are kept separatable by each spectrum ending with an extra card containing only two values. Since these values are beyond the 1024 spectral data points, after the three spectrum decks are separated and labeled the divider cards may be discarded.

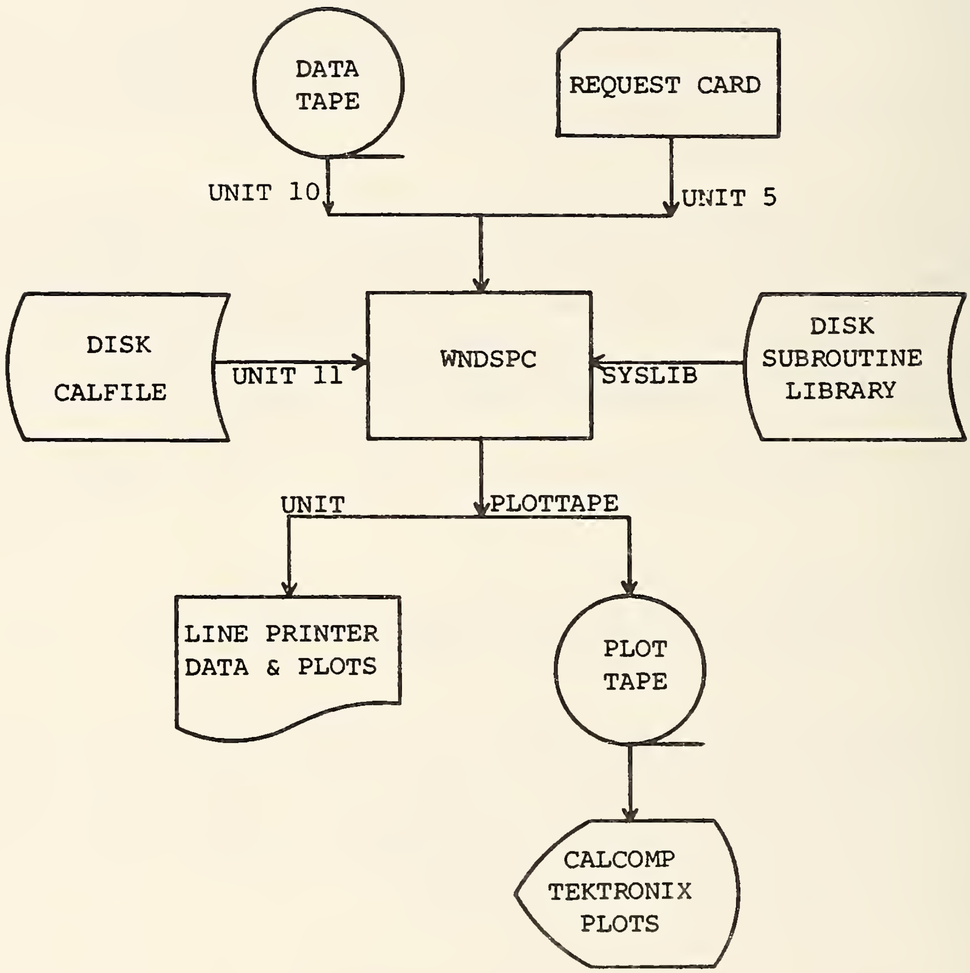


Figure 61. Program WNDSPC Setup Title

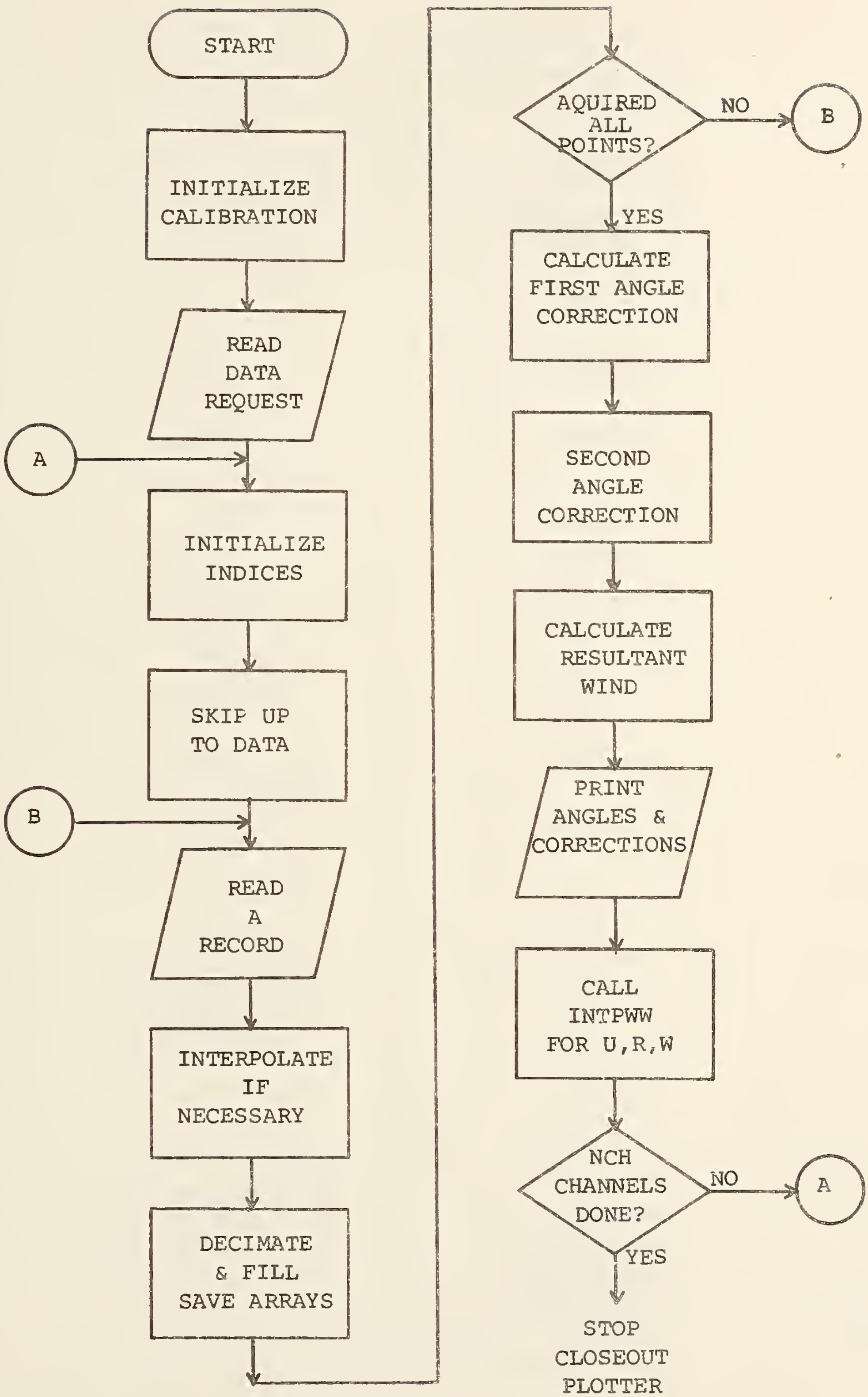


Figure 62. WNDSPC Flow Chart

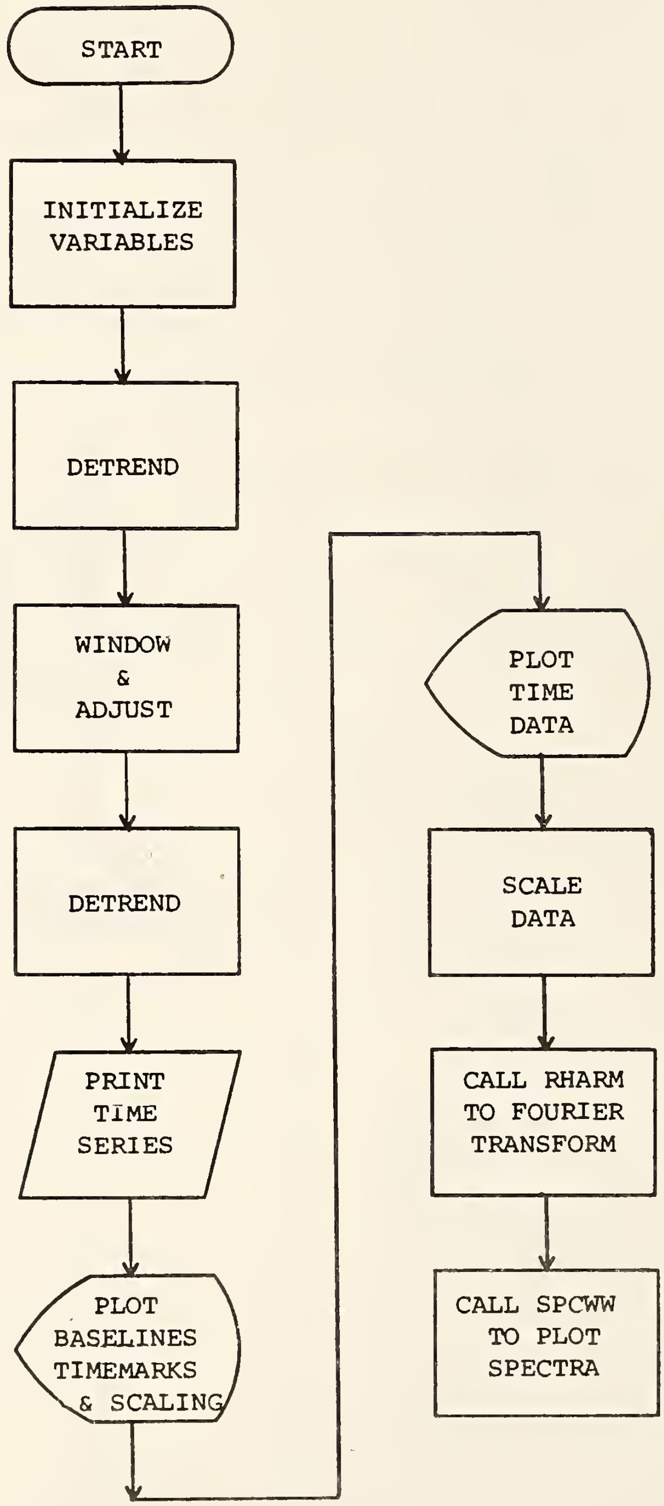


Figure 63. INTPWW Flow Chart

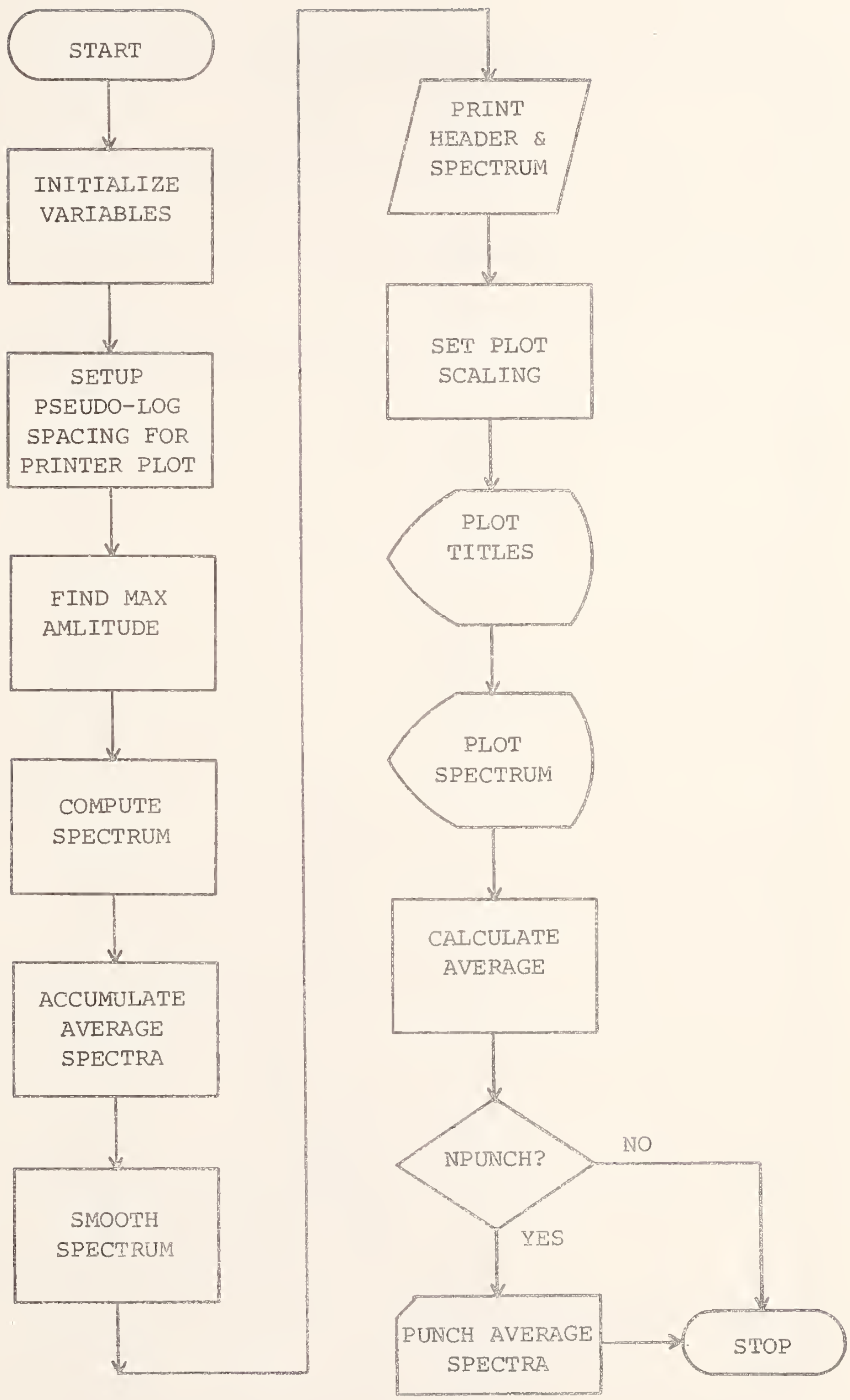


Figure 64. SPCPWW Flow Chart

00010436   76300

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	---	Tape number	2A4	1-8
2	70300 - 72161 (Newport) 72274 - present (Sitka)	Recording date	I5	11-15

Figure 65. WNDSPC Tape Number Card Format

```
10436   150   0   4   2   3   4   5
```

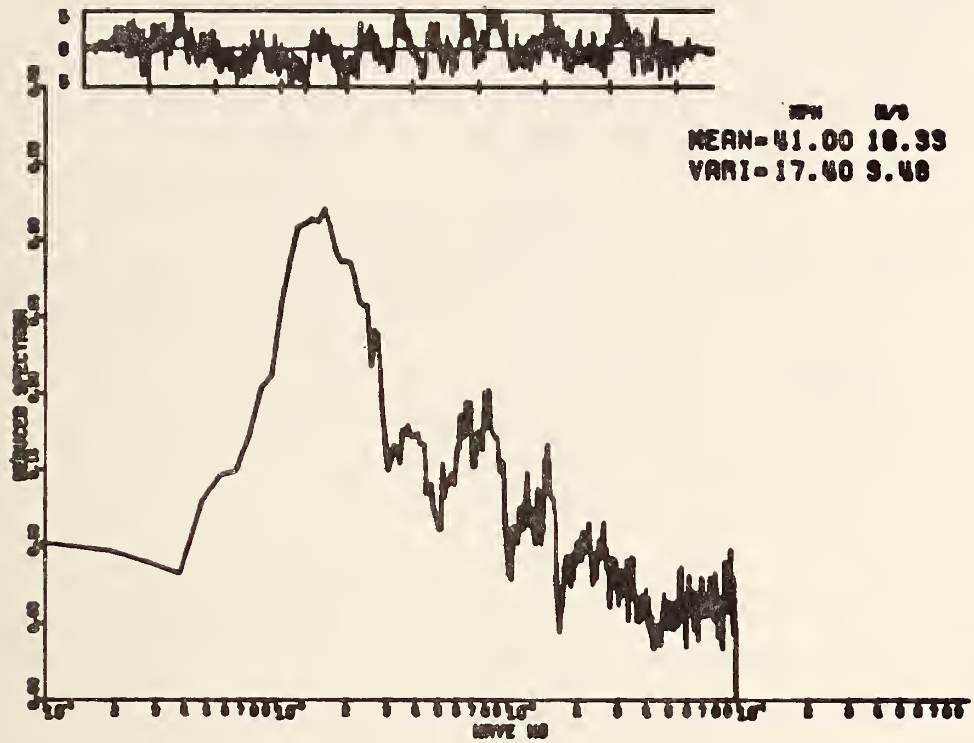
FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	1-99999	Tape number	I5	1-5
2	1-9999	Beginning record	I5	6-10
3	0,1	Punch averages? (1=punch)	I5	11-15
4	1-5	number of channels	I5	16-20
5-9	1-5 (Sitka)	Channel numbers	5I5	21-45
	1-9 (Newport)			

Figure 66. WNDSPC Request Card

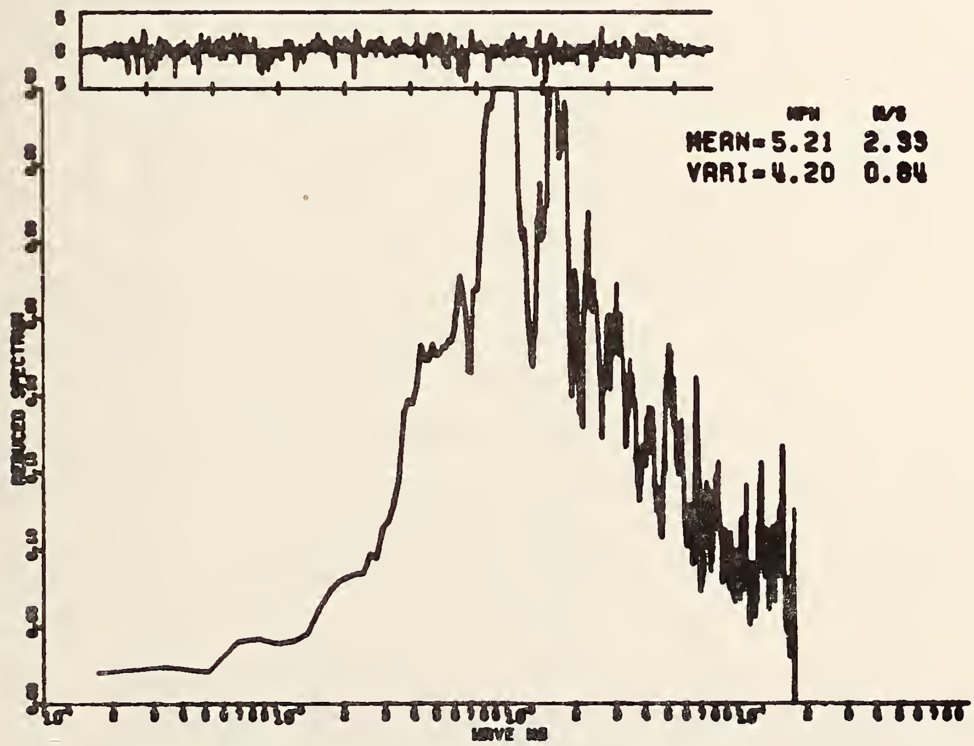
CHANNEL 2U FOR 573.4 SEC WIND SAMPLE STARTING REC 510

	P.S.	FREQ	F.N.
2	0.01860	0.00349	0.00018
4	0.18213	0.00698	0.00035
6	0.20192	0.01046	0.00053
8	0.18392	0.01395	0.00070
10	0.19221	0.01744	0.00088
12	0.22594	0.02093	0.00105
14	0.24982	0.02441	0.00123
16	0.31935	0.02790	0.00140
18	0.24611	0.03139	0.00158
20	0.25422	0.03488	0.00175
22	0.28186	0.03836	0.00193
24	0.31564	0.04185	0.00210
26	0.33763	0.04534	0.00228
28	0.37129	0.04883	0.00245
30	0.34115	0.05232	0.00263
32	0.32774	0.05580	0.00280
34	0.29166	0.05929	0.00298
36	0.25797	0.06278	0.00315
38	0.25450	0.06627	0.00333
40	0.20741	0.06975	0.00350
42	0.17376	0.07324	0.00368
44	0.17138	0.07673	0.00385
46	0.12617	0.08022	0.00403
48	0.11850	0.08371	0.00420
50	0.12789	0.08719	0.00438
52	0.11612	0.09068	0.00455
54	0.10682	0.09417	0.00473
56	0.10982	0.09766	0.00490
60	0.12316	0.10463	0.00525
64	0.12484	0.11161	0.00560
68	0.14672	0.11858	0.00595
72	0.14560	0.12556	0.00630
76	0.16062	0.13253	0.00665
80	0.15969	0.13951	0.00700
84	0.15314	0.14648	0.00735
88	0.17421	0.15346	0.00770
92	0.15969	0.16044	0.00805
96	0.14541	0.16741	0.00840
100	0.16369	0.17439	0.00875
104	0.15624	0.18136	0.00910
108	0.13858	0.18834	0.00945
112	0.13315	0.19531	0.00980
120	0.11115	0.20926	0.01050
128	0.11671	0.22321	0.01120
136	0.11257	0.23717	0.01190
144	0.15439	0.25112	0.01260
152	0.15711	0.26507	0.01330
160	0.10678	0.27902	0.01400
168	0.09439	0.29297	0.01470
176	0.10570	0.30692	0.01540
184	0.13816	0.32087	0.01610
192	0.13724	0.33482	0.01680
200	0.10777	0.34877	0.01750
208	0.13188	0.36272	0.01820
216	0.11428	0.37667	0.01890
224	0.10565	0.39063	0.01960
240	0.08387	0.41853	0.02100

Figure 67. WNDSPC Output



Resultant horizontal - 6R.



Vertical - 6W/U.

Figure 68. Individual Channel Horizontal and Vertical Wind Spectra.

Table 17. WNDSPC Variable Name List

Name	Com	Type	Dimension	Usage
A		R	(2,½ Passed)	Fourier coefficients array
AXX		R	1030	Array of wave numbers
AA1		R	1	First fourier coefficient of a pair
AA2		R	1	2nd fourier coefficient of a pair
ABEG		R	1	Window height at start of data
ADD		R	1	Arcane variable
AEND		R	1	Window height at end of data
AINC		R	1	Printer increment
AMP		R	1	Amplitude
AMP2		R	1	Current amplitude to test for max
ANGL		R	1	Horizontal wind angle V/U
ARG		R	1	Argument
ATTACK		R	1	Vertical wind angle
AU		R	1	Absolute value of a 'U' data point
AV		R	1	Absolute value of a 'V' data point
AZERO		R	1	First term of fourier coefficient
BBEG		R	1	Fraction of window to taper onset
BEGREC	X	I	1	Beginning record of request
BEND		R	1	Fraction of window to taper off
BLANK		I	1	Literal blank
BPER		R	1	Points from end to start taper off
BPRR		R	1	Number of points in to end taper on
CCSIZE		R	1	Calcomp plot size factor
CHANO		I	5	Wind channels to process
COMPN	X	R	3	Wind component
CONVRT		R	1	MPH to M/S factor
CR		R	1	Polynomial correction for given angle
DASH		I	1	Literal -
DATA1		R	21	Temporary array for 'U' data
DATA2		R	21	Temporary array for 'V' data
DATA3		R	21	Temporary array for 'W' data

Table 17. WNDSPC Variable Name List (continued)

Name	Com	Type	Dimension	Usage
DT		R	1	Sampling interval
EM		R	1	Log (base2) of arg
EYE		I	1	Literal I
FACTOR		R	1	Amplitude conversion factor
FREMAX		R	1	Max frequency
FREQ		R	1	An individual frequency
HMEAN	X	R	1	Mean velocity of horizontal wind
I		I	1	General index
I1		I	1	General index
I2		I	1	General index
IBUF		I	2000	Plot buffer storage
ICH	X	I	1	Current channel being processed
ICOL	X	I	1	Current column being processed
IDATE		I	1	Date
IERR		I	1	Error return flag
IFF		I	1	Function flag
II		I	1	General index
IM		I	1	NP+4
INDX		I	1	Point counter within PT array
INF		I	1	First-call-to-routine flag
INV		I	1	Work array for RHARM
IR		I	1	Cosine of theta
IRF		I	1	Read status flag
ISENSR	X	I	1	Sensor number
ISENU		I	1	Channel number of 'U' data
ISENV		I	1	Channel number of 'V' data
ISENW		I	1	Channel number of 'W' data
ITAPE	X	I	1	Tape number
J		I	1	General Index
JP		I	1	Position within lyne of a data point
K		I	1	General index

Table 17. WNDSPC Variable Name List (continued)

Name	Com	Type	Dimension	Usage
KOL		I	1	No. of printer plot positions across
L		I	1	Data point counter
LASTPL		I	3	Last channel flag
LENG		I	1	Number of points
LL		I	1	Data point counter
LYNE		I	73	Line array for printer plot
M		I	1	EM Truncated
N		I	1	Number of points
NAVE			1	NPTAVE
NCH	X	I	1	Number of channels
NDEG		I	1	Demean/detrend switch
NK		I	1	Original data points used per record
NMIN		I	1	Number of minutes
NN		I	1	Number of freq points per spectrum
NNP2		I	1	Number of freq points +2
NOREC		I	1	Number of records
NP		I	1	Number of points
NPTAVE	X	I	1	Number of points to average
NPUNCH	X	I	1	Card punch of average spectra flag
NTH		I	1	Print every nth point of spectrum
NUMI		I	1	No. of pts to add by interpolation
NUMLIN		I	1	No. of lines to print
P		R	1030	Unsmoothed spectral points
PT		R	3090	Data for the 3 average spectra
R		R	2100	R Component wind data
RADCON			1	Conversion factor degrees to radians
REC			1	Record number
RECNO		I	1	Record number
RSQ		R	1	Resultant wind squared
S		R	1	Work array for RHARM
SENSR			1	Sensor number

Table 17. WNDSPC Variable Name List (continued)

Name	Com	Type	Dimension	Usage
SAVEM		R	1	Save mean value
SAVEV		R	1	Save variance value
SENS		R	64,43	1 record of raw data
SKALE		R	1	Scaling factor for time trace plot
STAR		I	1	Literal *
SUMAMP		R	1	Sum of amplitudes within a spectrum
T2		R	1	TMEAN in meters/sec
TANG		R	1	Tangent of horizontal wind angle
TANGW		R	1	Tangent of vertical wind angle
TAPE		R	1	Tape number
TAPENO		I	2	Tape number literal
TAPR		R	1	Fraction tapered at each end
THETA		R	1	Horizontal wind angle
THI		R	1	Height of VSCAL from baseline
TINC		R	1	Plotter increment for time trace
TINCM		R	1	Plotter spacing per minute of data
TLEN		R	1	Length of time trace
TMEAN	X	R	1	Mean velocity
TMEANT		R	3	Mean for average spectrum
TSPAN		R	1	Time spanned by time trace
TTIME		R	1	TSPAN/2
U		R	2100	U component wind data
UAV		R	1	Average 'U' wind velocity
UCOR		R	1	First angle correction for 'U' data
UCOR2		R	1	Second U angle correction factor
UCORD		R	1	Second U angle correction adjusted
UCORF		R	1	Overall 'U' angle correction
UFAC		R	1	'U' component correction factor
USUM		R	1	Sum of 'U' values
V2		R	1	Variance in meters/sec
VARI	X	R	1	Variance of wind velocity

Table 17. WNDSPC Variable Name List (continued)

Name	Com	Type	Dimension	Usage
VARIT		R	3	Variance for average spectrum
VAR		R	1	Average 'V' wind velocity
VCOR		R	1	First angle correction for 'V' data
VCOR2		R	1	Second V angle correction factor
VCORD		R	1	Second V angle correction adjusted
VCORF		R	1	Overall 'V' angle correction
VEL		R	1	Velocity
VFAC		R	1	'V' component correction factor
VSCAL		R	1	Vertical scale for time trace
VSUM		R	1	Sum of 'V' values
W		R	2100	W component wind data
WAV		R	1	Average 'W' wind velocity
WINC		R	1	Wave number increment
WL1		R	1	Lower limit of 1st wave no. step
WL2		R	1	Lower limit of 2nd wave no. step
WL3		R	1	Lower limit of 3rd wave no. step
WL4		R	1	Lower limit of 4th wave no. step
WORK		R	passed	Data array
WSUM		R	1	Sum of 'W' values
WU1		R	1	Upper limit of 1st wave no. step
WU2		R	1	Upper limit of 2nd wave no. step
WU3		R	1	Upper limit of 3rd wave no. step
WU4		R	1	Upper limit of 4th wave no. step
X		R	1	X coordinate for plotter
XLOC		R	1	Horizontal coordinate of current spectrum
XLOK		R	1	Horizontal offset from plot origin
XT		R	1	Counter to plot minute marks
Y		R	1	An individual scaled trace value
YLOC		R	1	Vertical coordinate for current spectrum
YLOK		R	1	Vertical offset from plot origin

Table 17. WNDSPC Variable Name List (continued)

Name	Com	Type	Dimension	Usage
YSAVE		R	1	Save YLOC value
ZEROF		R	1	Frequency increment

```
C
C---------------------------------------------------------------------------
C
C         **********    PROGRAM WNDSPC (SITKA VERSION)      ***********
C
C      THIS PROGRAM INPUTS APPROX 10 MINUTES OF WIND DATA FROM U,R,W
C      DIRECTIONS OF UP TO 5 DIFFERENT SENSOR LOCATIONS USING
C      ANGLE CORRECTIONS AND DECIMATION BY A FACTOR OF 4.
C      DATA THEN SETUP FOR THE PLOTTING AND POWER SPECTRA SUBROUTINES.
C
C      ROUTINES CALLED: SITKA, INTRPN, WANGL, UVCAL, INTPNW, SPCPNW
C
C      PROG. BY RAY SOTOUDEH   S.T.A.   12/12/72
C      MODIFIED BY DUANE NELSON DURING 1975 - 1977.
C---------------------------------------------------------------------------
C
      COMMON/EXPARM/ITAPE,BEGREC,NPTAVE,NCH,NPUNCH
      COMMON/INPARM/COMPN(3),ICOL,ICH,ISENSR,TMEAN,HMEAN,VARI
      DIMENSION U(2100),W(2100),R(2100),IBUF(2000)
      DIMENSION DATA1(21),DATA2(21),DATA3(21)
      REAL SENS(64,43)
      INTEGER CHANO(5),TAPENO(2),RECNO,BEGREC
      CALL PLOTS (IBUF,2000,6)
      CALL NEWPEN (1)
      CCSIZE=.40
      CALL FACTOR (CCSIZE)
      DT=.28
      NPTAVE=19
C
C        READ TAPE NUMBER CARD AND INITIALIZE SENSOR TABLE
      IFF=1
      CALL SITKA (IFF,RECNO,IRF,SENS,TAPENO,IDATE)
C
C      READ DATA REQUEST CARD
C
      READ (5,85) ITAPE,BEGREC,NPUNCH,NCH,(CHANO(I),I=1,5)
   85 FORMAT (9I5)
      PRINT 95,IDATE,ITAPE,BEGREC
   95 FORMAT(///' SITKA WIND SPECTRA DATE',I6,' TAPE=',I6,' BEGREC=',I5)
C
      DO 400 ICH=1,NCH
      K=0
      YLOC=(6-ICH)*11.
      ISENSR=CHANO(ICH)
      ISENU=6*CHANO(ICH)-5
      ISENV=ISENU+2
      ISENW=ISENU+4
      RECNO=BEGREC
C
C        REWIND TAPE AND SKIP UP TO DATA TO USE
C
      IFF=2
      IF (ICH.EQ.1)   IFF=3
      IF (IFF.EQ.2)   REWIND 10
```

```
      CALL SITKA (IFF,RECNO,IRF,SENS,TAPENO,IDATE)
      PRINT 165,ISENSR,IRF,ISENU,ISENV,ISENW
  165 FORMAT ('1SKIPPING DOWN THE TAPE FOR CHAN',I3,3X,'IRF=',I1,' ISENU
     1=',I2,' ISENV=',I2,' ISENW=',I2)
      DO 170 I1=1,64
      DO 170 I2=1,43
  170 SENS(I1,I2)=0.
      DO 175 I=1,21
      DATA1(I)=0.
      DATA2(I)=0.
  175 DATA3(I)=0.
C
C        SETUP TO READ IN 9.3 MIN OF DATA DECIMATED BY FACTOR OF 4.
C        NOREC=128 FOR NEW SITKA, 120.5 FOR OLD (TO GET 2048 PT SPECTRA)
C        64 PTS/REC * .071 SEC/PT = 4.544 SEC/RECORD
C
      NP=2048
      NOREC=NP/17+1
      IF (IDATE.GE.75236)   NOREC=NP/16
C
      DO 250 J=1,NOREC
      IFF=3
      IF (IDATE.GE.75236)   GO TO 200
      CALL SITKA (IFF,RECNO,IRF,SENS,TAPENO,IDATE)
      IF (J.LE.1)   PRINT 185,IRF,RECNO
  185 FORMAT (' IRF=',I3,' RECNO NOW=',I5)
C
C        ADD IN MISSING POINT FOR OLD STYLE DATA
C        BY EITHER ADJACENT REAL DATA OR INTERPOL 1 POINT
C     INITIALIZE INTERPOL IF USED
C
      INTERP=1
      INTERP=0
      IF (INTERP.EQ.1)   GO TO 190
      IF (J.EQ.1)   GO TO 210
      K=K+1
      U(K)=SENS(2,ISENU)
      R(K)=SENS(2,ISENV)
      W(K)=SENS(2,ISENW)
      GO TO 210
  190 DO 194 I=1,16
      DATA1(I)=SENS(I*4,ISENU)
      DATA2(I)=SENS(I*4,ISENV)
  194 DATA3(I)=SENS(I*4,ISENW)
C        16 POINTS GO IN AND INTERP POINT ADDED AT BEGINNING
      NUM1=1
      NK=16
      INF=1
      IF (J.EQ.1)   INF=0
      CALL INTRPN(NUM1,DATA1,NK,INF)
      CALL INTRPN(NUM1,DATA2,NK,INF)
      CALL INTRPN(NUM1,DATA3,NK,INF)
      IF (J.EQ.1)   GO TO 210
      K=K+1
```

```
      U(K)=DATA1(I)
      R(K)=DATA2(I)
      W(K)=DATA3(I)
      GO TO 210
  200 CALL SITKA (IFF,RECNO,IRF,SENS,TAPEND,IDATE)
  210 DO 220 I=1,16
      K=K+1
C
C        IF ALL DATA POINTS AQUIRED, JUMP OUT OF THIS DATA AQ LOOP
      IF (K.GT.NP)   GO TO 260
C
C     USE R ARRAY FOR V UNTIL CORR MADE AND R IS CALCULATED
C
      U(K)=SENS(I*4,ISENU)
      R(K)=SENS(I*4,ISENV)
      W(K)=SENS(I*4,ISENW)
  220 CONTINUE
  250 CONTINUE
C
  260 CONTINUE
C
C        SUM,AVERAGE VELOCITIES AND CALC U/V ANGLE
C        PLUS AMPLITUDE CORRECTIONS USING THAT INDICATED ANGLE

      CALL WANGL (U,R,W,NP,ANGL,UAV,VAV,WAV,ATTACK)
      CALL UVCAL (UAV,VAV,UCOR,VCOR)
      PRINT 285,UAV,VAV,ANGL,WAV,ATTACK,UCOR,VCOR
  285 FORMAT (' UAV=',F6.2,' VAV=',F6.2,' ANGL=',F6.2,' WAV=',F6.2,
     1' ATTACK=',F6.2,' UCOR=',F5.2,' VCOR=',F5.2)
      DO 300 I=1,NP
      U(I)=U(I)*UCOR
  300 R(I)=R(I)*VCOR
C
C        SUM AND AVERAGE CORRECTED DATA TO SEE IF ANGLE CHANGES
C
      CALL WANGL (U,R,W,NP,ANGL,UAV,VAV,WAV,ATTACK)
      CALL UVCAL (UAV,VAV,UCOR2,VCOR2)
C
C        NOW RECORRECT ANGLE THEN U AND V AMPLITUDES
C
      UCORD=UCOR2/UCOR
      VCORD=VCOR2/VCOR
      PRINT 305,ANGL,UCORD,VCORD
  305 FORMAT (' ANGL=',F6.2,' UCORD=',F6.2,' VCORD=',F6.2)
      DO 310 I=1,NP
      U(I)=U(I)*UCORD
  310 R(I)=R(I)*VCORD
      CALL WANGL (U,R,W,NP,ANGL,UAV,VAV,WAV,ATTACK)

      NOW CALC HORIZ RESULTANT WIND AND STORE IT IN R ARRAY

  320 DO 330 I=1,NP
      RSQ=U(I)*U(I)+R(I)*R(I)
  330 R(I)=SQRT(RSQ)
```

WNDSPC Listing 32 (3 of 4)

```
C
      UCORF =UCOR*UCORD
      VCORF=VCOR*VCORD
      PRINT 365,ISENSR,NP,BEGREC,NOREC,ATTACK,ANGL,UCORF,VCORF
  365 FORMAT ('OCHAN',I4,' READY FOR INTPWR FOR ',I5,' PTS STARTING AT RE
     1CNO=',I4,2X,'NOREC=',I4,2X,'ATTACK=',F5.2,' ANGL=',F6.2,' UCORF=',
     3F5.2,' VCORF=',F5.2)
      PRINT 375,(U(I),I=1,70)
  375 FORMAT (' ',10E11.4)
C
C        ICOL=1 FOR U, 2 FOR R, 3 FOR W  INDICATING WHICH COLUMN OF PLOT
C        NPTAVE- NUMBER OF PTS TO BE USED FOR AVERAGING. IT MUST BE A
C             POSITIVE ODD INTEGER.  1 SHOULD BE USED FOR NO AVERAGING
C
      ICOL=1
      XLOC=0.
C     IF (ICH.GE.2)   GO TO 500
      CALL INTPWW (XLOC,YLOC,ISENSR,U,NP)
      ICOL=2
      XLOC=13.
      CALL INTPWW (XLOC,YLOC,ISENSR,R,NP)
      ICOL=3
      XLOC=26.
      HMEAN=TMEAN
      CALL INTPWW (XLOC,YLOC,ISENSR,W,NP)
  400 CONTINUE
C
  500 CALL PLOT(0.0,0.0,999)
      STOP        99
      END
```

WNDSPC Listing 32 (4 of 4)

```
C
C-----------------------------------------------------------------------
C
C        **********    PROGRAM WNDSPC (NEWPORT VERSION)    ***********
C
C     THIS PROGRAM INPUTS APPROX 10 MINUTES OF WIND DATA FROM U,R,W
C     DIRECTIONS OF UP TO 5 DIFFERENT SENSOR LOCATIONS USING
C     ANGLE CORRECTIONS AND DECIMATION BY A FACTOR OF 4.
C     DATA THEN SETUP FOR THE PLOTTING AND POWER SPECTRA SUBROUTINES.
C
C     ROUTINES CALLED: NEWPRT, INTRPN, WANGL, UVCAL, INTPWN, SPCPWW
C
C     PROG. BY RAY SOTOUDEH   S.T.A.   12/12/72
C     MODIFIED BY DUANE NELSON DURING 1975 - 1977.
C-----------------------------------------------------------------------
C
      COMMON/EXPARM/ITAPE,BEGREC,NPTAVE,NCH,NPUNCH
      COMMON/INPARM/COMPN(3),ICOL,ICH,ISENSR,TMEAN,HMEAN,VARI
      DIMENSION U(2100),W(2100),R(2100),IBUF(2000)
      DIMENSION DATA1(21),DATA2(21),DATA3(21)
      REAL SENS(64,43)
      INTEGER RECNO,BEGREC,CHANO(5)
      CALL PLOTS (IBUF,2000,6)
      CALL NEWPEN (1)
      CALL FACTOR (0.40)
      DT=.28
      NPTAVE=19
      NDEG=0
C
C        READ TAPE NUMBER CARD AND INITIALIZE SENSOR TABLE
C
      IFF=1
      CALL NEWPRT (IFF,RECNO,IPF,SENS,TAPEND,IDATE)
C
C     READ DATA REQUEST CARD
C
      READ (5,85) ITAPE,BEGREC,NPUNCH,NCH,(CHANO(I),I=1,5)
   85 FORMAT (9I5)
      PRINT 95,ITAPE,BEGREC
   95 FORMAT (///' NEWPORT WIND SPECTRA FROM TAPE',I6,' BEGREC=',I5)
C
C
C     INITIALIZE INDICES FOR A ROW OF 3 SPECTRA (U,R,W)
C
      DO 400 ICH=1,NCH
      RECNO=0
      K=0
      YLOC=(6-ICH)*11.
      ISENU=3*(CHANO(ICH)-1)+1
      ISENV=ISENU+1
      ISENW=ISENU+2
      ISENSR=CHANO(ICH)
      RECNO=BEGREC
C
```

WNDSPC Listing 33 (1 of 4)

```
C        REWIND TAPE AND SKIP UP TO DATA TO USE
C
      IFF=2
      IF (ICH.EQ.1)   IFF=3
      IF (IFF.EQ.2)   REWIND IC
      CALL NEWPRT (IFF,RECNO,IRF,SENS,TAPENO,IDATE)
      PRINT 165,ISENSR,IRF,ISENU,ISENV,ISENW
  165 FORMAT(1' SKIPPING DOWN THE TAPE FOR CHAN',I3,3X,'IRF=',I1,' ISENU
             $
01)  IEY013I SYNTAX*****************************************************************
     1=',I2,' ISENV=',I2,' ISENW=',I2)
      DO 170 I1=1,64
      DO 170 I2=1,43
  170 SENS(I1,I2)=0.
      DO 175 I=1,21
      DATA1(I)=0.
      DATA2(I)=0.
  175 DATA3(I)=0.
C
C        SETUP TO READ IN 9.3 MIN OF DATA DECIMATED BY FACTOR OF 4.
C        NOREC=128 FOR SITKA, 120.5 FOR NEWPORT (FOR 2048 PT SPECTRA)
C        64 PTS/REC * .071 SEC/PT = 4.544 SEC/RECORD
C
      NP=2048
      NOREC=NP/17+1
      DO 250 J=1,NOREC
      IFF=3
      CALL NEWPRT (IFF,RECNO,IRF,SENS,TAPENO,IDATE)
      IF (J.LE.1)   PRINT 185,IRF,RECNO
  185 FORMAT (' IRF=',I3,' RECNO NOW=',I5)
C
C        ADD IN MISSING POINT FOR NEWPORT DATA
C        BY EITHER ADJACENT REAL DATA OR INTERPOL 1 POINT
C       INITIALIZE INTERPOL IF USED
C
      INTERP=1
      INTERP=0
      IF (INTERP.EQ.1)   GO TO 190
      IF (J.EQ.1)   GO TO 210
      K=K+1
      U(K)=SENS(2,ISENU)
      R(K)=SENS(2,ISENV)
      W(K)=SENS(2,ISENW)
      GO TO 210
  190 DO 194 I=1,16
      DATA1(I)=SENS(I*4,ISENU)
      DATA2(I)=SENS(I*4,ISENV)
  194 DATA3(I)=SENS(I*4,ISENW)
C
C        16 POINTS GO IN AND INTERP POINT ADDED AT BEGINNING
C
      NUM1=1
      NK=16
      INF=1
```

```
      IF (J.EQ.1)   INF=0
      CALL INTRPN(NUM1,DATA1,NK,INF)
      CALL INTRPN(NUM1,DATA2,NK,INF)
      CALL INTRPN(NUM1,DATA3,NK,INF)
      IF (J.EQ.1)   GO TO 210
      K=K+1
      U(K)=DATA1(1)
      R(K)=DATA2(1)
      W(K)=DATA3(1)
  210 DO 220 I=1,16
      K=K+1
C
C        IF ALL DATA POINTS AQUIRED, JUMP OUT OF THIS DATA AQ LOOP
      IF (K.GT.NP)   GO TO 260
C
C     USE R ARRAY FOR V UNTIL CORR MADE AND R IS CALCULATED
C
      U(K)=SENS(I*4,ISENU)
      R(K)=SENS(I*4,ISENV)
      W(K)=SENS(I*4,ISENW)
  220 CONTINUE
      IF (J.GT.2)   GO TO 250
      PRINT 235,(U(I),I=1,20)
      PRINT 235,(R(I),I=1,20)
      PRINT 235,(W(I),I=1,20)
  235 FORMAT (' ',10E11.4)
  250 CONTINUE
C
  260 CONTINUE
C
C        SUM,AVERAGE VELOCITIES AND CALC U/V ANGLE
C        PLUS AMPLITUDE CORRECTIONS USING THAT INDICATED ANGLE
C
      CALL WANGL (U,R,W,NP,ANGL,UAV,VAV,WAV,ATTACK)
      CALL UVCAL (UAV,VAV,UCOR,VCOR)
      PRINT 285,UAV,VAV,ANGL,WAV,ATTACK,UCOR,VCOR
  285 FORMAT (' UAV=',F6.2,' VAV=',F6.2,' ANGL=',F6.2,' WAV=',F6.2,
     1' ATTACK=',F6.2,' UCOR=',F5.2,' VCOR=',F5.2)
      DO 300 I=1,NP
      U(I)=U(I)*UCOR
  300 R(I)=R(I)*VCOR
C
C        SUM AND AVERAGE CORRECTED DATA TO SEE IF ANGLE CHANGES
C
      CALL WANGL (U,R,W,NP,ANGL,UAV,VAV,WAV,ATTACK)
      CALL UVCAL (UAV,VAV,UCOR2,VCOR2)
C
C        NOW RECORRECT ANGLE THEN U AND V AMPLITUDES
C
      UCORD=UCOR2/UCOR
      VCORD=VCOR2/VCOR
      PRINT 305,ANGL,UCORD,VCORD
  305 FORMAT (' ANGL=',F6.2,' UCORD=',F6.2,' VCORD=',F6.2)
      DO 310 I=1,NP
```

WNDSPC Listing 33 (3 of 4)

```
      U(I)=U(I)*UCORD
  310 R(I)=R(I)*VCORD
      CALL WANGL (U,R,W,NP,ANGL,UAV,VAV,WAV,ATTACK)
C
C     NOW CALC HORIZ RESULTANT WIND AND STORE IT IN R ARRAY
C
  320 DC 330 I=1,NP
      RSQ=U(I)*U(I)+R(I)*R(I)
  330 R(I)=SQRT(RSQ)
C
      UCORF=UCOR*UCORD
      VCORF=VCOR*VCORD
      PRINT 365,ISENSR,NP,BEGREC,NOREC,ATTACK,ANGL,UCORF,VCORF
  365 FORMAT ('OCHAN',I4,' READY FOR INTPWR FOR',I5,' PTS STARTING AT RE
     1CNO=',I4,2X,'NOREC=',I4,2X,'ATTACK=',F5.2,' ANGL=',F6.2,' UCORF=',
     3F5.2,' VCORF=',F5.2)
      PRINT 375,(U(I),I=1,70)
  375 FORMAT (' ',10E11.4)
C
C       ICOL=1 FOR U, 2 FOR R, 3 FOR W  INDICATING WHICH COLUMN OF PLOT
C
      ICOL=1
      XLOC=0.
      CALL INTPWW (XLOC,YLOC,ISENSR,U,NP)
      ICOL=2
      XLOC=13.
      IF (ICH.GE.2)   GO TO 500 <- TEST ONLY
      CALL INTPWW (XLOC,YLOC,ISENSR,R,NP)
      ICOL=3
      XLOC=26.
      HMEAN=TMEAN
      CALL INTPWW (XLOC,YLOC,ISENSR,W,NP)
  400 CONTINUE
C
  500 CALL PLOT(0.0,0.0,999)
      STOP       99
      END
```

WNDSPC Listing 33 (4 of 4)

```
C       SUBROUTINE  I N T P W W
C-----------------------------------------------------------------------
C       THIS INTERMEDIATE ROUTINE PLOTS WIND AND SETS UP WIND SPECTRUM.
C       ROUTINES CALLED ARE: DETRND, WINDOW, RHARM, SPCPWW
C
C       PARAMETERS
C          XLOC,YLOC- STARTING LOCATION FOR THE PLOT ON PAPER
C          ISENSOR- SENSOR ~~NAME OR~~ NUMBER
C          WORK- WORK ARRAY. THIS ARRAY MUST BE DIMENSIONED  10 LOCATIONS
C          LARGER THAN LENG
C          LENG- # OF DATA PNTS. TO BE USED.  MUST BE GE 8 AND LE 4096
C
C       NOTE: IF LENG GT 4096 , CHANG THE DIMENSION OF INV & S IN THIS
C          PROGRAM TO 1/8 OF LENG
C
C       PROG. BY  RAY SOTOUDEH    S.T.A.  3/7/74
C       MODIFIED BY DUANE NELSON S.T.A.  1975,1976
C-----------------------------------------------------------------------
C
        SUBROUTINE INTPWW (XLOC,YLOC,ISENSR,WORK,LENG)
        COMMON/EXPARM/ITAPE,BEGREC,NPTAVE,KCH,NPUNCH
        COMMON/INPARM/COMPN(3),ICOL,IOH,LSENS,TMEAN,HMEAN,VARI
        DIMENSION WORK(1)
        DIMENSION INV(512),S(512)
        INTEGER BEGREC
        DATA ABEG,AEND,BBEG,BEND/.10,.10,.10,.10/
        TAPR=BBEG
        NP=LENG
        DT=.07
        CCSIZE=.40
C          M=10 (1024)  FOR 10 MINUTE SPECTRA  (IM=2052 AFTER DECIMATION)
        ARG=NP/2
        EM=(ALOG10(ARG))/(ALOG10(2.))       +.1
        PRINT 165,NP,EM,LSENS,COMPN(ICOL)
   165  FORMAT (///' NP=',I5,' EM=',F4.1,' FOR CHAN',I3,A1,' WIND DATA')
        M=EM
        IM=2*(2**M)+4.49
C
C          REMOVE LINEAR TREND AND CALCULATE MEAN AND VARIANCE
C
        NDEG=1
        PRINT 195,NDEG
   195  FORMAT (' READY FOR DETRND,NDEG=',I2,12X,'TMEAN,VARI IN MPH')
        CALL DTRND2 (WORK(1),NP,NDEG,TMEAN,VARI)
        SAVEM=TMEAN
        SAVEV=VARI
C
C       WINDOW THE DATA ARRAY
C          READJUST AMPLITUDE FOR LOSS TO WINDOW FUNCTION
C
        BPRR=BBEG*NP+.5
        BPER=BEND*NP+.5
        CALL WINDOW (WORK,WORK,NP,ABEG,BPRR,AEND,BPER)
        FACTOR=1./(1.-TAPR)
```

INTPWA Listing 34 (1 of 3)

```
      DO 300 I=1,NP
  300 WORK(I)=WORK(I)*FACTOR
      CALL DTRND2 (WORK(1),NP,NDEG,TMEAN,VARI)
      TMEAN=SAVEM
C     VARI=SAVEV
C
C       CONVERT TIME DATA FROM MPH TC M/S AND PRINTOUT THE TIME TRACE.
C
      CONVRT=.447
      DC 302 I=1,NP
  302 WORK(I)=WORK(I)*CONVRT
  303 CCNTINUE
      PRINT 305
  305 FCRMAT (' THE FOLLOWING DATA IS THE DECIMATED TIME TRACE IN METERS
     X/SEC AFTER WINDOWING AND READY FOR FOURIER TRANSFCRMING'/)
      NUMLIN=NP/10+1
      L=1
      DO 310 K=1,NUMLIN
      LL=L+9
      PRINT 315,(WORK(I),I=L,LL)
  310 L=L+10
  315 FCRMAT (' ',10F10.4)
C
C     DRAW FRAME AROUND TIME TRACE AND PLOT THE MINUTE MARKS.
C
      XLOK=XLOC+0.5
      YLOK=YLOC+8.5
      CALL PLOT (XLOK,YLOK,-3)
      TINC=.002/CCSIZE * 2048/LENG *DT/.07
      TINCM=TINC*64.*13.2
      TLEN=TINC*NP
      THI=.25/CCSIZE
      CALL PLOT (TLEN,0.,+2)
      CALL PLOT (0.,0.,+2)
      CALL PLOT (0.,THI,+2)
      CALL PLOT (TLEN,THI,+2)
      CALL PLOT (0.,0.,+3)
      CALL PLOT (0.,-THI,+2)
      CALL PLOT (TLEN,-THI,+2)
      CALL PLOT (0.,0.,+3)
      XT=0.
      NMIN=9
      DC 330 I=1,NMIN
      XT=XT+TINCM
  330 CALL SYMBOL (XT,-THI,.14,13,C.,-1)
      CALL PLOT (0.,0.,+3)
C
C     ADD VERTICAL AXIS SCALE VALUES AND SCALE THE DATA ACCORDINGLY.
C       SCALE 5 M/S (11.2MPH) = .25 INCH AFTER REDUCTION.
C     THEN PLOT CONDITIONED TIME SERIES DATA IN M/S FROM MEAN WIND
C
      CALL SYMBOL (-.3,THI-.14,.14,1H5,0.,1)
C     CALL SYMBOL (-.3,THI,.14,2H+5,C.,2)
      CALL SYMBOL (-.3,-.07,.14,1HC,C.,1)
```

INTPWA Listing 34 (2 of 3)

```
      CALL SYMBOL (-.3,-THI,.14,1H5,0.,1)
      CALL PLOT (0.,0.,+3)
      VSCAL=5.
      SKALE=THI/VSCAL
      X=0.
      DC 350 I=1,NP
      X=X+TINC
      Y=WORK(I)*SKALE
      CALL PLOT (X,Y,+2)
  350 CONTINUE
C
C        RESTORE ORIGINAL ORIGIN
      CALL PLOT (-XLOK,-YLOK,-3)
  500 CONTINUE
C
C     COMPUTE FOURIER COEF. THEN CALL TO PLOT REDUCED WIND SPECTRUM.
C
      CALL RHARM (WORK(1),M,INV,S,IERR)
      IF (IERR.NE.0)   PRINT 555,IERR
  555 FCRMAT (1H1,20HINTPWR--RHARM IERR=    ,I2)
      CALL SPCPWW (XLOC,YLOC,WORK(1),IM)
      RETURN
      END
```

INTPWA Listing 34 (3 of 3)

```
C     SUBROUTINE  S P C P W W
C-----------------------------------------------------------------------
C     THIS PROG. COMPUTES AND PLOTS POWER AND REDUCED SPECTRUM
C
C     ROUTINES CALLED: NONE
C
C     PARAMETERS
C        XLOC,YLOC- STARTING LOCATION ON PAPER
C        A- DATA ARRAY AS RETURNED BY 'RFARM'
C             CONTAINING N/2-2 UNIQUE COMPLEX POINTS
C       FOR 10 MIN SPEC WITH DT=.28SEC, N=2052   SO NN=1024,NNP2=1026
C
C     PROG. BY RAY SOTOUDEH   S.T.A.    3/7/74
C     MODIFIED BY DUANE NELSON DURING 1975-1977
C-----------------------------------------------------------------------
      SUBROUTINE SPCPWW (XLOC,YLOC,A,N)
      COMMON/EXPARM/ITAPE,BEGREC,NPTAVE,NCH,NPUNCH
      COMMON/INPARM/COMPN(3),ICOL,ICH,LSENS,TMEAN,HMEAN,VAR1
      DIMENSION A(2,1),LYNE(73),P(1030),AXX(1030),S(1030)
      DIMENSION PT(3090),TMEANT(3),VARIT(3),LASTPL(3)
      INTEGER LYNE,BLANK,EYE,DASH,STAR,JF
      INTEGER BEGREC
C       ALPHANUMERIC DATA STORED LEFT JUSTIFIED
      DATA BLANK,EYE,DASH,STAR,KOL/1H ,1HI,1H-,1H*,73/
C
C     INITIALIZE PROGRAM
C       SET INDEX FOR COLUMN (U,W,OR R)
C     SAVE YLOC TO GET FROM AVE PLOT TO 5TH CHAN YLOC FOR NEXT COLUMN.
C
      DT=.28
      INDX=(ICOL-1)*1030
      YSAVE=YLOC
      IF (ICH.GT.1.OR.ICOL.GT.1)   GO TO 20
      DO 3 I=1,1030
    3 S(I)=0.
      DO 4 I=1,3090
    4 PT(I)=0.
      DO 5 I=1,3
      TMEANT(I)=0.
      VARIT(I)=0.
    5 LASTPL(I)=0
      NNP2=N/2
   20 CONTINUE
      AZERO=A(1,1)
      T2=TMEAN*.447
      V2=VAR1*.447*.447
   30 NN=N/2-2
C       ZEROF=.001744 FOR DT=.28 10 MINUTE SPECTRA
      ZEROF=1.0/((N-4)*DT)
      FREMAX=NN*ZEROF
      TSPAN=(N-4)*DT
      TTIME=TSPAN/2.
C
C       VEL AND T2 BOTH ARE MEAN WIND SPEED IN METERS/SEC
```

```
C         BUT VEL IS USED ONLY FOR WAVE NUMBER CALC
C
      VEL=T2
      IF (VEL.LT.0.)   VEL=-VEL
      IF (ICOL.LT.3)   GO TO 70
C
C     SPECIAL SET-UP FOR VERTICAL SPECTRA USES HORIZONTAL MEAN VELOCITY
C        WHOSE VALUE WAS LOADED INTO HMEAN IN MAIN DRIVER PROGRAM
C
      VEL=HMEAN*.447
      IF (ICH.EQ.NCH)   VEL=SAVERV*.447
      IF (VEL.LT.0.)   VEL=-VEL
   70 CONTINUE
C
C     SET UP PSEUDO-LOG SPACING OF PRINTER-PLOT SPECTRUM
C
      WINC=ZEROF/VEL
      WL1=.005
      WU1=WL1+WINC
      WL2=.010
      WU2=WL2+WINC
      WL3=.020
      WU3=WL3+WINC
      WL4=.050
      WU4=WL4+WINC
      IF (ICOL.EQ.3)   PRINT 74,VEL,WINC
   74 FORMAT (' VERT CHAN VEL=',F7.3,' WINC=',F7.4)
      PRINT 75,N,DT,VEL,T2,VARI
   75 FORMAT(' N=',I4,' DT=',F7.4,' VEL=',F7.3,' T2=',F7.3,' VARI=',
     1F8.3)
C
C     FIND MAX AMPLITUDE AND SUM OF RAW P.S.D. (BEFORE REDUCING UNITS)
C     BUT MANUALLY SET MAXAMP TO .5 IF CONSTANT SCALING FOR ALL SPECTRA
C
      AMP=(A(1,2)*A(1,2)+A(2,2)*A(2,2))*TTIME
      SUMAMP=AMP
      AMP=AMP*ZEROF/V2
      DO 100 I=3,NN
      AMP2=(A(1,I)*A(1,I)+A(2,I)*A(2,I) )*TTIME
      SUMAMP=SUMAMP+AMP2
      IF(ISPCTM.EQ.1)  AMP2=AMP2*(I-1)*ZEROF/V2
      IF(AMP2.GT.AMP)  AMP=AMP2
  100 CONTINUE
      AMP=.5
      AINC=(KOL-1)/AMP
C
C     COMPUTE SPEC. AND PHASE
C
      DO 300 I=1,NN
      FREQ=I*ZEROF
      AA1=A(1,I+1)
      AA2=A(2,I+1)
      IF (AA1.EQ.0.0)   AA1=.001
      IF (AA2.EQ.0.0)   AA2=.001
```

```
      A(1,I)=(AA1*AA1+AA2*AA2)*TTIME
      A(1,I)=A(1,I)*FREQ/V2
      A(2,I)=ATAN2(AA1,AA2)*57.2958
  270 P(I)=A(1,I)
C
C        ALSO ACCUMULATE FOR AVERAGE SPECTRA
C
      PT(I+INDX)=PT(I+INDX)+P(I)
  300 CONTINUE
      TMEANT(ICOL)=TMEANT(ICOL)+TMEAN
      VARIT(ICOL)=VARIT(ICOL)+VARI
C
  350 CONTINUE
C
C        CALL SMOOTHING ROUTINE FOR UNSMOOTHED DATA ARRAY P OF NN POINTS
C          S IS THE SMOOTHED OUTPUT AVERAGED OVER NPTAVE PTS (USUALLY=19)
C
      NTH=1
      IF (TSPAN.GT.500.)   NTH=NTH*2
      IF (TSPAN.GT.1000.)  NTH=NTH*2
      CALL AVERG2(P,NN,NPTAVE,S)
C
C     PRINT SPECTRUM HEADING
C
      DO 400 I=1,KOL
      LYNE(I)=DASH
  400 CONTINUE
      LYNE(1)=EYE
      LYNE(KOL)=EYE
      PRINT 405,LSENS,COMPN(ICOL),TSPAN,BEGREC,NPTAVE,APP,LYNE
  405 FORMAT(1H1,'CHANNEL',I3,A1 ,' FOR',F7.1,' SEC WIND SAMPLE STARTING
     1 REC',I5,20X,I2,' PT AVE POWER SPECTRUM',/,27X,'P.S.',6X,'FREQ',
     25X,'W.N.',5X,'0',66X,F7.3,/55X,73A1)
      DO 420 I=1,KOL
  420 LYNE(I)=BLANK
      IF (VEL.LT.10.)    NTH=NTH/2
      IF (VEL.LT.5.0.AND.NTH.GE.2)   NTH=NTH/2
      DO 500 I=1,NN
      FREQ=I*ZEROF
      IF (S(I).LE.0.0)    S(I)=0.00001
      IF (S(I).GT..40)    S(I)=0.40
      AXX(I)=FREQ/VEL
      IF(AXX(I).LT.0.0)    AXX(I)=0.00001
C
C        ONLY PRINT EVERY  NTH  POINT OF SMOOTHED SPECTRA IF LONG
C
      IF (AXX(I).GT.WL1.AND.AXX(I).LT.WU1)    NTH=NTH*2
      IF (AXX(I).GT.WL2.AND.AXX(I).LT.WU2)    NTH=NTH*2
      IF (AXX(I).GT.WL3.AND.AXX(I).LT.WU3)    NTH=NTH*2
      IF (AXX(I).GT.WL4.AND.AXX(I).LT.WU4)    NTH=NTH*2
      IF (MOD(I,NTH).NE.0)    GO TO 500
      LYNE(1)=EYE
      LYNE(KOL)=EYE
      JP=AINC*S(I)+1.4999
```

SPCPWW Listing 35 (3 of 5)

```
      IF (JP.GT.72)   JP=72
      LYNE(JP)=STAR
      PRINT 485,I,S(I),FREQ,AXX(I),LYNE
  485 FORMAT (' ',I4,18X,F9.5,2X,2F9.5,3X,73A1)
      LYNE(JP)=BLANK
  500 CONTINUE
      PRINT 515,AZERO,SUMAMP,TMEAN,VEL,VARI
  515 FORMAT ('0AZERO=',F9.4,' SUMAMP=',F9.2,5X,' TMEAN=',F6.2,
     X' MPH=',F6.2,' M/S   VARI=',F7.3,' MPH')
      IF (XLOC.LT.0.)   XLOC=0.
      PRINT 535, (S(I),I=1,5)
  535 FORMAT (' FIRST 5 DATA VALUES FOR CALCOMP PLOT',5F10.3)
C
C     SET SCALE FACTORS (FIRST VALUE, DELTAV) FOR CONSTANT PLOT SIZE
C       SCALE ACROSS= 12 INCH= 4 DECADES  SO 1 INCH=.3333 DECADES
C       8 INCHES HIGH (FULL SCALE) = .40, SO 1 INCH = .050 DECADES
C
      S(NN+1)=0.0
      S(NN+2)=.050
      AXX(NN+1)=.0001
      AXX(NN+2)=.3333
  600 CONTINUE
C
C     PLOT MEAN,VARI,TAPE,RECORD AND SENSOR INFORMATION
C
      CALL SYMBOL (XLOC+9.7,YLOC+7.6,.14,11HMPH     M/S,0.0,11)
      CALL SYMBOL (XLOC+8.4,YLOC+7.2,.21,5HMEAN=,0.,5)
      CALL NUMBER (XLOC+9.5,YLOC+7.2,.21,TMEAN,0.,2)
      CALL NUMBER (XLOC+10.7,YLOC+7.2,.21,T2,0.,2)
      CALL SYMBOL (XLOC+8.4,YLOC+6.8,.21,5HVARI=,0.,5)
      CALL NUMBER (XLOC+9.5,YLOC+6.8,.21,VARI,0.,2)
      CALL NUMBER (XLOC+10.7,YLOC+6.8,.21,V2,0.,2)
      CALL SYMBOL (XLOC,YLOC-0.8,.21,5HTAPE=,0.0,5)
      TAPE=ITAPE
      CALL NUMBER (999.0,999.0,.21,TAPE,0.,-1)
      CALL SYMBOL(999.,999.,.21,8H SENSOR=,0.,8)
      SENSR=LSENS
      IF (LASTPL(ICOL).EQ.1)   GO TO 620
      CALL NUMBER(999.,999.,.21,SENSR,0.,-1)
      GO TO 622
  620 CALL SYMBOL (999.,999.,.21,3HAVE,0.,3)
  622 CALL SYMBOL (999.,999.,.21,COMPN(ICOL),0.,1)
      CALL SYMBOL (999.0,999.0,.21,10H   REC #= ,0.0,10)
      REC=BEGREC
      CALL NUMBER(999.0,999.0,.21,REC,0.,-1)
C
C     PLOT AXIS FOR SPECT.
C
      CALL AXIS (XLOC,YLOC,16HREDUCED SPECTRUM,16,8.0,90.0,S(NN+1),
     /S(NN+2))
      CALL LGAXS(XLOC,YLOC,7HWAVE NO,-7  ,12.0,0.0,AXX(NN+1),AXX(NN+2))
  640 CALL PLOT(XLOC,YLOC,-3)
      CALL LGLIN(AXX(1),S(1),NN,1,0,0,-1)
      CALL LGLIN(AXX(1),S(1),NN,1,0,0,-1)
```

```
      PRINT 642
  642 FORMAT (' SPECTRUM PLOTTED - RESTORING ORIGINAL PLOT ORIGIN')
  690 CALL PLOT (-XLOC,-YLOC,-3)
      IF (ICH.LT.NCH.OR.LASTPL(ICOL).GE.1)   GO TO 900
C
C        CALCULATE THE AVERAGE SPECTRA FROM ACCUMULATED TOTAL
C
      DO 750 I=1,NNP2
  750 P(I)=PT(I+INDX)/NCH
      LASTPL(ICOL)=1
C
C        SAVE LAST INDIV R MEAN VEL FOR LAST INDIV W CALC
C
      IF (ICOL.EQ.2)   SAVERV=TMEAN
      TMEAN=TMEANT(ICOL)/NCH
      VARI=VARIT(ICOL)/NCH
      T2=TMEAN*.447
C
C        USE NEW AVE VEL FOR WAVE NUMBER CALC EXCEPT IF VERTICAL
C         THEN LEAVE OLD VALUE FROM AVE R
C
      VEL=T2
      IF (ICOL.EQ.3)   VEL=HMEAN*.447
      V2=VARI*.447*.447
      PRINT 755, NCH
  755 FORMAT (' FINISHING SPECTRA - AVERAGE OF',I3)
      YLOC=0.
      GO TO 350
  900 YLOC=YSAVE
C
C        PUNCH OUT CARDS OF AVERAGE SPECTRA DATA
C
      IF (NPUNCH.EQ.0)   GO TO 990
      IF (LASTPL(ICOL).LT.1.OR.ICH.LT.NCH)   GO TO 990
      PRINT 925,ICOL
  925 FORMAT (' PUNCHING AVESPEC FOR ICOL=',I2)
      PUNCH 940,(S(I),I=1,NNP2)
  940 FORMAT (16F5.4)
  990 CONTINUE
C
      RETURN
      END
```

SPCPWW Listing 35 (5 of 5)

```
      BLOCK DATA
      COMMON/INPARM/COMPN(3),ICOL,ICH,LSENS,TMEAN,HMEAN,VARI
C       WIND COMPONENT ALPHANUMERIC DATA (STORED LEFT JUSTIFIED)
      DATA COMPN/1HU,1HR,1HW/
      END
```

BLK DATA Listing 36

```
      SUBROUTINE UVCAL(U,V,UFAC,VFAC)
      REAL U,V,UFAC,VFAC,A(8),AU,AV,THETA,IR,CR
      DATA A/99.70563,5.49133,-64.69608,-69.52574,85.19057,25.50650,
     - -56.69714,17.33202/
      RADCON=3.14159/180.0
      AU=ABS(U) 60.8
      AV=ABS(V) -6.1
      IF((AU.LE.1.0).OR.(AV.LE.1.0)) GO TO 10
      THETA=ATAN2(AV,AU)
      IF((THETA.LE.(2.0*RADCON)).OR.(THETA.GE.(87.9*RADCON))) GO TO 10
      IR=100.0*COS(THETA)
      CR=A(1)+A(2)*THETA+A(3)*THETA**2+A(4)*THETA**3+A(5)*THETA**4
     - +A(6)*THETA**5+A(7)*THETA**6+A(8)*THETA**7
      UFAC=IR/CR
      THETA=90.0*RADCON-THETA
      IR=100.0*COS(THETA)
      CR=A(1)+A(2)*THETA+A(3)*THETA**2+A(4)*THETA**3+A(5)*THETA**4
     - +A(6)*THETA**5+A(7)*THETA**6+A(8)*THETA**7
      VFAC=IR/CR
      GO TO 20
10    UFAC=1.0
      VFAC=1.0
20    RETURN
      END
```

UVCAL Listing 37

```
      SUBROUTINE WANGL (U,V,W,NP,ANGL,UAV,VAV,WAV,ATTACK)
C     FIND AVERAGE ANGLES BETWEEN WIND DATA COMPONENTS NP POINTS LONG
      DIMENSION U(1),V(1),W(1)
C       INITIALIZE
      USUM=0.
      VSUM=0.
      WSUM=0.
      DO 50 I=1,NP
      USUM=USUM+U(I)
      VSUM=VSUM+V(I)
   50 WSUM=WSUM+W(I)
      UAV=USUM/NP
      VAV=VSUM/NP
      WAV=WSUM/NP
      TANG=VAV/UAV
      ANGL=ATAN(TANG)
      ANGL=ANGL*57.3
      TANGW=WAV/UAV
      ATTACK=ATAN(TANGW)
      ATTACK=ATTACK*57.3
      RETURN
      END
```

WANGL Listing 38

```
      SUBROUTINE AVERG2(A,N,NAVE,R)
C     SUBROUTINE AVERSS(A,N,NAVE,R)
      DIMENSION A(1),R(1)
      DO 10 I=1,NAVE,2
      IF(I.NE.1)  GO TO 8
      ADD=A(1)
      R(1)=A(1)
      GO TO 10
    8 ADD=ADD+A(I)+A(I-1)
      II=I/2+1
      R(II)=ADD/I
10    CONTINUE
      II=NAVE/2
      NP=NAVE+1
      DO 20 I=NP,N
      ADD=ADD-A(I-NAVE)+A(I)
      R(I-NAVE/2)=ADD/NAVE
20    CONTINUE
      NP=N-NAVE/2+1
      II=NAVE
      DO 30 I=NP,N,2
      II=II-2
      ADD=ADD-A(I-2)-A(I-3)
      R(I)=ADD/II
30    CONTINUE
      R(N)=A(N)
      R(1)=(A(1)+A(2)+A(3))/3.0
      R(2)=(A(1)+A(2)+A(3)+A(4))/4.0
      R(N)=(A(N)+A(N-1)+A(N-2))/3.)
      R(N-1)=(A(N)+A(N-1)+A(N-2)+A(N-3))          /4.0
C     DO 40 I=1,N
C     A(I)=R(I)
40    CONTINUE
      RETURN
      END
```

AVERG2 Listing 39

PROGRAM WNDPRM

INTRODUCTION

Given a horizontal or vertical wind spectrum which averaged from several channels, there is a need to calculate those parameter (such as surface drag coefficient, etc.) resulting from fitting the data to the equation for a wind spectrum model.

Program WNDPRM does this by inputting one or more spectra on punched cards from program WNDSPC and outputting the calculated wind parameter values plus a Calcomp plot of the fit model spectrum superimposed on the input real spectrum.

This program is used in two separate versions for horizontal and vertical wind data, each of which uses its own model equation. For the horizontal wind, the Harris model is used, while the Panofsky model is used for the vertical wind data. The equations for these curves with their associated parameters is shown in the accompanying pages of equations.

See Figures 69 through 71, Table 18 and Listings 40 and 41.

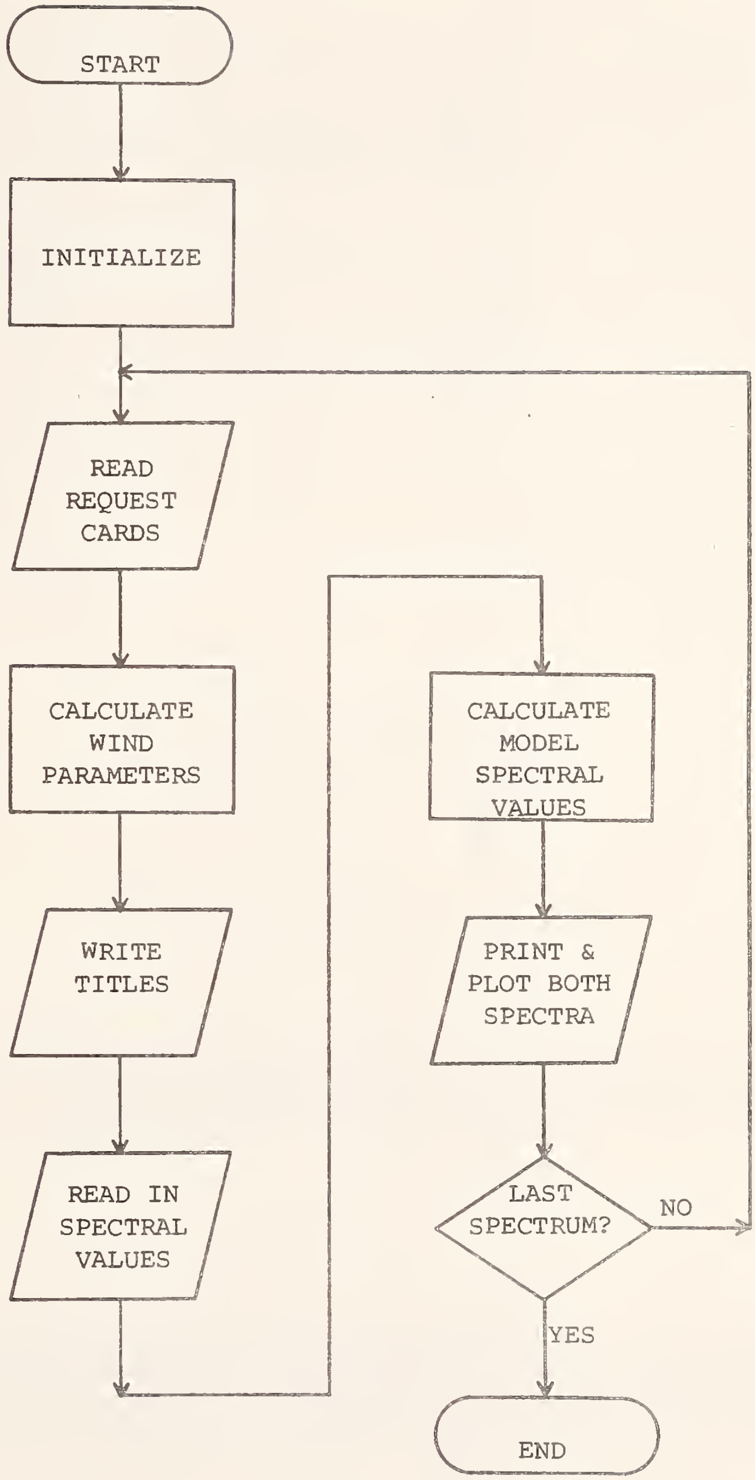


Figure 69. WNDPRM Flow Chart

.27 .13 20.2 6.2 62.7

FIELD NO.	RANGE	MEANING	FORMAT	COLUMNS
1	Usually .20-.30	Max amplitude of wind spectra	F10.5	1-10
2	Usually .05-.20	frequency of max. amplitude	F10.5	11-20
3	Usually 5.-50	Average wind velocity (M/S)	F10.5	21-30
4	Usually .5-10.	wind variance (M/S)	F10.5	31-40
5	62.7	Height of bridge deck (meters)	F10.5	41-50

Figure 70. WNDPRM Request Card

```
HORIZONTAL WIND COMPONENT FOR EVENT= 1

REDUCED SPECTRA MAX.    FREQUENCY MAX.    AVE. VELOCITY    AVE. VARIANCE    MEAN HEIGHT

      0.29000               0.05600          10.80000           3.40000       62.70000

ROUGHNESS LENGTH =   0.179433    SURFACE DRAG COEFFICIENT = 0.00989811    LENGTH CONSTANT =   229.3276

ICOUNT = 1024
```

WAVE NUMBER	AVERAGE SPECTRA,DORIA DATA	HARRIS FIT SPECTRA
0.00016	0.04020	0.01936
0.00032	0.04550	0.03857
0.00048	0.05300	0.05751
0.00065	0.05940	0.07604
0.00081	0.06480	0.09405
0.00097	0.06820	0.11143
0.00113	0.09890	0.12809
0.00129	0.10840	0.14395
0.00145	0.12870	0.15895
0.00161	0.13470	0.17305
0.00178	0.16100	0.18623
0.00194	0.17550	0.19846
0.00210	0.18750	0.20976
0.00226	0.20100	0.22013
0.00242	0.21060	0.22959
0.00258	0.21750	0.23817
0.00274	0.22850	0.24591
0.00291	0.23640	0.25284
0.00307	0.24170	0.25902
0.00323	0.24340	0.26448
0.00339	0.27190	0.26927
0.00355	0.27380	0.27343
0.00371	0.26790	0.27702
0.00388	0.27220	0.28008
0.00404	0.28890	0.28264
0.00420	0.28450	0.28476
0.00436	0.27920	0.28646
0.00452	0.28730	0.28779
0.00468	0.29650	0.28877
0.00484	0.28160	0.28945
0.00501	0.27670	0.28985
0.00517	0.27640	0.28999
0.00533	0.27170	0.28991
0.00549	0.27010	0.28962
0.00565	0.26750	0.28914
0.00581	0.26380	0.28851
0.00597	0.25920	0.28772
0.00614	0.26880	0.28681
0.00630	0.26860	0.28578
0.00646	0.24450	0.28465
0.00662	0.25830	0.28342
0.00678	0.27440	0.28212
0.00694	0.27210	0.28075
0.00710	0.25860	0.27932
0.00727	0.25410	0.27783
0.00743	0.25480	0.27630
0.00759	0.25570	0.27474
0.00775	0.24360	0.27314
0.00791	0.23490	0.27151
0.00807	0.24250	0.26986
0.00823	0.23470	0.26820

Figure 71. WNDPRM Output

Table 18. WNDPRM Variable Name List

Name	Com	Type	Dimension	Usage
A		R	1026	Average horizontal wind spectrum
ASIGSQ		R	1	Wind variance
AVEL		R	1	Average wind velocity
B		R	1026	Average vertical wind spectrum
EL		R	1	Length constant
EVENT		R	1	Event number
FMAX		R	1	Max. frequency
I		I	1	General index
IBUF		I	2000	Plotter buffer storage
ICOUNT		I	1	Number of data points
ID		I	1	Event number
J		I	1	General Index
KAPPA		R	1	Surface drag coefficient
KK		I	1	General index
M		I	1	Data counter
MAXWN		R	1	Max, wavenumber
N		I	1	Data Counter
NPLT		I	1	Number of spectra to process
RSH		R	1026	Harris model spectral curve
RSMAX		R	1	Max. amplitude of input spectrum
RSP		R	1	Panofsky model spectral curve
SPA		R	1026	Horizontal spectrum data
SPB		R	1026	Vertical spectrum data
XOF		R	1	X coordinate offset for plotter
YOF		R	1	Y coordinate offset for plotter
WN		R	1026	
ZEE		R	1	Height of bridge deck
ZO		R	1	Surface roughness length

```
C       **********    PROGRAM WNDPRM (HORIZ VERSION)        ***********
C
C      THIS PROGRAM INPUTS A SET OF AVERAGE HORIZONTAL WIND GUST
C      SPECTRAL VALUES ON CARDS FROM PROGRAM WNDSPC INTO ARRAY A.
C       THE OUTPUT IS CALCULATED WIND PARAMETERS AND A PLOT OF THIS
C      SPECTRUM VERSUS THE HARRIS MODEL SPECTRUM OF SAME PARAMETERS.
C
      DIMENSION A(1026),WN(1026),RSH(1026),SPA(1026),IBUF(2000)
      INTEGER USPEED
      REAL MAXWN,KAPPA
      CALL PLOTS (IBUF,2000,9)
      CALL NEWPEN (1)
C       USE FACTOR=.40 FOR CALCOMP, .67 FOR TEKTRONIX
      CALL FACTOR(.67)
      CALL FACTOR (.40)
C     CALL PLOT (-30.0,-56.0,-3)
      CALL PLOT (2.0,6.0,-3)
C       ADD XOFFSET AND YOFFSET TO ORIGIN SO AXIS LABELS NOT CUTOFF
      XCF=1.0
      XOF=0.
      YCF=2.0
      YOF=0.
C
C     READ IN THE RUN PARAMETERS
C
      READ(1,4) NPLT
    4 FORMAT (I2)
      DO 310 KK=1,NPLT
      READ(1,5) ID
    5 FORMAT (I2)
      READ(1,100) RSMAX,FMAX,AVEL,ASIGSQ,ZEE
  100 FORMAT (5F10.5)
C
C     CALCULATE SURFACE ROUGHNESS LENGTH(ZO), SURFACE DRAG COEF(KAPPA),
C     AND LENGTH CONSTANT(L)
C
      MAXWN = FMAX/AVEL
      ZO=EXP(ALOG(ZEE)-SQRT(.16*1.812*(AVEL**2.)/(RSMAX*ASIGSQ)))
      KAPPA = .16/((ALOG(10./ZO))**2.)
      EL = (SQRT(3.)*ALOG(10./ZO))/(MAXWN*ALOG(ZEE/ZO))
      WRITE(3,10) ID
   10 FORMAT(1H1,4X,'HORIZONTAL WIND COMPONENT FOR EVENT=',I2)
      WRITE(3,20)
   20 FORMAT (1H0,4X,20HREDUCED SPECTRA MAX.,4X,14HFREQUENCY MAX.,
     14X,13HAVE. VELOCITY,4X,13HAVE. VARIANCE,4X,11HMEAN HEIGHT)
      WRITE(3,30) RSMAX,FMAX,AVEL,ASIGSQ,ZEE
   30 FORMAT (1H0,8X,F10.5,12X,F10.5,6X,F10.5,8X,F10.5,4X,F10.5)
      WRITE(3,40) ZO,KAPPA,EL
   40 FORMAT (1H0,4X,'ROUGHNESS LENGTH = ',F10.6,4X,'SURFACE DRAG ',
     1'COEFFICIENT = ',F10.8,4X,'LENGTH CONSTANT = ',F10.4)
C
C       READ FREQUENCY MULTIPLIER AND P.S.
C
      M=1
```

WNDPRM Listing 40 (1 of 2)

```
  200 N=M+15
  210 READ(1,220,END=240) (A(I),I=M,N)
  220 FORMAT (16F5.4)
      IF (N.GE.1024)   GO TO 240
      M=N+1
      GO TO 200
C
  240 ICOUNT = 1024
      WRITE(3,241) ICOUNT
  241 FORMAT (1H0,4X,'ICOUNT = ',I4)
      WRITE(3,242)
  242 FORMAT (1H0,4X,'WAVE NUMBER',3X,'AVERAGE SPECTRA,REAL DATA',
     13X,'HARRIS FIT SPECTRA')
C
C     CALCULATE VALUES FOR HARRIS MODEL HORIZONTAL SPECTRAL CURVE
C
      DO 250 I=1,ICOUNT
  250 WN(I)=(I*(1.78571/1024.))/AVEL
      DO 260 I=1,ICOUNT
  260 RSH(I)=(4.*.4**2.*AVEL**2.)/(ASIGSC*ALOG(10./ZO)*ALOG(ZEE/ZO))
     1*((EL*WN(I))/((2+(WN(I)*EL*(ALOG(ZEE/ZO)/ALOG(10./ZO)))**2.)
     2**(5./6.)))  +YOF
      DO 280 I=1,ICOUNT
      SPA(I)=A(I)  +YOF
      IF (SPA(I).GT.9.0)   SPA(I)=9.C
  280 WRITE(3,300) WN(I),A(I),RSH(I)
  300 FORMAT (4X,F10.5,8X,F10.5,12X,F10.5)
      WN (ICOUNT+1)=0.0001
      WN(ICOUNT+2)=0.333
      SPA(ICOUNT+1)=2.0
      SPA(ICOUNT+1)=0.0
      SPA(ICOUNT+2)=0.05
      RSH(ICOUNT+1)=2.0
      RSH(ICOUNT+1)=0.0
      RSH(ICOUNT+2)=0.05
C
C     PLOT THE CURVES
C
      CALL LGAXS (XOF,YOF,1H ,-1,12.0,0.C,0.0001,0.333)
C     CALL LGAXS (0.0,0.0,1H ,-1,12.C,0.C,0.0001,0.333)
      CALL AXIS (XOF,YOF,1H ,1,8.0,9C.0,C.0,0.05)
      CALL LGLIN(WN,SPA,ICOUNT,1,0,0,-1)
      CALL LGLIN(WN,RSH,ICOUNT,1,0,0,-1)
      CALL SYMBOL(XOF,YOF-1.0,C.21,6HEVENT=,0.,6)
      US=USPEED
      EVENT=ID
      CALL NUMBER (999.,999.,.21,EVENT,0.0,-1)
      CALL PLOT (0.0,10.0,-3)
  310 CONTINUE
      CALL PLOT (0.0,0.0,999)
      WRITE (3,450)
  450 FORMAT (' END OF FILE WRITTEN ON PLOTTAPE')
      STOP
      END
```

WNDPRM Listing 40 (2 of 2)

```
C        ***********    PROGRAM WNDPRM (VERTICAL VERSION)    ************
C
C      THIS PROGRAM INPUTS A SET OF AVERAGE VERTICAL WIND GUST
C      SPECTRAL VALUES ON CARDS FROM PROGRAM WNDSPC INTO ARRAY A.
C       THE OUTPUT IS CALCULATED WIND PARAMETERS AND A PLOT OF THIS
C      SPECTRUM VERSUS THE PANOFSKY MODEL SPECTRUM OF SAME PARAMETERS.
C
      DIMENSION B(1026),WN(1026),RSP(1026),SPB(1026),IBUF(2000)
      INTEGER USPEED
      REAL MAXWN,KAPPA
      CALL PLOTS (IBUF,2000,9)
      CALL NEWPEN (1)
C       USE FACTOR=.40 FOR CALCOMP, .67 FOR TEKTRONIX
      CALL FACTOR(.67)
      CALL FACTOR (.40)
C     CALL PLOT (-30.0,-56.0,-3)
      CALL PLOT (2.0,6.0,-3)
C       ADD XOFFSET AND YOFFSET TO ORIGIN SO AXIS LABELS NOT CUTOFF
      XOF=1.0
      XOF=0.
      YOF=2.0
      XOF=0.
      YOF=0.
C
C     READ IN THE RUN PARAMETERS
C
      READ(1,4) NPLT
    4 FORMAT (I2)
      DO 310 KK=1,NPLT
      READ(1,5) ID
C     READ(1,5) USPEED
    5 FORMAT (I2)
      READ(1,100) RSWMAX,FMAX,AVEL,WVAR,ZEE
  100 FORMAT (5F10.5)
C
C     CALCULATE SURFACE ROUGHNESS LENGTH(ZO), SURFACE DRAG COEF(KAPPA),
C     AND LENGTH CONSTANT(L)
C
      MAXWN = FMAX/AVEL
      ZO=EXP(ALOG(ZEE)-SQRT((.16*(AVEL**2.)*.375)/(RSWMAX*WVAR)))
      KAPPA = .16/((ALOG(10./ZO))**2.)
      PMAXWN=.25/ZEE
      WRITE(3,10) ID
   10 FORMAT (1H1,4X,'VERTICAL WIND COMPONENT FOR EVENT=',I2)
      WRITE(3,20)
   20 FORMAT (1H0,4X,20HREDUCED SPECTRA MAX.,4X,14HFREQUENCY MAX.,
     14X13HAVE. VELOCITY,4X,13HAVE. VARIANCE,4X,11HMEAN HEIGHT)
      WRITE(3,30) RSWMAX,FMAX,AVEL,WVAR,ZEE
   30 FORMAT (1H0,8X,F10.5,12X,F10.5,6X,F10.5,8X,F10.5,4X,F10.5)
      WRITE(3,40) ZO,KAPPA,PMAXWN,MAXWN
   40 FORMAT (1H0,4X,'ROUGHNESS LENGTH = ',F10.6,4X,'SURFACE DRAG ',
     1'COEFFICIENT = ',F10.8,//4X,'PANOFSKY PEAK WAVE NUMBER = ',F10.6,
     24X,'AVERAGE SPECTRA PEAK WAVE NUMBER = ',F10.6)
C
```

WNDPRM Listing 41 (1 of 2)

```
C       READ FREQUENCY MULTIPLIER AND P.S.
C
      M=1
  200 N=M+15
  210 READ(1,220,END=240) (B(I),I=M,N)
  220 FORMAT (16F5.4)
      IF (N.GE.1024)   GO TO 240
      M=N+1
      GO TO 200
C
  240 ICOUNT = 1024
      WRITE(3,241) ICOUNT
  241 FORMAT (1H0,4X,'ICOUNT = ',I4)
      WRITE(3,242)
  242 FORMAT (1H0,4X,'WAVE NUMBER',3X,'AVERAGE SPECTRA,REAL DATA',
     13X,'PANOFSKY FIT SPECTRA')
C
C     CALCULATE VALUES FOR PANOFSKY MODEL VERTICAL SPECTRAL CURVE
C
      DO 250 I=1,ICOUNT
  250 WN(I)=(I*(1.78571/1024.))/AVEL
      DO 260 I=1,ICOUNT
  260 RSP(I)=(.16*(AVEL**2.))/(WVAR*((ALOG(ZEE/Z0)**2.)))
     1*(6.*WN(I)*ZEE)/((1.+(4.*WN(I)*ZEE))**2.)  +YOF
      DO 280 I=1,ICOUNT
      SPB(I)=B(I)  +YOF
      IF (SPB(I).GT.9.0)   SPB(I)=9.0
  280 WRITE(3,300) WN(I),B(I),RSP(I)
  300 FORMAT (4X,F10.5,8X,F10.5,16X,F10.5)
      WN (ICOUNT+1)=0.0001
      WN(ICOUNT+2)=0.333
      SPB(ICOUNT+1)=2.0
      SPB(ICOUNT+1)=0.0
      SPB(ICOUNT+2)=0.05
      RSP(ICOUNT+1)=2.0
      RSP(ICOUNT+1)=0.0
      RSP(ICOUNT+2)=0.05
C
C     PLOT THE CURVES
C
      CALL LGAXS (XOF,YOF,1H  ,-1,12.0,0.0,0.0001,0.333)
      CALL AXIS (XOF,YOF,1H  ,1,8.0,90.0,0.0,0.05)
      CALL LGLIN(WN,SPB,ICOUNT,1,0,0,-1)
      CALL LGLIN(WN,RSP,ICOUNT,1,0,0,-1)
      CALL SYMBOL(XOF,YOF-1.0,0.21,6HEVENT=,0.,6)
      US=USPEED
      EVENT=ID
      CALL NUMBER (999.,999.,.21,EVENT,0.0,-1)
      CALL PLOT (0.0,10.0,-3)
  310 CONTINUE
      CALL PLOT (0.0,0.0,999)
      WRITE (3,450)
  450 FORMAT (' END OF FILE WRITTEN ON PLOTTAPE')
      STOP
```

41 (2 of 2)

FEDERALLY COORDINATED PROGRAM OF HIGHWAY RESEARCH AND DEVELOPMENT (FCP)

The Offices of Research and Development of the Federal Highway Administration are responsible for a broad program of research with resources including its own staff, contract programs, and a Federal-Aid program which is conducted by or through the State highway departments and which also finances the National Cooperative Highway Research Program managed by the Transportation Research Board. The Federally Coordinated Program of Highway Research and Development (FCP) is a carefully selected group of projects aimed at urgent, national problems, which concentrates these resources on these problems to obtain timely solutions. Virtually all of the available funds and staff resources are a part of the FCP, together with as much of the Federal-aid research funds of the States and the NCHRP resources as the States agree to devote to these projects.*

FCP Category Descriptions

1. Improved Highway Design and Operation for Safety

Safety R&D addresses problems connected with the responsibilities of the Federal Highway Administration under the Highway Safety Act and includes investigation of appropriate design standards, roadside hardware, signing, and physical and scientific data for the formulation of improved safety regulations.

2. Reduction of Traffic Congestion and Improved Operational Efficiency

Traffic R&D is concerned with increasing the operational efficiency of existing highways by advancing technology, by improving designs for existing as well as new facilities, and by keeping the demand-capacity relationship in better balance through traffic management techniques such as bus and carpool preferential treatment, motorist information, and rerouting of traffic.

* The complete 7-volume official statement of the FCP is available from the National Technical Information Service (NTIS), Springfield, Virginia 22161 (Order No. PB 242057, price $45 postpaid). Single copies of the introductory volume are obtainable without charge from Program Analysis (HRD–2), Offices of Research and Development, Federal Highway Administration, Washington, D.C. 20590.

3. Environmental Considerations in Highway Design, Location, Construction, and Operation

Environmental R&D is directed toward identifying and evaluating highway elements which affect the quality of the human environment. The ultimate goals are reduction of adverse highway and traffic impacts, and protection and enhancement of the environment.

4. Improved Materials Utilization and Durability

Materials R&D is concerned with expanding the knowledge of materials properties and technology to fully utilize available naturally occurring materials, to develop extender or substitute materials for materials in short supply, and to devise procedures for converting industrial and other wastes into useful highway products. These activities are all directed toward the common goals of lowering the cost of highway construction and extending the period of maintenance-free operation.

5. Improved Design to Reduce Costs, Extend Life Expectancy, and Insure Structural Safety

Structural R&D is concerned with furthering the latest technological advances in structural designs, fabrication processes, and construction techniques, to provide safe, efficient highways at reasonable cost.

6. Prototype Development and Implementation of Research

This category is concerned with developing and transferring research and technology into practice, or, as it has been commonly identified, "technology transfer."

7. Improved Technology for Highway Maintenance

Maintenance R&D objectives include the development and application of new technology to improve management, to augment the utilization of resources, and to increase operational efficiency and safety in the maintenance of highway facilities.

FHWA
R&D