NOAA Technical Memorandum ERL PMEL-6

A PROCESSING SYSTEM FOR AANDERAA CURRENT METER DATA

R.L. Charnell
G.A. Krancus

Pacific Marine Environmental Laboratory
Seattle, Washington
July 1976

UNITED STATES
DEPARTMENT OF COMMERCE
Elliot L. Richardson, Secretary

NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION
Robert M. White, Administrator

Environmental Research
Laboratories
Wilmot N. Hess, Director

NOTICE

The Environmental Research Laboratories do not approve, recommend, or endorse any proprietary product or proprietary material mentioned in this publication. No reference shall be made to the Environmental Research Laboratories or to this publication furnished by the Environmental Research Laboratories in any advertising or sales promotion which would indicate or imply that the Environmental Research Laboratories approve, recommend, or endorse any proprietary product or proprietary material mentioned herein, or which has as its purpose an intent to cause directly or indirectly the advertised product to be used or purchased because of this Environmental Research Laboratories publication.

CONTENTS

A PROCESSING SYSTEM FOR AANDERAA CURRENT METER DATA

R. L. Charnell
G. A. Krancus

ABSTRACT. Several projects being conducted by the Pacific Marine Environmental Laboratory (PMEL) involve direct measurement of current using the model RCM-4 Aanderaa current meter equipped with conductivity, temperature, and pressure sensors. At present, PMEL has over 100 RCM-4's and obtains 200-300 current meter records per year. To cope with this volume of data, PMEL has developed a processing system to rapidly apply corrections and produce several routine products used in subsequent data analysis. This technical memorandum describes this processing system.

1. INTRODUCTION

The strength of the PMEL Aanderaa current meter processing system lies in minimizing the manpower normally required to reduce current meter data. Because of the high current meter use rate it is imperative that data from recently returned current meters be examined rapidly to insure proper operation of the meters prior to their recommitment to the field. By reducing the manpower for data processing, more time can be spent in the scientific analysis of data.

To process a given meter tape the average time spent by an oceanographic technician is 5 hrs, and processing can be completed in an elapsed time of a few days. Normally four or more meter tapes are processed at one time, so that all output products described below may be ready within a week from the time the actual tapes enter the laboratory. This is a significant improvement over the 2 to 4 months currently experienced in other parts of ERL (D. A. Mayer, AOML, personal communication). The processing package was developed for the scientist. However, several of the displays and tabulated data rapidly convey a visual summary of a large volume of current meter data. Thus this package can be used by a program manager to rapidly assess progress of a project. Such a management tool is the plotted output that succinctly presents processed data and flow characteristics on a single figure.

Processing consists of four phases: (1) translation, (2) conversion of coded data to engineering units, (3) editing, and (4) product generation. The translation is done with an electromechanical system which reads the signal and checks parity of each record. The data are then written on a computer compatible tape for subsequent operations. This tape is then run through the computer, in our case a CDC-6400, for conversion and cleanup. This results in production of a printout of all data, including error analysis, and of an interim data tape. The third segment of the system, editing, is currently being done solely by technicians. We are now in the process of automating this portion of the work. Eventually data will be processed with a single computer pass and hence eliminate this time-consuming interruption. The last phase of processing takes the clean, edited data through several filtering and calculation steps. Output from this phase is a processed data tape for use in future analyses, a summary printout, and a plotted presentation of all data.

The data generated by the RCM-4's have few errors. The largest portion is related to the time base. Periodically the electromechanical system will fail to read an existing synchronous (sync) pulse signal on the data tape and hence generate an extra record, apparently lengthening the observation time. However, the extra record produced is either incomplete or zero-filled and results in a parity error. By keying on the sync pulse during translation and continuously checking parity the few time-base errors generated can be identified and eliminated. It is this identifiable signature which should allow comprehensive editing of these data by computer and eventually result in single pass processing. Other errors encountered are values which exceed the normal ranges. These errors are usually caused by the current meter encoding circuits and, although never resulting in a parity error, they do follow a specific pattern. Again, they are identifiable and easily corrected. The combination of a low number of errors and their easy identification is key to the rapid processing of these current meter data.

Our experience has shown a total number of errors less than 1% of each record. The low number of errors in the records is not accidental. Each meter is examined in detail before deployment with all contact points of the digitizer thoroughly cleaned and electrical circuits checked. Rapid translation of the data tape from the previous deployment gives a 6-channel strip chart record, allowing identification of specific malfunctions to be rectified. After the check and spot calibration, a data tape is produced and checked. While not part of the post-operation processing, this stage in the total operation is critical to production of reliable data.

The PMEL processing system for Aanderaa current meter data relies on the identification and removal of errors as part of the processing system. It simultaneously generates several products, rather than waiting for sequential checking of the data at the end of each operation. It must be recognized that checking of the data at each stage is as necessary as before. However, processing in a simultaneous mode allows an early examination of data to aid in equipment turnaround, future field planning, and rapid data analysis. Since subsequent checking rarely turns up errors in processing, this approach is worth the gamble.

2. ELEMENTS OF THE SYSTEM

The data processing procedure starts with the original 0.5-mil data tape created by an RCM-4 Aanderaa current meter. This tape is removed from the meter with no rewinding and rerecorded onto a stronger 1.5-mil working tape. The delicate 0.5-mil tape is then stored and ordinarily is not replayed under normal circumstances. The working tape is then processed by the system depicted in figure 1. The elements of this system are described below.

2.1. Translation

The Aanderaa tape translator was designed and built by PMEL. It is used to read the 1.5-mil working data tape and to rewrite this data on a medium-density (556 bpi) computer compatible 7-track raw data tape. Besides the raw data tape, the translator also produces a 6-channel strip chart. This is an invaluable aid in early detection of a current meter malfunction and in verifying the quality of the data.

The RCM-4 current meters use a dual-channel tape recorder with channel A being an exact duplicate of channel B, except that one channel may be more readable than the other. The meter records six 10-bit words in serial form followed by a sync pulse. Each 10-bit word is read by the translator and expanded into two 6-bit characters by inserting flag bits after the fifth and tenth input bit. Each character is then packed into a 400-character output buffer. After each word is read a check is made for the sync pulse. When it is encountered, a 2-character (12-bit) error word is transferred to the output buffer. The reader can detect incorrect bit counts within words in addition to incorrect word counts between sync pulses. Any discrepancies are encoded and written in the error word. Hence, for every data frame (six 10-bit words) that is read from the working tape, seven 2-character words (12-bit words) are written to the output buffer. The output buffer is finally dumped to tape, in odd parity, when 25 frames have been processed. The translation phase of processing is complete when the entire working tape has been read. The resulting raw data tape is then taken to the CDC 6400 for all subsequent phases of processing.

2.2. Conversion Program (AANCMRD)

The first computer function performed on the translated data is done by the conversion program (AANCMRD). AANCMRD reads the tape, created by the translator, converts raw data into engineering units, makes a listing of the data in both forms, and creates an intermediate tape used for editing. The program is written in CDC FORTRAN version 2.3 and uses some nonstandard subroutines that have been implemented on the University of Washington's CDC 6400. Inputs to this program include the calibration equations, the magnetic deviation at the mooring site, the time interval between records, and the type of speed sensor used.

The actual processing done by AANCMRD is in two steps. First, translated data are read in, unpacked, the sync pulse (which is encoded in the sixth and twelfth bit of the sixth word) located, and the error word is checked for any problems the translator had with individual records. Unpacking consists of restoring the data to their original form by removing bits 6 and 12, then compressing everything to the right. The data are then

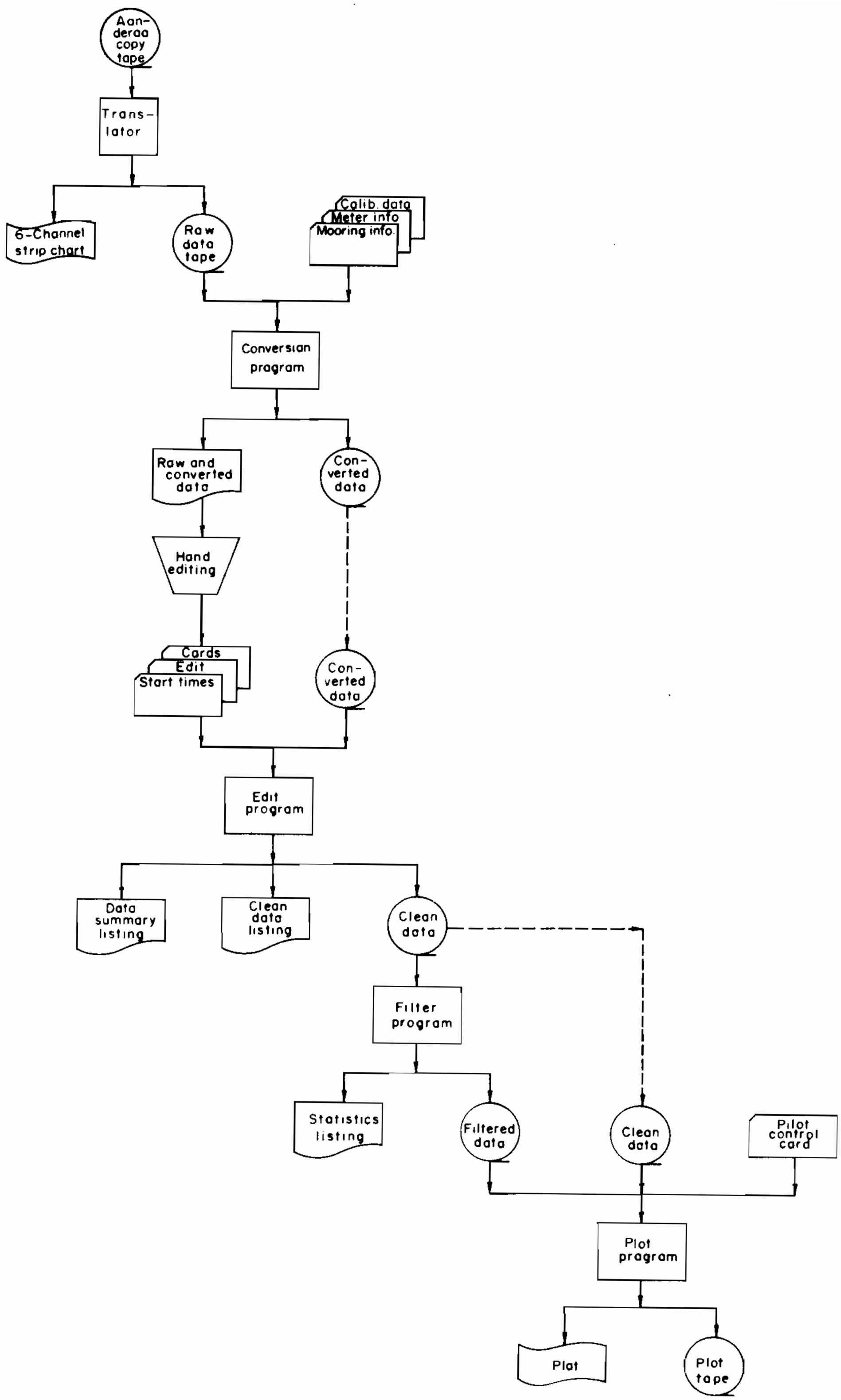

Figure 1. Flow Chart of Aanderaa Current Meter data processing.

converted, salinity computed, and any bad records are written on OUTPUT (in our case the line printer). Step two involves generating a summary of bad records, removing negative speed values, and writing all converted data on both TAPE3 and OUTPUT. The next phase in processing is hand editing. This process identifies bad values, rectifies the time base, and produces correction cards for improving the data on TAPE3. These cards plus TAPE3 are the input to the edit program (EDTDAT) where these corrections are applied.

2.3. Edit Program (EDTDAT)

This program uses as input the converted data tape created by AANCMRD and the edit cards generated in the hand editing step; AANCMRD's TAPE3 is now called TAPE1. Output from EDTDAT includes a clean data tape and listing, plus a Data Summary Report. Like AANCMRD this program also is written in CDC FORTRAN version 2.3 but does not use any locally implemented subroutines.

EDTDAT can add, change, or delete records by proper selection of control parameters on the individual edit cards. The time base that was established and verified by hand editing is used to assign a date-time group to each record. The value for speed, which is taken by rotor counter, is considered to be the speed at the time the direction and sensor readings were recorded. The U and V components of velocity are computed at this time. Following this correction phase of processing the data are filtered to remove high frequency noise and filtered a second time to remove the tidal portions of the signal.

2.4. Filters

The program which does the filtering also calculates total energy spectra and determines extrema for a Progressive Vector Diagram (PVD) to be drawn in the plot step. Filtering and spectral analysis are carried out using a general time series analysis package known as FESTSA. This package of subroutines was developed initially at the University of Hawaii, modified extensively at the University of Miami, and is currently being maintained by NOAA at AOML, Miami, and Suitland, Maryland. The copy of FESTSA used here is written in CDC FORTRAN EXTENDED version 4.

The U and V components of velocity are convolved with two separate two-sided Lanczos filters. The first is a low pass filter with a response of 6 db down at a period of 2.86 hrs and is such that less than 0.1% of the amplitude is passed at periods of 2 hrs and more than 99% of the amplitude is passed at periods greater than 5 hrs (see fig. 2). Output from this step yields one data point per hr with 4-hr starting and stopping transients lopped off each end.

The second filter removes most of the tidal energy with a response of 6 db down at a period of 35 hrs such that 0.1% of the amplitude is passed at periods of 25 hrs while 99% is passed at periods of 55 hrs (see fig. 2). The resultant time series from this operation yields one data

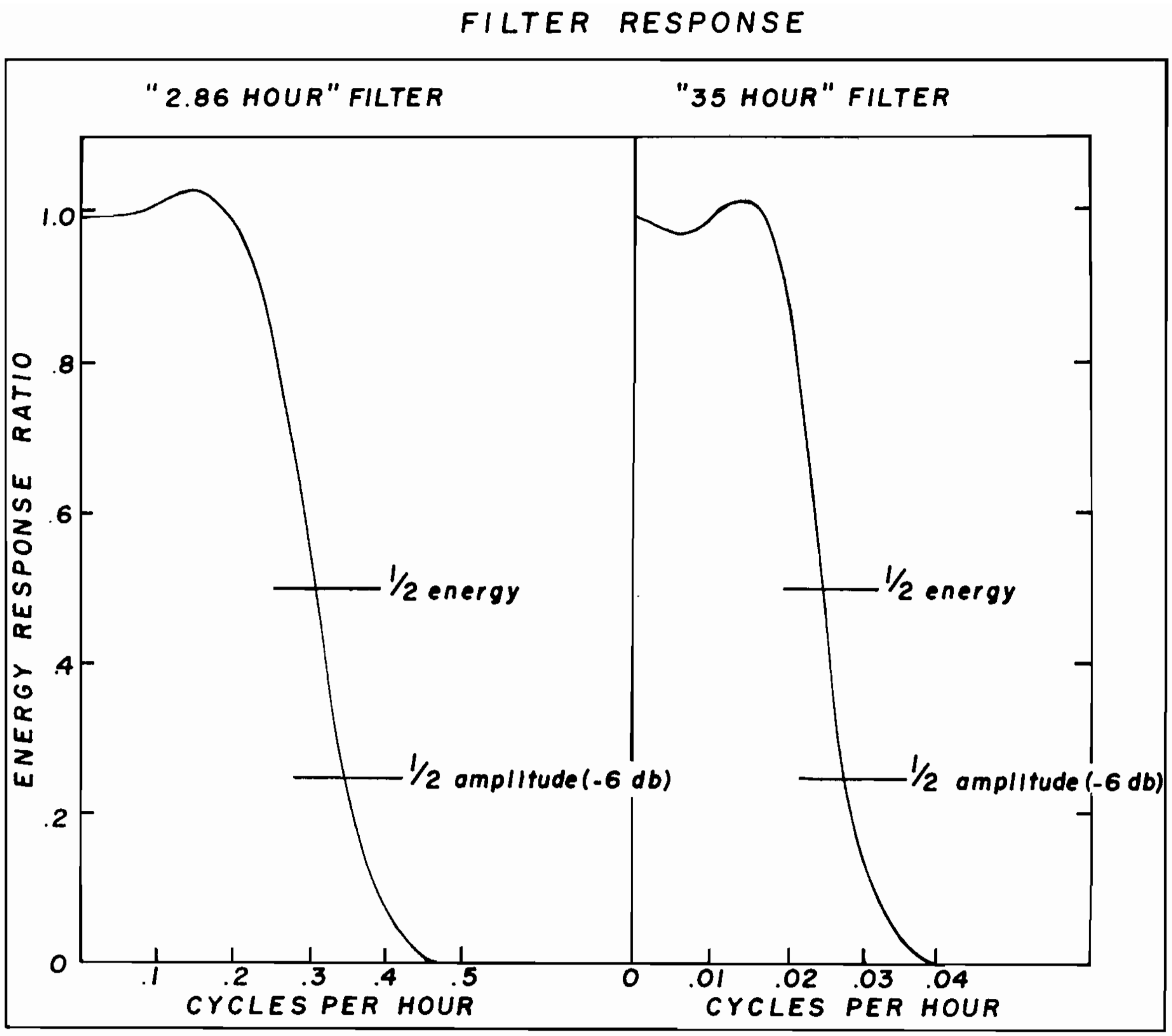

Figure 2. Response of the low-pass filters.

point per 6 hrs with 60-hr starting and stopping transients lopped off each end. The output from each filter is copied to tape and preserved for future reference.

The total energy spectra is calculated from the 2.86-hr filtered time series such that the ensuing numbers represent an ensemble averaged periodogram. The complete operation is actually performed in two steps. First the time series is broken up into 360-hr segments, the mean value removed, and the last segment zero filled. The Fourier coefficients are found for each segment and the ensemble averaged spectral energy is then computed. This yields 36 bins. Next, the series is broken into 120-hr segments and the same manipulations are performed. This yields an additional 12 bins for a total of 48 bins for each component. The U and V components are then summed. The spectrum represents the distribution of variance among the 48 frequencies and generally accounts for about 95% of the total variance. Output from the spectral and PVD computations are written on a scratch file (TAPE4) and passed to the plot program.

2.5. Plot Program

This program makes use of the clean data created by EDTDAT, the filtered U, V time series, and the spectra. Additional information is given to the program via control card input. The program is written in CDC FORTRAN EXTENDED version 4 and utilizes standard CalComp subroutines. Outputs include pertinent mooring information and some statistics, a spectral plot, a progressive vector diagram, and plots of various parameters versus time.

The parameters plotted against time include U, V, temperature, pressure, and salinity. Plotting the latter three data sets is optional and may be turned off. The U and V components are passed over twice: first for the PVD and second for the time series plot. The second is done in 10-day segments such that the origin is reset at the beginning of each 10-day set. This minimizes the amount of central memory required for data storage.

Under normal circumstances, the filter program and then the plot program are executed in the same job stream. This is essential if one wants the spectral plot as this information is passed, via a temporary file (TAPE4), between the programs. Other information on this file includes the PVD bounds, the variances, and the mean pressure.

3. INPUT FORMATS

There are various types of input to the processing system. Each has a distinct format that is described in this section. In addition to the computer compatible tape format that results from the translator, the card formats for controlling operations, functions, and data corrections are described.

3.1. Conversion Inputs

AANCMRD (the conversion program) takes two types of input: one is the raw data tape created by the translator and the other is seven punched cards with the mooring and calibration data. The raw data tape has 25 Aanderaa records (seven 12-bit words per record) packed into one physical record or block followed by a 3/4-in tape gap. It is a 7-track, odd parity, 556 bpi computer compatible tape. The data fields are written in the order: reference word, temperature, conductivity, pressure, direction, and speed. It may be read most effectively by using a FORTRAN BUFFER IN statement (see subroutine GETREC of AANCMRD).

The seven punched cards are a major source of errors and must be reviewed upon successful execution. In general, card 1 is a combination of correction factors and program control fields, cards 2 through 5 have the calibration equations, and cards 6 and 7 have header information for the output data tape. Formats for these cards are:

Card	Name	Format	Columns	Comments
1	XMAG	F10.5	1-10	Magnetic declination in degrees
	NDATA	I5	11-15	Approximate number of Aanderaa records[1]
	DELTIME	F5.2	16-20	Sample time in minutes
	NSKIP	I5	21-25	Number of records to skip
	NFSKIP	I5	26-30	Number of files to skip[2]
	NUMETR	L1	31	Type of speed sensor[3]
2	A0(1)	F10.5	1-10	Speed constant[4]
	A0(2)	F10.5	11-20	Direction constant
	A0(3)	F10.5	21-30	Temperature constant
	A0(4)	F10.5	31-40	Conductivity constant
	A0(5)	F10.5	41-50	Pressure constant
3	A1(1)	F10.5	1-10	Speed first degree coefficient
	A1(2)	F10.5	11-20	Direction first degree coefficient
	A1(3)	F10.5	21-30	Temperature first degree coefficient
	A1(4)	F10.5	31-40	Conductivity first degree coefficient
	A1(5)	F10.5	41-50	Pressure first degree coefficient
4	A2(1)	E14.7	1-14	Speed second degree coefficient
	A2(2)	E14.7	15-28	Direction second degree coefficient
	A2(3)	E14.7	29-42	Temperature second degree coefficient
	A2(4)	E14.7	43-56	Conductivity second degree coefficient
	A2(5)	E14.7	57-70	Pressure second degree coefficient

(Card format continued)

Card	Name	Format	Columns	Comments
5	A3(1)	E14.7	1-14	Speed third degree coefficient
	A3(2)	E14.7	15-28	Direction third degree coefficient
	A3(3)	E14.7	29-42	Temperature third degree coefficient
	A3(4)	E14.7	43-56	Conductivity third degree coefficient
	A3(5)	E14.7	57-70	Pressure third degree coefficient
6	PROJ	A10	1-10	Project name
	MOOR	A10	11-20	Mooring identifier
	MET	A5	21-25	Meter number
	METDP	A5	26-30	Meter depth
	YLAT	A10	31-40	Latitude
	XLONG	A10	41-50	Longitude
	BOTDP	F5.2	51-55	Bottom depth
7	ITIMES(1)	I5	1-5	Start hour and minute
	ITIMES(2)	I5	6-10	Start day
	ITIMES(3)	I5	11-15	Start month
	ITIMES(4)	I5	16-20	Start year

[1]This number is taken from the translator which counts the number of good records plus the number of bad records. It should be verified with a rough calculation.

[2]NFSKIP is normally set to zero since this is a very inefficient way to skip files. It is better to use existing system utilities for file positioning.

[3]NUMETR may be either T or F. T implies that the speed sensor used resets itself to zero after each reading. F implies that it is the constant accumulation type which is reset to zero when the counter reaches 1023.

[4]It is important that the speed sensor gear ratio be figured into this constant. For a gear ratio of 4 to 1, this number is around 2.76. Similarly, for a gear ratio of 2 to 1, it is about 1.5.

3.2. Edit Inputs

EDTDAT (the edit program) takes two inputs; one is the blocked binary data tape created by AANCMRD and the other is one or more punched cards. The magnetic tape has two header records on it followed by the actual data records. The first header has the following information in the order: project, mooring, meter, meter depth, latitude, longitude, and bottom depth. This header may be changed if the information is poorly formatted or inaccurate. The second header has the start time, day, month, and year.

Both of these headers are written on the clean tape but the start times are modified to reflect the fact that records will have been deleted from the beginning of the series. The individual data records from AANCMRD have data stored on them in the following order: record number, speed, direction, temperature, conductivity, pressure, and salinity.

Only one punched card is necessary to make EDTDAT run. It has all the information on it to assign date-time groups to the data records and to delete any starting and stopping transients. The rest of the cards are optional and are used for editing the individual records. It is possible to add, delete, or change records by proper manipulation of the leading entries on each card. The punched cards use the following format:

Card	Name	Format	Columns	Comments
1	DELMIN	F6.2	1-6	Time between records in minutes
	NSKIP	I4	7-10	Number of records to skip down
	NREF	I5	11-15	Reference record for the time mark
	ITIME	I5	16-20	Hour and minute of reference record
	IDAY	I5	21-25	Day of reference record
	IMONTH	I5	26-30	Month of reference record
	IYEAR	I5	31-35	Year of reference record
	IMAX	I5	36-40	Number of last record to be processed
	CHG	L1	41	Changes header information[1]
2-N	ADD	L1	1	Add a record[2]
	NREC1	I5	2-6	Number of the record to be modified[3]
	TEMP(1)	F10.3	7-16	Speed
	TEMP(2)	F10.3	17-26	Direction
	TEMP(3)	F10.3	27-36	Temperature
	TEMP(4)	F10.3	37-46	Conductivity
	TEMP(5)	F10.3	47-56	Depth
	TEMP(6)	F10.3	57-66	Salinity

---

[1]This field is used to indicate that a change is to be made to the information on the first header record. If a T is entered the following card in line must have the new header information in the same format as card 6 of input to AANCMRD. If an F is entered, the first header record on the clean tape will be the same as on the converted data tape.

[2]If new header information is entered it would actually be the second card and the detailed record corrections would be on cards 3 through N. To actually add a record or records the record just before the insertion point must be flagged as a record to be changed or dropped.

[3]To change a record NREC1 should be positive. Even though only one field need be changed, all fields must be present on the card. To delete a record NREC1 should be negative and none of the other data fields need be present.

3.3. Plot Control

The plot program has four inputs: (1) the clean data tape, (2) the filtered data tape, (3) one or two punched cards, and (4) statistical and spectral data. The heading information plus temperature, pressure, and salinity data are taken off of the clean tape which is in blocked binary form. The 2.86-hr and 35-hr filtered U and V components are on the filtered tape. This tape is also in blocked binary form with the data from the separate filters being written on separate files each of which has two header records like those on the clean tape. Before execution, these files are copied onto two separate local files, TAPE1 and TAPE2.

The first punch card is essential as it controls what plots will be made and also provides scaling information. The format of this card is given below. The second card is optional and may be used when the PVD information normally transmitted via TAPE4 is not present. The statistics (the PVD range, U and V minimums, U and V variances, and mean pressure) plus the spectral data (the amplitudes of the 48 bins and the confidence intervals) are transferred directly from the filter program via the local file TAPE4. Without this file no spectral plot can be made but the statistics for the PVD and labeling will still be made if the second card is present. When TAPE4 and this second card are not present no PVD plot will be made. The punch cards have the following formats:

Card	Name	Format	Columns	Comments
1	TLOW	F5.0	1-5	Low value on temperature scale
	SLOW	F5.0	6-10	Low value on salinity scale
	RANGE	F5.0	11-15	PVD range[1]
	TPLT	L1	16	T for temperature plot F for no temperature plot
	SPLT	L1	17	T for salinity plot F for no salinity plot
	PPLT	L1	18	T for pressure plot F for no pressure plot
2	UMIN	F5.2	1-5	Minimum value of U for PVD
	VMIN	F5.2	6-10	Minimum value of V for PVD
	RANGE2	F5.2	11-15	PVD range[2]
	UVAR	F5.2	16-20	U variance
	VVAR	F5.2	21-25	V variance
	PMEAN	F5.2	26-30	Mean pressure

[1]This number may be found in the output from AANCMRD which is usually run for all meters on a string at the same time. This way they may all be plotted using a PVD box of the same scale.

[2]The program will set up the PVD box using the larger of RANGE or RANGE2.

4. OUTPUT PRODUCTS

Output from the system includes tapes, printout and plotted data. This section describes these products and specifies the various formats.

4.1. Converted and Raw Data Listing

The Converted and Raw Data Listing is generated by AANCMRD and is used in the hand editing step. Besides a complete listing of the data other information is given which must be verified to assure accuracy of the clean data.

On the first page of output, all information which was read in from punched cards is given. The calibration coefficients should be checked at this point to ensure that the right numbers were used in converting raw data into engineering units. Also, mooring information should be examined since this is what will be written on the header of the clean tape. Of particular importance here is the latitude of the station for this value is used in the plot program to compute the inertial frequency.

On the second page of output, records in which the translator found errors are listed. After this list is given the total number of data records processed and percentage of them found to be in error.

Next is the listing of all converted and raw data. An example of the first page is given in figure 3. It is the converted data shown in this part that has been written on the converted data tape and will be used as input to the edit program. The first thing to pick out of this listing is the first record recorded after the meter has been positioned in the water for one complete sampling period and also the last record recorded before the anchor was released. The start and stop times should then be assigned and the time base verified. All the converted data must then be scanned for any obvious errors and the correction cards encoded. An interpolation flag value of 1 is used to indicate that a negative speed was found and that the speed value given is an interpolation between the preceding and following records. The last thing written on this output is the PVD information. Since it is possible to go directly from the converted data tape to the plotted data summary, this information is useful so that all meters on a string will be plotted using the same PVD scale.

4.2. Clean Data Tape and Printout

Of primary importance in this whole system is the clean data tape generated by EDTDAT since this is the permanent record of the investigation and serves as the basis for all future analysis. This tape is 7-track written in blocked binary, odd parity at 800 bpi. While this is a very efficient configuration, it would be necessary to convert this into another form if it were to be sent off to another installation.

The first two records written on this tape are header records (see section 3.2 for details). The rest of the entries are the data records

RECORD	CALCULATED DATA SPEED	DIP	TEMP	COND	DEPTH	INTERPOLATION SAL	FLAG	SPEED	RAW DATA DIR	TEMP	COND	DEPTH	REF	ERROR TYPES A B C DEF
1	1.50	88.29	14.816	.346	-.02	.140	0	0	202	758	0	51	92	0
2	1.50	67.27	14.865	.346	-.02	.140	0	0	199	760	0	51	92	0
3	1.50	84.88	14.889	.346	-.02	.140	0	0	192	761	0	51	92	0
4	1.50	80.77	14.937	.346	-.02	.139	0	0	180	763	0	51	92	0
5	1.50	79.41	14.985	.346	-.02	.139	0	0	176	765	0	51	92	0
6	1.50	77.01	15.009	.346	-.02	.139	0	0	169	766	0	51	92	0
7	1.50	330.29	15.058	.346	.42	.139	0	0	910	768	0	54	92	0
8	1.50	278.33	15.251	.346	.13	.138	0	0	758	776	0	52	92	0
9	1.50	275.60	15.396	.346	.13	.137	0	0	750	782	0	52	92	0
10	1.50	273.89	15.566	.346	.13	.136	0	0	745	789	0	52	92	0
11	1.50	323.11	14.001	.346	.13	.145	0	0	889	724	0	52	92	0
12	58.91	45.91	4.156	31.003	58.63	32.959	0	312	78	296	411	447	92	1
13	1.50	19.25	-2.531	.346	-7.58	.284	0	0	0	0	0	0	739	10
14	61.85	63.34	4.246	31.152	83.22	33.044	0	328	129	300	413	613	93	0
15	64.43	355.24	4.111	31.077	98.18	33.092	0	342	983	294	412	714	93	0
16	80.80	258.17	4.404	31.227	80.55	32.974	0	431	699	307	414	595	92	0
17	114.29	332.00	4.381	31.227	69.15	32.996	0	613	915	306	414	518	92	0
18	103.99	91.03	4.494	31.450	95.37	33.145	0	557	210	311	417	695	93	0
19	38.85	313.26	4.291	31.301	96.70	33.174	0	263	860	302	415	704	92	0
20	128.64	325.16	4.517	31.301	69.89	32.948	0	691	895	312	415	523	92	0
21	87.24	63.34	4.224	31.227	94.03	33.155	0	466	129	299	414	686	93	0
22	21.56	71.89	4.246	31.227	94.03	33.132	0	109	154	330	414	686	92	0
23	22.29	77.01	4.246	31.152	94.03	33.044	0	113	169	300	413	686	93	0
24	20.08	96.15	4.224	31.152	94.03	33.067	0	101	225	299	413	686	93	0
25	21.92	86.58	4.224	31.227	94.03	33.155	0	111	197	299	414	686	92	0
26	20.45	87.61	4.269	31.227	94.03	33.109	0	103	200	301	414	686	93	0
27	21.74	98.55	4.404	31.376	94.03	33.148	0	110	232	307	416	686	93	0
28	22.29	91.03	4.359	31.376	94.03	33.194	0	113	210	305	416	686	93	0
29	22.29	116.32	4.427	31.450	94.03	33.213	0	113	284	308	417	686	93	0
30	21.37	101.62	4.494	31.450	94.03	33.145	0	108	241	311	417	686	93	0
31	21.56	140.25	4.472	31.450	94.03	33.168	0	109	354	310	417	686	93	0
32	21.37	132.04	4.427	31.376	94.03	33.126	0	108	330	308	416	686	93	0
33	21.37	159.39	4.381	31.376	94.03	33.171	0	108	410	306	416	686	93	0
34	20.27	142.30	4.427	31.450	94.03	33.213	0	102	360	308	417	686	93	0
35	20.45	161.78	4.517	31.525	94.03	33.210	0	103	417	312	418	686	93	0
36	21.00	155.29	4.607	31.525	94.03	33.119	0	106	398	316	418	686	93	0
37	20.64	193.57	4.607	31.600	94.03	33.206	0	104	510	316	419	686	93	0
38	20.27	186.39	4.584	31.600	94.03	33.229	0	102	489	315	419	686	93	0
39	20.08	189.81	4.584	31.600	94.03	33.229	0	101	499	315	419	686	93	0
40	20.82	199.72	4.629	31.600	94.03	33.183	0	105	528	317	419	686	93	0
41	20.64	204.85	4.494	31.450	94.03	33.145	0	104	543	311	417	686	93	0
42	20.64	186.73	4.449	31.376	94.03	33.103	0	104	490	309	416	686	93	0
43	23.58	190.83	4.269	31.227	94.03	33.109	0	120	502	301	414	686	93	0
44	21.74	226.38	4.539	31.525	94.03	33.187	0	110	606	313	418	686	93	0
45	20.27	203.14	4.494	31.450	94.03	33.145	0	102	538	311	417	686	93	0
46	19.35	256.12	4.607	31.525	94.03	33.119	0	97	693	316	418	686	93	0
47	20.08	261.93	4.629	31.600	94.03	33.183	0	101	710	317	419	686	93	0
48	18.98	262.61	4.584	31.525	94.03	33.142	0	95	712	315	418	686	93	0
49	20.64	262.27	4.494	31.450	94.03	33.145	0	104	711	311	417	686	93	0
50	20.27	286.25	4.269	31.227	94.03	33.109	0	102	787	301	414	686	93	0

Figure 3. Example of converted and raw data printout.

with information recorded in the following order: date, time, U, V, temperature, pressure, conductivity, record number, and salinity.

The clean data printout, shown in figure 4, is generated at the same time as the clean tape. It is a printed record of what is on the tape and is used as a written confirmation of any strange events future analysis may uncover. In addition to the information recorded on the tape, the listing also prints the speed and direction.

4.3. Summary Data Printout

The summary data printout presents mean values for each hour, each day and each week of the record. Figure 5 is an example of the output for 7 days of record. Each of the seven major blocks of data on the page represents 1 day. Data for each day are presented in hourly means in four columnar sets of six rows each. Each hourly set is denoted by its Julian day and hour. For each hour, temperature and salinity means are calculated from all values recorded for that hour. Sigma-t, shown in the fourth column, is a mean value calculated from the temperature and salinity values from that hour. The fifth and sixth columns show the vector-averaged values of speed and direction determined from all values recorded in that hour.

For each day, summary daily values for each measured commodity are shown in the line following the hourly summaries. Temperature, salinity, and sigma-t are arithmetic mean values of all data recorded during the day. Net speed is the vector-averaged speed of all recorded values that day in the true north direction shown. Also shown is the mean of all speed values recorded that day. Depth is the mean of all observed values from the pressure sensor.

Following the seven individual daily summaries is a line indicating the mean values for these 7 days. Net speed is the vector-averaged speed of all data observed during the week at the true north direction indicated. As before, the mean speed and depth are simple mean values for all data observed in the 7 days.

For the case of the week in which the observation period began or ended, the week has fewer hourly values than the maximum 168 possible. The averages for both the day and the week are corrected for the reduced number of values.

4.4. Plotted Data Summary

The plotted data contains several types of information. Figure 6 shows a typical example but reduced in size for this publication. Normally the figure elements are about 9 in (22.9 cm) high with the plot designed for use on a 12-in drum plotter. The record depicted here is normally about 80 in (203.2 cm) long.

REC. NO.	DATE	TIME	U-VEL. CM/SEC	V-VEL. CM/SEC	SPEED CM/SEC	COMPASS DEGREES	TEMP. DEG.C	COND. MMHO/CM	DEPTH METERS	SALINITY (PPT)
1	2 FEB 76	2045	-27.561	-1.532	27.603	266.819	4.967	30.684	22.908	31.831
2	2 FEB 76	2115	-28.354	-5.235	28.833	259.539	4.967	30.684	22.908	31.831
3	2 FEB 76	2145	-26.580	-5.744	27.193	257.805	4.967	30.684	22.908	31.831
4	2 FEB 76	2215	-25.348	-1.871	25.417	265.779	4.990	30.752	22.908	31.887
5	2 FEB 76	2245	-23.825	-2.049	23.913	265.086	4.990	30.752	22.908	31.887
6	2 FEB 76	2315	-22.683	-.024	22.683	269.940	4.990	30.684	23.027	31.809
7	2 FEB 76	2345	-19.196	-1.650	19.267	265.086	4.990	30.684	23.145	31.809
8	3 FEB 76	0015	-16.360	-5.786	17.353	250.524	4.945	30.684	23.263	31.852
9	3 FEB 76	0045	-14.326	-5.760	15.440	248.097	4.945	30.684	23.381	31.852
10	3 FEB 76	0115	-17.569	-5.156	18.310	253.645	4.922	30.617	23.617	31.796
11	3 FEB 76	0145	-19.429	-6.087	20.360	252.605	4.900	30.617	23.677	31.818
12	3 FEB 76	0215	-20.878	-11.660	23.913	240.817	4.922	30.617	23.854	31.796
13	3 FEB 76	0245	-25.173	-6.894	26.100	254.685	4.900	30.617	23.854	31.818
14	3 FEB 76	0315	-29.568	-3.628	29.790	263.006	4.967	30.684	23.854	31.831
15	3 FEB 76	0345	-28.334	-6.664	29.107	256.765	4.877	30.617	23.854	31.839
16	3 FEB 76	0415	-27.174	-8.333	28.423	252.951	4.900	30.617	23.854	31.818
17	3 FEB 76	0445	-27.951	-5.161	28.423	259.539	5.035	30.752	23.854	31.843
18	3 FEB 76	0515	-29.746	-6.617	30.473	257.458	5.147	30.886	23.854	31.890
19	3 FEB 76	0545	-30.505	-6.980	31.293	257.112	5.215	30.953	23.795	31.902
20	3 FEB 76	0615	-31.213	2.237	31.293	274.100	4.787	30.482	23.677	31.771
21	3 FEB 76	0645	-31.111	3.369	31.293	276.180	4.675	30.415	23.440	31.801
22	3 FEB 76	0715	-32.644	-1.022	32.660	268.206	4.562	30.280	23.322	31.753
23	3 FEB 76	0745	-30.995	4.309	31.293	277.914	4.562	30.213	23.263	31.675
24	3 FEB 76	0815	-31.976	-.227	31.977	269.593	4.652	30.415	23.263	31.823
25	3 FEB 76	0845	-32.262	5.083	32.660	278.954	4.652	30.348	23.263	31.745
26	3 FEB 76	0915	-28.839	6.903	29.653	283.461	4.697	30.348	23.263	31.702
27	3 FEB 76	0945	-26.760	5.555	27.330	281.727	4.720	30.348	23.263	31.680
28	3 FEB 76	1015	-25.380	1.357	25.417	273.060	4.720	30.415	23.263	31.758
29	3 FEB 76	1045	-23.892	3.764	24.187	278.954	4.742	30.415	23.263	31.736
30	3 FEB 76	1115	-23.800	3.455	24.050	278.260	4.787	30.482	23.381	31.771
31	3 FEB 76	1145	-23.902	-.749	23.913	268.206	4.945	30.617	23.617	31.775
32	3 FEB 76	1215	-22.395	-2.610	22.547	263.352	4.967	30.684	23.913	31.831
33	3 FEB 76	1245	-25.459	-2.189	25.553	265.086	4.967	30.684	24.090	31.830
34	3 FEB 76	1315	-28.661	-4.223	28.970	261.619	4.990	30.684	24.267	31.809
35	3 FEB 76	1345	-31.580	-5.831	32.113	259.539	4.967	30.684	24.386	31.830
36	3 FEB 76	1415	-34.506	-7.239	35.257	258.152	4.967	30.684	24.504	31.830
37	3 FEB 76	1445	-34.557	-10.826	36.213	252.605	4.967	30.684	24.504	31.830
38	3 FEB 76	1515	-34.062	-17.432	38.263	242.897	4.990	30.684	24.563	31.809
39	3 FEB 76	1545	-39.142	-18.561	43.320	244.630	4.967	30.617	24.563	31.753
40	3 FEB 76	1615	-40.889	-25.853	48.377	237.696	4.967	30.684	24.563	31.830
41	3 FEB 76	1645	-45.356	-23.560	51.110	242.550	5.035	30.752	24.563	31.843
42	3 FEB 76	1715	-51.364	-8.523	52.067	260.579	4.967	30.684	24.563	31.830
43	3 FEB 76	1745	-51.827	-11.201	53.023	257.805	4.900	30.617	24.504	31.818
44	3 FEB 76	1815	-52.855	-4.222	53.023	265.432	4.945	30.617	24.327	31.775
45	3 FEB 76	1845	-52.939	-9.444	53.775	259.885	4.967	30.684	24.090	31.830
46	3 FEB 76	1915	-54.197	-5.984	54.527	263.699	4.900	30.617	23.795	31.818
47	3 FEB 76	1945	-53.605	-3.304	53.707	266.473	4.675	30.280	23.558	31.645
48	3 FEB 76	2015	-51.624	-10.504	52.682	258.498	4.427	30.079	23.322	31.648
49	3 FEB 76	2045	-51.356	5.561	51.657	276.180	4.810	30.482	23.263	31.749
50	3 FEB 76	2115	-51.050	5.841	51.383	276.527	4.742	30.415	23.086	31.736

Figure 4. Example of clean data printout.

```
DAYHR TEMP SALI SIGMA SPED DIR   DAYHR TEMP SALI SIGMA SPED DIR   DAYHR TEMP SALI SIGMA SPED DIR   DAYHR TEMP SALI SIGMA SPED DIR
    0   .0   .0   .00   .0   0   22901  9.5 32.2 24.90  8.4 130   22902  9.6 32.3 24.92  9.9  39   22903  9.5 32.3 24.96 10.2  56
22904  9.5 32.4 25.01 12.5  76   22905  9.1 32.3 25.04  9.6  99   22906  9.9 32.3 24.84  9.6 110   22907  9.0 32.3 25.02  8.1  12
22908  8.6 32.4 25.16  9.3  14   22909  8.3 32.4 25.23  8.1  62   22910  8.2 32.4 25.19  7.1 101   22911  8.0 32.4 25.25  7.2 116
22912  8.9 32.3 25.06  7.8 129   22913  9.7 32.3 24.90  8.1 295   22914 10.2 32.3 24.82 13.1 338   22915 10.6 32.2 24.72 18.1 353
22916 10.0 32.3 24.85 17.8 359   22917  9.5 32.3 24.92 14.5  16   22918  9.8 32.3 24.90 14.1  32   22919  9.4 32.2 24.91 11.9  40
22920  8.7 32.4 25.12 13.1  50   22921  7.8 32.4 25.26  9.3 311   22922  8.1 32.4 25.25  6.4 347   22923  7.3 32.4 25.32  7.2  81
FOR  17 AUG 74  TEMP= 9.10  SALINITY=32.32  SIGMAT=25.02  NET SPEED= 6.83 AT  37  MEAN SPEED=10.65  DEPTH= 26.03

23000  9.0 32.4 25.10  8.3  82   23001 10.4 32.3 24.77  9.2 313   23002  9.8 32.3 24.92 13.6 340   23003  9.2 32.3 24.99 13.3   1
23004  9.1 32.3 25.03 14.7  20   23005  8.7 32.3 25.11 14.4  44   23006  9.1 32.3 25.04 14.3  56   23007  9.3 32.3 25.00 16.7  71
23008  9.4 32.3 24.98 12.4  82   23009  9.0 32.4 25.08  8.2 133   23010  8.2 32.4 25.21 11.5 189   23011  8.5 32.4 25.21 11.6 260
23012  8.7 32.4 25.16 10.7 263   23013  8.8 32.4 25.12 11.7 280   23014  9.7 32.3 24.93 14.6 307   23015  9.6 32.3 24.95 17.9 339
23016 10.2 32.2 24.76 16.2   5   23017 10.7 32.3 24.76 16.7   5   23018  9.8 32.3 24.88 20.6   8   23019  8.6 32.3 25.10  2.2  76
23020  8.7 32.4 25.11 16.6  57   23021  8.8 32.3 25.08 11.8  72   23022  9.3 32.3 24.98 12.0  89   23023  8.8 32.4 25.12 12.8 104
FOR  18 AUG 74  TEMP= 9.23  SALINITY=32.33  SIGMAT=25.02  NET SPEED= 6.59 AT  24  MEAN SPEED=14.00  DEPTH= 25.90

23100  8.8 32.4 25.16 11.2 156   23101  8.8 32.3 25.07 14.8 182   23102  8.8 32.4 25.13 13.9 279   23103  9.4 32.3 24.97 16.5 314
23104  9.6 32.3 24.94 15.2 352   23105  8.9 32.4 25.08 11.1 355   23106  9.0 32.4 25.08 16.8   1   23107  8.8 32.3 25.09   .7 132
23108  8.9 32.3 25.05 20.4  58   23109  8.9 32.3 25.06 14.9  84   23110  8.9 32.4 25.09 13.6  91   23111  8.7 32.4 25.15 12.3 105
23112  8.8 32.4 25.12 12.4 120   23113  9.4 32.3 25.00 15.6 207   23114  9.1 32.4 25.05 16.1 249   23115  9.0 32.3 25.04 15.3 294
23116  9.6 32.3 24.91 18.0 321   23117  9.5 32.4 24.99 14.9 360   23118  9.3 32.2 24.93 14.7   1   23119  9.9 32.3 24.89 13.6  27
23120  9.1 32.3 25.04 15.8  57   23121  9.0 32.3 25.05 13.5  68   23122  8.7 32.2 25.00 12.6  82   23123  7.9 32.4 25.26 16.1  93
FOR  19 AUG 74  TEMP= 9.04  SALINITY=32.33  SIGMAT=25.05  NET SPEED= 4.45 AT  32  MEAN SPEED=15.25  DEPTH= 25.76

23200  7.6 32.4 25.30 10.7  97   23201  8.3 32.2 25.09 10.4 162   23202  9.3 32.3 24.98 14.8 182   23203  9.9 32.2 24.85  8.0 228
23204  9.8 32.3 24.89  8.4 282   23205  9.8 32.2 24.79  4.4 139   23206  9.0 32.4 25.08  1.5 191   23207  8.7 32.4 25.16 13.2 356
23208  9.3 32.4 25.02 10.8  32   23209  9.4 32.3 25.00  9.0  59   23210  8.4 32.3 25.14 10.0  68   23211  8.2 32.4 25.21  7.1  80
23212  8.2 32.4 25.20  8.0 113   23213  8.5 32.3 25.14  9.1 188   23214  9.1 32.3 25.02 10.4 215   23215  9.5 32.3 24.95 11.4 244
23216  9.5 32.3 24.97  7.7 280   23217  9.4 32.3 25.00  8.6 358   23218  9.2 32.4 25.04 10.0   7   23219  9.1 32.3 25.03  8.5  18
23220  8.8 32.4 25.10  9.2   8   23221  8.8 32.4 25.10 10.6   9   23222  8.6 32.4 25.14 13.0   9   23223  8.7 32.3 25.10 11.3  10
FOR  20 AUG 74  TEMP= 8.96  SALINITY=32.33  SIGMAT=25.05  NET SPEED= 2.06 AT  28  MEAN SPEED=10.16  DEPTH= 25.76

23300  8.7 32.4 25.13  9.3  12   23301  9.1 32.4 25.09  5.6  14   23302 10.1 32.4 24.89  6.7  65   23303  9.4 32.3 24.97  6.8 141
23304  9.4 32.3 24.99  8.7 173   23305  9.5 32.3 24.97  6.5 332   23306  9.3 32.3 25.02  7.6 349   23307  8.9 32.3 25.08  7.8 339
23308  8.7 32.3 25.09  9.3 328   23309  8.9 32.3 25.06  9.6 338   23310  9.0 32.3 25.06 10.8 352   23311  9.1 32.0 24.74  2.7   0
23312  8.7 32.3 25.05  3.6   4   23313  8.8 32.3 25.09  2.3   5   23314 10.0 32.1 24.74  3.4  58   23315  9.3 32.2 24.94  8.0  98
23316  9.4 32.3 24.95  5.4 129   23317  9.2 31.9 24.69  5.2 180   23318  9.2 32.1 24.84  2.3 268   23319  9.0 32.3 25.03  6.6 348
23320  9.1 32.3 25.01  4.7 352   23321  9.0 32.4 25.07  3.2 359   23322  9.1 32.3 25.00  4.9 354   23323  9.2 31.9 24.72  6.1 354
FOR  21 AUG 74  TEMP= 9.17  SALINITY=32.26  SIGMAT=24.97  NET SPEED= 3.24 AT   5  MEAN SPEED= 6.39  DEPTH= 25.76

23400  9.1 32.3 25.01  5.7  40   23401  8.6 32.2 25.04  5.3  69   23402  8.6 32.3 25.11  6.4  98   23403  9.3 32.3 24.99  9.6 159
23404 10.0 32.3 24.86 13.9 182   23405 10.0 32.4 24.92 12.4 205   23406  9.4 31.9 24.64  5.4 273   23407  9.3 32.3 25.00 10.5 323
23408  9.5 32.3 24.96  9.2 349   23409  9.0 32.3 25.01  6.2   2   23410  8.9 32.4 25.09  4.8   6   23411  8.6 32.3 25.09  2.7  10
23412  8.6 32.3 25.12  1.7  18   23413  8.7 32.4 25.13   .9 143   23414  9.0 32.4 25.11  1.2 152   23415  9.1 32.3 25.04  1.6 219
23416  8.8 32.4 25.10  4.8 278   23417  9.1 32.3 25.03  7.0 279   23418  9.4 32.3 24.97  6.4 311   23419  9.6 32.3 24.91  6.4 323
23420  9.1 32.4 25.09  9.7 350   23421  9.1 32.5 25.14 11.4  15   23422  8.4 32.3 25.15 13.3  51   23423  8.5 32.3 25.13 12.7  60
FOR  22 AUG 74  TEMP= 9.06  SALINITY=32.31  SIGMAT=25.03  NET SPEED= 1.98 AT   4  MEAN SPEED= 7.26  DEPTH= 25.77

23500  8.2 32.4 25.19  7.5  61   23501  8.2 32.4 25.21  6.5 110   23502  8.7 32.3 25.11  9.1 180   23503  8.9 32.4 25.10 13.8 215
23504  8.8 32.4 25.13 15.0 254   23505  8.5 32.4 25.18 15.2 281   23506  8.5 32.3 25.13 12.0 307   23507  8.1 32.3 25.20  9.5 341
23508  8.2 32.3 25.17  9.9 353   23509  8.0 32.3 25.20 12.0 340   23510  8.3 32.3 25.11 17.2  13   23511  9.0 32.3 25.02 13.6  28
23512  8.7 32.3 25.09 13.2  49   23513  8.2 32.4 25.22  9.3  72   23514  8.4 32.3 25.15  8.8  86   23515  8.2 32.4 25.20  5.8  98
23516  8.7 32.3 25.09  9.7 102   23517  8.6 32.3 25.08 10.4 128   23518  8.3 32.4 25.18  8.9 259   23519  8.1 32.3 25.19  7.9 315
23520  8.1 32.3 25.18  7.4 338   23521  8.1 32.3 25.18  8.6   1   23522  8.2 32.4 25.20  8.7  13   23523  8.3 32.4 25.20 10.2  30
FOR  23 AUG 74  TEMP= 8.39  SALINITY=32.34  SIGMAT=25.16  NET SPEED= 3.59 AT   6  MEAN SPEED=10.64  DEPTH= 25.85


FOR  7 DAYS    TEMP=  9.99  SALINITY=32.32  SIGMAT=25.04  NET SPEED= 3.99 AT  23  MEAN SPEED=10.62  DEPTH= 25.83
```

Figure 5. Example of summary data printout.

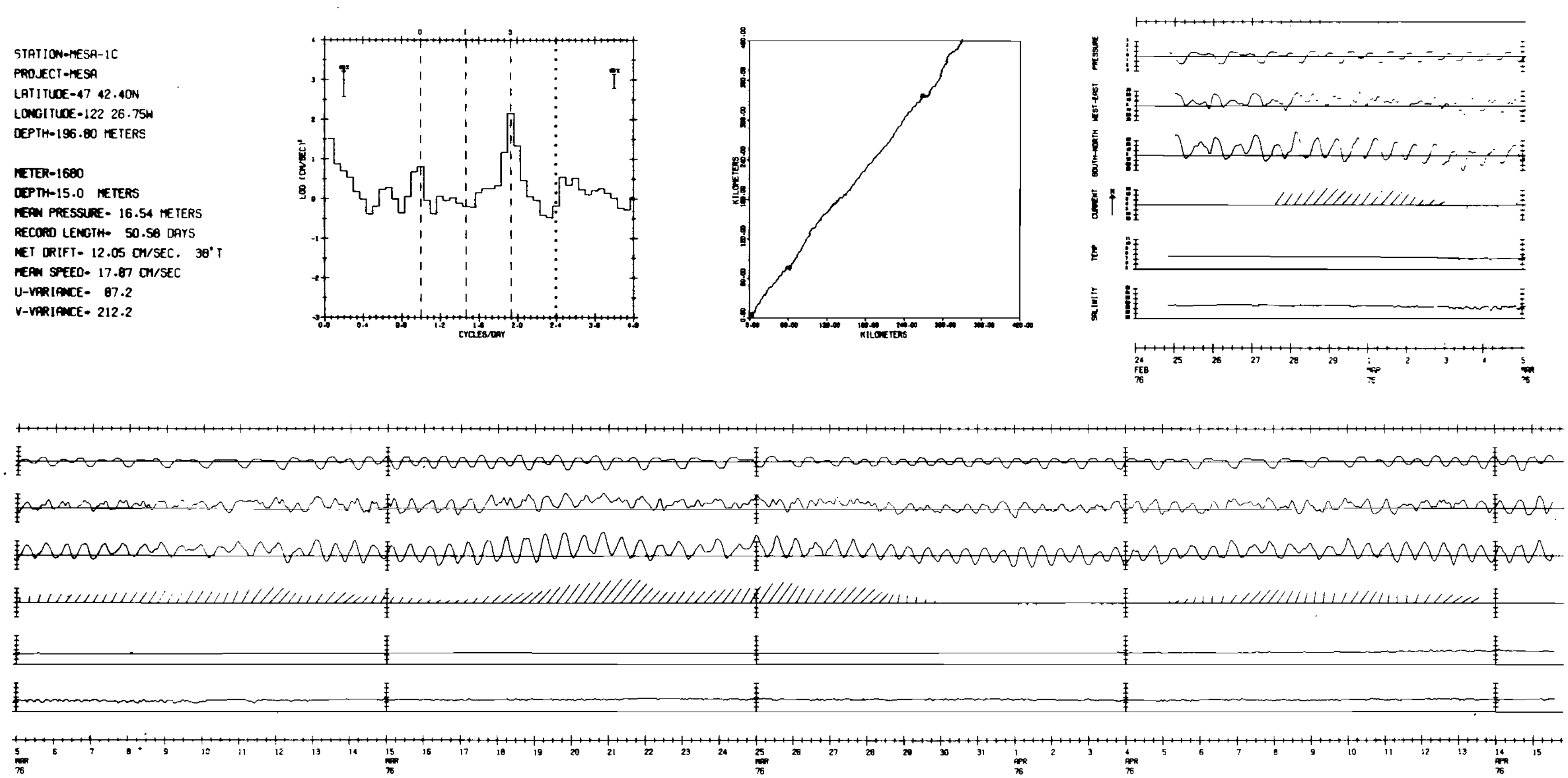

Figure 6. Example of data plot.

The first segment of the plot is a written summary of the record. The first two lines identify the station and the project. The next two lines, the position, and the fifth, water depth at that site. The next two lines identify the meter by number and its level in the water column, measured from the surface. Mean pressure is calculated from all values over the usable record. Record length denotes the length of usable record. Net Drift is the vector-averaged speed over the entire record at the indicated direction; mean speed is the arithmetic mean of all speed values for the record. The variances are in the U (East) and V (North) directions.

The second segment of the plot is a spectral energy diagram for this series. The vertical dashed lines denote the frequency of the daily (D) and semidaily (S) tides and the inertial (I) frequency. The vertical line of small squares indicates a scale chance of the abscissa from 0.2 cycles/day/in to 1.2 cycles/day/in. The line in the upper left-hand corner shows the error band of the 80% confidence level for the left-hand scale. A similar line in the upper right-hand corner shows the error band for the right-hand scale.

The third segment of the plot is a PVD for the entire record. The beginning of the PVD is denoted by an S; the end by an F.

The fourth segment which constitutes the bulk of the plot, displays the time series of all data types recorded. The upper and lower hatched lines show the time with a scale of 1 day/in divided into quarters of a day. The upper data line, pressure, presents the instantaneous values of pressure relative to the mean pressure denoted in the first segment of the plot. The ordinate has a scale of 8 db/in. The second and third data lines are the East and North components of the record filtered with the 2.86-hr low-pass filter. These data were resampled hourly. The data line marked CURRENT shows the 35-hr low-pass filtered data resampled at 6 hrs. The data are shown in a vector time series with north depicted by the arrow at the left. If the coordinate system is rotated the arrow at the left shows the new north axis. For the last two data records, temperature and salinity, all recorded values are plotted unfiltered.

5. ACKNOWLEDGMENTS

This system was developed in pieces by many different individuals. R. M. Reynolds assembled the tape translator and initially developed the AANCMRD and EDTDAT programs. B. A. Walters was the first to use these parts in production and contributed to the debugging and modifying of the programs. The filters were done by C. A. Pearson whose knowledge of FESTSA has greatly enhanced the analysis of the data. The critical eye of Richard Sillcox has led to many major improvements at all levels, especially in the job stream necessary to process many current meters at one time.

Development of this system was supported in part by the Marine Ecosystems Analysis (MESA) Program and Outer Continental Shelf Environmental Assessment Program (OCSEAP) of NOAA's Environmental Research Laboratories.

APPENDIX

PROGRAM LISTINGS

```
      PROGRAM AANCMRD(INPUT,OUTPUT,TAPE1,TAPE2,TAPE3,TAPE10,
     1TAPE5=INPUT,TAPE6=OUTPUT)
C
C     TAPE (TAPE1,556 BPI,STRANGER) GENERATED USING THE PMEL 1-TRACK
C     PROGRAM TO READ AANDERAA CM DATA FROM 7-TRACK
C     TO 7-TRACK CONVERTER.
C     RECORD NUMBER,COMPUTED DATA,RAW DATA, AND ERROR SUMMARY.
C     COMPUTES, PRINTS AND WRITES ON TAPE (TAPE3,800 BPI,BINARY,SCOPE)
C     ERROR RECORDS ARE MARKED ON LISTING WITH ASTERISKS AND SUMMARIZED
C     AT THE END OF EACH FILE.
C
C  DATA CARDS
C
C  CARD 1
C
C     XMAG = ANGLE (IN DEGREES) TO CORRECT COMPASS READINGS FOR
C            MAGNETIC DECLINATION (F10.5)
C     NDATA = NUMBER OF SETS OF DATA ON THE TAPE (I5)
C     DELTIME = TIME INTERVAL (IN MINUTES) BETWEEN DATA SAMPLES (F5.2)
C     NSKIP = NUMBER OF DATA TAPE RECORDS TO SKIP (I5)
C     NFSKIP = NUMBER OF 7-TRACK TAPE FILES TO SKIP (I5)
C     NUMETR= T FOR NEW METER (L1)
C             F FOR OLD METER
C
C  CARDS 2-5
C     A0(I),A1(I),A2(I),A3(I) = COEFFICIENTS TO BE USED IN THE
C         EQUATIONS FOR CONVERTING RAW DATA INTO ENGINEERING UNITS.
C          THESE EQUATIONS ARE OF THE FORM:
C               ZN(I)=A0(I)+A1(I)*N+A2(I)*N**2+A3(I)*N**3
C          CARD 2 HAS A0(1)---A0(5)      (5F10.5)
C          CARD 3 HAS A1(1)---A1(5)      (5F10.5)
C          CARD 4 HAS A2(1)---A2(5)      (5F14.7)
C          CARD 5 HAS A3(1)---A3(5)      (5E14.7)
C          NOTE: INCLUDE ROTOR GEAR RATIO WHEN FIGURING
C                A1(1) FOR SPEED EQUATION
C
C  CARD 6
C     MOORING AND METER INFORMATION
C     (MUST LEFT JUSTIFY ALL FIELDS)
C     PROJ= PROJECT (A10)
C     MOOR= MOORING NUMBER (A10)
C     MET= METER NUMBER (A5)
C     METDP = METER DEPTH (A5)
C     YLAT= MOORING LATITUDE (A10)
C     XLONG= MOORING LONGITUDE (A10)
C     BOTDP = BOTTOM DEPTH (F5.2)
C
C  CARD 7
C     STARTING TIMES AND DEPTH INFORMATION
C     ITIMES = ARRAY TO STORE STARTING AND STOP TIMES AS FOLLOWS:
C        FOR I=1  START HOUR AND MINUTE (I5)
C            I=2  START DAY (I5)
C            I=3  START MONTH (I5)
C            I=4  START YEAR (I5)
C
```

```
      DIMENSION NX(6),NZ(6),ZN(6),BUF(40)
      DIMENSION        XPOS1(6),INEG(20),YNEG(20,6),XPOS2(6),
     1NFLG(20),TEMP(20,5),ITEMP(20)
      DIMENSION NNZ(20,6),NCHK(20)
      DIMENSION ITIMES(4)
      DIMENSION A0(5),A1(5)
      DIMENSION A2(5),A3(5)
      LOGICAL NUMETR
      COMMON/COM1/NREC
      COMMON /ZIP/II,L,IZZZ
      DATA NX/6,3,4,5,2,1/,NVAL,NRECTOT/6,25/
      DATA PARI/.TRUE./
      UMIN=UMAX=USUM=0.0
      VMIN=VMAX=VSUM=0.0
      PI=3.1415926
      NCALC=5
      NREC=100
      II = 100
      L = 0
C
C     READ CONTROL CARDS WITH CALIBRATION DATA.
C
 997  READ (5,122) XMAG,NDATA,DELTIME,NSKIP,NESKIP,NUMETR
 122  FORMAT (F10.5,I5,F5.2,2I5,L1)
      IF (EOF,5) 999,998
 998  WRITE (6,123)
 123  FORMAT (1H1,9X,*CONTROL CARDS - *//)
      READ(5,5000) (A0(I),I=1,5)
      READ(5,5000) (A1(I),I=1,5)
 5000 FORMAT(5F10.5)
      READ(5,5001) (A2(I),I=1,5)
      READ(5,5001) (A3(I),I=1,5)
 5001 FORMAT(5E14.7)
      WRITE (6,125) XMAG,NDATA,DELTIME,NSKIP,NESKIP,NUMETR
 125  FORMAT (10X,F10.5,I5,F5.2,2I5,L1)
      DO 10 I=1,5
   10 WRITE(6,6000) I,A0(I),I,A1(I),I,A2(I),I,A3(I)
 6000 FORMAT(//*  A0(*,I2,*)=*,F10.5,5X,*  A1(*,I2,*)=*,F10.5,
     1 *  A2(*,I2,*)=*,E14.7,*  A3(*,I2,*)=*,E14.7)
      CALL ERRBIT (1,PARI)
C
C     READ FROM CARDS THEN WRITE ON TAPE AND LISTING
C           THE MOORING AND METER INFORMATION
C
      READ(5,700) PROJ,MOOR,MET,METDP,YLAT,XLONG,BOTDP
  700 FORMAT(2A10,2A5,2A10,F5.2)
      WRITE(6,701) PROJ,MOOR,YLAT,XLONG,BOTDP,MET,METDP
  701 FORMAT(//5X,*PROJECT:*,A10,5X,*MOORING:*,A10,//6X,*LATITUDE:*,
     +        A10,5X,*LONGITUDE:*,A10,5X,*BOTTOM DEPTH:*,F6.2
     +        //6X,*METER:*,A5,5X,*DEPTH:*,A5)
      WRITE(3) PROJ,MOOR,MET,METDP,YLAT,XLONG,BOTDP
      READ (5,703) ITIMES
  703 FORMAT (8I5)
      WRITE (6,704) ITIMES
  704 FORMAT (*0*,5X,*START TIME:*,I5,5X,*DAY:*,I5,5X,*MONTH:*,I5,
     +      5X,*YEAR:*,I5)
```

```
      WRITE (6,705) DELTIME
  705 FORMAT (*0*,5X,*SAMPLE TIME:*,F6.2/*1*)
      WRITE (3) ITIMES,DELTIME
      DECODE(5,706,METOP) PRESS
  706 FORMAT(F5.1)
C
C     SKIP NFSKIP FILES.
C
      NPAR=0
      IF (NFSKIP.EQ.0) GO TO 334
      DO 335 I=1,NFSKIP
 397  BUFFER IN (1,1) (BUF(1),BUF(40))
 396  CALL XRCL
      IF (UNIT,1) 396,397,335,336
 336  NPAR=NPAR+1
      IF (NPAR.LE.10) GO TO 397
      STOP
 335  CONTINUE
C
C     SKIP NSKIP CASSETTE RECORDS.
C
 334  IF (NSKIP.EQ.0) GO TO 340
      DO 910 I=1,NSKIP
 910  CALL GETREC (NX,NVAL,NRECTOT,NZ,NTYPE,NCHECK)
 333  CONTINUE
  340 N=NBAD=0
      S1 = 0.
C
C           DATA IS STORED AS FOLLOWS:
C           ZN(1)=SPEED
C           ZN(2)=DIRECTION
C           ZN(3)=TEMPERATURE
C           ZN(4)=CONDUCTIVITY
C           ZN(5)=PRESSURE
C           ZN(6)=SALINITY
C
      DO 900 I=1,NDATA
      IZZZ = I
      CALL GETREC (NX,NVAL,NRECTOT,NZ,NTYPE,NCHECK)
      S2 = NZ(1)
      GO TO (810,820,830),NTYPE
C
C     GOOD DATA ROUTINE.
C
  810 SD = NZ(2)
      ST = NZ(3)
      SC = NZ(4)
      SDEP = NZ(5)
      IF(NUMETR) S1=0.0
      ZN(1) = A0(1) + A1(1)*(S2-S1)/DELTIME
      ZN(2) = A0(2) + A1(2)*SD + XMAG
      IF(ZN(2).GT.360.) ZN(2)=ZN(2)-360.
      ZN(3) = A0(3) + A1(3)*ST + A2(3)*(ST**2) + A3(3)*(ST**3)
      ZN(4) = A0(4) + A1(4)*SC
      ZN(5) = A0(5) + A1(5)*SDEP
      ZN(6)=SALIN1(PRESS,ZN(3),ZN(4))
```

```
      S1 = S2
 840  N=N+1
      WRITE(2)I,ZN,NZ,NCHECK
      GO TC 900
C
C     RAD DATA ROUTINE
C
  820 SD = NZ(2)
      ST = NZ(3)
      SC = NZ(4)
      SDEP = NZ(5)
      IF(NUMETR) S1=0.0
      ZN(1) = AC(1) + A1(1)*(S2-S1)/DELTIME
      ZN(2) = AC(2) + A1(2)*SD + XMAG
      IF(ZN(2).GT.360.) ZN(2)=ZN(2)-360.
      ZN(3) = A0(3) + A1(3)*ST + A2(3)*(ST**2) + A3(3)*(ST**3)
      ZN(4) = AC(4) + A1(4)*SC
      ZN(5) = AC(5) + A1(5)*SDEP
      ZN(6)=SALINI(PRESS.ZN(3),ZN(4))
      S1 = S2
      WRITE(2)I,ZN,NZ,NCHECK
      WRITE(6,104)I.ZN,NZ.NCHECK
  104 FORMAT(X,2H**,I4,F8.1,F8.2,2F6.3,F8.2,F8,3,10X,6(4X04),3XI10)
      NBAD=NBAD+1
 900  CONTINUE
C
C     LIST ERROR DATA RECORDS.
C
 830  END FILE 2
      WRITE (6,108)
 108  FORMAT (1H0.9X,26H**************************/10X,1H*,24X,1H*/
     *10X,26H*  ERROR RECORDS SUMMARY */10X,1H*,24X,1H*/
     *10X,26H**************************//)
      FPER=NBAD*100.0/I
      WRITE (6,109) I,NBAD,FPER
 109  FORMAT (10X,*TOTAL NUMBER OF CASSETTE RECORDS = *,
     *I5,//10X,*NUMBER OF ERROR AANDERAA RECORDS = *,I5
     *,* (*,F7.1,* PERCENT),*//)
      REWIND 2
C
C  DO SPEED INTERPOLATION AND WRITE RESULTS ON UNIT 3.
C     NFLAG = 0 MEANS THAT NO SPEED INTERPOLATION WAS DONE
C           = 1 MEANS AN INTERPOLATION WAS PERFORMED ON THE SPEED
C
      WRITE(6,1111)
 1111 FORMAT(1H1)
      WRITE (6,103)
  103 FORMAT(18X*CALCULATED DATA*18X,*INTERPOLATION*,13X,*RAW DATA*2FX,
     1*ERROR TYPES*/* RECORD  SPEED     DIR      TEMP     COND    DEPTH   SAL
     2     FLAG*3X,*SPEED     DIR      TEMP     COND     DEPTH      REF  *,
     3*     A B C DEF*)
    1 READ(2) IREC,ZN,NZ,NCHECK
      IF(EOF,2) 300,50
   50 IF(ZN(1).LT.0.) 200,100
  100 IPOS1 = IREC
      DO 101 I=1,6
```

```
 101 XPOS1(I) = ZN(I)
 102 NFLAG = 0
     WRITE(3) IPOS1,XPOS1
     WRITE(6,1500) IPOS1,XPOS1,NFLAG,NZ,NCHECK
1500 FORMAT(1X,I4    ,2F8.2,2F8.3,F8.2,F8.3,I5,1X,6(4XI4),4X,I10)
     IF (NZ(1) .LE. 1) GO TO 1
     U=DELTIME*60.0*ZN(1)*SIN(ZN(2)*PI/180.)
     USUM=USUM+U
     IF (USUM .LT. UMIN) UMIN=USUM
     IF (USUM .GT. UMAX) UMAX=USUM
     V=DELTIME*60.0*ZN(1)*COS(ZN(2)*PI/180.)
     VSUM=VSUM+V
     IF (VSUM .LT. VMIN) VMIN=VSUM
     IF (VSUM .GT. VMAX) VMAX=VSUM
     GO TO 1
 200 IF(IREC.NE.1) GO TO 201
     ZN(1) = 0.
     GO TO 100
 201 JJ = 0
 202 JJ = JJ + 1
     INEG(JJ) = IREC
     DO 2020 I=1,6
2020 NNZ(JJ,I) = NZ(I)
     DO 203 I=1,6
     NCHK(JJ) = NCHECK
 203 XNEG(JJ,I) = ZN(I)
     READ(2) IREC,ZN,NZ,NCHECK
     IF (EOF,2) 300,222
 222 IF(ZN(1).LT.0.) GO TO 202
     IPOS2 = IREC
     DO 204 I=1,6
 204 XPOS2(I) = ZN(I)
     XJJ = JJ + 1
     DEL = (XPOS2(1)-XPOS1(1))/XJJ
     NFLAG = 1
     DO 205 J=1,JJ
     XJ = J
     XNEG(J,1) = XPOS1(1) + XJ*DEL
     WRITE(6,1500) INEG(J),XNEG(J,1),XNEG(J,2),XNEG(J,3),XNEG(J,4),
    1 XNEG(J,5),XNEG(J,6),NFLAG,NNZ(J,1),NNZ(J,2),NNZ(J,3),NNZ(J,4),
    2NNZ(J,5),NNZ(J,6),NCHK(J)
 205 WRITE(3) INEG(J),XNEG(J,1),XNEG(J,2),XNEG(J,3),XNEG(J,4),
    1XNEG(J,5),XNEG(J,6)
     IPOS1 = IPOS2
     DO 206 I=1,6
 206 XPOS1(I) = XPOS2(I)
     GO TO 102
 300 END FILE 3
     UMIN=UMIN/100000.
     UMAX=UMAX/100000.
     URANGE=UMAX+ABS(UMIN)
     VMIN=VMIN/100000.
     VMAX=VMAX/100000.
     VRANGE=VMAX+ABS(VMIN)
     WRITE (6,9001) UMIN,UMAX,URANGE,VMIN,VMAX,VRANGE
9001 FORMAT (*1*,5X,*UMIN=*,F8.1,5X,*UMAX=*,F8.1,5X,*URANGE=*,F8.1,
     +         //6X,*VMIN=*,F8.1,5X,*VMAX=*,F8.1,5X,*VRANGE=*,F8.2)
 999  STOP
      END
```

```
      SUBROUTINE GETREC(NX,NVAL,NRECTOT,NZ,NTYPE,NCHECK)
C
C     SUBROUTINE TO READ BINARY DATA FROM 7-TRACK TAPE(TAPE 1)
C       WHICH WAS CREATED BY AANDERAA TRANSLATOR.
C
C     EACH 7-TRACK RECORD MUST CONTAIN AN INTEGER NO. OF DATA RECS.
C
C     EACH RECORD IS READ IN BLOCKS OF NVAL AND THE PROGRAM
C       EXPECTS A FLAG AND ERROR WORD PER FORMAT.
C
C     NX      = RESHUFFLE ARRAY.
C     NVAL    = NO. WORDS/DATA RECORD.
C     NRECTOT= NO. DATA RECS/EOR
C     NTYPE   = 1 FOR GOOD DATA,
C             = 2 FOR ERROR---A= BITS/WORD.NE.10
C                             B= PWE,
C                             C= WORDS/SYNC.NE.CORRECT VALUE,
C                             D= FLAG BITS OUT OF SEQUENCE,
C                             E= SYNC WORD ENCOUNTERED BEFORE 6TH WORD,
C                             F= NO SYNC FLAG.
C             = 3 FOR EOF ENCOUNTERED.
C
C
      INTEGER BUF
      DIMENSION BUF(40),NX(NVAL),NZ(NVAL)
      COMMON/COM1/NREC
      COMMON /ZIP/II,L,IZZZ
      INTEGER ROL
      NPAR=0 $ IFLGCK=0000101
      IA=0004000$ IB=0002000 $ IC = 0001000
C
C     INITIALIZE DATA ARRAYS TO ZERO.
C
      DO 100 I=1,NVAL
  100 NZ(I)=0
      NREC=NREC+1 $ NCHECK=0 $ NTYPE=1
C
C     READ NEW TAPE RECORD IF NECCESSARY.
C
      IF(II.LE.L) GO TO 302
  103 BUFFER IN (1,1) (BUF(1),BUF(40))
   20 CALL XRCL(1)
      IF(UNIT,1) 20,104,140,160
  104 II = 0
      L = LENGTH(1)
      NCHECK = 0 $ NTYPE = 1
 1040 NSHFT = 0
      II = II + 1
      IIB = BUF(II)
      GO TO 300
  140 NTYPE=3 $ NREC=NRECTOT $ RETURN
  160 WRITE(6,162) IZZZ
  162 FORMAT(10X,55H***PARITY ERROR ON TAPE 1, CONTINUE WITH NEXT RECORD
     1***,I5,* IS THE PRESENT RECORD NUMBER *)
      NPAR=NPAR+1
```

```
      IF(NPAR.GE.10)165,103
  165 WRITE(6,166) IZZZ
  166 FORMAT(X,34H***PARITY ERROR ON TAPE 1, STOP***,I5,* IS THE PRESENT
     1 RECORD NUMBER *)
      STOP
  300 NREC = 0
C
C     UNPACK 1 AANDERAA RECORD.
C
C
C           THE DATA IS PACKED IN THE FOLLOWING ORDER:
C                REF. WORD,TEMP.,COND.,PRESS.,DIRECTION,SPEED.
C
C           THE DATA IS STORED IN THE ARRAY NZ IN THE ORDER:
C                SPEED,DIRECTION,TEMP.,COND.,PRESS.,REF. WORD.
C
  302 DO 399 I=1,NVAL
      IVAL = I
      IIB = ROL(IIP,12)
      NSHFT = NSHFT + 1
      NZS = IIB.AND.0007777
      ICK = 0000101.AND.NZS
      IF(ICK.EQ.0)310,320
  320 IF(I.EQ.NVAL)310,300
  310 K = NX(I)
      NZ1 = NZS.AND.0777700
      NZ2 = NZS.AND.0000077
      NZ11 = ISHIFT(NZ1,-7)
      NZ21 = NZ2/2
      NZ12 = ISHIFT(NZ11,5)
      NZ(K) = NZ12.OR.NZ21
      IF(NSHFT.GE.5) 398,399
  398 NSHFT = 0
      II = II + 1
      IF(II.LE.L) GO TO  3980
      IF(IVAL.EQ.NVAL) GO TO 399
      GO TO 103
 3980 IIB = BUF(II)
  399 CONTINUE
C
C     NO SYNC FLAG +
C
      IF(ICK.EQ.0) 410,420
  410 NCHECK=NCHECK+1
      GOTO 460
C
C     CHECK ERROR WORD
C
  420 IIB = ROL(IIP,12)
      NSHFT = NSHFT + 1
      NZS =IIB.AND.0007777
      ICK = 0000101.AND.NZS
      IF(NSHFT.GE.5) 421,422
  421 NSHFT = 0
      II = II + 1
      IF(II.LE.L) GO TO 4210
```

```
      IF(IVAL.EQ.NVAL) GO TO 422
      GO TO 103
 4210 IIB = BUF(II)
  422 IF(ICK.EQ.0000101)450,440
  440 NCHECK=100+NCHECK
  450 NZA = NZS.AND.IA
      IF(NZA.NE.0) NCHECK = NCHECK + 100000000
      NZB = NZS.AND.IB
      IF(NZB.NE.0) NCHECK = NCHECK + 1000000
      NZC = NZS.AND.IC
      IF(NZC.NE.0) NCHECK = NCHECK + 10000
  460 IF(NCHECK.NE.0)NTYPE=2
  462 RETURN
C
C     MISPLACED FLAG WORD.
C
  500 NCHECK=NCHECK+10
      IF(ICK.EQ.1) 501,539
  501 IF(NSHFT.GE.5) 502,420
  502 NSHFT = 0
      II = II+1
      IF(II.LE.L) GO TO 503
      GO TO 103
  503 IIB = BUF(II)
      GO TO 420
  539 WRITE(6,540)
  540 FORMAT(X,*----------PROGRAM UNSYNCED------------------*)
      IF(NSHFT.GE.5) 541,440
  541 NSHFT = 0
      II = II +1
      IF(II.LE.L) GO TO 542
      GO TO 103
  542 IIB = BUF(II)
      GO TO 440
      END
```

```
      FUNCTION SALIN1 (P,T,G)
C    COMPUTES SALINITY FROM PRESSURE,TEMP.+CONDUCTIVITY.
C
C    FUNCTION SUBPROGRAM SALIN P,T,G
C     RETURNS    SALINITY PARTS PER THOUSAND.
C     ARGUMENTS P PRESSURE DECIBARS.1DBAR=.01MN/SQ M.
C               T TEMPERATURE DEGREES C 1948 TPTS (T48)
C                  N.B. T48=(-5.80E-6*T68+(1.+4.88E-4))*T68 WHERE T68
C                       IS TEMPERATURE ON 1968 TPTS.
C               G ELECTRICAL CONDUCTIVITY MILLIMHO/CM.
C     VALIDITY-P 0. TO 6000.,T 0. TO 30.,SALINITY 30.TO 40.
C
C     PROGRAMMER-TREVOR SANKEY,IOS WORMLEY.
C     DATE-4TH DECEMBER 1974.
C     LANGUAGE-ASA FORTRAN (BASIC STANDARD)
C     MACHINE-FOR USE ON ALL IOS FACILITIES,IN HOUSE AND EXTERNAL.
C     PURPOSE-DEVELOPED FROM EARLIER VERSIONS FOR USE AS IOS STANDARD.
C     DESIGN AIMS-A)CHOICE OF MOST ACCEPTABLE EXPERIMENTAL FORMULAE.
C                 B)ARRANGEMENT FOR EFFICENT COMPILATION AND EXECUTION.
C                 C)FULLY SELF DOCUMENTING.
C     REFERENCES-SOURCES OF FORMULAE.
C     BRADSHAW,A. AND SCHLEICHER,K.E.(1965) THE EFFECT OF PRESSURE ON
C     THE ELECTRICAL CONDUCTANCE OF SEAWATER,DEEP SEA RESEARCH,12,151-162
C     BROWN,N.L. AND ALLENTOFT,B.(1966) SALINITY,CONDUCTIVITY AND
C     TEMPERATURE RELATIONSHIPS OF SEA-WATER,OVER THE RANGE OF
C     0 TO 50P.P.T. BISSETT-BERMAN CORP.REPORT NO.MJO 2003.
C     COX, .A.,CULKIN,F. AND RILEY,J.P.(1967) THE ELECTRICAL CONDUCTIVITY
C     /CHLORINITY RELATIONSHIP IN NATURAL SEA WATER.DEEP SEA RESEARCH,
C     14,203-220.
C     TWO UNPUBLISHED POLYNOMIAL FITS ARE USED,BOTH TO DATA CONTAINED
C     IN BROWN AND ALLENTOFT(1966),ONE,ALTHOUGH NOT GIVEN IN THEIR
C     PAPER,IS DUE TO THE AUTHORS THEMSELVES,THE OTHER WAS MADE BY
C     MR.J.CREASE.
C    METHOD.
C     1.GIVEN G IS OBSERVED IN SITU CONDUCTIVITY.
C     2.DIVIDE BY RP(P,T,S)=G(P,T,S)/G(0,T,S) FROM B+S(1965)
C      GIVING G(0,T,S) I.E.REMOVING PRESSURE EFFECT.
C     3.GIVEN G(0,15,35)=42.909 MMHO/CM ABS.COND COPENHAGEN WATER.
C     4.MULTIPLY BY CP(T)=G(0.T.35)/G(0,15,35) FROM CREASE*S FIT TO
C      B+A(1966) GIVING G(0,T,35),COND.COPENHAGEN WATER AT OBS.TEMP.
C     5.TAKE RATIO.
C     FOR EFFICENCY IN THIS ROUTINE STEP 2 IS INTERCHANGED WITH STEPS 3-5
C     SO THE RATIO RTS=G(P,T,S)/G(0.T.35) IS FORMED FIRST AND THEN
C     DIVIDED BY THE SALINITY DEPENDENT RP WITHIN THE ITERATIVE LOOP.
C     6.YOU NOW HAVE RT(P,T,S)=G(0,T,S)/G(0,T,35) THE CONDUCTIVITY  RATIO
C       AT THE OBSERVED TEMPERATURE.
C     7.CORRECT RT USING B+A*S UNPUBLISHED FIT TO THEIR 1966 DATA TO GET
C       R(RT,T)=G(0,15,S)/G(0,15,35) THE CONDUCTIVITY RATIO AT 15 DEG.C.
C     8.CONVERT R TO SALINITY USING INTERNATIONAL TABLES POLYNOMIAL.
C       C,C+R(1967).
C     STEPS 2 AND 6 TO 8 FORM A STRONGLY CONVERGENT ITERATIVE LOOP AND
C     S IS FOUND FROM THE TRIAL VALUE 35. IN TWO PASSES.
C
C     *CALCULATE TERMS IN PRESSURE AND TEMPERATURE ALONE.
C     *PRESSURE EFFECT(B+S)
```

```
C       CONVERT TO 1948 TEMPERATURE SCALE
        T=(-5.80E-6*T+(1+4.88E-4))*T
        CG=((-7.9E-6*T+8.3089E-4)*T-4.5302E-2)*T+1.5192
        F=((3.3E-13*P-3.3913E-8)*P+1.042E-3)*P
        H=(-2.492E-9*P+2.577E-5)*P+4.E-4
        CJ=((-1.657E-4*T+8.276E-3)*T-0.1535)*T+1.
        CL=-7.6E-5*T+6.95E-3
        B=(F*CG+H*CJ)*.01
C       *RESULTANT COEFFS. A+D*S=G(P,T,S)/G(0,T,S).
        D=-B*CL
        A=-D*35.+B+1.
C       *TEMP.VARIATION OF COND.(CREASE FIT).
        CP=(((-.532272E-8*T-2.924136E-7)*T+1.019834E-4)*T+.02011813)*T
       1+.676538
C       *CALC.RATIO G(P,T,S)/G(0,T,35).42.896 IS ASSUMED G(0,15,35)
        RTS=G/(42.896*CP)
C       *TERM IN TEMPERATURE CORRECTION TO COND.RATIO (B+A)
        Q=(-8.9E-4*T+8.E-2)*T-1.
C       *CALCULATION OF SALINITY.
C       * THIS A STRONGLY CONVERGENT ITERATIVE PROCESS AS THE PRESSURE
C       * CORRECTION IS WEAKLY DEPENDENT ON SALINITY. THE CALCULATION IS
C       * DONE TWICE.
C       *  FIRST USING TRIAL S=35 GIVING INTERMEDIATE S.
C       *  SECOND USING INTERMEDIATE S GIVING FINAL VALUE.
C       * ERRORS ARE LESS THAN .0003 PPT OVER THE RANGE OF OCEANIC CONDS.
C       *FIRST SET TRIAL VALUE.
        SALIN1=35.
C       *DO CALCULATION TWICE.
        DO 1 I=1,2
C           *CALC.PRESSURE CORR. AS FN.OF S.
            RP=D*SALIN1+A
C           *APPLY PRESSURE CORR. TO GIVE G(0,T,S)/G(0,T,35)
C           *G(0,T,S)/G(0,T,35)=G(P,T,S)/G(0,T,35) / G(P,T,S)/G(0,T,S)
            RT=RTS/RP
C           *APPLY TEMP.CORR.TO RATIO TO GET G(0,15,S)/G(0,15,35)
            R=(((-4.5E-3*RT+.022)*RT-.0175)*Q+1.)*RT
C           *APPLY INT.TABLES FORMULA TO GET SALINITY.
    1       SALIN1=((((-1.32311*R+5.98624)*R-10.67869)*R+12.80832)*R+
     1      28.2972)*R-.08996
C       *RETURN
        RETURN
        END
```

```
      PROGRAM EDITDAT(INPUT,OUTPUT,TAPE1,TAPE2,TAPE9,TAPE5=INPUT,
     1TAPE6=OUTPUT)
      DIMENSION ZN(6),TEMP(6),ITIMES(4)
      LOGICAL ADD,CHG
C  THIS PROGRAM EDITS OUT THE REST OF THE BAD DATA, CALCS. TIMES,U AND V
C
C  DATA CARDS
C  CARD 1
C     DELMIN = TIME IN MINUTES BETWEEN RECORDS  (F6.2)
C     NSKIP = NUMBER OF RECORDS TO SKIP IN FROM BEGINNING OF FILE
C             BEFORE STARTING PROCESSING   (I4)
C     NREF = REFERENCE RECORD FOR TIME MARK   (I5)
C     ITIME = TIME IN UT FOR REFERENCE RECORD (I5)
C     IDAY = DAY OF REFERENCE RECORD (I5)
C     IMONTH = MONTH OF REFERENCE RECORD   (I5)
C     IYEAR = LAST TWO DIGITS OF YEAR OF REFERENCE RECORD (I5)
C     IMAX = NO. OF LAST RECORD TO BE PROCESSED (I5)
C     CHG = T IF THE HEADER CARD IS TO BE CHANGED (L1)
C         = F IF NOT   (L1)
C  CARDS 2 - N
C     ADD = T   IF DATA RECORD ON THE CARD READ IS TO BE INSERTED IN THE
C               FILE AT THIS POINT. IN ORDER TO PICK WHERE YOU WANT THE
C               RECORD INSERTED, THE RECORD JUST BEFORE THE INSERTION
C               POINT MUST BE FLAGGED AS A REC. TO BE CHANGED OR DROPPED.
C         = F   IF DATA RECORD ON THE CARD IS NOT TO BE INSERTED AS
C               ANOTHER RECORD.
C     NREC1 = NO. OF THE DATA RECORD TO BE CHANGED ( IF NEGATIVE THE
C             RECORD WILL BE DROPPED)   (I5)
C     TEMP = NEW VALUES OF SPEED, DIRECTION, TEMP.,CONDUCTIVITY, AND
C            DEPTH WHICH ARE TO BE PUT IN RECORD NO. NREC1   (6F10.3)
      PI = 3.1415926
      READ(5,100) DELMIN,NSKIP,NREF,ITIME,IDAY,IMONTH,IYEAR,IMAX,CHG
  100 FORMAT(F6.2,I4,6I5,L1)
      WRITE(6,1011) DELMIN,NSKIP,NREF,ITIME,IDAY,IMONTH,IYEAR,IMAX,CHG
      WRITE(9,1011) DELMIN,NSKIP,NREF,ITIME,IDAY,IMONTH,IYEAR,IMAX,CHG
 1011 FORMAT(*1*,4X,* CONTROL CARD=*,F6.2,I4,6I5,L1///)
      READ(1) PROJ,MOOR,MET,METDP,YLAT,XLONG,BOTDP
      IF (CHG) READ(5,200) PROJ,MOOR,MET,METDP,YLAT,XLONG,BOTDP
  200 FORMAT(2A10,2A5,2A10,F5.2)
      WRITE (2) PROJ,MOOR,MET,METDP,YLAT,XLONG,BOTDP
      WRITE(6,201) PROJ,MOOR,YLAT,XLONG,BOTDP,MET,METDP
      WRITE(9,201) PROJ,MOOR,YLAT,XLONG,BOTDP,MET,METDP
  201 FORMAT(//6X,*PROJECT:*,A10,5X,*MOORING:*,A10,//6X,*LATITUDE:*,
     +        A10,5X,*LONGITUDE:*,A10,5X,*BOTTOM DEPTH:*,F6.2,
     +        //6X,*METER:*,A5,5X,*DEPTH:*,A5)
      READ(1) ITIMES
      ITIMES(1)=ITIME
      ITIMES(2)=IDAY
      ITIMES(3)=IMONTH
      ITIMES(4)=IYEAR
      WRITE(6,202) ITIMES,DELMIN
      WRITE(9,202) ITIMES,DELMIN
      IREC = 1
  202 FORMAT(*0*,5X,*START TIME:*,I5,5X,*DAY:*,I3,5X,*MONTH:*,I3,
     +        5X,*YEAR:*,I3//6X,*SAMPLE TIME:*,F6.2)
```

```
      WRITE(2) ITIMES,DELMIN
      WRITE(9,1000)
C
C           EDIT AND WRITE DATA
C
      IREC=0
 1000 FORMAT(*1*/9H REC. NO.,4X,4HDATE,4X,4HTIME,4X,6HU-VEL.,4X,
     16HV-VEL.,4X,5HSPEED,4X,7HCOMPASS,5X,5HTEMP.,5X,5HCOND.,4X,
     26HDEPTH ,3X,8HSALINITY/29X,,6HCM/SEC,4X,6HCM/SEC,4X,6HCM/SEC,3X,
     37HDEGREES,5X,5HDEG.C,4X,7HMMHO/CM,3X,6HMETERS,4X,5H(PPT)/)
      IF(NSKIP.EQ.0) GO TO 104
      DO 103 I=1,NSKIP
  103 READ(1) IDUM,TEMP
  104 IFLAG = 1
  300 READ(5,101) ADD,NREC1,TEMP
  101 FORMAT(L1,I5,6F10.3)
      IF(EOF,5) 301,1040
  301 NREC1 = 0
      ADD = .FALSE.
 1040 IF(ADD) GO TO 302
      READ(1) NREC,ZN
      IF(NREC.GT.IMAX) GO TO 500
      IF(EOF,1) 500,1041
 1041 IF(IABS(NREC1).NE.NREC) GO TO 310
      IF(NREC1.LT.0) 300,302
  302 DO 105 I=1,6
  105 ZN(I) = TEMP(I)
      IFLAG = 2
  310 IREC=IREC+1
      CALL GETDATE(IDAY,IMONTH,IYEAR,ITIME,1,DELMIN,IREC,NDATE,NTIME,
     C      JDHR)
      U = ZN(1)* SIN(ZN(2)*PI/180.)
      V = ZN(1)* COS(ZN(2)*PI/180.)
C           WRITE ALL INFORMATION ON TAPE9 WHICH IS COPIED TO OUTPUT.
      WRITE(9,1001) IREC,NDATE,NTIME,U,V,ZN
 1001 FORMAT(1X,I6,2X,A10,2X,A4,8F10.3)
C           WRITE THE DATE,TIME,U,V,TEMPERATURE,PRESSURE,CONDUCTIVITY,
C           RECORD NUMBER,AND SALINITY ON TAPE2, THE CLEAN TAPE.
      WRITE(2) NDATE,NTIME,U,V,ZN(3),ZN(5),ZN(4),IREC,ZN(6)
C           GENERATE THE DATA SUMMARY PRINTOUT ON OUTPUT.
      CALL SUMIT(ZN(3),ZN(6),U,V,ZN(5),JDHR,NREC,IMAX,NDATE)
      GO TO (1040,104) IFLAG
  500 END FILE 2
      END
```

```
      SUBROUTINE GETDATE(IDAY,IMONTH,IYEAR,ITIME,IIN,DELMIN,NOUT,NDATE,
     +      NTIME,JDHR)
      DIMENSION MON(12),NDAY(12)
      DATA MON /3HJAN,3HFEB,3HMAR,3HAPR,3HMAY,3HJUN,3HJUL,3HAUG,
     1 3HSEP,3HOCT,3HNOV,3HDEC/
      DATA NDAY /31,28,31,30,31,30,31,31,30,31,30,31/
C     ADJUST FOR LEAP YEARS
      IF(MOD(1900+IYEAR,4).EQ.0) NDAY(2) = 29
C       CALC. INTERVAL IN MIN.,HRS., DAYS, AND MOS.
      NMMTOT = (NOUT-IIN)*DELMIN
      NHRTOT = NMMTOT/60
      NDYTOT = NHRTOT/24
      NMMLT = NMMTOT-NHRTOT*60
      NHRLT = NHRTOT-NDYTOT*24
C     CALC. TIME OF DESIRED DATA PT.
      NH1 = ITIME/100
      NM2 = ITIME - NH1*100
      NM3 = NM2 + NMMLT
      IF(NM3.LT.60) GO TO 910
      NM3 = NM3-60
      NH1 = NH1 + 1
  910 NH2 = NH1 + NHRLT
      IF(NH2.LT.24) GO TO 920
      NH2 = NH2-24
      NDYTOT = NDYTOT +1
  920 NTIME1 = NH2*100 + NM3
C    CALC. DATE OF DESIRED DATA PT.
      IY1 = IYEAR
      NMON1 = IMONTH
      ND1 = IDAY + NDYTOT
  960 IF(ND1.GT.NDAY(NMON1)) 930,940
  930 ND1 = ND1-NDAY(NMON1)
      NMON1 = NMON1 + 1
      IF(NMON1.GT.12) 950,960
  950 IY1 = IY1 + 1
      NDAY(2) = 28
      IF(MOD(1900+IY1,4).EQ.0) NDAY(2) = 29
      NMON1 = 1
      IF(IY1.GE.100) IY1 = 0
      GO TO 960
  940 NTIME1 = NTIME1 + 10000
      ENCODE(5,102,NTIME2) NTIME1
  102 FORMAT(I5)
      DECODE(5,103,NTIME2) DUM,NTIME
  103 FORMAT(A1,A4)
      ENCODE(10,110,NDATE) ND1,MON(NMON1),IY1
  110 FORMAT(1X,I2,1X,A3,1X,I2)
C          COMPUTE JULIAN DATE
      JDATE=0
      IF (NMON1 .EQ. 1) GO TO 500
      INDEX=NMON1-1
      DO 500 I=1,INDEX
      JDATE=JDATE+NDAY(I)
  500 CONTINUE
      JDATE=JDATE+ND1
      JDHR=JDATE*100+NH2
      RETURN
      END
```

```
      SUBROUTINE SUMIT(TEMP,SALIN,U,V,DPTH,JDHR,NREC,IMAX,NDATE)
      DIMENSION ISTORE(2,25),STORE(4,25),VALUE(7),HRTOTS(7),DYTOTS(7),
     C      WKTOTS(7),TOTALS(4)
      DATA ICNT/0/
      VALUE(1)=TEMP
      VALUE(2)=SALIN
      VALUE(3)=SIGMAT(TEMP,SALIN)
      VALUE(4)=U
      VALUE(5)=V
      VALUE(6)=SQRT(U*U+V*V)
      VALUE(7)=DPTH
      IF (ICNT .GT. 0) GO TO 50
C
C           INITIALIZE THE ARRAYS
C
      ICNT=1
      JDSAV=JDHR
      NDSAV=NDATE
      IHR=IVAL=IDAY=0
      DO 10 I=1,7
           HRTOTS(I)=VALUE(I)
           DYTOTS(I)=0.0
           WKTOTS(I)=0.0
   10 CONTINUE
      DO 20 I=1,4
      DO 20 J=1,25
           STORE(I,J)=0.0
           IF (I .LE. 2) ISTORE(I,J)=0
   20 CONTINUE
      WRITE(6,2030)
      GO TO 999
C
C           ADD UP THE DATA VALUES
C
   50 IF (JDHR .NE. JDSAV) GO TO 150
      ICNT=ICNT+1
      DO 100 I=1,7
  100 HRTOTS(I)=HRTOTS(I)+VALUE(I)
      IF (NREC .NE. IMAX) GO TO 999
C
C           COMPUTE AND STORE HOURLY AVERAGES
C
  150 IHOUR=MOD(JDSAV,100)+1
      DO 200 I=1,3
  200 STORE(I,IHOUR)=HRTOTS(I)/ICNT
      UAVG=HRTOTS(4)/ICNT
      VAVG=HRTOTS(5)/ICNT
      STORE(4,IHOUR)=SQRT(UAVG*UAVG+VAVG*VAVG)
      ISTORE(1,IHOUR)=JDSAV
      ISTORE(2,IHOUR)=IDEGS(HRTOTS(4),HRTOTS(5))
      DO 250 I=1,7
           DYTOTS(I)=DYTOTS(I)+HRTOTS(I)
           HRTOTS(I)=VALUE(I)
  250 CONTINUE
      IHR=IHR+ICNT
```

```
      ICNT=1
      JDSAV=JDHR
      IF (IHOUR .LT. 24  .AND.  NREC .NE. IMAX) GO TO 999
C
C           COMPUTE DAILY AVERAGES AND WRITE SUMMARY
C
      IDAY=IDAY+1
      DO 300 I=1,3
  300 STORE(I,25)=DYTOTS(I)/IHR
      UAVG=DYTOTS(4)/IHR
      VAVG=DYTOTS(5)/IHR
      STORE(4,25)=SQRT(UAVG*UAVG+VAVG*VAVG)
      ISTORE(1,25)=NDSAV
      ISTORE(2,25)=IDEGS(DYTOTS(4),DYTOTS(5))
      SPDAVG=DYTOTS(6)/IHR
      DPAVG=DYTOTS(7)/IHR
      DO 350 I=1,7
           WKTOTS(I)=WKTOTS(I)+DYTOTS(I)
           DYTOTS(I)=0.0
  350 CONTINUE
      IF (NREC .NE. IMAX) GO TO 450
      INDEX1=IHOUR+1
      DO 400 I=1,4
      DO 400 J=INDEX1,24
           STORE(I,J)=C.0
           IF (I .LE. 2) ISTORE(I,J)=0
  400 CONTINUE
  450 DO 500 I=1,6
           INDEX1=I*4-3
           INDEX2=I*4
           WRITE(6,2000) (ISTORE(1,K),(STORE(J,K),J=1,4),ISTORE(2,K),
     C      K=INDEX1,INDEX2)
 2000 FORMAT(4(3X,I5,2F5.1,F6.2,F5.1,1X,I3))
  500 CONTINUE
      WRITE(6,2010) ISTORE(1,25),(STORE(J,25),J=1,4),ISTORE(2,25),
     C      SPDAVG,DPAVG
 2010 FORMAT(*    FOR *,A10,*  TEMP=*,F5.2,*  SALINITY=*,
     C      F5.2,*  SIGMAT=*,F5.2,*  NET SPEED=*,F5.2,* AT *,I3,
     C      *  MEAN SPEED=*,F5.2,*  DEPTH=*,F6.2/)
      IVAL=IVAL+IHR
      NDSAV=NDATE
      IHR=0
      IF (IDAY .LT. 7  .AND.  NREC .NE. IMAX) GO TO 999
C
C           COMPUTE AND WRITE 7 DAY MEANS
C
      DO 550 I=1,3
  550 TOTALS(I)=WKTOTS(I)/IVAL
      UAVG=WKTOTS(4)/IVAL
      VAVG=WKTOTS(5)/IVAL
      TOTALS(4)=SQRT(UAVG*UAVG+VAVG*VAVG)
      IDIR=IDEGS(WKTOTS(4),WKTOTS(5))
      SPDAVG=WKTOTS(6)/IVAL
      DPAVG=WKTOTS(7)/IVAL
      WRITE(6,2020) IDAY,(TOTALS(I),I=1,4),IDIR,SPDAVG,DPAVG
 2020 FORMAT(*0  FOR *,I2,* DAYS    TEMP=*,F6.2,*  SALINITY=*,
```

```
      C       F5.2,*  SIGMAT=*,F5.2,*  NET SPEED=*,F5.2,* AT *,I3,
      C       *  MEAN SPEED=*,F5.2,*  DEPTH=*,F6.2)
       IF (NREC .EQ. IMAX) GO TO 999
C
C             WRITE PAGE HEADING AND SET UP FOR NEXT 7 DAYS
C
      WRITE(6,2030)
 2030 FORMAT(*1 *,4(* DAYHR TEMP SALI SIGMA SPED DIR  *))
      IDAY=IVAL=0
      DO 600 I=1,7
  600 WRITS(I)=0.0
  999 RETURN
      END


       FUNCTION SIGMAT(TEMP,S)
C
C   SUBROUTINE TO COMPUTE SIGMA-T
C
      CL = (S-0.030)/1.805
      SUMT = - ((TEMP-3.98)**2 / 503.570)* ((TEMP+283.0)/(TEMP+67.26))
      AT = TEMP * (4.7867-0.098185*TEMP + 0.0010843*TEMP**2) * 0.001
      BT = TEMP * (18.030-0.8164*TEMP + 0.01667*TEMP**2) * 1.0E-06
      SIG0 = -0.069 + 1.4708*CL - 0.001570*CL**2 + 0.0000398*CL**3
      SIGMAT = SUMT + (SIG0 + 0.1324)*(1.0-AT+BT*(SIG0-0.1324))
      RETURN
      END


      FUNCTION IDEGS(U,V)
      PI=3.1415926
      RADS=ATAN2(V,U)
      IF (RADS .GT. PI/2) RADS=5.*PI/2.-RADS
      IF (RADS .LE. 0.0) RADS=ABS(RADS)+PI/2.
      IF (RADS .LE. PI/2.) RADS=PI/2.-RADS
      IDEGS=INT((RADS*180./PI)+.5)
      RETURN
      END
```

```
      PROGRAM LEWDP(INPUT,OUTPUT,TAPE1,TAPE2,TAPE3,TAPE4,
     *       TAPE5=INPUT,TAPE6=OUTPUT,TAPE99)
C
C           TAPE1 = 2 HR FILTERED U, V DATA
C           TAPE2 = 40 HR FILTERED U, V DATA
C           TAPE3 = CLEAN TEMP,SALINITY,AND PRESSURE DATA
C           TAPE4 = PVD AND SPECTRAL INFORMATION FROM FILTER
C           TAPE99 = CAL COMP PLOT TAPE
C
      DIMENSION ITIMES(3,4),DELT(3),SPECTRA(52)
      COMMON U(240),V(240),W(240),USCALE,VSCALE
      LOGICAL END1,END2,END3,END4,TIME1,TPLT,SPLT,PPLT
      DATA END1,END2,END3,END4/.FALSE.,.FALSE.,.FALSE.,.FALSE./
      DATA TIME1/.TRUE./
      CALL PLOTS
      CALL PLOT(0.0,1.0,-3)
C
C           READ TAPE HEADING INFORMATION AND
C           WRITE IT ON OUTPUT AND TAPE99
C
      READ (1) DUMY
      IF (EOF(1)) 920,20
   20 READ (2) DUMY
      IF (EOF(2)) 940,22
   22 READ(3) PROJ,MOOR,MET,METDP,YLAT,XLONG,BOTDP
      IF (EOF(3)) 930,24
   24 READ(1) (ITIMES(1,I),I=1,4),DELT(1),DELAY1,CUTOFF1
      READ(2) (ITIMES(2,I),I=1,4),DELT(2),DELAY2,CUTOFF2
      READ(3) (ITIMES(3,I),I=1,4),DELT(3)
      WRITE(6,1000) PROJ,MOOR,YLAT,XLONG,BOTDP,MET,METDP
 1000 FORMAT(*1*,5X,*PROJECT:*,A10,5X,*MOORING:*,A10,//6X,*LATIT
     +       A10,5X,*LONGITUDE:*,A10,5X,*BOTTOM DEPTH:*,F6.2,
     +       //6X,*METER:*,A5,5X,*DEPTH:*,A5)
      WRITE(6,1005)
 1005 FORMAT(/////5X,*START:*,5X,*TIME*,8X,*DAY*,5X,*MONTH*,5X,*
     +5X,*DELT*,5X,*DELAY*,5X,*CUTOFF*)
      DO 25 I=1,3
      WRITE(6,1010) I,(ITIMES(I,J),J=1,4),DELT(I)
 1010 FORMAT(*0*,5X,*TAPE*,I1,4(5X,I5),4X,F6.2)
      IF (I .EQ. 1) WRITE(6,1020) DELAY1,CUTOFF1
      IF (I .EQ. 2) WRITE(6,1020) DELAY2,CUTOFF2
 1020 FORMAT(*+*,59X,2(5X,F5.2))
   25 CONTINUE
      ENCODE(18,1030,HEADER) MOOR
 1030 FORMAT(*STATION:*,A10)
      CALL SYMBOL(2.0,8.0,.21,HEADER,0.0,18)
      ENCODE(18,1040,HEADER) PROJ
 1040 FORMAT(*PROJECT:*,A10)
      CALL SYMBOL(2.0,7.5,.21,HEADER,0.0,18)
      ENCODE(19,1050,HEADER) YLAT
 1050 FORMAT(*LATITUDE:*,A10)
      CALL SYMBOL(2.0,7.0,.21,HEADER,0.0,19)
      ENCODE(20,1060,HEADER) XLONG
 1060 FORMAT(*LONGITUDE:*,A10)
      CALL SYMBOL(2.0,6.5,.21,HEADER,0.0,20)
      ENCODE(19,1070,HEADER) BOTDP
 1070 FORMAT(*DEPTH:*,F6.2,* METERS*)
```

```
      CALL SYMBOL(2.0,6.0,.21,HEADER,0.0,19)
      ENCODE(11,1080,HEADER) MET
 1080 FORMAT(*METER:*,A5)
      CALL SYMBOL(2.0,5.0,.21,HEADER,0.0,11)
      ENCODE(18,1090,HEADER) METDP
 1090 FORMAT(*DEPTH:*,A5,* METERS*)
      CALL SYMBOL(2.0,4.5,.21,HEADER,0.0,18)
C
C          READ PVD LABELING AND CONTROL INFORMATION
C          FROM TAPE4 AND INPUT.
C
      READ(5,2000) TLOW,SLOW,RANGE,TPLT,SPLT,PPLT
 2000 FORMAT(3F5.0,3L1)
      IF (EOF(5)) 910,30
   30 READ (4) UMIN,VMIN,RANGE2,UVAR,VVAR,PMEAN
      IF (EOF(4)) 950,34
   32 READ (5,2010) UMIN,VMIN,RANGE2,UVAR,VVAR,PMEAN
 2010 FORMAT(6F5.2)
      IF (EOF(5)) 960,34
   34 IF (RANGE .LT. RANGE2) RANGE=RANGE2
C
C          WRITE MEAN PRESSURE, U, AND V VARIANCES ON TAPE99
C
      ENCODE(27,8020,PRESS) PMEAN
 8020 FORMAT(*MEAN PRESSURE:*,F6.2,* METERS*)
      CALL SYMBOL(2.0,4.0,.21,PRESS,0.0,27)
      ENCODE (17,8030,VAR) UVAR
 8030 FORMAT(*U-VARIANCE:*,F6.1)
      CALL SYMBOL(2.0,2.0,.21,VAR,0.0,17)
      ENCODE (17,8040,VAR) VVAR
 8040 FORMAT(*V-VARIANCE:*,F6.1)
      CALL SYMBOL(2.0,1.5,.21,VAR,0.0,17)
      IF (END4) GO TO 50
C
C          READ SPECTRA INFORMATION AND PLOT IT
C
      READ (4) (SPECTRA(I),I=1,52)
      CALL SPECPLT(SPECTRA,YLAT)
C
C          MAKE PVD PLOT AND LABEL VERTICAL AXIS
C
   50 CALL PVDPLT(DELT(1),RANGE,UMIN,VMIN)
   60 CALL LABEL(9.0,9.75,TLOW,SLOW)
C
C          RESET ORGIN THEN DRAW AXIS.
C
      STHR=INT(ITIMES(3,1)/100.)
      STMIN=MOD(ITIMES(3,1),100)/60.
      STPOS=(STHR+STMIN)/24.
      WRITE(6,9099) STHR,STMIN,STPOS
 9099 FORMAT(5X,*STHR=*,F5.2,* STMIN=*,F5.3,* STPOS=*,F6.3)
   80 CALL PLOT(10.0,0.0,-3)
      CALL DRAWAX(ITIMES)
C
C          READ FROM TAPE1 THE U AND V ARRAYS
C          THEN PLOT THEM
C
```

```
      IF (END1) GO TO 105
      DO 90 I=1,240
      READ (1) U(I),V(I)
      IF (EOF(1)) 95,90
   90 CONTINUE
      GO TO 100
   95 END1=.TRUE.
      IF (I .EQ. 1) GO TO 105
  100 NPTS=I-1
      WRITE (6,9004) NPTS
 9004 FORMAT (* RED U AND V ARRAYS, NPTS=*,I5)
      USCALE=0.0125
      VSCALE=0.0125
      X0=STPOS+(DELAY1-1.)/24.
      X1=X0+1./24.
      IF (.NOT. TIME1) GO TO 102
      USAV=U(1)
      VSAV=V(1)
      X0=X1
  102 CALL PLOTEM(NPTS,6.875,5.625,USAV,VSAV,0.0,X0,X1,TPLT,SPLT
      USAV=U(NPTS)
      VSAV=V(NPTS)
C
C           READ CURRENT STICK DATA FROM TAPE2 AND PLOT IT
C
  105 IF (END2) GO TO 125
      DO 110 I=1,40
      READ (2) U(I),V(I)
      IF (EOF(2)) 115,110
  110 CONTINUE
      GO TO 120
  115 END2=.TRUE.
      IF (I .EQ. 1) GO TO 125
  120 NPTS=I-1
      WRITE (6,9006) NPTS
 9006 FORMAT (* RED STICK DATA, NPTS=*,I5)
      USCALE=0.025
      VSCALE=0.025
      X0=STPOS+DELAY2/24.
      Y0=4.375
      CALL STKPLT(NPTS,X0,Y0,DELT(2))
C
C           READ TEMPERATURE, CONDUCTIVITY, AND PRESSURE
C           FROM TAPE3 STORING ONLY HOURLY VALUES THEN PLOT THEM.
C
  125 IF (END3) GO TO 200
      NSKIP=60/INT(DELT(3))
      READ(3) NDATE,NTIME,UU,VV,TEMP,PRESS,COND,IREC,SALIN
      IF (EOF(3)) 145,130
  130 DO 140 I=1,240
      U(I)=TEMP-TLOW
      V(I)=SALIN-SLOW
      W(I)=PRESS-PMEAN
      DO 140 J=1,NSKIP
      READ(3) NDATE,NTIME,UU,VV,TEMP,PRESS,COND,IREC,SALIN
      IF (EOF(3)) 145,140
  140 CONTINUE
```

```
      GO TO 150
  145 END3=.TRUE.
      IF (I .EQ. 1) GO TO 200
  150 NPTS=I-1
      WRITE(6,9008) NPTS,NSKIP
 9008 FORMAT(* RED TEMP AND COND, NPTS=*,I5,5X,*NSKIP=*,I3)
      USCALE=0.125
      VSCALE=0.125
      XO=STPOS-1./24.
      X1=STPOS
      IF (.NOT. TIME1) GO TO 155
      TSAV=U(1)
      SSAV=V(1)
      PSAV=W(1)
      XO=X1
  155 CALL PLOTEM(NPTS,2.75,1.5,TSAV,SSAV,PSAV,XO,X1,TPLT,SPLT,P
      TSAV=U(NPTS)
      SSAV=V(NPTS)
      PSAV=W(NPTS)
  200 IF (END1 .AND. END2 .AND. END3) GO TO 800
      IF (TIME1) TIME1=.FALSE.
      GO TO 80
C
C          AFTER ALL DATA HAS BEEN PLOTTTED
C          DRAW FINAL YAXIS, LABEL IT, AND STOP
C
  800 Y=1.5
      DO 820 I=1,6
      DO 810 J=1,7
      CALL PLOT(9.9375,Y,3)
      CALL PLOT(10.0625,Y,2)
      Y=Y+0.125
  810 CONTINUE
      Y=Y+0.375
  820 CONTINUE
      X=10.0
      CALL PLOT(X,9.125,3)
      CALL PLOT(X,8.875,2)
      Y=8.5
      DO 830 I=1,6
      CALL PLOT(X,Y,3)
      Y=Y-.75
      CALL PLOT(X,Y,2)
      Y=Y-.5
  830 CONTINUE
      CALL PLOT(X,0.875,3)
      CALL PLOT(X,0.625,2)
      DAY=FLOAT(ITIMES(3,2))
      CALL NUMBER(10.0,0.375,.14,DAY,0.0,-1)
      CALL LABEL(10.5,10.1,TLOW,SLOW)
      GO TO 999
  910 WRITE (6,9010)
 9010 FORMAT (*0*,5X,*INPUT DATA CARD MISSING. TRY AGAIN.*)
       GO TO 990
  920 WRITE (6,9020)
 9020 FORMAT (*0*,5X,*TAPE1 IS INCOMPLETE. TRY AGAIN.*)
      GO TO 990
```

```
 930 WRITE (6,9030)
9030 FORMAT (*0*,5X,*TAPE3 IS INCOMPLETE. TRY AGAIN.*)
     GO TO 990
 940 WRITE (6,9040)
9040 FORMAT(*0*,5X,*TAPE2 IS INCOMPLETE. TRY AGAIN.*)
     GO TO 990
 950 WRITE(6,9050)
9050 FORMAT(*0*,5X,*NO SPECTRA PLOT. MISSING TAPE4.*)
     END4=.TRUE.
     GO TO 32
 960 WRITE(6,9060)
9060 FORMAT(*0*,5X,*NO PVD PLOT. MISSING PVD INFORMATION.*)
      PMEAN=0.0
      PPLT=.FALSE.
     GO TO 60
 990 DUMP=0.0
     CALL PLOT(0.0,0.0,999)
     DUMP=1/DUMP
 999 CALL PLOT(20.0,-1.0,-3)
     CALL PLOT(0.0,0.0,999)
     STOP
     END
```

```
      SUBROUTINE DRAWAX(ITIMES)
      DIMENSION NDAY(12),MONTH(12),ITIMES(3,4)
      DATA NDAY/31,28,31,30,31,30,31,31,30,31,30,31/
      DATA MONTH/3HJAN,3HFEB,3HMAR,3HAPR,3HMAY,3HJUN,3HJUL,
     $           3HAUG,3HSEP,3HOCT,3HNOV,3HDEC/
      IF(ITIMES(3,4) .GT. 1900) ITIMES(3,4)=ITIMES(3,4)-1900
      IF(MOD(ITIMES(3,4)+1900,4) .EQ. 0) NDAY(2)=29
C
C           DRAW THE BOTTOM TIME LINE
C
      CALL PLOT(0.0,.75,3)
      X=10.0
      CALL PLOT(X,.75,2)
      DO 20 I=1,10
      DO 10 J=1,3
      X=X-0.25
      CALL PLOT(X,.8125,3)
      CALL PLOT(X,.6875,2)
   10 CONTINUE
      X=X-0.25
      CALL PLOT(X,0.875,3)
      CALL PLOT(X,0.625,2)
   20 CONTINUE
C
C           LABEL LOWER TIME AXIS
C
  200 DAY=FLOAT(ITIMES(3,2))
      MON=ITIMES(3,3)
      YEAR=FLOAT(ITIMES(3,4))
      CALL NUMBER(0.0,0.375,.14,DAY,0.0,-1)
      CALL SYMBOL(0.0,0.125,.14,MONTH(MON),0.0,3)
      CALL NUMBER(0.0,-.125,.14,YEAR,0.0,-1)
      DO 300 I=1,10
      X=FLOAT(I)
      DAY=DAY+1.0
      IF (DAY .LE. NDAY(MON)) GO TO 280
      DAY=1.0
      MON=MON+1
      IF (MON .LE. 12) GO TO 260
      MON=1
      YEAR=YEAR+1.0
      IYR=INT(YEAR)
      IF(MOD(IYR+1900,4) .EQ. 0) NDAY(2)=29
  260 IF (I .EQ. 10) GO TO 300
      CALL NUMBER(X,-.125,.14,YEAR,0.0,-1)
      CALL SYMBOL(X,0.125,.14,MONTH(MON),0.0,3)
  280 IF (I .EQ. 10) GO TO 300
      CALL NUMBER(X,0.375,.14,DAY,0.0,-1)
  300 CONTINUE
      ITIMES(3,2)=INT(DAY)
      ITIMES(3,3)=MON
      ITIMES(3,4)=INT(YEAR)
C
C           DRAW CONDUCTIVITY AXIS
C
      CALL PLOT(0.0,2.25,3)
      CALL PLOT(0.0,1.5,2)
```

```
      CALL PLOT(10.0,1.5,1)
C
C          DRAW TEMPERATURE AXIS AND SCALE
C
      CALL PLOT(10.0,2.75,3)
      CALL PLOT(0.0,2.75,2)
      CALL PLOT(0.0,3.5,1)
C
C          DRAW CURRENT AXIS
C
      CALL PLOT(0.0,4.0,3)
      CALL PLOT(0.0,4.75,2)
      CALL PLOT(0.0,4.375,3)
      CALL PLOT(10.0,4.375,2)
C
C          DRAW V THEN U AXIS
C
      CALL PLOT(10.0,5.625,3)
      CALL PLOT(0.0,5.625,2)
      CALL PLOT(0.0,5.25,3)
      CALL PLOT(0.0,6.0,2)
      CALL PLOT(0.0,6.5,3)
      CALL PLOT(0.0,7.25,2)
      CALL PLOT(0.0,6.875,3)
      CALL PLOT(10.0,6.875,2)
C
C          DRAW WIND AXIS
C
      CALL PLOT(10.0,8.125,3)
      CALL PLOT(0.0,8.125,2)
      CALL PLOT(0.0,7.75,3)
      CALL PLOT(0.0,8.5,2)
C
C          DRAW TOP TIME LINE
C
      X=10.0
      CALL PLOT(0.0,9.0,3)
      CALL PLOT(X,9.0,2)
      DO 50 I=1,10
      DO 40 J=1,3
      X=X-0.25
      CALL PLOT(X,9.0625,3)
      CALL PLOT(X,8.9375,2)
   40 CONTINUE
      X=X-0.25
      CALL PLOT(X,9.125,3)
      CALL PLOT(X,8.875,2)
   50 CONTINUE
C
C          PUT TICK MARKS ON VERTICAL AXIS
C
      Y=1.5
      DO 70 I=1,6
      DO 60 J=1,7
      CALL PLOT(-0.0625,Y,3)
      CALL PLOT(0.0625,Y,2)
      Y=Y+0.125
   60 CONTINUE
      Y=Y+0.375
   70 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE LABEL(XSYM,XNUMB,TLOW,SLOW)
C
C          WRITE LABELS FOR VERTICAL AXIS
C
      X1=XSYM
      X2=XSYM+.25
      X3=XSYM+.363
      ENCODE(31,2001,LAB)
 2001 FORMAT(*SALINITY        TEMP        CURRENT*)
      CALL SYMBOL(X1,1.45,.126,LAB,90.0,31)
      CALL SYMBOL(X2,4.125,.5,19,0.0,-1)
      CALL SYMBOL(X3,4.655,.126,1HN,0.0,1)
      ENCODE(33,2002,LAB)
 2002 FORMAT(*SOUTH-NORTH  WEST-EAST    PRESSURE*)
      CALL SYMBOL(X1,5.10,.126,LAB,90.0,33)
      DO 100 I=1,6
      GO TO (10,20,30,40,50,60) I
   10 Y=8.5
      FPNA=3.0
      FPNB=1.0
      IDEC=-1
      GO TO 70
   20 Y=7.25
      FPNA=30.0
      FPNB=10.0
      GO TO 70
   30 Y=6.0
      GO TO 70
   40 Y=4.75
      FPNA=15.0
      FPNB=5.0
      GO TO 70
   50 Y=3.5
      FPNA=TLOW+6.0
      FPNB=1.0
      GO TO 70
   60 Y=2.25
      FPNA=SLOW+6.0
      FPNB=1.0
   70 DO 100 J=1,7
      XNUM=FPNA-FPNB*(J-1)
      IF (I .LT. 5 .AND. J .GT. 4) XNUM=-XNUM
      CALL NUMBER(XNUMB,Y,.07,XNUM,0.0,IDEC)
      Y=Y-0.125
  100 CONTINUE
      WRITE (6,9003)
 9003 FORMAT (* WROTE LABELS*)
      RETURN
      END
```

```
      SUBROUTINE SPECPLT(SPECTRA,YLAT)
      DIMENSION SPECTRA(52),DOTS(3)
      PI=3.1415926
      CALL PLOT(9.0,0.0,-3)
      ENCODE(12,1010,LABEL)
 1010 FORMAT(12HLOG (CM/SEC))
      CALL SYMBOL(0.5,4.5,0.14,LABEL,90.0,12)
      CALL NUMBER(0.4,5.925,.084,2.0,90.0,-1)
      ENCODE(10,1020,LABEL)
 1020 FORMAT(*CYCLES/DAY*)
      CALL SYMBOL(4.5,1.0,0.14,LABEL,0.0,10)
C
C           DRAW AND LABEL BOX
C
      CALL RECT(1.0,1.5,7.0,8.0,0.0,3)
      Y=1.437
      YNUM=-3
      DO 10 I=1,8
      CALL NUMBER(.675,Y,.112,YNUM,0.0,-1)
      Y=Y+.063
      CALL PLOT(.9,Y,3)
      CALL PLOT(1.1,Y,2)
      IF (I .EQ. 8) GO TO 10
      Y=Y+.5
      CALL PLOT(.95,Y,3)
      CALL PLOT(1.05,Y,2)
      Y=Y+.437
      YNUM=YNUM+1
   10 CONTINUE
      X=0.0
      DO 20 I=1,9
      X=X+1.0
      CALL PLOT(X,8.6,3)
      CALL PLOT(X,8.4,2)
      IF (I .EQ. 9) GO TO 25
      DO 20 J=1,5
      X2=X+J/6.
      CALL PLOT(X2,8.55,3)
      CALL PLOT(X2,8.45,2)
   20 CONTINUE
   25 Y=9.0
      DO 30 I=1,8
      Y=Y-.5
      CALL PLOT(8.9,Y,3)
      CALL PLOT(9.1,Y,2)
      IF (I .EQ. 8) GO TO 30
      Y=Y-.5
      CALL PLOT(8.95,Y,3)
      CALL PLOT(9.05,Y,2)
   30 CONTINUE
      XNUM=4.8
      DX=1.2
      X=10.0
      DO 40 I=1,9
      X=X-1.0
      CALL PLOT(X,1.6,3)
      CALL PLOT(X,1.4,2)
```

```
      IF (I .EQ.9) GO TO 50
      CALL NUMBER(X-.15,1.25,.112,XNUM,0.0,1)
      IF (I .EQ. 3) DX=.4
      XNUM=XNUM-DX
      DO 40 J=1,5
      X2=X-J/6.0
      CALL PLOT(X2,1.55,3)
      CALL PLOT(X2,1.45,2)
   40 CONTINUE
   50 CALL NUMBER(.85,1.25,.112,0.0,0.0,1)
C
C           PLOT THE SPECTRA
C
      X0=1.0+1.0/12.0
      Y=SPECTRA(1)+4.5
      CALL PLOT(X0,Y,3)
      CALL PLOT(X0,Y,2)
      DO 100 I=1,47
      X=X0+I/6.0
      Y=SPECTRA(I)+4.5
      CALL PLOT(X,Y,1)
      Y=SPECTRA(I+1)+4.5
      CALL PLOT(X,Y,1)
  100 CONTINUE
      CALL PLOT(9.0,Y,1)
C
C           DRAW DIURNAL, SEMIDIURNAL, AND INERTIAL LINES
C
      X=1.0+15.0/6.0
      CALL PLOT(X,1.5,3)
      CALL DASHPT(X,8.5,.2)
      X=X-.05
      CALL SYMBOL(X,8.65,.112,31,0.0,-1)
      X=1.0+29.0/6.0
      CALL PLOT(X,8.5,3)
      CALL DASHPT(X,1.5,.2)
      X=X-.05
      CALL SYMBOL(X,8.65,.112,46,0.0,-1)
      DECODE(10,1030,YLAT) DEGS,YMINS
 1030 FORMAT(F2.0,1X,F5.2)
      YMINS=YMINS/60.0
      DEGS=DEGS+YMINS
      INERT=INT(30.*SIN(DEGS*PI/180.)+.5)
      WRITE(6,8000) INERT
 8000 FORMAT(5X,*INERTIAL FREQ=*,I5)
      IF (INERT .LT. 0  .OR.  INERT .GT. 48) GO TO 900
      X=1.0+INERT/6.0
      CALL PLOT(X,1.5,3)
      CALL DASHPT(X,8.5,.2)
      X=X-.05
      CALL SYMBOL(X,8.65,.112,36,0.0,-1)
C
C           DRAW IN CONFIDENCE INTERVALS AND THE 2.4 LINE
C
      X=1.5
      DO 150 I=1,4,2
      Y1=7.5+SPECTRA(48+I)
```

```
      Y2=7.5+SPECTRA(49+I)
      CALL PLOT(X-.05,Y1,3)
      CALL PLOT(X+.05,Y1,2)
      CALL PLOT(X,Y1,3)
      CALL PLOT(X,7.5,2)
      CALL SYMBOL(X-.02,7.48,.07,74,0.0,-1)
      CALL PLOT(X,7.5,3)
      CALL PLOT(X,Y2,2)
      CALL PLOT(X-.05,Y2,3)
      CALL PLOT(X+.05,Y2,2)
      Y=Y2+.05
      CALL NUMBER(X-.100,Y,.084,80.0,0.0,-1)
      CALL SYMBOL(X+.075,Y,.084,22,0.0,-1)
      X=8.5
  150 CONTINUE
      ENCODE(30,8020,DOTS)
 8020 FORMAT(3(10H..........))
      CALL SYMBOL(7.05,1.43,.28,DOTS,90.0,30)
      GO TO 999
  900 WRITE(6,9000)
 9000 FORMAT(5X,*INTERIAL FREQUENCY OUT OF BOY.*)
  999 RETURN
      END
```

```
      SUBROUTINE PVDPLT(DELMIN,RANGE,UMIN,VMIN)
      DIMENSION DRIF(3)
      PI=3.1415926
      STOT=0.0
      ICNT=0
C
C          CALCULATE PVD SCALE AND INCREMENTS
C
      CALL PLOT(12.0,0.0,-3)
      ITEMP=INT(RANGE/7.0)
      DO 10 I=1,10
      ITEMP=ITEMP+1
      ITEST=MOD(ITEMP,10)
      IF (ITEST .EQ. 0) GO TO 40
   10 CONTINUE
   40 DX=FLOAT(ITEMP)
      UVSCALE=1./DX
C
C          DRAW BOX AND LABEL IT
C
      CALL AXIS(0.0,1.5,10HKILOMETERS,-10,7.0,0.0,0.0,DX)
      CALL AXIS(0.0,1.5,10HKILOMETERS,10,7.0,90.0,0.0,DX)
      CALL PLOT(0.0,8.5,3)
      CALL PLOT(7.0,8.5,2)
      CALL PLOT(7.0,1.5,1)
C
C          SET PEN TO START POSITION THEN PLOT.
C
      X=(ABS(UMIN)+2.)*UVSCALE
      Y=1.5+((ABS(VMIN)+2.0)*UVSCALE)
      CALL PLOT(X,Y,3)
      CALL SYMBOL(X,Y,.098,46,0.0,-1)
      XSTART=X
      YSTART=Y
  100 READ(1) U,V
      IF (EOF(1)) 150,110
  110 X=X+(U*DELMIN*0.0006)*UVSCALE
      Y=Y+(V*DELMIN*0.0006)*UVSCALE
      CALL PLOT(X,Y,1)
      STOT=STOT+SQRT(U*U+V*V)
      ICNT=ICNT+1
      GO TO 100
C
C          CALCULATE NET DRIFT AND RANGE IN DAYS
C
  150 CALL SYMBOL(X,Y,.098,33,0.0,-1)
      XSTOP=X
      YSTOP=Y
      XRANGE=XSTOP-XSTART
      YRANGE=YSTOP-YSTART
      RADS=ATAN2(YRANGE,XRANGE)
      IF (RADS .GT. PI/2) RADS=5*PI/2-RADS
      IF (RADS .LE. 0.0) RADS=ABS(RADS)+PI/2
      IF (RADS .LE. PI/2) RADS=PI/2-RADS
      IDEGS=INT(RADS*180./PI)
      RANGE=SQRT(XRANGE*XRANGE+YRANGE*YRANGE)
      CNT=FLOAT(ICNT)
```

```
      DAYS=CNT/24.0
      SECS=CNT*3600.
      CMS=RANGE*100000./UVSCALE
      DRIFT=CMS/SECS
      SMEAN=STOT/CNT
      ENCODE(26,8010,DAY) DAYS
 8010 FORMAT(*RECORD LENGTH:*,F7.2,* DAYS*)
      CALL SYMBOL(-19.0,3.5,.21,DAY,0.0,26)
      ENCODE(30,8020,DRIF) DRIFT,IDEGS
 8020 FORMAT(*NET DRIFT:*,F6.2,* CM/SEC, *,I3,* T*)
      CALL SYMBOL(-19.0,3.0,.21,DRIF,0.0,30)
      CALL SYMBOL(-13.95,3.19,.07,54,0.0,-1)
      ENCODE(24,8025,MEAN) SMEAN
 8025 FORMAT(*MEAN SPEED:*,F6.2,* CM/SEC*)
      CALL SYMBOL(-19.0,2.5,.21,MEAN,0.0,24)
C
C           REPOSITION TAPE1 AND RETURN.
C
      REWIND 1
      READ (1) DUMY
      READ (1) DUMY
      RETURN
      END
```

```
      SUBROUTINE PLOTEM(NPTS,YTOP,YBOT,U0,V0,W0,X0,X1,TPLT,SPLT,
      COMMON U(240),V(240),W(240),USCALE,VSCALE
      LOGICAL TPLT,SPLT,PPLT
C
C          PLOT THE U ARRAY FROM LEFT TO RIGHT
C
      IF (YTOP .LT. 3.0  .AND.  .NOT. TPLT) GO TO 60
      Y=YTOP+U0*USCALE
      CALL PLOT(X0,Y,3)
      Y=YTOP+U(1)*USCALE
      CALL PLOT(X1,Y,2)
      DO 10 I=2,NPTS
      X=X1+(I-1)/24.0
      Y=YTOP+U(I)*USCALE
      IF (Y .LT. 2.25) GO TO 20
      CALL PLOT(X,Y,2)
   10 CONTINUE
      GO TO 60
   20 X=X1+I/24.0
      Y=YTOP+U(I+1)*USCALE
      IF (Y .LT. 2.25) Y=2.75
       CALL PLOT(X,Y,3)
      GO TO 10
C
C          PLOT THE V ARRAY FROM RIGHT TO LEFT
C
   60 IF (YBOT .LT. 2.0 .AND. .NOT. SPLT) GO TO 100
      Y=YBOT+V(NPTS)*VSCALE
      CALL PLOT(X,Y,3)
      CALL PLOT(X,Y,2)
      DO 70 I=2,NPTS
      X=X1+(NPTS-I)/24.0
      IV=NPTS-(I-1)
      Y=YBOT+V(IV)*VSCALE
      IF (Y .LT. 1.25) GO TO 80
      CALL PLOT(X,Y,2)
   70 CONTINUE
      Y=YBOT+V0*VSCALE
      CALL PLOT(X0,Y,1)
      GO TO 100
   80 X=X1+(NPTS-I-1)/24.0
      Y=YBOT+V(IV-1)*VSCALE
      IF (Y .LT. 1.25) Y=1.5
       CALL PLOT(X,Y,3)
      GO TO 70
C
C          PLOT THE W ARRAY
C
  100 IF (YTOP .GT. 3.0  .OR.  .NOT. PPLT) GO TO 999
      Y=8.125+W0*0.125
      CALL PLOT(X0,Y,3)
      Y=8.125+W(1)*0.125
      CALL PLOT(X1,Y,2)
      DO 120 I=2,NPTS
      X=X1+(I-1)/24.0
      Y=8.125+W(I)*0.125
      IF (Y .GT. 6.75  .OR.  Y .LT.7.5) GO TO 140
```

```
      CALL PLOT(X,Y,2)
  120 CONTINUE
      GO TO 999
  140 X=X1+I/24.0
      Y=8.125+W(I+1)*6.125
      IF (Y .GT. 8.75  .OR.  Y .LT. 7.5) Y=8.125
      CALL PLOT(X,Y,3)
      GO TO 120
  999 RETURN
      END
```



```
      SUBROUTINE STKPLT(NPTS,XO,YO,DELT)
      COMMON U(240),V(240),W(240),USCALE,VSCALE
      XLEN=DELT/1440.
      DO 10 I=1,NPTS
      XO=XO+XLEN
      CALL PLOT(XO,YO,3)
      X1=XO+U(I)*USCALE
      Y1=YO+V(I)*VSCALE
      CALL PLOT(X1,Y1,2)
   10 CONTINUE
      RETURN
      END
```


USCOMM - ERL