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A PROCESSING SYSTEM FOR AANDERAA CURRENT METER DATA

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R. L. Charnell
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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
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
FILTER RESPONSE

"2.86 HOUR" FILTER

"35 HOUR" FILTER

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:

<table>
<thead>
<tr>
<th>Card</th>
<th>Name</th>
<th>Format</th>
<th>Columns</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>XMAG</td>
<td>F10.5</td>
<td>1-10</td>
<td>Magnetic declination in degrees</td>
</tr>
<tr>
<td></td>
<td>NDATA</td>
<td>15</td>
<td>11-15</td>
<td>Approximate number of Aanderaa records¹</td>
</tr>
<tr>
<td></td>
<td>DELTIME</td>
<td>F5.2</td>
<td>16-20</td>
<td>Sample time in minutes</td>
</tr>
<tr>
<td></td>
<td>NSKIP</td>
<td>15</td>
<td>21-25</td>
<td>Number of records to skip</td>
</tr>
<tr>
<td></td>
<td>NFSKIP</td>
<td>15</td>
<td>26-30</td>
<td>Number of files to skip²</td>
</tr>
<tr>
<td></td>
<td>NUMETR</td>
<td>L1</td>
<td>31</td>
<td>Type of speed sensor³</td>
</tr>
<tr>
<td>2</td>
<td>AO(1)</td>
<td>F10.5</td>
<td>1-10</td>
<td>Speed constant⁴</td>
</tr>
<tr>
<td></td>
<td>AO(2)</td>
<td>F10.5</td>
<td>11-20</td>
<td>Direction constant</td>
</tr>
<tr>
<td></td>
<td>AO(3)</td>
<td>F10.5</td>
<td>21-30</td>
<td>Temperature constant</td>
</tr>
<tr>
<td></td>
<td>AO(4)</td>
<td>F10.5</td>
<td>31-40</td>
<td>Conductivity constant</td>
</tr>
<tr>
<td></td>
<td>AO(5)</td>
<td>F10.5</td>
<td>41-50</td>
<td>Pressure constant</td>
</tr>
<tr>
<td>3</td>
<td>A1(1)</td>
<td>F10.5</td>
<td>1-10</td>
<td>Speed first degree coefficient</td>
</tr>
<tr>
<td></td>
<td>A1(2)</td>
<td>F10.5</td>
<td>11-20</td>
<td>Direction first degree coefficient</td>
</tr>
<tr>
<td></td>
<td>A1(3)</td>
<td>F10.5</td>
<td>21-30</td>
<td>Temperature first degree coefficient</td>
</tr>
<tr>
<td></td>
<td>A1(4)</td>
<td>F10.5</td>
<td>31-40</td>
<td>Conductivity first degree coefficient</td>
</tr>
<tr>
<td></td>
<td>A1(5)</td>
<td>F10.5</td>
<td>41-50</td>
<td>Pressure first degree coefficient</td>
</tr>
<tr>
<td>4</td>
<td>A2(1)</td>
<td>E14.7</td>
<td>1-14</td>
<td>Speed second degree coefficient</td>
</tr>
<tr>
<td></td>
<td>A2(2)</td>
<td>E14.7</td>
<td>15-28</td>
<td>Direction second degree coefficient</td>
</tr>
<tr>
<td></td>
<td>A2(3)</td>
<td>E14.7</td>
<td>29-42</td>
<td>Temperature second degree coefficient</td>
</tr>
<tr>
<td></td>
<td>A2(4)</td>
<td>E14.7</td>
<td>43-56</td>
<td>Conductivity second degree coefficient</td>
</tr>
<tr>
<td></td>
<td>A2(5)</td>
<td>E14.7</td>
<td>57-70</td>
<td>Pressure second degree coefficient</td>
</tr>
</tbody>
</table>
### Card Name Format Columns Comments

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

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:

<table>
<thead>
<tr>
<th>Card</th>
<th>Name</th>
<th>Format</th>
<th>Columns</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DELMIN</td>
<td>F6.2</td>
<td>1-6</td>
<td>Time between records in minutes</td>
</tr>
<tr>
<td></td>
<td>NSKIP</td>
<td>14</td>
<td>7-10</td>
<td>Number of records to skip down</td>
</tr>
<tr>
<td></td>
<td>NREF</td>
<td>I5</td>
<td>11-15</td>
<td>Reference record for the time mark</td>
</tr>
<tr>
<td></td>
<td>ITIME</td>
<td>I5</td>
<td>16-20</td>
<td>Hour and minute of reference record</td>
</tr>
<tr>
<td></td>
<td>IDAY</td>
<td>I5</td>
<td>21-25</td>
<td>Day of reference record</td>
</tr>
<tr>
<td></td>
<td>IMONTH</td>
<td>I5</td>
<td>26-30</td>
<td>Month of reference record</td>
</tr>
<tr>
<td></td>
<td>IYEAR</td>
<td>I5</td>
<td>31-35</td>
<td>Year of reference record</td>
</tr>
<tr>
<td></td>
<td>IMAX</td>
<td>I5</td>
<td>36-40</td>
<td>Number of last record to be processed</td>
</tr>
<tr>
<td></td>
<td>CHG</td>
<td>L1</td>
<td>41</td>
<td>Changes header information¹</td>
</tr>
<tr>
<td>2-N</td>
<td>ADD</td>
<td>L1</td>
<td>1</td>
<td>Add a record²</td>
</tr>
<tr>
<td></td>
<td>NREC1</td>
<td>I5</td>
<td>2-6</td>
<td>Number of the record to be modified³</td>
</tr>
<tr>
<td></td>
<td>TEMP(1)</td>
<td>F10.3</td>
<td>7-16</td>
<td>Speed</td>
</tr>
<tr>
<td></td>
<td>TEMP(2)</td>
<td>F10.3</td>
<td>17-26</td>
<td>Direction</td>
</tr>
<tr>
<td></td>
<td>TEMP(3)</td>
<td>F10.3</td>
<td>27-36</td>
<td>Temperature</td>
</tr>
<tr>
<td></td>
<td>TEMP(4)</td>
<td>F10.3</td>
<td>37-46</td>
<td>Conductivity</td>
</tr>
<tr>
<td></td>
<td>TEMP(5)</td>
<td>F10.3</td>
<td>47-56</td>
<td>Depth</td>
</tr>
<tr>
<td></td>
<td>TEMP(6)</td>
<td>F10.3</td>
<td>57-66</td>
<td>Salinity</td>
</tr>
</tbody>
</table>

¹This 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.

²If 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.

³To 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:

<table>
<thead>
<tr>
<th>Card</th>
<th>Name</th>
<th>Format</th>
<th>Columns</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TLOW</td>
<td>F5.0</td>
<td>1-5</td>
<td>Low value on temperature scale</td>
</tr>
<tr>
<td></td>
<td>SLOW</td>
<td>F5.0</td>
<td>6-10</td>
<td>Low value on salinity scale</td>
</tr>
<tr>
<td></td>
<td>RANGE</td>
<td>F5.0</td>
<td>11-15</td>
<td>PVD range&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>TPLT</td>
<td>L1</td>
<td>16</td>
<td>T for temperature plot</td>
</tr>
<tr>
<td></td>
<td>SPLT</td>
<td>L1</td>
<td>17</td>
<td>T for salinity plot</td>
</tr>
<tr>
<td></td>
<td>PPLT</td>
<td>L1</td>
<td>18</td>
<td>T for pressure plot</td>
</tr>
<tr>
<td></td>
<td>UMIN</td>
<td>F5.2</td>
<td>1-5</td>
<td>Minimum value of U for PVD</td>
</tr>
<tr>
<td></td>
<td>VMIN</td>
<td>F5.2</td>
<td>6-10</td>
<td>Minimum value of V for PVD</td>
</tr>
<tr>
<td></td>
<td>RANGE2</td>
<td>F5.2</td>
<td>11-15</td>
<td>PVD range&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>UVAR</td>
<td>F5.2</td>
<td>16-20</td>
<td>U variance</td>
</tr>
<tr>
<td></td>
<td>VVAR</td>
<td>F5.2</td>
<td>21-25</td>
<td>V variance</td>
</tr>
<tr>
<td></td>
<td>PMEAN</td>
<td>F5.2</td>
<td>26-30</td>
<td>Mean pressure</td>
</tr>
</tbody>
</table>

<sup>1</sup>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.

<sup>2</sup>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
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.
<table>
<thead>
<tr>
<th>REC. NO.</th>
<th>DATE</th>
<th>TIME</th>
<th>U-VEL CM/SEC</th>
<th>V-VEL CM/SEC</th>
<th>SPEED CM/SEC</th>
<th>COMPASS DEGREES</th>
<th>TEMP °C</th>
<th>COND MGAUSS</th>
<th>DEPTH METERS</th>
<th>SALINITY (PPT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 FEB 76</td>
<td>045</td>
<td>-27.561</td>
<td>-1.532</td>
<td>27.699</td>
<td>264.893</td>
<td>4.967</td>
<td>30.684</td>
<td>22.908</td>
<td>31.831</td>
</tr>
<tr>
<td>4</td>
<td>2 FEB 76</td>
<td>045</td>
<td>-23.927</td>
<td>-0.24</td>
<td>27.699</td>
<td>264.893</td>
<td>4.967</td>
<td>30.684</td>
<td>22.908</td>
<td>31.831</td>
</tr>
<tr>
<td>5</td>
<td>2 FEB 76</td>
<td>045</td>
<td>-22.716</td>
<td>-5.744</td>
<td>27.699</td>
<td>264.893</td>
<td>4.967</td>
<td>30.684</td>
<td>22.908</td>
<td>31.831</td>
</tr>
</tbody>
</table>

Figure 4. Example of clean data printout.
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 change 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 Silcox 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 AANCMOD (INPUT, OUTPUT, TAPE1, TAPE2, TAPE3, TAPE4, TAPE5, INPUT, TAPE6, OUTPUT)

TAPE (TAPE1, 560 RPI, STRANGER) GENERATED USING THE PMEL 1-TRACK
PROGRAM TO READ AANDERAA CH DATA FROM 7-TRACK
TO 7-TRACK CONVERTER.

COMPUTES, PRINTS AND WRITES ON TAPE (TAPE4, RPI, BINARY, SCORE)
ERROR RECORDS ARE MARKED ON LISTING WITH ASTERISKS AND SUMMARIZED
AT THE END OF EACH FILE.

DATA CARDS

CARD 1

XMAG = ANGLE (IN DEGREES) TO CORRECT COMPASS READING FOR
MAGNETIC DECLINATION (FILE.5)
NDATA = NUMBER OF SETS OF DATA ON THE TAPE (T5)
DELTIME = TIME INTERVAL (IN MINUTES) BETWEEN DATA SAMPLES (F5.7)
NSKIP = NUMBER OF DATA TAPE RECORDS TO SKIP (T5)
NF_SKIP = NUMBER OF 7-TRACK TAPE FILES TO SKIP (T5)
NUMTR = T FOR NEW METER (L1)
F FOR OLD METER

CARDS 2-5

A0(1), A1(1), A2(1), A3(1) = COEFFICIENTS TO BE USED IN THE
EQUATIONS FOR CONVERTING RAW DATA INTO ENGINEERING UNITS.

THESE EQUATIONS ARE OF THE FORM:

2N(1) = A0(1) + A1(1) * N + A2(1) * N^2 + A3(1) * N^3

CARD 2 HAS AO(1) = A0(1) (5F10.5)
CARD 3 HAS A1(1) = A1(1) (5F10.5)
CARD 4 HAS A2(1) = A2(1) (5F10.5)
CARD 5 HAS A3(1) = A3(1) (5F10.5)

NOTES: INCLUDE ROTOR GEAR RATIO WHEN ENTERING
A1(1) FOR SPEED EQUATION

CARD 6

MOORING AND METER INFORMATION
(MUST LEFT JUSTIFY ALL FIelds)
PROJ = PROJECT (A16)
MOOR = MOORING NUMBER (A16)
MET = METER NUMBER (AE)
METDP = METER DEPTH (AS)
YLAT = MOORING LATITUDE (A16)
XLAT = MOORING LONGITUDE (A16)
BOTDF = BOTTOM DEPTH (F5.2)

CARD 7

STARTING TIMES AND DEPTH INFORMATION
TIMES = ARRAY TO STORE STARTING AND STOP TIMES AS FOLLOWS:
FOR 1:1 START HOUR AND MINUTE (T5)
1:2 START DAY (T5)
1:3 START MONTH (T5)
1:4 START YEAR (TF)
DIMENSION NX(6),NZ(6),IZN(6),BUF(40)
DIMENSION XPOS(6),INEG(20),XNEG(?0,6),XPOSZ(?6),
INFLG(20),TEMP(20),ITEMP(20)
DIMENSION NNX(?0,6),NCHK(20)
DIMENSION ITIMES(?4)
DIMENSION AV(5),A1(?5)
DIMENSION A2(?5),A3(?5)
LOGICAL NUMER
COMMON /ZIP/IN,IZ
COMMON /ZIP/IN,IZZ
DATA NX/6,4,5,2,1/AV,VAL,NREC01/A,25/
DATA PARI/TRUE./
UMIN=UMAX=USUM=U0
VMIN=VMAX=VSUM=0
PI=3.1415926
NCALC*5
NREC=14
II = 100
L = (C
C
READ CONTROL CARDS WITH CALIBRATION DATA.
C
997 READ (5,122) XMG,NDATA,DELTIME,NSKTP,NEKTP,NUMETR
122 FORMAT (F10.5,F15.5,F5.2,2I5,L1)
IF ([DF,5] 999,998
998 WRITE (6,123)
123 FORMAT (1I10,9X,*C) /TRCL CARDS - */
READ(5,5000) (AV(I),I=1,5)
READ(5,5000) (A1(I),I=1,5)
READ(5,5001) (A2(I),I=1,5)
READ(5,5001) (A3(I),I=1,5)
5001 FORMAT (5E14.7)
WRITE (6,125) XMG,NDATA,DELTIME,NSKTP,NEKTP,NUMETR
125 FORMAT (1Gx,F10.5,F15.5,F5.2,2I5,L1)
DO 16 TI=1,5
16 WRITE(6,F604) I,A1(I),I,A2(I),I,A3(I)
6000 FORMAT (/A0(*,I2,*)**,*F10.5,F5.2,2I5,A,2I0,5,0)*
1 * A2(*,I2,*)**,*F14.7,0* A3(*,I2,*)**,*F14.7
CALL ERRIT (1,PART)
C
C
READ FROM CARDS THEN WRITE ON TAPE AND LISTING
C
THE MOUNTING AND METER INFORMATION
C
READ(5,700) PROJ,MOOR,MET,MFTOP,YLAT,XLONG,ANUDP
700 FORMAT (2A10,G5.2,ZA10,F5.2)
WRITE(6,701) PROJ,MOOR,YLAT,XLONG,ANUDP,MET,MFTOP
701 FORMAT (/A0(*,PROJECTIO,1A5,0,MONTPNG,*,A10,1/6X,0,5LATTITUN*,
  + 1A5,0,PROJECTIO,1A5,0,MONTPNG,*,A10,1/6X,0,LATTITUN*,
  + 1A5,0,PROJECTIO,1A5,0,MONTPNG,*,A10,1/6X,0,LATTITUN*)
  + 1A5,0,PROJECTIO,1A5,0,MONTPNG,*,A10,1/6X,0,LATTITUN*)
WRITE(3) PROJ,MOUNT,MET,MFTOP,YLAT,XLONG,ANUDP
READ (5,703) ITIMES
703 FORMAT (15)
WRITE (6,704) ITIMES
704 FORMAT (A5,5X,START TIME,15.5Y,0,NAY,*,TF,5X,MONTH,*,TF,5X,YEARM,*,TF)
  + 5X,STAR,*,ITIMES
DATA IS STORED AS FOLLOWS:
ZN(1) = SPEED
ZN(2) = DIRECTION
ZN(3) = TEMPERATURE
ZN(4) = CONDUCTIVITY
ZN(5) = PRESSURE
ZN(6) = SALINITY

DO 940 I = 1, NDATA
222 = I
CALL GETREC (NX, NVAL, NRECT0T, NZ, NTYPF, NCHECK)
52 = NZ(1)
GO TO (190, 192, 193), NTYPF

GOOD DATA ROUTINE.

810 SD = NZ(2)
ST = NZ(3)
SC = NZ(4)
SREP = NZ(5)
IF (NUMETR) 51 = G + J
ZN(1) = A1(1) + A1(1)*(S2-51)/DELTME
ZN(2) = A0(2) + A(2)*SD + XMAG
IF (ZN(2) .GT. 360.) ZN(2) = ZN(2) - 360.
ZN(3) = A(3) + A(3)*ST + A(3)*(ST*ST) + A(3)*(ST**3)
ZN(4) = A(4) + A(4)*SC
ZN(5) = A0(5) + A(5)*SREP
ZN(6) = SALINI(PRESS, ZN(3), ZN(4))
S1 = S2

WRITE (2) I, IN, N7, NCHECK
GO TO 900

C
RAD DATA ROUTINE
C
820 SD = N7(2)
ST = N7(3)
SC = N7(4)
SDEP = N7(5)
IF (NUMTR) S1 = 0.0
ZN(1) = AC(1) + AL(1)*(S2 - S1)/DELTME
ZN(2) = AC(2) + AL(2)*SD + XMAG
IF (ZN(2) GT 360.) ZN(2) = ZN(2) - 360.
ZN(3) = AC(3) + AL(3)*ST + A2(3)*(ST**2) + A2(3)*(ST**3)
ZN(4) = AC(4) + AL(4)*SC
ZN(5) = AC(5) + AL(5)*SDEP
ZN(6) = SALLN(PRESS, ZN(3), ZN(4))
S1 = S2
WRITE (2) I, IN, N7, NCHECK
WRITE (6, 104) I, IN, N7, NCHECK
104 FORMAT (X, 2H*', 14*F8.1, 13*F9.1, 3*F8.1, 6*F10.4, 3*Y10)
RAD = RAD + 1
900 CONTINUE
C
LIST ERROR DATA RECORDS
C
430 END FILE 2
WRITE (6, 108)
108 FORMAT (14*G*, 26H*'$'***************10X, 1H*, 4Y*, 1H*/*
*10X, 26H* ERROR RECORDS SUMMARY */17Y*, 1H*, 24Y*, 1H*/*
*10X, 26H*'$'***************/*)
FPEX = NPEX = 10.0
WRITE (6, 109) INHAX, FPEX
109 FORMAT (14X*, TOTAL NUMBER OF CASSETTE RECORDS = *,
*15, /*15, /*15, /*IF ERROR AVERAGE RECORDS = *, 15
*15, /*15, /*PERCENT), */)
REWIND 2
C
60 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 (14H)
WRITE (6, 1103)

1103 FORMAT (14X*, CALCULATED DATA*16X, INTERPOLATION*13X, RAW DATA*22X,
1 ERROR TYPES** RECORD SPEED UNO TEMP CONN DEPTH SAL
2 FLAC*3X*SPEED DIR TEMP CONN DEPTH REF *,
3 A C DEF*)
1 READ (2) IFCF, ZN, N7, NCHECK
IF (FCF = 2) 36L, 50
50 IF (ZN(1), LT, 4) ZNU, 1C
100 IF (C3) = IPEC
DO 111 I = 1, 6
SUBROUTINE GETREC(INX,NVAL,NRECTOT,N7,NTYPE,NCHECK)

SUBROUTINE TO READ BINARY DATA FROM 7-TRACK TAPE (TAPE 1)

WHICH WAS CREATED BY AANDERAA TRANSLATOR.

EACH 7-TRACK RECORD MUST CONTAIN AN INTEGER NO. OF DATA RECS.

EACH RECORD IS READ IN BLOCKS OF NVAL AND THE PROGRAM

EXPECTS A FLAG AND ERROR WORD READ FORMAT.

NX = RESHUFFLE ARRAY,
NVAL = NO. WORDS/DATA RECORD,
NRECTOT = NO. DATA RECS/ENR.
NTYPE = 1 FOR GOOD DATA,
        2 FOR ERROR (A= BITS/WORD INV.
        B= PWE,
        C= WORDS/SYNC, NE, CORRECT VALUE,
        D= FLAG BIT OUT OF SEQUENCE,
        E= SYNC WORD ENCOUNTERED BEFORE 6TH WORD,
        F= NO SYNC FLAG.
        3 FOR EOF ENCOUNTERED.

INTEGER III
DIMENSION BUF(40),NX(NVAL),NZ(NVAL)
COMMUN/COM1/NREC
COMMUN /ZIP/II*1,L*IZZ
INTEGER ROL
NPAR=0 $ IFLECK=6 $IC=161
IA=00040045 $ IC=001990

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
READ NEW TAPE RECORD IF NECESSARY.
C
IF(II.LE.L) GO TO 302
103 BUFFER IN (1,1) (ALF(1),ALF(40))
20 CALL XRLC(1)
   IF(UNIT,1) 20,104,140,160
164 III=0
   L=LENGTH(1)
   NCHECK = L $ NTYPE = 1
1046 NSHFT = 0
   II = II + 1
   II=ALF(1)
   (C TO 30C
140 NTYPE=3 IF NREC=NRECTOT $ RETURN
160 WRITE(L*,162) IZZZ
162 FOMAT(11X,5X,3H15H) ERROR ON TAPE 1, CONTINUE WITH NEXT RECORD
110,4,15,* IS THE PRESENT RECORD NUMBER *)
NPAR=NPAR+1
IF(NPAR.GE.10)165,103,166
165 WRITE(*,166) I772
166 FORMAT(*34***PARITY ERROR ON TAPE 1. STOP***15,* IS THE PRESENT
1 RECORD NUMBER *)
STOP
300 NREC = 0
UNPACK 1 AND ARAAA RECORD.
THE DATA IS PACKED IN THE FOLLOWING ORDER:
REF. WORD, TEMP-, COND-, PRESS-, DIRECTION, SPEED.
THE DATA IS STORED IN THE ARRAY N2 IN THE ORDER:
SPEED, DIRECTION, TEMP-, COND-, PRESS-, REF. WORD.
302 DO 399 I=1,NVAL
   IVAL = I
   J = ROL(I,12)
   NSHFT = NSHFT + 1
   N2 = I2.BAND.00777777
   J = IDB.OUDC1011.AND.N2
   IIF(J.EQ.0).310*320
   320 IF(J.EQ.NVAL)310,300
   310 K = N2(I)
   N1 = N2.I.AND.07777760
   H2 = N2.I.AND.00777777
   N21 = ISHFT(N21,-7)
   N22 = N22/2
   N23 = ISHFT(N22,-5)
   N2(K) = N22.OR.N223
   IIF(NISHFT.GE.5)998,999
   398 NSHFT = 0
   II = II + 1
   IIF(II.LE.1)GOTJ 3980
   IF(IVAL.EQ.NVAL)GOTC 399
   GO TO 103
   3990 II = BUF(II)
   399 CONTINUE
AG SYNC FLAG
IIF(J.EQ.U)410,420
410 NCHECK=NCHECK+1
GOTC 460
CHEK ERRCH WORD
420 II = ROL(I,12)
   NSHFT = NSHFT + 1
   N2 = I2.BAND.00777777
   J = IDB.OUDC1011.AND.N2
   IIF(NISHFT.GE.5)421,422
   421 NSHFT = 0
   II = II + 1
   IIF(II.LE.1)GOTO 4210
IF (IVAL .EQ. NVAL) GO TO 422
GO TO 103
421 JIR = BUF(I)
422 IF (ICK .EQ. 0) GO TO 1450, 44C
440 NCHECK = 100 + NCHECK
450 NZA = N7S .AND. IA
IF (NZA .EQ. 0) NCHECK = NCHECK + 1000000
N7A = N7S .AND. IB
IF (N7A .EQ. 0) NCHECK = NCHECK + 100000
N7C = N7S .AND. IC
IF (N7C .EQ. 0) NCHECK = NCHECK + 1000
460 IF (NCHECK .NE. 0) NTYPE = 2
462 RETURN
C
C MISPLACED FLAG WORD.
C
500 NCHECK = NCHECK + 1C
IF (ICK .EQ. 1) 501, 939
501 IF (NSHFT .GE. 5) 502, 42C
502 NSHFT = 0
II = II + 1
IF (II .LE. 1) GO TO 503
GO TO 103
503 JIR = BUF(I)
GO TO 429
539 WRITE (6,540)
540 FORMAT (X, '----------PROGRAM UNSYNCFN---------------------')
IF (NSHFT .GE. 5) 541, 44C
541 NSHFT = 0
II = II + 1
IF (II .LE. 1) GO TO 542
GO TO 103
542 JIR = BUF(I)
GO TO 44D
END
FUNCTION SALIN (P,T,S)
C COMPUTES SALINITY FROM PRESSURE, TEMP.*, CONDUCTIVITY.
C
FUNCTION SUBPROGRAM SALIN P,T,S
C RETURNS SALINITY PARTS PER THOUSAND,
C ARGUMENTS
C P PRESSURE DECIBAR, 0.1MN/50 M,
C T TEMPERATURE DEGREES C 104A PTS (746)
C M.B. T6A*(-5.0+6*TA+1.4+9*E-4)*TA6 WHERE T6A
C IS TEMPERATURE ON 104A PTS.
C G ELECTRICAL CONDUCTIVITY MILLIMHO/CM.
C
C 0. TO 600G.P-T.S TO 30, SALINITY 30. TO 4C.
C
C PROGRAMMER-TREVOR SANKEY, IDS WORMLEY.
C DATE-4TH DECEMBER 1974.
C LANGUAGE-ASA FORTRAN (FAC FACILITY STANDARD)
C MACHINE-FOR USE ON ALL IDS FACILITIES IN HOUSE AND EXTERNAL.
C PURPOSE-DEVELOPED FROM EARLIER VERSIONS FOR USE AS IDS STANDARD.
C DESIGN AIDS-A CHOICE OF MOST ACCEPTABLE EXPERIMENTAL FORMULAE.
C INARRANGEMENT FOR EFFICIENT COMPIATION AND EXECUTION.
C FULLY SELF DOCUMENTING.
C
C REFERENCES-SOURCES OF FORMULAE
C BRADSHAW, A. AND SCHLICHER, K.E. (1965) THE EFFECT OF PRESSURE ON
C THE ELECTRICAL CONDUCTANCE OF SEAWATER, DEEP SEA RESEARCH, 12, 151-167
C BROWN, H. AND ALLEN (1966) SALINITY, CONDUCTIVITY AND
C TEMPERATURE RELATIONSHIPS OF SEAWATER, OVER THE RANGE OF
C 0 TO 5CP. P,T,S BISSELT-GERKEN CORP REPORT NO. MD 1993.
C COX, A. BAULKING, F. AND PILEY, J. P. (1967) THE ELECTRICAL
C CONDUCTIVITY
C CHLORINITY RELATIONSHIP IN NATURAL SEAWATERS, DEEP SEA RESEARCH,
C 14, 203-220.
C
C TWO UNPUBLISHED POLYNOMIAL FITS ARE USED, BOTH TO DATA CONTAINED
C IN BROWN AND ALLEN (1966); ONE,ALTHOUGH NOT GIVEN IN THEIR
C PAPER, IS DUE TO THE AUTHORS THEMSELVES, THE OTHER WAS MADE BY
C A.J. CREASE.
C
C METHOD
C 1. GIVEN G IS OBSERVED IN SITU CONDUCTIVITY.
C 2. DIVIDE BY RP(P,T,S)*G(P,T,S)/G(T,35) FOR 949(1965)
C 3. GIVING GI(O,T,35) = 2.964 MILLIMHO/C, CONC COPENHAGEN WAT.
C 4. MULTIPLY BY CP(T)*G(O,T,35)/G(O,T,35) TO CONE doub. fit to
C 949(1966) GIVING GI(O,T,35). CONC COPENHAGEN WAT. AT OBS TEMP.
C 5. TAKE RATIO.
C FOR EFFICIENCY IN THIS ROUTINE STEP 2 IS INTERCHANGED WITH STEPS 3-F
C SO THE RATIO RT=G(P,T,S)/G(O,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(O,T,S)/G(O,T,35) THE CONDUCTIVITY RATIO
C AT THE OBSERVED TEMPERATURE.
C 7. CORRECT RT USING 2 Doub. UNPUBLISHED FIT TO THEIR 1966 DATA TO GET
C R(T,P,T)=G(O,T,35)/G(O,T,35) THE CONDUCTIVITY RATIO AT 1 D.E.C.,
C 8. CONVET P TO SALINITY USING INTERNATIONAL TABLES POLYNOMIAL.
C
C STEPS 2 AND 6 TO A FORM A STRONGLY CONVERGENT ITERATIVE LOOP AND
C S IS FOUND FROM THE TRIAL VALUE 3, TO TWO PLACES.
C *CALCULATE TERMS IN PRESSURE AND TEMPERATURE ALONE.
C *PRESSURE EFFECT(RAS)
CONVERT TO 1948 TEMPERATURE SCALE

T = (-5.4E+8 * T + (1.96E+4)) * T

C = (-7.4E+8 * T + (8.0E+4)) * T - 4.530E-2 * T + 1.5192

F = (1.3E-1 * T + 3.9E+3) * T + 1.42E-9

H = (-2.49E-9 * T - 0.57E-5) * T + 4.1E-4

J = (-1.657E-4 * T + 2.7E-3) * T - 1.53E-1 * T + 1

C = -7.6E-5 * T + 6.9E-3

R = (F * C + M * C) * T

RESULTANT COEFFS.

A + D * S = G(P, T, S) / G(P, T, S)

D = 0 * C

* TEMP. VARIATION OF COND. (CREASE FIT).

C = (((-5.2272E-4 * T - 2.92413E-7) * T + 1.920E-1) * T + 0.9201197) * T

1 = 6.76538

* CALC. KATT0 GIP(T, S) / G(P, T, S) * 42.594 TO ASSUMED G(P, T, S)

R = G/((42.594 * CP)

* TERM IN TEMPERATURE CORRECTION TO COND. RATT0 (RAT0)

G = (-6.9E-4 * T + 8.5E-2) * T - 1.

* CALCULATION OF SALINITY

* THIS A STRONGLY CONVERGENT ITERATIVE PROCESS AS THE PRESSURE

* CORRECTION IS WEAKLY DEPENDENT ON SALINITY, THE CALCULATION IS

* LONG TWICE

* FIRST USING TRIAL S = 35 GIVING INTERMEDIATE S.

* SECOND USING INTERMEDIATE S GIVING FINAL VALUE.

* ERRORS ARE LESS THAN .0003 PUT OVER THE RANGE OF OCEANIC CONDS.

* FIRST SET TRIAL VALUE

SALIN0 = 35.

* DO CALCULATION TWICE

DO 1 = 1, 2

* CALC. PRESSURE CORR. AS FN. GE S.

P = 0 * SALIN0 * A

* APPLY PRESSURE CORR. TO GIVE G(P, T, S) / G(P, T, S)


* R = R * P / R

* APPLY TEMP. CORR. TO RAT0 TO GET G(P, T, S) * G(P, T, S) / G(P, T, S)

P = (((-4.73E-1 * T + 4.22E+2) * T - 1.97E-1) * T + 1

* APPLY INTERPOLATION FORMULA TO GET SALINTY.

SALIN0 = (((-1.3231E+0 + 5.54624) * R - 1.4734) * R + 12.90E+3) * R

1 = 28.2072H = 0.0096

* RETURN

RETURN

END
PROGRAM EDITDAT (INPUT, OUTPUT, TAPE1, TAPE2, TAPE3, TAPE4, TAPE5 = INPUT, 
  ITAPE = OUTPUT)
DIMENSION ZN(6), TIMES(6), ITIMES(4)
LOGICAL AUD, CHG
C THIS PROGRAM EDITS OUT THE REST OF THE BAD DATA, CALCS. TIMES, U AND V
C DATA CARDS
C CARD 1
C DELMIN = TIME IN MINUTES BETWEEN RECORDS (F10.2)
C NSKIP = NUMBER OF RECORDS TO SKIP IN FILE BEFORE BEGINNING OF FILE
C NREF = REFERENCE RECORD FOR TIME MARK (I15)
C TIME = TIME IN UT FOR REFERENCE RECORD (I15)
C DAY = DAY OF REFERENCE RECORD (I15)
C MONTH = MONTH OF REFERENCE RECORD (I15)
C YEAR = LAST TWO DIGITS OF YEAR OF REFERENCE RECORD (I15)
C IMAX = NUMBER OF LAST RECORD TO BE PROCESSED (I15)
C CHG = 1 IF THE HEADER CARD IS TO BE CHANGED (I1)
C = 0 IF NOT (I1)
C CARDS 2 = CUSTOM FORMATTED DATA CARDS
C AUD = 1 IF DATA RECORD ON THE CARD READ IS TO BE INSERTED IN THE
C FILE AT THIS POINT. IN DANGER TO PICK WHERE YOU WANT THE
C RECORD INSERTED, THE RECORD JUST BEFORE THE INSERTION
C POINT MUST BE FLAGGED AS A RECORD TO BE CHANGED OR DROPPED.
C = 1 IF DATA RECORD ON THE CARD IS NOT TO BE INSERTED AS
C ANOTHER RECORD.
C NREC1 = NUMBER OF DATA RECORD TO BE CHANGED (IN NEGATIVE THE
C RECORD WILL BE DROPPED) (I15)
C TEMP = NEW VALUES OF SPEED, DIRECTION, TEMP., CONDUCTIVITY, AND
C DEPTH WHICH ARE TO BE PUT IN RECORD NUM. NREC1 (I15, 3)
PI = 3.1415926
READ (5, 100) DELMIN, NSKIP, NREF, TIME, DAY, MONTH, YEAR, IMAX, CHG
100 FORMAT (F10.2, I15, 11)
WRITE (6, 1011) DELMIN, NSKIP, NREF, TIME, DAY, MONTH, YEAR, IMAX, CHG
1011 FORMAT (I15, I15, 11)
READ (11) PI, CHG
WRITE (200) PI, CHG
READ (5, 200) PROJ, MCOR, MET, METDP, YLAT, XLONG, BTDP
200 FORMAT (2A5, 2A5, 2A5, F6.2)
WRITE (2) PROJ, MCOR, MET, METDP, YLAT, XLONG, BTDP
WRITE (6, 201) PROJ, MCOR, MET, METDP, YLAT, XLONG, BTDP
WRITE (201, 200) PROJ, MET, MCOR, METDP, YLAT, XLONG, BTDP
201 FORMAT (2A5, 2A5, 2A5, 2A5, 2A5, 2A5, 2A5)
READ (11) ITIMES
ITIMES(1) = ITIME
ITIMES(2) = IDAY
ITIMES(3) = IMONTH
ITIMES(4) = IYEAR
WRITE (6, 202) ITIMES, DELMIN
WRITE (202, 200) ITIMES, DELMIN
IREC = 1
202 FORMAT (2A5, 2A5, 2A5, 2A5, 2A5, 2A5, 2A5, 2A5, 2A5, 2A5, 2A5, 2A5, 2A5, 2A5, 2A5)
30
WHITE(2) ITIMESTDELMIN
WHITE(4,1000)

C CULL AND WRITE DATA
C
IKEC=0
1000 FORMAT(*4*8H REC. NO.,4X,HDATE,4X,HTIME,4X,6HU-VEL.,4X,
16H-VEL.,4X,5HSPED.,4X,7HCOMPASS,5X,7HTEMP.,2A,5HCOND.,4X,
2HDEPTh.,3X,8HSALINITY/24X,6HCM/SEC,4X,6HCM/SEC,4X,6HCM/SEC,3X,
37HDEGREES,3X,5HULC.,4X,7HMMHO/CM. 3A,6HI ME. TER.,4X,4X,4X,H(PPT.)/
IF(NSKIP,=0.0) GO TO 104
OU 104 1*1,NISKIP
103 READ(1) IDLM,TEMP
104 IFLAG = 1
300 READ(5,1C1) AUW,NKEC1,TEMP
14A FORMAT(15,6F12.3)
1F(EOF,5) 301,1040
301 NKEC1 = 0
AU = .FALSE.
1040 IF(ADD) GO TO 362
READ(1) NKEC1,ZN
IF(NKEC1.0,T,1MAX) GO TO 500
IF(EOF,1) 300,1041
1341 IF(AABS(NREC1).NE.NKLC1) GO TO 310
IF(NKLC1.LT.0) 300,302
362 OU 105 I=16
10C ZN(1) = TEMP1
IFLAG = 2
310 INCR+1
CALL ULDATE(DAY,1,UNTHM,1,YEAR,1,TIME,1,UTELMIN,1,IKC,NOATE,NTIME,
1 JUHR)
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(1+1,1101) IREC,NOATE,NTIME,U,V,ZN
1101 FORMAT(11,1,2X,1I0,1,2X,4X,9F10.3)
C WRITE THE LATESTIME, U, V, TEMPERATURE, PRESSURE, CONDUCTIVITY,
C VALUES FOR NUMBER AND SALINITY ON TAPE2, THE CLEAN TAPE.
WRITE(2) NOATE,NTIME,U,V,ZN(3),ZN(5),JUHR,NREC1,1MAX,NOATE
C GENERATE THE DATA SUMMARY PRINTOUT ON OUTPUT.
CALL SUMRT(ZN(1),ZN(6)),U,V,ZN(5),JUHR,NREC1,1MAX,NOATE
GU TO (1040,104) IFLAG
500 END FILE 2
END
SUBROUTINE GETDATE(IDAY, IMONTH, IYEAR, ITIME, INLIN, DELMIN, NOUT, NODATE, + NTIME, JUHR)

DIMENSION MUN(12), NDAY(12)

DATA MUN /3JAN, 3FEB, 3MAR, 3APR, 3MAY, 3JUN, 3JUL, 3AUG, + 3SEP, 3OCT, 3NOV, 3DEC/

DATA NDAY /31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31/

C ADJUST FOR LEAP YEARS
IF(MOD(IYEAR, 4).EQ.0) NDAY(2) = 29

C CALL. INTERVAL IN MIN., HOURS, DAYS, AND MONTHS.
NMMLUT = (NOUT-1)*DFMLH
NMRTUT = NMTOI/60
NUTUT = NMRTUT/24
NMMLT = NMMLUT-NMRTUT*60
NMRLT = NMRTUT-NUTUT/24

C CALC. TIME OF DESIRED DATA PT.
NH1 = ITIME/100
NH2 = ITIME - NH1*100
NM3 = NP2 + NMMLT
IF(NM3.LT.60) NM3 = 60
NH1 = NH1 + 1
NH2 = NH2 - 24
NUTOT = NUTUT + 1

C CALC. DATE OF DESIRED DATA PT.
IY1 = IYEAR
NMUN1 = IFICH
ND1 = IDAY + NWTOT

IY1 = IY1 + 1
NDAY(4) = 29
IF(MOD(IY1,4).EQ.0) NDAY(2) = 29
NMUN1 = 1
IF(IIY1.GE.100) IY1 = 0
GU TO 460

IY1 = IY1 + 1
NDAY(4) = 29
IF(MOD(IY1,4).EQ.0) NDAY(2) = 29
NMUN1 = 1
IF(IIY1.GE.100) IY1 = 0

C LUMPED JULIAN DATE
JDATE = 0
IF (NMUN1.GT.1) GU TO 500
INDEX = NMUN1 - 1
DL = 60 + INDEX
JDATE = JDATE + NDAY(1)

C CONTINUE
JDATE = JDATE + ND1
JUHR = JDATE*100 + NH2

KLRKRN
END

32
SUBROUTINE SUMII(TEMP,SALIN,UV,DPTH,JDHR,NREC,IMAX,NDATE)
DIMENSION ISTORE(2,25),STORE(4,25),VALUE(7),HRTOTS(7),DYTOTS(7),

C

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 .GE. 0) GO TO 50

C

INITIALIZE THE ARRAYS

ICNT=1
JSAV=JDHR
MSAV=NDATE
IMH=IVAL=IDAY=0
DO 10 I=1,7
HRTOTS(I)=VALUE(I)
DYTOTS(I)=0.0
HRTOTS(I)=0.0
10 CONTINUE
DL 20 I=1,4
DL 20 J=1,25
STORE(I,J)=0.0
IF (I .LE. 2) ISTORE(I,J)=0
20 CONTINUE
WRITE(6,2050)
GO TO 999

C

ADD UP THE DATA VALUES

C

DO 100 ICNT=ICNT+1
DL 100 I=1,7
HRTOTS(I)=HRTOTS(I)+VALUE(I)
IF (NREC .NE. IMAX) GO TO 999

C

COMPUTE AND STORE HOURLY AVERAGES

C

150 IMHRK=MCU(JDOSAV,10U)*1
UU 200 I=1,3
200 STGKC(I+1,HOUR)=HRTOTS(I)/ICNT
UAVG=HRTLOTS(4)/ICNT
VAVG=HRTLOTS(5)/ICNT
STGKC(4+1,HOUR)=SQRT(UAVG*UAVG+VAVG*VAVG)
STORE(1,HOUR)=JSAV
ISTCKL(2+1,HOUR)=UG (HRTOTS(4),HRTOTS(5))
DL 200 I=1,7
DYTOTS(I)=DYTOTS(I)+HRTOTS(I)
HRTLOTS(I)=VALUE(I)
250 CONTINUE
IF=IMH+ICNT

33
C

COMPUTE DAILY AVERAGES AND WRITE SUMMARY

DAY=IDAY+1
DG 300 1=1,3
300 STURE(I,25)=YITUTS(I)/IHR
UAVG=YITUTS(4)/IHR
VAVG=YITUTS(5)/IHR
SIGMA(4,25)=SQR(UAVG*UAVG+VAVG*VAVG)
ISTORE(I,25)=NDSAV
ISTORE(2,25)=IDEGS(YITUTS(4),YITUTS(5))
SPUAVG=YITUTS(6)/IHR
UPAVG=YITUTS(7)/IHR
DG 350 I=1,7
YITUTS(I)*MAYTO(J)+YITUTS(I)
SSTORE(I,25)=NSAV
ISTORE(I,2)=0
750 CONTINUE
IF (NREC  NE. IMAX) GO TO 450
INDEX=IHOUR+1
DG 400 1=1,4
DL 400 J=INDEX+1
STORE(I,J)=C+0
IF (I  LE. 2) ISTORE(I,J)=0
450 CONTINUE
450 DG 500 1=1,6
INDEX2=1+4
SSTORE(6,200)=ISTORE(I,K),STLKE(1,J),J=1,9,1STURE(2,K),
K=INDEX1,INDEX2
500 CONTINUE
WHITE(0,201) ISTORE(I,25)=(STURE(I,25),J=1,9),ISTORE(2,25),
C SPUAVG,UPAVG
200 FORMAT(4X,15,25=1,F4.2,F5.1,F13)
500 CONTINUE
WHITE(0,202) ISTORE(I,25)=ISTURE(I,25),J=1,9,1STURE(2,25),
C SPUAVG,UPAVG
2010 FORMAT(* FUR *,ALU*, TEMP**,F5.2**, SALINITY**,
C F5.2*, SIGMA**,F5.2*, NET SPEED**,F5.2*, AT *,13,
C * MEAN SPEED**,F5.2**, DFPTH**,F5.2*/
IVAL=IVAL+IHR
NVSAY=DATE
IHR=0
IF (IDAY  LT. 7  AND. NREC  NE. IMAX) GO TO 999
C

COMPUTE AND WRITE 7 DAY MEANS

C

DG 550 1=1,3
550 YITULS(1)=YITUTS(1)/IVAL
UAVG=YITUTS(4)/IVAL
VAVG=YITUTS(5)/IVAL
TUTS(4)=SQR(UAVG*UAVG+VAVG*VAVG)
YITULS(4)=IDEGS(YITUTS(4),YITUTS(5))
SPUAVG=YITUTS(6)/IVAL
UPAVG=YITUTS(7)/IVAL
WHITE(0,203) IDAY,(TUTALS(1),I=1,4),INDEX,SPDAVG,UPAVG
2020 FORMAT(* FUR *,F5.2*, DAYS TEMPERATURE,F5.2**, SALINITY**,

34
C  F5.2* SIGMAT**, F5.2* NET SPEED**, F5.2* AT *, 13,
C  MHEAN SPEED**, F5.2* DEPTH**, F5.2)
C  (NRE, EQF, IMAX) GO TO 999
C
C  WRITE PAGE HEADING AND SET UP FOR NEXT 7 DAYS
C
C  WRITE (6, 630)
2036 FORMAT (1, 4(*, UAH HR TEMP SALI SIGMA SPEED DIR *))
   IDAY=IVAL=0
   DU 600 1=1, 7
640 WRITE (1)=0, 0
999 RETURN
END

FUNCTION SIGMAT(TEMP)
C
C  SUBROUTINE TL CMLCCLL, SIGMA-T
C
C     CL = (4.030)/1.005
SUMT = = ((TEMP-3.99)/50.570) * ((TEMP+253.0)/(TEMP+67.2*3))
AT = TEMP * (1.0367-0.03615*TEMP + 0.0414643*TEMP**2) * 0.001
BT = TEMP * (10.030-6.16*TEMP + 0.031667*TEMP**2) * 1.01-06
S159 = -6.061 + 1.470e*CL - 0.001157e*CL**2 + 0.000639e*CL**3
SIGMAT = SUMT + (S159 + 0.124)*(1.0-AT+BT*(SIGMAT-0.124))
RETURN
END

FUNCTION IDEGS(U, V)
PI=3.1415926
KAUS=ATAN2(V, U)
IF (KAUS < UT, PI/2.) KAOS=5.0*PI/2.-KAUS
IF (KAUS < LT, 0.0) KAOS=ABS(KAUS)+PI/2.
IF (KAUS < LT, PI/2.) KAOS=PI/2.-KAUS
LUOS=INT((KAOS+1.0, PI/4))
RETURN
END

35
PROGRAM LEWOP (INPUT,OUTPUT,TAPE1,TAPE2,TAPE3,TAPE4,
* TAPE5=INPUT,TAPE6=OUTPUT,TAPE99)
C
C TAPE1 = 2 HR FILTERED U, V DATA
C TAPE2 = 4 HR FILTERED U, V DATA
C TAPE3 = CLEAN TEMP, SALINITY AND PRESSURE DATA
C TAPE4 = PVD AND SPECTRAL INFORMATION FROM FILTER
C TAPE99 = CAL TEST PLOT TAPE
C
DIMENSION ITIMES(3,4), DELT(3), SPECTRA(52)
COMMON U(241), V(241), W(240), (XSCALE, VSCALE)
LOGICAL END1, END2, END3, END4, TIMF1, TPLT, SPLT, PPLT
DATA END1, END2, END3, END4, /FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE,
DATA TIMF1, /TRUE,
CALL PLOTS
CALL PLOT(U=0,1,0=3)
C
READ TAPE HEADING INFORMATION AND
WRITE IT ON OUTPUT AND TAPE99
C
READ (1) DUMMY
IF (EOF(1)) 920, 20
20 READ (2) DUMMY
IF (EOF(2)) 940, 22
22 READ(3) PROJECTIO, MOOR, MET, METOP, YLAT, YLONG, BDTDP
IF (EOF(3)) 930, 24
24 READ(1) (ITIMES(1,1), I=1,4), DELT(1), DELAY1, CUTOFF1
READ(2) (ITIMES(2,1), I=1,4), DELT(2), DELAY2, CUTOFF2
READ(3) (ITIMES(3,1), I=1,4), DELT(3)
WRITE(6,1605) PROJECTIO, MOOR, MET, METOP, YLAT, YLONG, BDTDP
1605 FORMAT(*5X, PROJECTIO, 5X, MOOR, 5X, MET, 5X, METOP, 5X, YLAT, 5X, YLONG, 5X, BDTDP)
DO 25 I=1,3
WRITE(4,11010) I, (ITIMES(1,J), J=1,4), DELT(1)
11010 FORMAT(*5X, ITIMES(1,J), 5X, DELT(1))
IF (1*EQ. 1) WRITE(6,1020) DELAY1, CUTOFF1
IF (1*EQ. 2) WRITE(6,1020) DELAY2, CUTOFF2
1020 FORMAT(*5X, DELAY1, 5X, CUTOFF1)
25 CONTINUE
ENCODER(1,1,30, HEADER) WND
1030 FORMAT(STATI0N=4, A10)
CALL SYMNOL(2, 0, 0, 0, 21, 'HEADER', 0, 1)
ENCODER(1,1,40,HEADER) PND
1040 FORMAT(*PROJECTI0N=A10)
CALL SYMNOL(2, 0, 7, 5, 21, 'HEADER', 0, 1)
ENCODER(1,1,50,HEADER) YLAT
1050 FORMAT(*LATITUDE=A10)
CALL SYMNOL(2, 0, 7, 5, 21, 'HEADER', 0, 10)
ENCODER(1,1,50,HEADER) YLAT
1060 FORMAT(*LONGITUDE=A10)
CALL SYMNOL(2, 0, 6, 5, 21, 'HEADER', 0, 10)
ENCODER(1,1,70,HEADER) BDTDP
1070 FORMAT(*DEPTH=6, F6.2, * METERS)

36
CALL SYMBOL(2,0,5,0,21,HEADER,0,0,11)
ENCODE(18,1680,HEADER) MFT
1090 FORMAT(*METERS*,A10)
CALL SYMBOL(2,0,5,0,21,HEADER,0,0,10)
ENCODE(11,1680,HEADER) MFT
C
C READ PVD LABELING AND CONTROL INFORMATION
C FROM TAPE AND INPUT.
C
READ(5,2000) TLOW,SLOW,PRANGE,PPLT,PLT,PPLT
2000 FORMAT(3F5.0,3L1)
IF (EOF(5)) 910,30
30 READ (4) UMIN,VMIN,PRANGE?,UVAR,VRVAR,PMAN
IF (EOF(4)) 950,34
32 READ (5,2010) UMIN,VMIN,PRANGE?,UVAR,VRVAR,PMAN
2010 FORMAT(3F5.2)
IF (EOF(5)) 950,34
34 IF (RANGE LT RANGE2) RANGE=RANGE2
C
C WRITE MEAN PRESSURE, U, AND V VARIANCES ON TAPE99
C
ENCOD(27,8L20,PRESS) PMAN
6020 FORMAT(*MEAN PRESSURE*,F6.2,METERS*)
CALL SYMBOL(2,4,4,0,21,PRESS,0,0,77)
ENCOD(17,F630,VAR) UVAR
6030 FORMAT(*U-VARIANCE*,F6.1)
CALL SYMBOL(2,0,2,0,21,VAR,0,0,17)
ENCOD(17,F640,VAR) VRVAR
6040 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 SPECDLT(SPECTRA,YLAT)
C
MAKE PVD PLOT AND LABEL VERTICAL AXIS
C
50 CALL PVDPLT(DELTL1,RANGE,UMIN,VMIN)
60 CALL LABEL(9,0,9,75,TLOW,SLOW)
C
RESET ORIGIN THEN DRAW AXES.
C
STHR*INT(TIMES(3,1)/100.)
STMIN=STHR*INT(TIMES(3,1)/100.)/60.
STPOS=STHR*STMIN/24.
WRITE(0,9999) STHR,STMIN,STPOS
9999 FORMAT(5X,*STHR*,F5.2,* STMIN=*,F8.3,* STPOS=*,F8.3)
00 CALL PLT(I,0,0,0,-3)
CALL GRDAX(TIMES)
C
C READ FROM TAPE1 THE U AND V ARRAYS
C THEN PLOT THEM
C
PROGRAM LEWDP 73/73 OPT=1  FTN 4,5+410

IF (END1) GO TO 103
DO 90 I=1,240
READ (1) U(I),V(I)
IF (EOF(1)) 95,90
90 CONTINUE
GO TO 106
END1=.TRUE.
IF (I .EQ. 1) GO TO 105
100 NPTS=1-1
WRITE (6,9004) NPTS
9004 FORMAT (* RED U AND V ARRAYS, NPTS=*,I5)
USCALE=0.0125
VSSCALE=0.0125
XO=STPOS*(DELAY1-1.)/24.
X1=XO+1./24.
IF (.NOT. TIME1) GO TO 190
USAV=U(1)
VSAV=V(1)
X0=X1
102 CALL PLOTEM(NPTS,6,875,.5,975,.5,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
END2=.TRUE.
IF (I .EQ. 1) GO TO 125
120 NPTS=1-1
WRITE (6,9006) NPTS
9006 FORMAT (* RED STICK DATA, NPTS=*,I5)
USCALE=0.025
VSSCALE=0.025
XJ=STPOS*DELAY2/24.
Y0=4.375
CALL STKPLT(NPTS,X0,Y0,DPLT(7))

C
C READ TEMPERATURE, CONDUCTIVITY, AND PRESSURE FROM TAPE3 STORING ONLY "HOURLY" VALUES THEN PLOT THEM.

C
125 IF (END3) GO TO 200
NSKIP=60/INT(DELT(3))
READ(3) NDATE,TIME,UL,UV,TEMPPR,COND,REC,SALIN
IF (EOF(3)) 145,130
130 DO 140 I=1,240
U(I)=TEMP-IL0W
V(I)=SALIN-IL0W
W(I)=PRESS-PMEAN
DO 140 J=1,NSKIP
READ(3) NDATE,TIME,UL,UV,TEMPPR,COND,REC,SALIN
IF (EOF(3)) 145,140
140 CONTINUE
PROGRAM LEWDP 73/73 OPT=1 FTN 4.5+4.10

GO TO 150
145 FNO3=.TRUE.
IF (I1 EQ. 1) GO TO 20C
150 NPTS=I-1
WRITE(6,9008) NPTS,NSKIP
9008 FORMAT(* RED TEMP AND COND, NPTS=*, I5, 5Y, *NSKIP=*, I3)
USCALE=0.125
VSCALE=0.125
X0=STPOS=1.245
X1=STPOS
IF (.NOT. TIME1) GO TO 155
TSAV=U(1)
SSAV=V(1)
PDAV=W(1)
X0=X1
155 CALL PLOTHEM(NPTS, 2, 75, 1.5, TSAV, SSAV, PSAV, X0, X1, TP(1), SPL(1),
TSAV=U(NPTS)
SSAV=V(NPTS)
PSAV=W(NPTS)
200 IF (EN1 .AND. FNO2 .AND. ENO3) GO TO 800
IF (TIME1) TIME1=.FALSE.
GO TO 10

C
C AFTER ALL DATA HAS BEEN PLOTTED
C
C DRAW FINAL XAXIS, LABEL TO AND STOP
C
800 Y=1.8
DO 820 I=1,6
DO 810 J=1,7
CALL PLT(9.9375,Y,3)
CALL PLT(11,J625,Y,2)
Y=Y+0.125
810 CONTINUE
Y=Y+0.375
820 CONTINUE
X*AV=0
CALL PLT(X, 9.125,3)
CALL PLT(X, 8.375,2)
Y=Y+.5
DO 830 I=1,6
CALL PLT(X, Y,3)
Y=Y+.75
CALL PLT(X, Y,2)
Y=Y+.5
830 CONTINUE
CALL PLT(X, 9.375,3)
CALL PLT(X, 8.625,2)
DAY=FLOAT(TIMES(3,2))
CALL NUMBER(10.0,0.375,14, DAY,0, .FALSE.)
CALL LABEL(10.5, 10.1, TLOW, TLOW)
63 TO 999
910 WRITE (6, 9010)
9010 FORMAT(* INPUT DATA CARD MISSING, TRY AGAIN, *)
GC TO 990
920 WRITE (6, 9020)
9020 FORMAT(* TAPE1 IS INCOMPLETE, TRY AGAIN, *)
GO TO 990

39
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 TAPE.*)
      FNC4=.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=U
   CALL PLOT(L=U,U=U,999)
   DUMP=1/DUMP
999 CALL PLOT(L=U,U=U,999)
   CALL PLOT(U=U,U=U,999)
   STOP
END
SUBROUTINE DRAWAX

DIMENSION NDAY(12), MONTH(12), TIMES(3, 4)
DATA NDAY/31, 28, 31, 30, 31, 30, 31, 30, 31, 30, 31, 31/
DATA MONTH/3HAUG, 3HSEP, 3HNOV, 3HDEC, 3HJAN, 3HFEBR, 3HMAR, 3HAPR, 3HMAY, 3HJUN, 3HJUL,
% 3HAUG, 3HSEP, 3HNOV, 3HDEC/

IF(ITIMES(3, 4) .GT. 1900) TIMES(3, 4) = TIMES(3, 4) - 1900
IF(MOD(ITIMES(3, 4) + 1900, 7) .EQ. 6) NDAY(2) = 29

C C
C DRAW THE BOTTOM TIME LINE
C
CALL PLOT(0.0, 75.3)
X = 1.0
CALL PLOT(X, .75, 2)
DO 20 I = 1, 10
DO 10 J = 1, 3
X = X - 0.25
CALL PLOT(X, .975, 3)
CALL PLOT(X, .675, 2)
10 CONTINUE
X = X - 0.25
CALL PLOT(X, 0.875, 3)
CALL PLOT(X, .625, 2)
20 CONTINUE

C C
C LABEL LOWER TIME AXYS
C
200: DAY = FLOAT(ITIMES(3, 2))
MON = FLOAT(ITIMES(3, 1))
YEAR = FLOAT(ITIMES(3, 4))
CALL NUMBER(0.0, 0.375, 14, DAY, 0, 0, -1)
CALL SYMBOL(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 200
DAY = 1.0
MON = MON + 1
IF (MON .LE. 12) GO TO 200
MON = 1
YEAR = YEAR + 1.0
IY = INT(YEAR)
IF(MON(IY + 1) .GT. 1900) NDAY(IY) = 29

260 IF I .EQ. 10 GO TO 300
CALL NUMBER(0.0, -125, 14, YEAR, 0, 0, -1)
CALL SYMBOL(0.0, 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
C DRAW CONDUCTIVITY AXYS
C
CALL PLOT(0.0, 2.25, 3)
CALL PLOT(0.0, 1.5, 2)

41
CALL PLOT(10.0,1.5,1)

DRAW TEMPERATURE AXES AND SCALE

CALL PLOT(10.0,2.75,3)
CALL PLOT(0.0,2.75,2)
CALL PLOT(0.0,3.5,1)

DRAW CURRENT AXIS

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)

DRAW V THEN U AXIS

CALL PLOT(10.0,5.625,3)
CALL PLOT(0.0,5.625,2)
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)

DRAW WIND AXIS

CALL PLOT(10.0,8.125,3)
CALL PLOT(0.0,8.125,2)
CALL PLOT(6.0,7.75,3)
CALL PLOT(0.0,8.5,2)

DRAW TCP TIME LINE

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
Y=Y+C*25
CALL PLOT(X,9.0,6.25,3)
CALL PLOT(X,8.625,2)
40 CONTINUE
X=X-C*25
CALL PLOT(X,9.125,3)
CALL PLOT(X,8.875,2)
50 CONTINUE

PUT TICK MARKS ON VERTICAL AXES

Y=1.5
DO 70 J=1,6
DO 60 I=1,7
CALL PLOT(-L,9.0,25+Y,3)
CALL PLOT(0.0,6.25+Y,2)
Y=Y+0.125
60 CONTINUE
Y=Y+0.375
70 CONTINUE
RETURN
END
SUBROUTINE LABEL (XSYM, XNUM, TLOW, SLOW)

WRITE LABELS FOR VERTICAL AXES

C
C
XI=XSYM
X2=XSYM+.25
X3=XSYM+.363
ENCODE(31,2CL1,LAR)

2061 FORMAT (*SALINITY* TEMP  CURRENT*)
CALL SYMNL (X1,.145,.126,LAR,.90,.0,.31)
CALL SYMNL (X2,.4,.125,.5,.19,.0,.0,.0,.1)
CALL SYMNL (X3,.4,.655,.126,.1N,.0,.0,.1)
ENCODE(33,2002,LAR)

2062 FORMAT (*SOUTH-NORTH  WEST-EAST* PRESSURE*)
CALL SYMNL (X1,.5,.10,.126,LAR,.90,.0,.33)
DO 100 I=1,6
   10 Y=8.5
      FPA=3.0
      FPNR=1.0
      FPNC=-1
      GO TO 70
   20 Y=7.25
      FPA=3.0
      FPNR=1.0
      GO TO 70
   30 Y=6.0
      GO TO 70
   40 Y=4.75
      FPA=1.0
      FPNR=5.0
      GO TO 70
   50 Y=3.5
      FPA=TLOW+6.0
      FPNR=1.0
      GO TO 70
   60 Y=2.25
      FPA=SLOW+6.0
      FPNR=1.0
   70 DO 100 J=1,7
      XNUM=FPA-1.0
      IF (I .LT. 5 .AND. J .GT. 4) XNUM=XNUM
      CALL NUMBER (XNUM, Y, 1, XNUM, M, N, TPE, F)
      Y=Y-.75
100 CONTINUE
WRITE (*,9013)
9013 FORMAT (* WRITE LABELS*)
RETURN
END
SUBROUTINE SPECPLT(SPECTRA,YLAT)
DIMENSION SPECTRA(32),OMTS(3)
PI=3.1415926
CALL PLRT(9.0,6.0,-3)
ENCOD(12,10,10,10,10,10)
1010 FORMAT(12HLOG (CM/SEC))
CALL SYMBOL(9.3,4.5,3.14,LABEL,90.0,12)
CALL NUMBER(0.4,5.925,6.04,2.0,90.0,0.1)
ENCOD(10,15,20,10,10)
1020 FORMAT(*CYCLES/DAY*)
CALL SYMBOL(9.5,1.0,0.14,LABEL,9.0,10)
C
C DRAW AND LABEL AX
C
CALL RECT(1.0,1.5,7.0,0.0,0.0,3)
Y=1.437
YNUM=-3
DO 10 I=1,8
CALL NUMBER(6.75,Y+11.2,YNUM,0.0,0.0,1)
Y=Y+.063
CALL PLOT(I,9,Y3)
CALL PLOT(I,1,Y2)
IF (I .EQ. 8) GO TO 10
Y=Y+.5
CALL PLOT(9,5,Y3)
CALL PLOT(1,05,Y2)
Y=Y+.437
YNUM=YNUM+1
10 CONTINUE
I=0.0
DO 20 I=1,9
I=I+1.0
CALL PLOT(8.9,Y3)
CALL PLOT(8.4,Y2)
IF (I .EQ. 9) GO TO 25
DO 20 J=1,5
X2=I+J/6.0
CALL PLOT(8.5,Y3)
CALL PLOT(8.05,Y2)
20 CONTINUE
25 Y=9.5
DO 30 I=1,8
Y=Y-.5
CALL PLOT(8.9,Y3)
CALL PLOT(9.1,Y2)
IF (I .EQ. 9) GO TO 30
Y=Y-.5
CALL PLOT(9.95,Y3)
CALL PLOT(9.05,Y2)
30 CONTINUE
XNUM=4.0
DX=1.2
X=16.0
DO 40 I=1,9
X=X+.0
CALL PLOT(X,1.6,Y3)
CALL PLOT(X,1.4,Y2)
40 CONTINUE
SUBROUTINE SPECPLT 73/73 OPT=1

IF (I = EQ. 9) GO TO 50
CALL NUMBER(X,15,1,25,1170XNUM,0,0,1)
IF (I = EQ. 3) DX = 4
XNUM = XNUM + Dx
DO 40 J = 1,5
XZ = X - J/6.0
CALL PLOT(X?,1,55,3)
CALL PLOT(X?,1,45,2)
40 CONTINUE
50 CALL NUMBER(1,89,1,25,1170XO,0,0,6,0,1)
C
C PLOT THE SPECTRA
C
XO = 1.0 + 10.0/12.0
Y = SPECTRA(I) + 4.5
CALL PLOT(X,Y,3)
CALL PLOT(X,Y,2)
DO 100 I = 1,47
X = XO + I/6.0
Y = SPECTRA(I) + 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* = -0.05
CALL SYMRL(Y,8.6,12,31,0.7,-1)
X* = 1.0 + 29.0/6.0
CALL PLOT(X,8,5,3)
CALL DASHPT(X,1,5,2)
X* = -0.05
CALL SYMRL(Y,8.6,112,44,0.7,-1)
DECAD(Y,10.4,30,YLAT,DEGS, YMIN)
1430 FORMAT(F2.4,1X,F5.2)
YMIN = YMIN(60,0)
DEGS = DEGS + YMIN
INERT = INT(360.*SIN(DEGS*DR/180.)) + 6
WRITE(6,6300) INERT
6300 FORMAT(5X,*INERTIAL FREQ. T5)
IF (INERT = LT. C OR. INERT .GT. 48) GO TO 70D
X = 1.0 + INERT/6.0
CALL PLOT(X,1,5,3)
CALL DASHPT(X,8,5,2)
X = -0.05
CALL SYMRL(Y,8.6,112,44,0.7,-1)
C
C DRAW 1A CONFIDENCE INTERVALS AND THE 7.4 LTMF
C
Y = 1.5
DO 150 I = 1,4,2
Y1 = 7.5 + SPECTRA(I4,0,1)
150 CONTINUE
SUBROUTINE SPECPLT

Y2 = 7.5 + SPECTRA(49 + I)
CALL PLOT(X - 0.5, Y1 + 3)
CALL PLOT(X + 0.5, Y1 + 2)
CALL PLOT(X + Y1, 3)
CALL PLOT(X + Y1, 2)
CALL SYMBOL(X - 0.2, 7.4, 0.7, 74, 0, 0.1)
CALL PLOT(X + 7.5, 3)
CALL PLOT(X + Y2, 2)
CALL PLOT(X - 0.5, Y2 + 3)
CALL PLOT(X + 0.5, Y2 + 2)
T = Y2 + 0.5
CALL NUMBER(X - 1.05, Y2 + 0.4, 75, 0, 0.7, 0, 1)
CALL SYMBOL(X + 1.05, Y2 + 0.4, 75, 0, 0.7, 1)
X = 8.5
150 CONTINUE
ENCOD(30, 8C20, NOTS)
A62C FORMAT(3(10H**********))
CALL SYMBOL(7.05, 1.43, 75, 0, NOTS, 90, 0, 30)
GO TO 999
900 WRITE(6, 990C)
9000 FORMAT(5X, INTERNAL FREQUENCY OUT OF ROY.
999 RETURN
END
SURROUNTE PVDDPLT

DIMENSION DRIVPLT(3)
PI=3.1415926
STOT=0
ICNT=0

CALL PLOT(12.0,0,0,-3)
ITEM=INT(RANGE/7.0)
GO 10 I=1,10
ITEM=ITEM+1
IF (ITEM NEQ. 10) GO TO 40
10 CONTINUE

40 DX=FLOAT(ITEM)
UVSCALF=1./DX

CALL AXIS(0.0,1.5,10,HST,10.0,0.0,0.0,0.0)
CALL AXIS(0.0,1.5,10,HST,10.0,0.0,0.0,0.0)
CALL PLOT(0.0,0.8,5.3)
CALL PLOT(7.0,0.8,5.3)
CALL PLOT(7.0,1.5,1)

CALL PLOT(1.0,1.0,0.0)
CALL SYMOL(X,Y,.C9,.46,.7,-1)
XSTART=X
YSTART=Y

100 READ(11),U,V
IF (EOF(11)) 150,110
110 X=X+(U*DELMIN+G0DE)*UVSCALF
Y=Y+(V*DELMIN+G0DE)*UVSCALF
CALL PLOT(X,Y,1)
STOT=STOT+SORT(U+U+V+V)
ICNT=ICNT+1
GO TO 100

150 CALL SYMOL(X,Y,.W9,.5,.7,-1)
XSTOP=X
YSTOP=Y
XRANGE=XSTOP-XSTART
YRANGE=YSTOP-YSTART
RADS=ATAN2(YRANGE,XRANGE)
IF (RADS LEQ. PI/2) RADS=PI/2-RADS
IF (RADS LT. PI/2) RADS=PI/2-RADS
IDEGS=INT(RADS*180./PI)
RANGE=SORT(XRANGE*XRANGE+YRANGE*YRANGE)
CNT=FLOAT(ICNT)
SUBROUTINE PVDPLT  73/73  OPT=1  

DAYS=CN T/24.0
SECS=CN T*3600.
CMS=RANGE*10000./LVSCALE
DRIFT=CMS/SECS
SMEAN=STOT/CNT

ENCODE(26,8(10,DAY) DAYS
FR010 FORMAT(*RECORD LENGTH=*,F7.2,* DAYS*)
CALL SYMBOL(-19.0+3.5,+21,DAY,0.0,26)
ENCOD(30,8(2G,8(8,C8.8)
DRIFT,INFG
FR020 FORMAT(*NET DRIFT=*,F6.2,* CM/SEC, *,(3,* T*)
CALL SYMBOL(-14.9+3.0,+7,DRFT,0.0,30)
CALL SYMBOL(-13.95+3.16,+0.94,9,9,-1)
ENCOD(24,8(25,MEAN) SMEAN
FR025 FORMAT(*MEAN SPEED=*,FA,7,* CM/SEC*)
CALL SYMBOL(-19.0+2.5,+21,MEAN,9,9.24)

C
REPOSITION TAPE I AND RETURN.
C

RE0IND 1
READ (1) DUMP
READ (1) DUMP
RETURN
END
SUBROUTINE PLOTEM(NPTS, YTOP, YMT, U9, W0, W1, X0, XI, TPLT, SPLT)
COMMON (U(240), V(240), W(240), USCALF, VSCLAE)
LOGICAL TPLT, SPLT, PPLT

C C C

C PLOT THE U ARRAY FROM LEFT TO RIGHT
C C
IF (YTOP .LT. 3.0 .AND. .NOT. TPLT) GO TO 60
Y=YTOP+U*USCALF
CALL PLOT(X, Y, 3)
Y=YTOP+U(1)*USCALF
CALL PLOT(X, Y, 2)
GO TO 10
I=2*NPTS
X=XI+(I-1)/24.0
Y=YTOP+U(I)*USCALF
IF (Y .LT. 7.25) GO TO 20
CALL PLOT(X, Y, 2)
10 CONTINUE
GO TO 60
20 X=XI+I/24.0
Y=YTOP+U(I+1)*USCALF
IF (Y .LT. 7.25) Y=7.75
CALL PLOT(X, Y, 3)
GO TO 10
C C C

C PLOT THE V ARRAY FROM RIGHT TO LEFT
C C
60 IF (YBOT .LT. 2.0 .AND. .NOT. SPLT) GO TO 10C
Y=YBOT+V(NPTS)*VSCLAE
CALL PLOT(X, Y, 3)
CALL PLOT(X, Y, 2)
GO TO 70
I=1
NPTS
X=XI+(NPTS-I)/24.0
IV=NPTS-(I-1)
Y=YBOT+V(IV)*VSCLAE
IF (Y .LT. 1.25) GO TO 80
CALL PLOT(X, Y, 2)
70 CONTINUE
Y=YBOT+V*VSCLAE
CALL PLOT(X, Y, 1)
GO TO 100
80 X=XI+(NPTS-I-1)/24.0
Y=YBOT+V(I-1)*VSCLAE
IF (Y .LT. 1.25) Y=1.5
CALL PLOT(Y, Y, 3)
GO TO 70
C C C

C PLOT THE W ARRAY
C C
100 IF (YTOP .GT. 3.0 .OR. .NOT. PPLT) GO TO 999
Y=Y+1.25+W(1)*1.25
CALL PLOT(X, Y, 3)
Y=Y+1.25+W(1)*1.25
CALL PLOT(X, Y, 2)
GO TO 100
I=2*NPTS
X=XI+(I-1)/24.0
Y=Y+1.25+W(I)*1.25
IF (Y .GT. 6.75 .OR. Y .LT. 7.25) GO TO 140
SUBROUTINE PLOTC  73/73  OPT=1  FTN 4.5+410

   CALL PLOT(X,Y,Z)
120  CONTINUE
   GO TO 999
140  X=X+I/24.0
       Y=Y+125*(1+I)*.125
       IF (Y.GT.P .OR. Y.LT.7.9) Y=A.125
       CALL PLOT(X,Y,3)
   GO TO 120
999  RETURN
   END

SUBROUTINE STKPLT  73/73  OPT=1  FTN 4.5+410

   SUBROUTINE STKPLT(NPTS,XY,XO,YO,DELT)
   COMMON U(740),V(240),W(240),USCALF,VSCLAF
   XLEN=DELT/1440.
   DO 10 I=1,NPTS
       YC=YO+XLEN
       CALL PLOT(XG,YG,3)
       XG=XG+U(I)*USCALF
       YG=YG+V(I)*VSCLAF
       CALL PLOT(XG,YG,2)
   10  CONTINUE
   RETURN
   END