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MEMORANDUM REPORT ARBRL-MR-03259

A PROCEDURE FOR THE SEMIAUTOMATIC
REDUCTION OF EXPERIMENTAL DATA
DIGITIZED FROM ANALOG TAPE

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US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
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I. INTRODUCTION

Studies of the interior ballistics of guns and rockets and the dynamics of weapon systems require the recording and analysis of large amounts of time-correlated information. The type of information associated with ballistic phenomena usually has a high frequency content and a short duration. Wide-band, frequency-modulated (FM) magnetic tape recorders are used to record this type of data. These recorders have the capability of recording simultaneously fourteen channels of 80 kilohertz (kHz) data at their maximum recording speed. A problem arises with this type of recording when an automated data reduction system is used. The problem is that automated data reduction methods invariably use a digital computer which requires that the information be in binary format. The obvious solution is to sample the original FM tape at an appropriate rate and to convert the information from analog form to digital form (A/D) which can then be recorded on a digital tape.

Since the digitizing equipment used in the Interior Ballistics Division (IBD) of the Ballistic Research Laboratory (BRL) either was not computer-controlled or has severe main memory limitations, the IBD recently purchased a Hewlett-Packard (HP) minicomputer, Model 1000-F, with which to digitize firing data, off-line, from analog tapes. The biggest advantage to this system is that the available main memory does not limit the amount of data which can be digitized in one pass; this is accomplished using a double buffering technique which effectively allows the transfer of data from tape directly to disc. The capacity of the disc now becomes the limiting factor of the amount of data digitized. Reports on the actual A/D equipment and the associated software will be published soon.

The data, once digitized and stored on the disc, can then be transported to the mainframe. At BRL, this is a CDC CYBER System: 1) mainframe A (MFA), a CYBER 170/173, and 2) mainframe Z (MFZ), a CYBER 70/76. A CalComp plotter, Model 1055, is a peripheral to that system.

A procedure is described in this report for the step-by-step processing of these data until they are converted into engineering units and then stored on a permanent file, integrated, tabulated, and/or plotted. The computer programs involved are given as well as sample inputs and outputs.

II. CONVERSION OF DATA ON ANALOG TAPE TO DIGITAL TAPE

An oscillograph record of a single channel of interior ballistic data is shown in Figure 1. It is an analog pressure-time record, with calibrations, reproduced from one channel of a 14-channel magnetic tape. To convert this record to digital form, an A/D converter samples the analog signal at a selected time and at an appropriate rate. It is important that the sampling times and rates preserve the original pressure-time relationship; i.e., the sampling times must be directly related to the real time of the event.

The sampling rate for the calibration steps is somewhat arbitrary. The only basic requirement is to get enough samples to make a reasonable evaluation of the level by averaging. The sampling rates for the record portion must next be determined. In this case, the sampling rate is more critical. If the rate is too low, there will be insufficient information to reconstruct the continuous record. For example, in Figure 1, if a 5 kHz

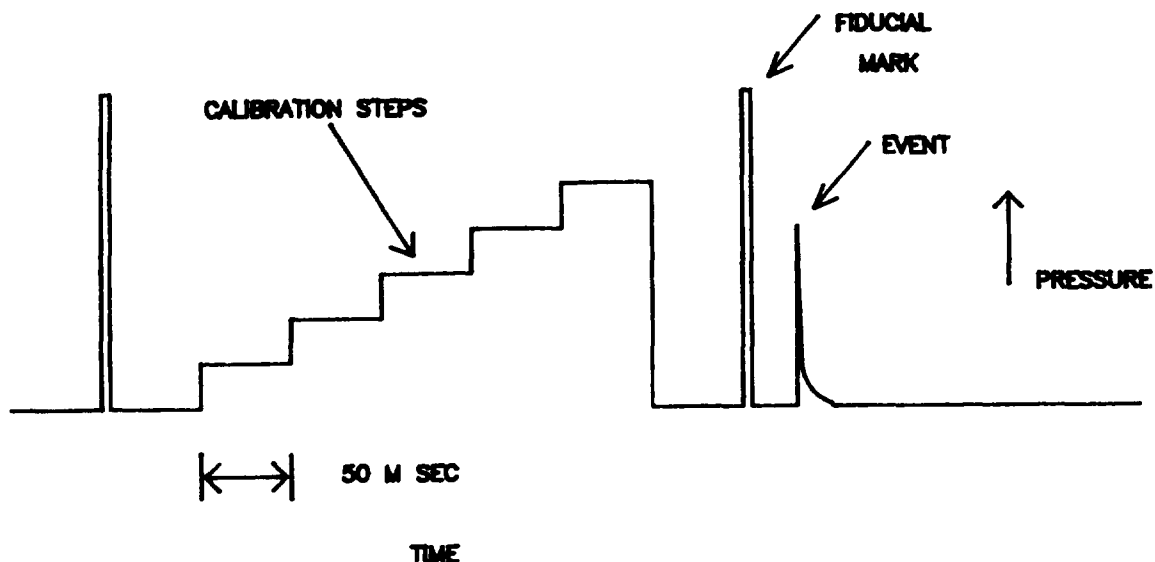


Figure 1. Analog Pressure-Time Record

sampling rate is used for the pressure-time portion, it would be impossible to make an accurate peak pressure measurement from the few samples obtained. Conversely, if the sampling rate is higher than that necessary to reconstruct the signal, expensive computer time will be wasted processing unnecessary data. It is obvious that a million samples would not necessarily produce a better defined record, indicating that there is a direct relation between the rate that the data vary and the number of the samples needed to accurately reconstruct it. The rate that a signal varies is directly related to its maximum frequency content or bandwidth. The commonly used sampling rate is five times the maximum data frequency content or bandwidth of the signal.

The bandwidth of an FM tape recorder is directly proportional to the tape speed. The actual bandwidth versus speed varies with the recorder; for instance, using FM Wide Band I at 120 inches per second (ips) the FM bandwidth is 80 kHz, at 60 ips the bandwidth is 40 kHz, etc. A proper sampling rate can therefore be selected based on the tape speed. For example, to record information with a frequency content of 40 kHz, the tape speed would be set at 60 ips which would indicate a 200k samples per second rate that is five times the bandwidth.

For data channels with calibration steps, one has a choice of two digitizing procedures. Normally the calibration duration is approximately 300 milliseconds, while the event lasts only ten or twenty milliseconds. The first choice is to make two passes over the data: one at a low digitizing rate for calibration steps and one at a high rate for the event. Often this method leads to bookkeeping uncertainties in matching calibration steps to the event. The second, and more preferred, choice is to digitize both calibration steps and the event at the higher digitizing rate and to eliminate the uncertainty, even though many more data are generated. The excess data can then be eliminated at a later time as discussed in Step 3.

The HP digitizer has the capability to digitize up to 16 channels of data in one pass of the analog tape. Consequently, the data that are stored on the disc are interwoven; that is, they are stored $x_1, y_1, \dots, z_1, x_2, y_2, \dots, z_2, \dots$. These data need to be sorted and this is discussed in Step 2.

Next, the data on the disc file of the HP1000 must be transported to a disc file on the BRL mainframe where the data analysis programs reside. The data can be transported in two ways: 1) They can be transferred to a 9-track digital tape which is then hand-carried to the CYBER tape library. 2) They can be transmitted interactively from the disc through an HP9845 desktop computer/terminal to the CYBER MFA via a modem link. This process is discussed in Step 1.

Step 1. Creating a file on CYBER MFA or MFZ

Data can be transferred between the HP1000 and the CYBER using the modem link on the HP9845 or using magnetic tape. Each method is discussed below.

A. Modem link

1. We have chosen not to link the HP1000 directly to the CYBER. Instead, the connection to the CYBER is through an HP9845 using an emulator routine which makes the terminal look like a Tektronix 4014 to the CYBER.
2. An HP9845 is connected to the HP1000. Data can be transferred from the HP1000 to the HP9845 and then to the CYBER. The reverse transfer can also be made.
3. This method is slow and is not recommended for large data files.
4. Directions for using the HP9845 communications are given in Appendix A.
5. The disc file on the CYBER MFA contains data in the following format:

Record 1 contains

DT	Time between samples
INW	Number of data words

Records 2,3...contain

INW data words

All data are in format (4E20.14). If INW is not a multiple of four, the remainder of the last record is filled with zeros.

B. Magnetic Tapes

1. At the present time, this method is still the most efficient and least time-consuming way to transfer large amounts of data to the CYBER. Interactive usage on MFA greatly increases the clock time for a job which uses tapes. It is faster and cheaper to read tapes on MFZ. The user has the option of reading his tapes on either MFA or MFZ.
2. Directions for using the procedures to read specific digital tape formats and an example are given in Appendix B.

3. The disc file created on the CYBER by the program which reads the HP tape contains data in the following format:

Record (buffer) 1 contains header information

ITYPE	Type of File	(0: A/D file)
NAMEF	File name on the HP1000 tape	
MSSG	Tape label	
NCHAN	Number of channels	
LRECL	Logical record length	
NREC	Total number of records	
IREC	Number of data records (NREC - 1)	
SRATE	Sampling rate	
IPBR	Tape speed factor	
DT	Time between samples	

Records (buffer) 2 through NREC contain the data.

This format is repeated for all the files on the HP1000 tape.

4. To read the disc file containing the data, you must use an unformatted READ for the data records for each file transferred.

The FORTRAN statements required are as follows:

```
10  READ(u)  ITYPE,NAMEF,MSSG,NCHAN,LRECL,NREC,IREC,SRATE,IPBR,DT
    IF(EOF(u).NE.0)  GOTO 100

    DO 20 J=1, IREC
        READ(u)  INW, (IDATA(I),I=1,INW)
        .
        .
        .
20  CONTINUE
    .
    .
    .
    GOTO 10
    .
    .
    .
100 STOP
```

NOTE: 1) Since the current maximum logical record length in the programs which create these tapes is 8192 (16-bit words), the number of CDC 60-bit words required is 2185 per record (buffer). The actual limit in the CDC program to read the tapes is 3000.

2) At the moment, only A/D tapes (ITYPE=0) are converted. Other types of tapes will be developed later. If it becomes necessary to read these tapes on the CYBER, appropriate changes will have to be made in the conversion program. The program will print a warning if ITYPE $\neq$ 0, but it will not prevent execution.

- 3) u is the unit number you assign to read your disc file in your PROGRAM statement.
- 4) INW is the number of samples in each record.
- 5) Unformatted input/output transfers data between main memory and an external storage device. Data are not converted to any format when read or written this way. However, the user should be aware that the data, when written in a formatted WRITE, are actually INTEGER data.

Once the data have been transferred to a CYBER disc file, they must be sorted since, when the digitization is done, all channels of interest are sampled at one analog tape position before proceeding to the next position. This is Step 2.

Step 2. Sorting the data into contiguous sequences.

The data are obtained by sampling all channels from the analog tape to be digitized at a given position before moving on to the next position, as illustrated in Figure 2.

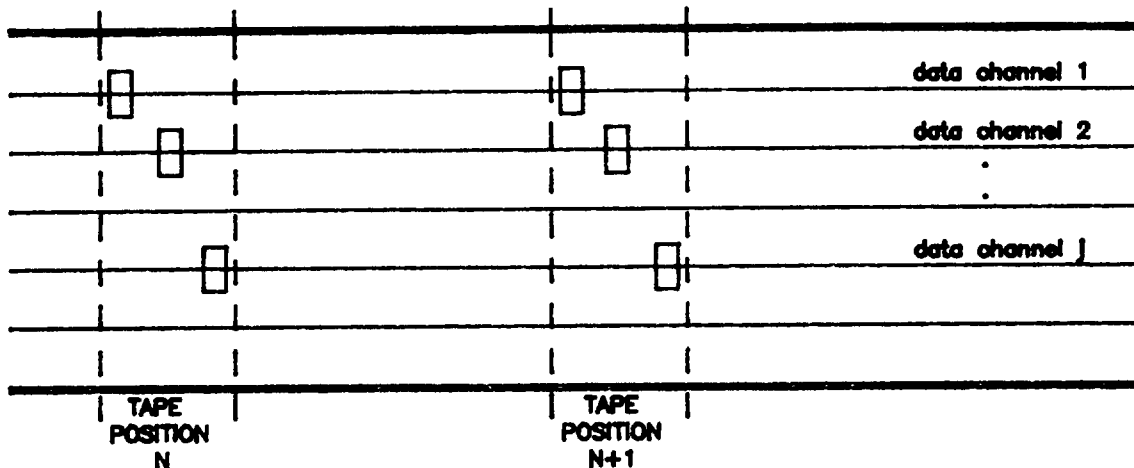
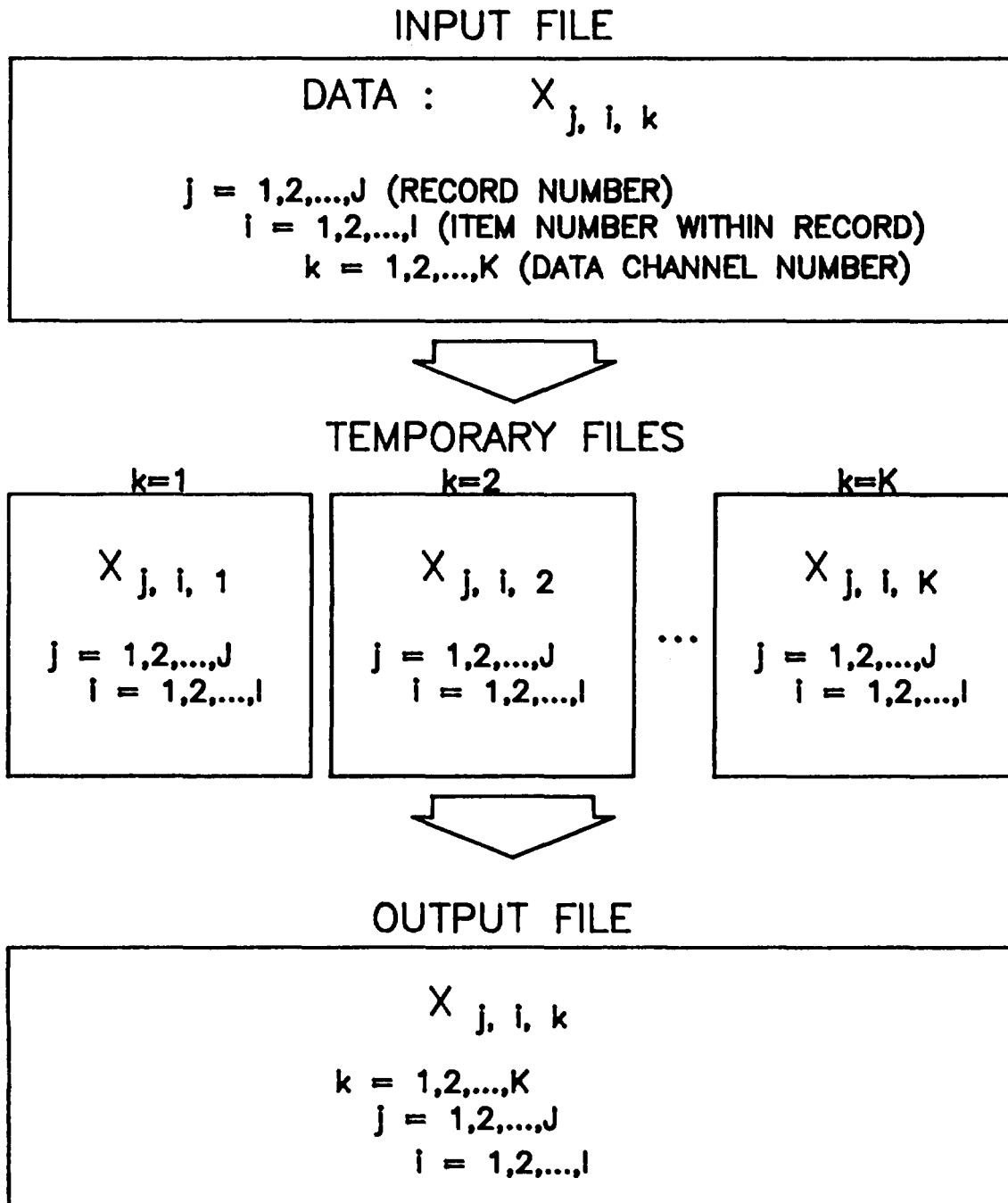


Figure 2. Data Sampling Format

Since the analog tape is actually moving at a constant speed, there is a slight time skew from channel to channel, but this skewness is normally negligible compared to the sampling rate.

A computer program has been written for MFZ to sort the data into contiguous sequences, plot the sequences, and write a permanent file for the next step. (See Appendix C.) Since all of the data for one channel are not in memory at any one time, several sequences are formed and stored on temporary files, one file for each channel, until the end of the digitizing pass. Each temporary file is then written, in order, to the permanent file in such a way that all of the sequences for the first channel are written first, all of the ones for the second channel are next, and so forth. This procedure is illustrated in Figure 3.



NOTE: Temporary files are necessary because the data are read one record at a time and the quantity of data may be very large.

Figure 3. Schematic of the Procedure To Sort the Data

In the example shown in Figure 4, the calibration steps and the event are digitized in the same pass. This method creates an excess of data points. An editing procedure to save only the pertinent data is discussed next in Step 3.

Step 3. Editing the Data File

A typical channel of data can be divided into seven sections, as shown in Figure 5. Not all channels contain every section. Sections 1, 3, 5, and 7 contain data which can be deleted; however, the duration of Section 5 must be accounted for if time is counted from the fiducial mark in Section 4 and is stored in the variable TSTART on the output file. Using this rationale on the example in Figure 4, sequences 1, 2, 13, 17, 18,...,23 can be deleted. Now, sequences 3 through 12 make up section 2; sequence 14 makes up section 4; and, sequences 15 and 16 make up section 6. There is no section 5 in this example. Next, we sample section 2 at equally spaced intervals. Thus, using this method, we have vastly reduced the number of data points.

A computer program has been written for MFZ to edit the data, plot the results, and write a permanent file to be used in Step 4, where the conversion to engineering units is done. The input parameters required for the program are: 1) the sequence numbers where sections 2 through 7 start, 2) the sampling interval for the calibration steps (for instance, if one sample is taken for every fifty input data points - the interval equals fifty), 3) the sampling interval for the event, and 4) the option to print a message. For the example in Figure 5, the input, format 9I5, would be:

3 13 14 15 15 17 50 1 0

Following this process, the data points for a given channel can finally be merged into one sequence. A computer listing of Step 3 is in Appendix D. A plot of the results thus far is shown in Figure 6.

Step 4. Converting to Engineering Units

A computer program¹ was written several years ago to convert digitized data into engineering units. The program was modified to accept the data produced in Step 3. The mechanics of handling the data are different, but the actual conversion is the same. The equipment producing the data and recording them on analog tape has not changed; just the digitizing equipment has changed. This FORTRAN IV program directs the digital computer to read the information from the computer file, perform the many necessary calculations, and provide the reduced data in tabular and/or plotted form as output of the computer. This program, which is in modular form, has many options which are chosen according to the particular input data and the desired output. The options available to date in the program are: (1) calibration, (2) location of a step function, (3) conversion of the dependent variable to engineering units, (4) integration of the dependent variable, (5) plotting of the output data, and (6) tabulation of the output data.

¹C.L. Henry, R.L. Martz, E.M. Wineholt, "An Improved Procedure For The Reduction of Interior Ballistic Data Recorded on Analog Tape," BRL MR 2374, April 1974 (AD 919924L).

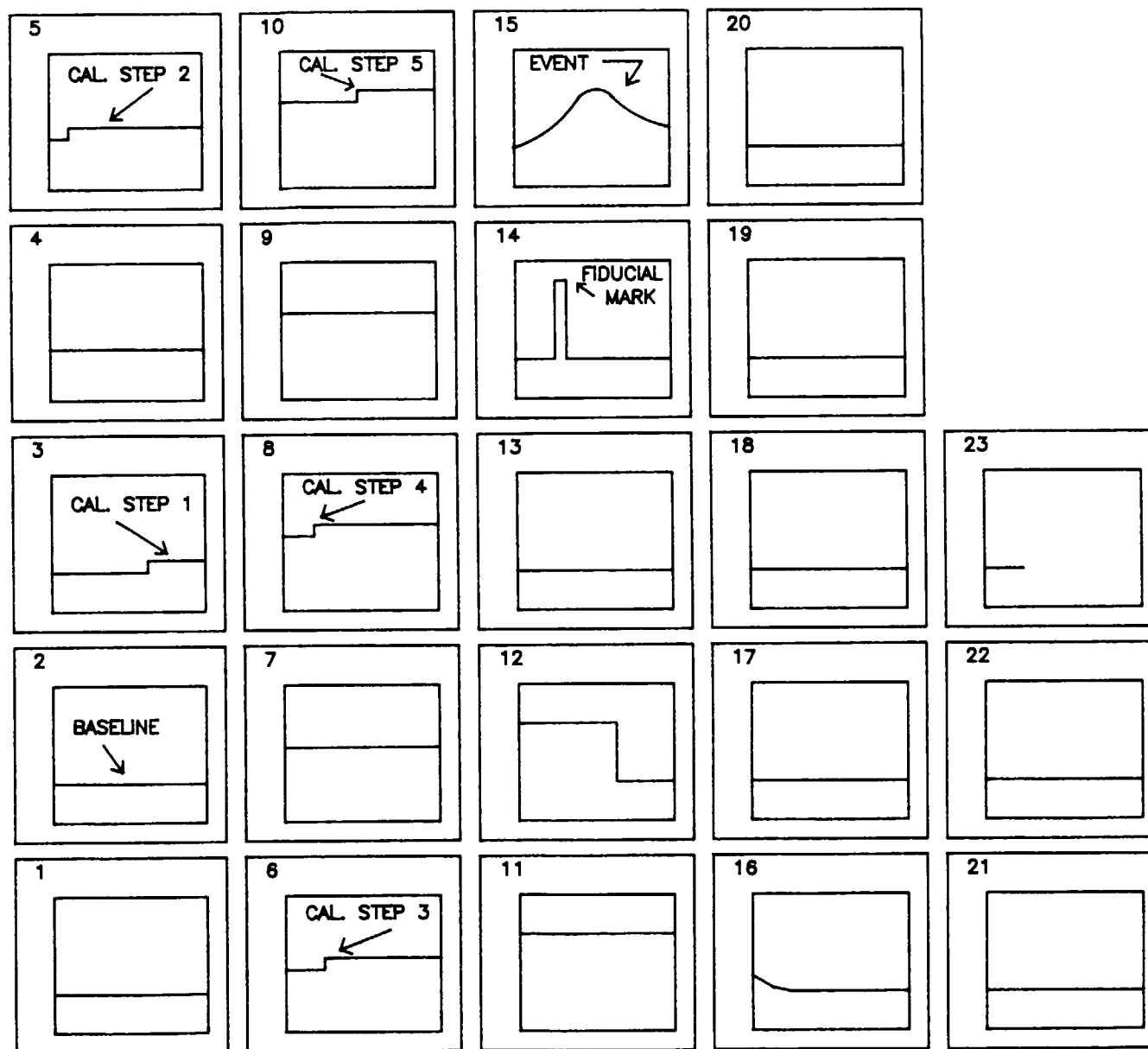


Figure 4. An Example Showing the Sequences of a Data Channel at the End of Step 2

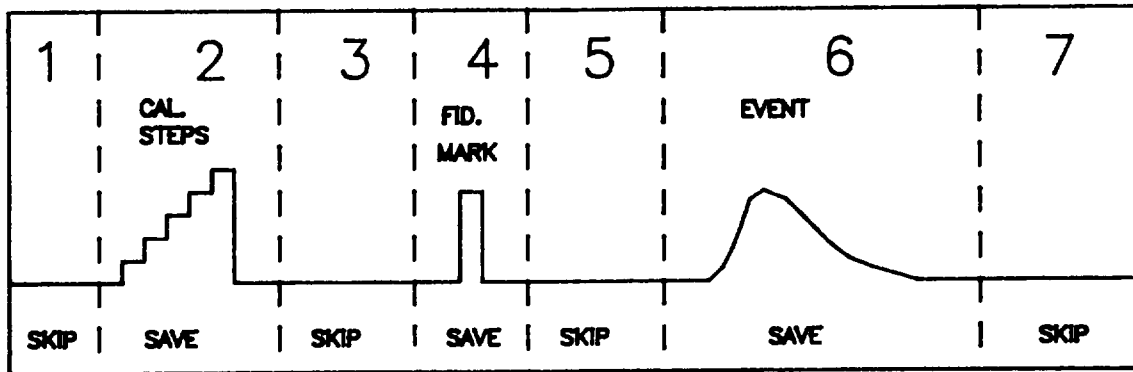


Figure 5. Typical Sections of a Data Channel

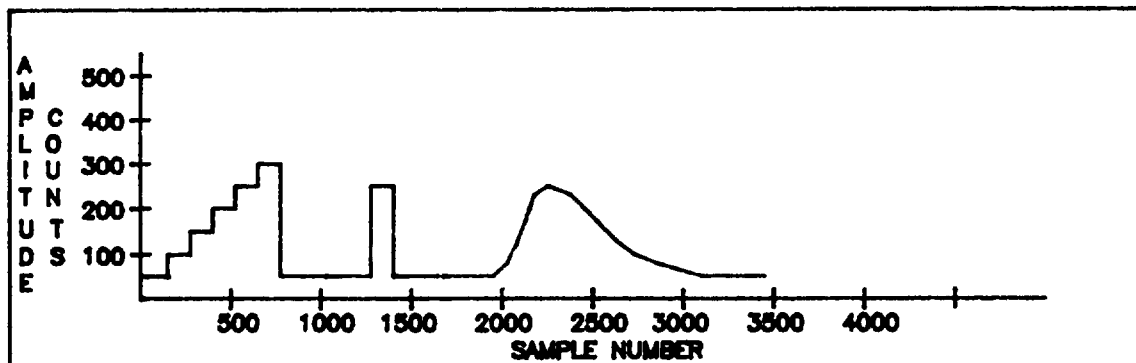


Figure 6. An Example of the Data Remaining After Editing

Basically, the conversion is accomplished by fitting a second-degree polynomial by the method of least squares to the amplitudes in counts of the calibration steps which have known values in engineering units. Thus, the relationship between engineering units and counts is determined and the conversion can be accomplished. The time for each data point relative to the fiducial mark is also calculated. The option to integrate once or twice is provided as well as the option to plot or not. A listing of the program and a sample input and output are in Appendix E.

Various parameters are necessary input data for the program, as illustrated in Figure 7. They are:

1. NX The number of samples to be averaged for each calibration step,
2. NY(i), i=1,...,NS The sample indices marking the position on each calibration step to start processing data, (NS ≤ 6)
3. ITZ The number of samples to skip after sampling the last calibration step before starting to search for the fiducial mark,
4. IX The number of samples to skip after the fiducial mark to reach the data which are to be converted to engineering units,
5. IBSE The number of samples to skip after the fiducial mark before starting to sample the baseline,
6. B The calibration constant for the gage in engineering units per calibration step, and
7. DLTM A time adjustment to be subtracted from the value at the fiducial mark, TSTART, which comes from the data file.

Some channels of data may not have a fiducial mark so the program has the option to skip that part. Time is then counted from the first sample.

These parameters and other control variables either have default values which can be changed using NAMELIST or are read in as card images. The details and an example are provided in Appendix E.

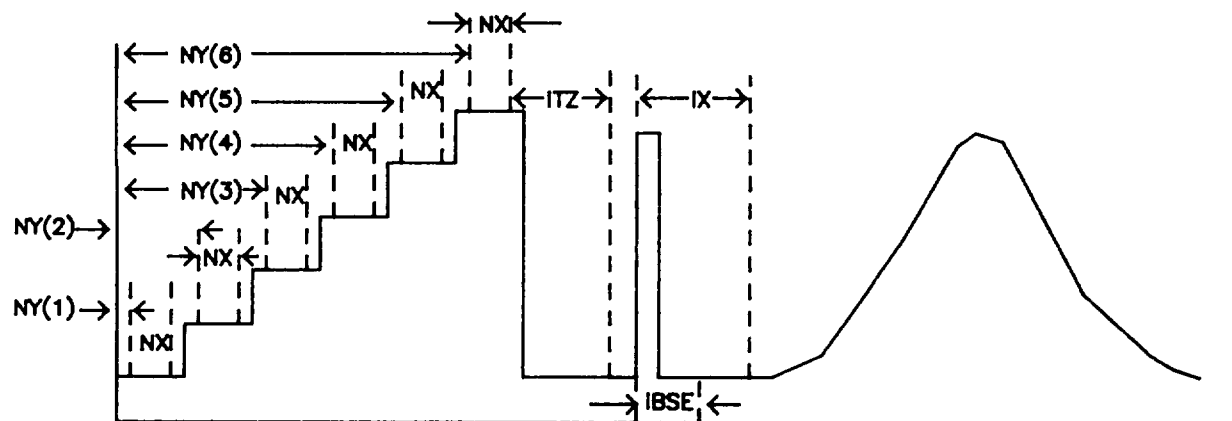


Figure 7. Graphic Explanation of Input Parameters

III. CONCLUSIONS

To convert experimental data digitized by IBD's HP1000 minicomputer system into the same computer file format required by existing computer programs, a four-step procedure has been devised. Separate steps are necessary because engineering judgments must be made before further processing is possible. These steps are:

1. Reading the data into a computer file,
2. Sorting the data so that all the data samples for one channel are contiguous in a file,
3. Editing the data so that unnecessary samples are not processed further, and
4. Converting the data into engineering units and creating an output file with the same format as previously generated in Reference 1.

This output file now contains the data in the format required for input into numerous experimental data analysis programs.

APPENDIX A

INPUT TO CYBER MFA VIA MODEM LINK ON HP9845

APPENDIX A

1. Preparation.

a. Turn on HP9845 and 7906 disc drive.

b. When disc drive is ready,

LOAD "ANPACK:D12",10

EXECUTE

c. When menu appears,

K3 (Data Communications)

d. Choose data link.

1 **CONT** for HP1000 or 2 **CONT** for CDC

e. Specify HP9845 file.

When "terminal ready" message appears, indicating the terminal emulator program is loaded, then

K13 (1) To get into edit mode

(2) It is not necessary to change any info on the first line. If you are going to the CDC and you do not want your password displayed on screen, you may want to change ECHO to ON by using **→** to space over and use STEP key to change to 'ON'.

STORE - To store data communication information line

(3) This line needs to be changed to the name of file and its size on the HP9845.

Change TEST:TI5 to filename:C12

Change SIZE=010 to # of records you want

STORE - To store file info line

(4) Will get a message that edit mode has been exited.

(5) If this is a new file, then it must be created. If it is not, skip this step.

SHIFT K12 To create file on HP9845
Answer "Y" to creation question. Message will appear on screen when creation is completed.

f. **CONT** Sends prompt to CDC or HP1000. Wait for LOGIN messages.

2. From CDC to HP9845.

a. LOGIN to CDC

b. Repeat I.E.(1) through I.E.(4), changing first edit line back to ECHO OFF if you turned it ON.

c. /GET,A=Pfn. **CR** = **CONT**

/ASSIGN,TT,B. **CR**

/COPYSBF,A,B. No **CR** !

SHIFT **K15** to turn record on

CONT

d. When finished recording,

SHIFT **K15** to turn record off

e. Log off CDC

/BYE

f. **SHIFT** **K4** to disconnect from CDC;

now back under control of HP9845.

3. From HP9845 to CDC

a. LOGIN to CDC

b. Repeat I.E.(1) through I.E.(4), changing first edit line back to ECHO OFF if you turned it ON.

c. Terminal definition defaults are set to emulate a Tektronix 4014 with a page width of 80 columns. If you need to set the terminal definition (TC parameter) to another terminal or the page width to a different size, then enter

/TRMDEF,TC= ,PW= .

See the NOS IAF Manual for parameter values. For most data transfers from the HP9845, the default parameters will be good and this step can be skipped.

d. Data transfer procedure:

NEW,LFN1

TEXT

'Enter Text Mode' message returned by CDC

SHIFT

K14

"N" to handshake message from the HP9845

Data being transferred will be displayed on screen.

When all data has been transferred,

CONTROL

T

then

CONT

=

CR

This terminates the input in TEXT mode and gets you back to READY mode in IAF.

- e. Check the data transfer:

/REWIND,LFN1

/LIST,F=LFN1

- f. To save the file:

/SAVE,LFN1=PFN/PW=_____,M=_____,CT=_____.

- g. Disconnect procedure:

/BYE

SHIFT

K4

4. From HP9845 to HP1000.

- a. Log in to HP1000.

- b. Repeat steps I.E.(1) to I.E.(4), changing file info line to correct file name and file size.

- c. :ST,1,NAMR - No **CR** = **CONT**

SHIFT

K14

Upload

"N" to handshake question

CONT

- d. When finished transferring to HP1000,

DO NOT **SHIFT** **K14** as this will cause great problems.

- e. Be careful not to hit

SHIFT

K15

as this will write all kinds of error messages over your file on the HP9845.

- f. Log off HP1000

:EX,SP

g. **SHIFT** **K4** to disconnect.

5. From HP1000 to HP9845.

a. Log in to HP1000.

b. Repeat steps I.E.(1) to I.E.(4), changing file info line to correct file name and file size.

c. ST, NAMR,1 No **(CR)** = **CONT**

SHIFT **K14** to turn record on

CONT to start recording

d. When finished recording,

SHIFT **K14** to turn record off

e. Log off HP1000

:EX,SP

f. **SHIFT** **K4** to disconnect

APPENDIX B

INPUT TO CYBER VIA MAGNETIC TAPE

APPENDIX B

1. MFA

```
Usern.  
USER,username,password.  
CHARGE,account,project number.  
GET,HPTAPEB.  
FILE,TAPE7,CM=NO.  
BEGIN,GET,TAPE,LF=TAPE7,VSN=vsn,DEN=1600,TK=9,LABELED=NO,S.  
    where vsn=tape library number  
HPTAPEB.  
REWIND,TAPE10.  
SAVE,TAPE10=pfn.  
    where pfn = name of disc file you are creating.
```

Note that input tape from the HP1000 must be on unit 7 and your output disc file is on unit 10.

2. MFZ

```
Usern,STMFZ,P4,NT1.  
ACCOUNT,account.  
BEGIN,READZ,HPTAPEP,VSN=vsn,PF=pfn,ID=userid.  
  
    where vsn = tape library number,  
           pfn = name of disc file you are creating, and  
           userid = your ID on MFZ.
```

It is strongly recommended that you use this procedure and copy your file from MFZ to MFA if you need the data on MFA.

3. Listing of MFA file ADTAPE1/UN=BOOTS:

```
BOOTS,STMFZ,P6,NT1.  
ACCOUNT,PDxxx.  
BEGIN,READZ,HPTAPEP,VSN=6978,PF=LOLA2,ID=BOOTS.
```

APPENDIX C
IMPLEMENTATION OF STEP 2

APPENDIX C.1.a

Listing of MFA File ADTAPE2/UN=BOOTS

APPENDIX C.1.a

Listing of MFA File ADTAPE2/UN=BOOTS

a. Job Control Language

```
BOOTS,STMFZ,P6,T100.  
ACCOUNT,PDxxx.  
BEGIN,ATTACH,PLOTLIB.  
ATTACH,TAPE1,LOLA2,ID=BOOTS.  
REQUEST,TAPE3,*PF.  
REQUEST,TAPE2,*PF.  
REQUEST,TAPE13,*PF.  
FTN,R=0.  
LGO.  
EXIT,U.  
BEGIN,PLOT,CALCOMP,TAPE13.  
CATALOG,TAPE3,LOLAD,ID=BOOTS.  
CATALOG,TAPE13,PLTT,ID=BOOTS.
```

APPENDIX C.1.b

Program

```

1      PROGRAM RDHTD(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE1,TAPE3,
* TAPE13,TAPE14,TAPE15,TAPE16,TAPE17,TAPE18,TAPE19,TAPE2,
* TAPE20,TAPE21,TAPE22,TAPE23,TAPE24,TAPE25,TAPE26)
5      COMMON ISTR(2500),COUNT(2500),NCH,NBLK,NU,K,IRD,CH1(2500),IK,ISU,
* CH2(2500),CH3(2500),CH4(2500),CH5(2500),CH6(2500),CH7(2500),NCY,
* CH8(2500),CH9(2500),CH10(2500),CH11(2500),CH12(2500),CAL(2500)
* ,NCAL,NCHA,NSSQ(8),IPL,IDIM,NAMEF,DT,JJ,NUS
      IDIM=2500
      IPL=1
10     IRD=0
      50 WRITE(6,1000)
      CALL RDDTA(1)
      DO 60 IU=14,26
      REWIND IU
15     60 CONTINUE
      IRD=IRD+1
      NBR=NCH*(IDIM/NU)
      NCY=NBLK/NBR
      IF(NBLK-NCY*NBR.NE.0) NCY=NCY+1
20     ISU=1
      IK=1
      NUS=0
      NCAL=0
      NCHA=0
25     DO 500 I=1,NCY
      IF(I.EQ.NCY.AND.IABS(NBLK-NCY*NBR).NE.0)NBR=IABS(NBLK-(NCY-1)*NBR)
      DO 100 N=1,NBR
      CALL RDDTA(2)
      CALL DEULT(N)
30     100 CONTINUE
      K=K+1
      CALL WRTDTA
      500 CONTINUE
      WRITE(6,1100) NCAL,NCHA
35     CALL WRTTPE
      GO TO 50
1000  FORMAT(1H1)
1100  FORMAT(' NO. OF CAL BLKS',I10,5X,'NO. OF DATA BLKS',I10)
      END

```

```

1      SUBROUTINE DEMULT(ICYL)
      COMMON Istor(2500),COUNT(2500),NCH,NBLK,MJ,K,IRD,CH1(2500),IK,ISU
      * CH2(2500),CH3(2500),CH4(2500),CH5(2500),CH6(2500),CH7(2500),NCY,
      * CH8(2500),CH9(2500),CH10(2500),CH11(2500),CH12(2500),CAL(2500)
5      * NCAL,NCHA,MSSG(8),IPL,IDIM,NAREF,DT,JJ,MUS
      IF(ICYL.EQ.1)JJ=0
      IF(RJ.EQ..0)JJ=0
      IF(JJ.EQ.0)MS=1
      IF(ICYL.EQ.1)K=1
10     MUS=MUS+MJ
      RJ=MOD(MUS,NCH)
      IF(JJ.GT.0)GOTO115
90    DO 100 M=MS,MJ,NCH
      IF(RJ.GT.0..AND.M+NCH.GT.MJ) GO TO 110
15     IF(ISU.EQ.1) IK=K
      ISU=2
      IF(NCH.GE.1) CH1(K)=ISTOR(M)
      IF(NCH.GE.2) CH2(K)=ISTOR(M+1)
      IF(NCH.GE.3) CH3(K)=ISTOR(M+2)
20     IF(NCH.GE.4) CH4(K)=ISTOR(M+3)
      IF(NCH.GE.5) CH5(K)=ISTOR(M+4)
      IF(NCH.GE.6) CH6(K)=ISTOR(M+5)
      IF(NCH.GE.7) CH7(K)=ISTOR(M+6)
      IF(NCH.GE.8) CH8(K)=ISTOR(M+7)
25     IF(NCH.GE.9) CH9(K)=ISTOR(M+8)
      IF(NCH.GE.10) CH10(K)=ISTOR(M+9)
      IF(NCH.GE.11) CH11(K)=ISTOR(M+10)
      IF(NCH.GE.12) CH12(K)=ISTOR(M+11)
      GO TO 60
30     50 CAL(K)=ISTOR(M)
      60 K=K+1
      IF(K.EQ.11..AND.ISU.EQ.1) WRITE(6,1000) IRD, (CAL(J),J=1,10)
      IF(K.EQ.11..AND.ISU.EQ.2) WRITE(6,1000) IRD, (CH1(J),J=1,10)
35     100 CONTINUE
      RETURN
40     110 JJ=MJ-M+1
      MM=MJ-JJ+1
      GO TO 120
      115 MM=-JJ+1
      JS=JJ
      JI=JJ+1
      JJ=NCH
      MS=NCH-JS+1
45     GO TO (120,121,122,123,124,125,126,127,128,129,130,131),JI
      120 IF(JJ.GE.1) CH1(K)=ISTOR(MM)
      121 IF(JJ.GE.2) CH2(K)=ISTOR(MM+1)
      122 IF(JJ.GE.3) CH3(K)=ISTOR(MM+2)
      123 IF(JJ.GE.4) CH4(K)=ISTOR(MM+3)
      124 IF(JJ.GE.5) CH5(K)=ISTOR(MM+4)
50     125 IF(JJ.GE.6) CH6(K)=ISTOR(MM+5)
      126 IF(JJ.GE.7) CH7(K)=ISTOR(MM+6)
      127 IF(JJ.GE.8) CH8(K)=ISTOR(MM+7)
      128 IF(JJ.GE.9) CH9(K)=ISTOR(MM+8)
      129 IF(JJ.GE.10) CH10(K)=ISTOR(MM+9)
55     130 IF(JJ.GE.11) CH11(K)=ISTOR(MM+10)
      131 IF(JJ.GE.12) CH12(K)=ISTOR(MM+11)
      IF(JJ.EQ.NCH)K=K+1
      IF(JJ.EQ.NCH)GO TO 90
      RETURN
60     1000 FORMAT(1H ,16,10F8.0)
      END

```

```

1      SUBROUTINE PLAT(IPL0T,DATA,IRD1,INU)
      COMMON ISTOR(2500),COUNT(2500),NCH,NBLK,NU,K,IRD,CH1(2500),IK,ISU
      * CH2(2500),CH3(2500),CH4(2500),CH5(2500),CH6(2500),CH7(2500),NCY,
      * CH8(2500),CH9(2500),CH10(2500),CH11(2500),CH12(2500),CAL(2500)
5      * NCAL,NCHA,NSSG(8),IPL,IDIM,NAMEF,DT,JJ,NUS
      DIMENSION LABEL(4), DATA(2500),ITITLE(3)
      IF(IPL0T.GT.1) GO TO 100
      IPL0T=2
      XB=1.75
10     YB=.4
      XAX=5.
      YAX=4.
      XPAGE=7.
      YPAGE=4.75
15     FACT=1.
      IUNIT=13
      LABEL(1)=10H BOOTS 390
      LABEL(2)=10H 6121
      LABEL(3)=10HRAW DATA
20     LABEL(4)=10HLOLA2
      MODE=1
      CALL PLTBEG(XPAGE,YPAGE,FACT,IUNIT,LABEL)
      XMI=0.
      XMA=IDIM
25     YMI=0.
      YMA=5000.
      DX=500.
      DY=1000.
      XS=(XMA-XMI)/XAX
      YS=(YMA-YMI)/YAX
30     1000 CALL PLTSCA(XB,YB,XMI,YMI,XS,YS)
      CALL PLTUND(XMI,XMA,YMI,YMA)
      CALL PLTAXS(DX,DY,XMI,XMA,YMI,YMA,4)
      CALL LABELA(DX,DY,XMI,XMA,YMI,YMA,1.,1.)
35     ENCODE(30,1000,ITITLE) IRD1,INU
1000    FORMAT(3H ID,110,8H PLOT,18,1H)
      TX=XMI
      TY=YMA+.05*YS
      CHT=.1
40     CALL PLTSYN(CHT,ITITLE(1),0.,TX,TY)
      TIC=DX*DT*1000.
      TIME=DT*FLOAT(NU)*1000.
      TY=YMA+.20*YS
      ENCODE(12,2000,ITITLE)NAMEF
45     2000 FORMAT(1H ,A10,1H)
      CALL PLTSYN(CHT,ITITLE,0.,TX,TY)
      TX=XMI-XS*1.55
      TY=YMA-YS*1.3
      ITITLE(1)=10HTIME, MS)
50     CALL PLTSYN(CHT,ITITLE,0.,TX,TY)
      TY=YMA-YS*1.45
      ENCODE(16,3000,ITITLE)TIME
3000    FORMAT(8H /FRAME=,F7.3,1H)
      CALL PLTSYN(CHT,ITITLE,0.,TX,TY)
55     TY=YMA-YS*1.6
      ENCODE(16,4000,ITITLE)TIC
4000    FORMAT(8H /TIC=,F7.3,1H)
      CALL PLTSYN(CHT,ITITLE,0.,TX,TY)
      CALL PLTDTS(MODE,0,COUNT(1),DATA(1),NU,0)
      CALL PLTPGE
      RETURN
      END

```

```

1      SUBROUTINE RDDTA(ICODE)
      COMMON ISTR(2500),COUNT(2500),NCH,NBLK,NJ,K,IRD,CH1(2500),IK,ISU
      x,CH2(2500),CH3(2500),CH4(2500),CH5(2500),CH6(2500),CH7(2500),NCY,
5      x,CH8(2500),CH9(2500),CH10(2500),CH11(2500),CH12(2500),CAL(2500)
      x,NCAL,NCHA,MSSG(8),IPL,IDIN,NAMEF,DT,JJ,NUS
      IF(ICODE.NE.1) GO TO 200
      READ(1)ITYPE,NAMEF,MSSG,NCH,NJ,MREC,NBLK,SRATE,IPBR,DT,SAMPS
      IF(EOF(1).NE.0.) STOP
      WRITE(6,1)NAMEF,NCH,NBLK,NJ,DT
10     RETURN
      200 IF(ICODE.NE.2) GO TO 300
      READ(1) NJ,(ISTR(I),I=1,NJ)
      IF(EOF(1).NE.0.) STOP
      RETURN
15     300 WRITE(6,2)ICODE
      RETURN
      1 FORMAT(//,' FILE NAME ',A10,13X,' NO. OF CHANNELS = ',I5/
      x          ' NO. OF RECORDS = ',I10,6X,' LENGTH OF A RECORD = ',I10/
      x          ' TIME INCREMENT,SEC = ',E12.5//)
20     2 FORMAT(' RDDATA ERROR, ICODE = ',I10)
      END

```

```

1      SUBROUTINE WRTDTA
COMMON ISTR(2500),COUNT(2500),NCH,NBLK,MU,K,IRD,CH1(2500),IK,ISU,
* CH2(2500),CH3(2500),CH4(2500),CH5(2500),CH6(2500),CH7(2500),NCY,
* CH8(2500),CH9(2500),CH10(2500),CH11(2500),CH12(2500),CAL(2500)
5      * ,NCAL,NCHA,MSSG(8),IPL,IDIM,NAMEF,DT,JJ,NUS
      IF(ISU.EQ.2) GO TO 40
      WRITE(14) K,(CAL(J),J=1,K)
      NCAL=NCAL+1
      RETURN
10     40 IF(IK.EQ.1.AND.ISU.EQ.2) GO TO 50
      KK=IK-1
      IF(KK.NE.0)WRITE(14) KK,(CAL(J),J=1,KK)
      IF(KK.NE.0)NCAL=NCAL+1
      IJ=K-KK
15     IF(NCH.GE.1) WRITE(15) IJ,(CH1(J),J=IK,K)
      IF(NCH.GE.2) WRITE(16) IJ,(CH2(J),J=IK,K)
      IF(NCH.GE.3) WRITE(17) IJ,(CH3(J),J=IK,K)
      IF(NCH.GE.4) WRITE(18) IJ,(CH4(J),J=IK,K)
      IF(NCH.GE.5) WRITE(19) IJ,(CH5(J),J=IK,K)
20     IF(NCH.GE.6) WRITE(20) IJ,(CH6(J),J=IK,K)
      IF(NCH.GE.7) WRITE(21) IJ,(CH7(J),J=IK,K)
      IF(NCH.GE.8) WRITE(22) IJ,(CH8(J),J=IK,K)
      IF(NCH.GE.9) WRITE(23) IJ,(CH9(J),J=IK,K)
      IF(NCH.GE.10) WRITE(24) IJ,(CH10(J),J=IK,K)
25     IF(NCH.GE.11) WRITE(25) IJ,(CH11(J),J=IK,K)
      IF(NCH.GE.12) WRITE(26) IJ,(CH12(J),J=IK,K)
      IK=1
      NCHA=NCHA+1
      RETURN
30     50 IF(NCH.GE.1) WRITE(15) K,(CH1(J),J=1,K)
      IF(NCH.GE.2) WRITE(16) K,(CH2(J),J=1,K)
      IF(NCH.GE.3) WRITE(17) K,(CH3(J),J=1,K)
      IF(NCH.GE.4) WRITE(18) K,(CH4(J),J=1,K)
      IF(NCH.GE.5) WRITE(19) K,(CH5(J),J=1,K)
35     IF(NCH.GE.6) WRITE(20) K,(CH6(J),J=1,K)
      IF(NCH.GE.7) WRITE(21) K,(CH7(J),J=1,K)
      IF(NCH.GE.8) WRITE(22) K,(CH8(J),J=1,K)
      IF(NCH.GE.9) WRITE(23) K,(CH9(J),J=1,K)
      IF(NCH.GE.10) WRITE(24) K,(CH10(J),J=1,K)
40     IF(NCH.GE.11) WRITE(25) K,(CH11(J),J=1,K)
      IF(NCH.GE.12) WRITE(26) K,(CH12(J),J=1,K)
      WRITE(6,1)NCY,NCHA,K,(CH1(J),J=1,10)
1      FORMAT(3I10,10F7.0)
      NCHA=NCHA+1
45     RETURN
      END

```

```

1      SUBROUTINE WRTTPE
      COMMON ISTR(2500),COUNT(2500),NCH,NBLK,MU,K,IRD,CH1(2500),IK,ISU,
* CH2(2500),CH3(2500),CH4(2500),CH5(2500),CH6(2500),CH7(2500),NCY,
* CH8(2500),CH9(2500),CH10(2500),CH11(2500),CH12(2500),CAL(2500)
5      * ,NCAL,NCHA,MSSG(8),IPL,IDIM,NAMEF,DT,JJ,MUS
      DIMENSION DATA(2500)
      DO 5 I=1,IDIM
      COUNT(I)=I
10      5 CONTINUE
      ITPE=14
      IPL=1
      IF(NCAL.EQ.0)GO TO 300
      WRITE(2)NAMEF
      IRD1=IRD+10000
15      WRITE(2) IRD1,DT,NCH,NCAL
      REWIND ITPE
      DO 200 N=1,NCAL
      READ(ITPE) MU,(DATA(J),J=1,MU)
      IF(N.EQ.1) WRITE(6,1000) IRD1,MU,(DATA(J),J=1,10)
20      IF(N.EQ.NCAL/2) WRITE(6,1000) IRD1,MU,(DATA(J),J=1,10)
      IF(N.EQ.NCAL) WRITE(6,1000) IRD1,MU,(DATA(J),J=1,10)
      IF(N.EQ.1)CALL PLAT(IPL,DATA,IRD1,N)
      WRITE(2) MU,(DATA(J),J=1,MU)
25      200 CONTINUE
      300 ITPE=ITPE+1
      WRITE(3)NAMEF
      WRITE(3) IRD,DT,NCH,NCHA
      DO 600 N=1,NCH
      IRD1=IRD+10000
30      REWIND ITPE
      DO 400 I=1,NCHA
      READ(ITPE) MU,(DATA(J),J=1,MU)
      IF(I.EQ.1)WRITE(6,1000)ITPE,NCHA
      IF(I.EQ.1)WRITE(6,1000)NCH
35      IF(I.EQ.1) WRITE(6,1000) IRD1,MU,(DATA(J),J=1,10)
      IF(I.EQ.NCHA/2) WRITE(6,1000) IRD1,MU,(DATA(J),J=1,10)
      IF(I.EQ.NCHA) WRITE(6,1000) IRD1,MU,(DATA(J),J=1,10)
      IF(N.EQ.1)CALL PLAT (IPL,DATA,IRD1,I)
      WRITE(3) MU,(DATA(J),J=1,MU)
40      400 CONTINUE
      ITPE=ITPE+1
      600 CONTINUE
      RETURN
1000  FORMAT(1H ,2I10,10F8.0)
45      END

```

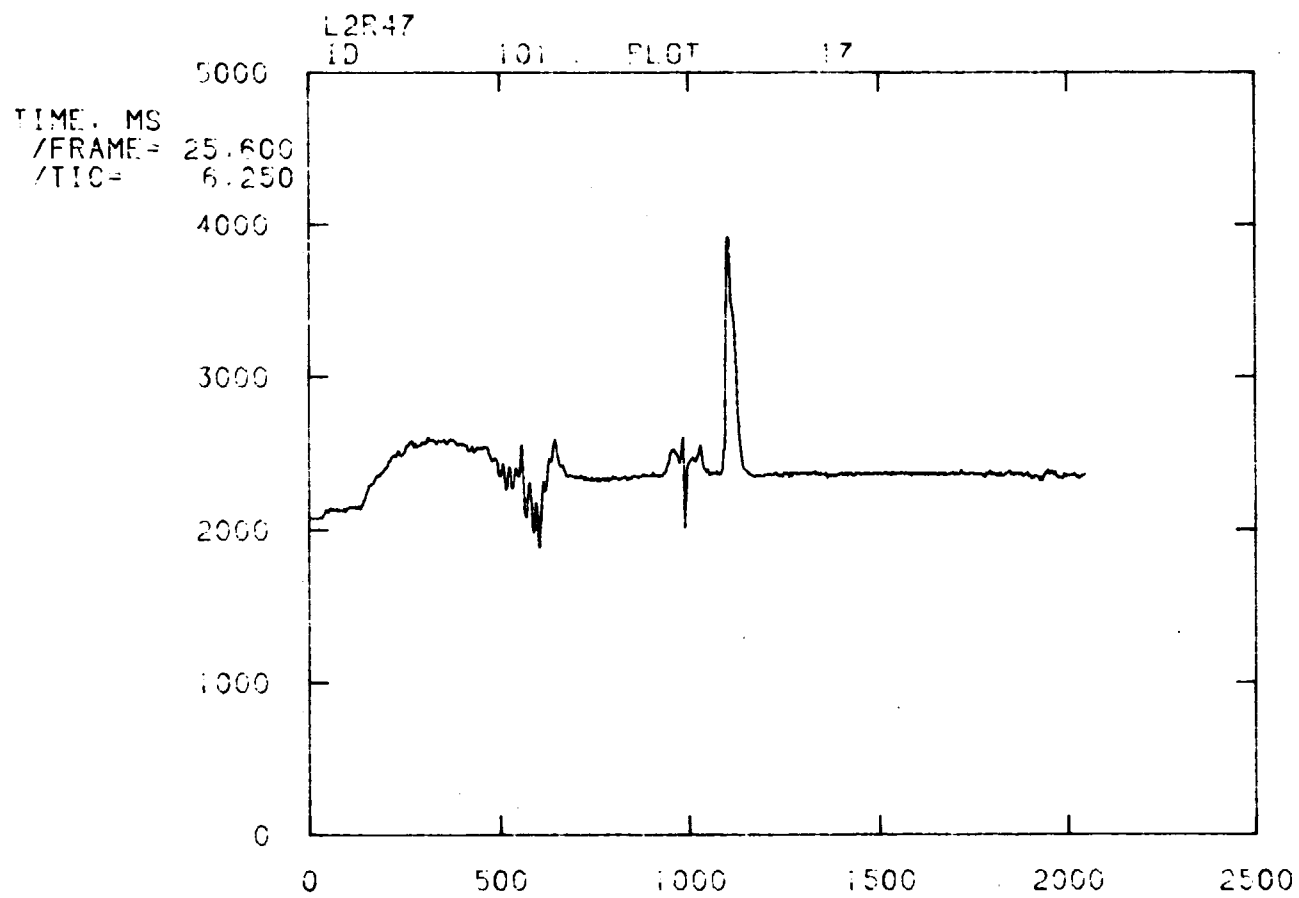
APPENDIX C.2

Sample Output

FILE NAME L2R47
 NO. OF RECORDS - 200
 TIME INCREMENT, SEC - .12500E-04
 NO. OF CHANNELS - 4
 LENGTH OF A RECORD - 1024

1	2168.	2165.	2162.	2163.	2162.	2160.	2158.	2158.	2163.	2167.		
25	0	0	2048	2168.	2165.	2162.	2163.	2162.	2160.	2158.	2158.	2163.
1	2142.	2143.	2144.	2140.	2140.	2143.	2151.	2155.	2150.	2143.		
25	1	1	2048	2142.	2143.	2144.	2140.	2140.	2143.	2151.	2155.	2150.
1	2121.	2123.	2124.	2124.	2119.	2118.	2118.	2123.	2129.	2127.		
25	2	2	2048	2121.	2123.	2124.	2124.	2119.	2118.	2118.	2123.	2129.
1	2089.	2094.	2096.	2095.	2090.	2091.	2099.	2100.	2097.	2092.		
25	3	3	2048	2089.	2094.	2096.	2095.	2090.	2091.	2099.	2100.	2097.
1	2358.	2359.	2360.	2363.	2363.	2364.	2368.	2371.	2367.	2365.		
25	4	4	2048	2358.	2359.	2360.	2363.	2363.	2364.	2368.	2371.	2367.
1	2368.	2363.	2361.	2360.	2366.	2374.	2375.	2369.	2362.	2360.		
25	5	5	2048	2368.	2363.	2361.	2360.	2366.	2374.	2375.	2369.	2362.
1	2645.	2639.	2636.	2635.	2634.	2634.	2637.	2643.	2646.	2644.		
25	6	6	2048	2645.	2639.	2636.	2635.	2634.	2637.	2643.	2646.	2644.
1	2636.	2646.	2650.	2646.	2639.	2632.	2625.	2624.	2628.	2634.		
25	7	7	2048	2636.	2646.	2650.	2646.	2639.	2632.	2625.	2624.	2628.
1	2900.	2902.	2903.	2906.	2912.	2919.	2922.	2917.	2913.	2911.		
25	8	8	2048	2900.	2902.	2903.	2906.	2912.	2919.	2922.	2917.	2913.
1	2916.	2916.	2911.	2905.	2900.	2898.	2904.	2912.	2915.	2917.		
25	9	9	2048	2916.	2916.	2911.	2905.	2900.	2898.	2904.	2912.	2915.
1	3193.	3193.	3190.	3187.	3184.	3185.	3186.	3186.	3186.	3188.		
25	10	10	2048	3193.	3193.	3190.	3187.	3184.	3185.	3186.	3186.	3188.
1	3184.	3188.	3190.	3191.	3194.	3195.	3192.	3186.	3181.	3181.		
25	11	11	2048	3184.	3188.	3190.	3191.	3194.	3195.	3192.	3186.	3181.
1	3467.	3466.	3468.	3469.	3468.	3465.	3463.	3462.	3460.	3461.		
25	12	12	2048	3467.	3466.	3468.	3465.	3463.	3462.	3460.	3461.	3461.
1	3464.	3461.	3463.	3467.	3470.	3469.	3469.	3469.	3468.	3463.		
25	13	13	2048	3464.	3461.	3463.	3467.	3470.	3469.	3469.	3468.	3463.
1	2094.	2092.	2091.	2097.	2097.	2097.	2094.	2094.	2099.	2096.		
25	14	14	2048	2094.	2092.	2091.	2097.	2097.	2097.	2094.	2094.	2099.
1	2089.	2082.	2079.	2085.	2086.	2085.	2082.	2082.	2089.	2093.		
25	15	15	2048	2089.	2082.	2079.	2085.	2086.	2085.	2082.	2082.	2089.
1	2082.	2083.	2088.	2087.	2080.	2077.	2078.	2085.	2084.	2077.		
25	16	16	2048	2082.	2083.	2088.	2087.	2080.	2077.	2078.	2085.	2084.
1	2366.	2366.	2370.	2371.	2373.	2375.	2374.	2370.	2373.	2378.		
25	17	17	2048	2366.	2366.	2370.	2371.	2373.	2375.	2374.	2370.	2373.
1	2367.	2368.	2365.	2363.	2367.	2369.	2369.	2367.	2369.	2372.		
25	18	18	2048	2367.	2368.	2365.	2363.	2367.	2369.	2369.	2367.	2372.
1	2299.	2308.	2319.	2330.	2338.	2344.	2352.	2358.	2362.	2365.		
25	19	19	2048	2299.	2308.	2319.	2330.	2338.	2344.	2352.	2358.	2362.
1	2376.	2377.	2371.	2367.	2369.	2373.	2376.	2378.	2377.			
25	20	20	2048	2376.	2377.	2377.	2371.	2367.	2369.	2373.	2376.	2378.
1	2385.	2385.	2385.	2382.	2374.	2368.	2369.	2378.	2383.	2375.		
25	21	21	2048	2385.	2385.	2385.	2382.	2374.	2368.	2369.	2378.	2383.
1	2377.	2368.	2367.	2370.	2371.	2375.	2376.	2369.	2363.	2365.		
25	22	22	2048	2377.	2368.	2367.	2370.	2371.	2375.	2376.	2369.	2363.
1	2367.	2366.	2369.	2372.	2373.	2373.	2369.	2370.	2374.	2376.		
25	23	23	2048	2367.	2366.	2369.	2372.	2373.	2373.	2369.	2370.	2374.

1	2377.	2381.	2387.	2391.	2388.	2382.	2379.	2376.	2374.	2371.		
25	24	2048	2377.	2381.	2387.	2391.	2388.	2382.	2379.	2376.	2374.	2371.
NO. OF CAL BLKS	0		NO. OF DATA BLKS	25								
15	25											
4												
101	2048	2168.	2165.	2162.	2163.	2162.	2160.	2158.	2158.	2163.	2167.	
101	2048	3184.	3188.	3190.	3191.	3194.	3195.	3192.	3188.	3181.	3181.	
101	2048	2377.	2381.	2387.	2391.	2388.	2382.	2379.	2376.	2374.	2371.	
16	25											
4												
201	2048	2042.	2037.	2035.	2032.	2029.	2028.	2027.	2036.	2044.	2045.	
201	2048	3029.	3022.	3016.	3018.	3023.	3026.	3023.	3025.	3031.	3036.	
201	2048	2031.	2036.	2040.	2044.	2040.	2040.	2042.	2042.	2045.	2041.	
17	25											
4												
301	2048	2726.	2725.	2719.	2722.	2724.	2722.	2720.	2727.	2732.	2735.	
301	2048	1204.	1197.	1201.	1210.	1213.	1217.	1218.	1216.	1206.	1199.	
301	2048	3412.	3413.	3403.	3398.	3404.	3411.	3410.	3403.	3400.	3411.	
18	25											
4												
401	2048	2565.	2569.	2575.	2576.	2569.	2559.	2552.	2552.	2559.	2564.	
401	2048	1183.	1181.	1180.	1178.	1179.	1188.	1195.	1195.	1188.	1177.	
401	2048	3405.	3402.	3405.	3410.	3410.	3401.	3399.	3403.	3405.	3404.	



APPENDIX D
IMPLEMENTATION OF STEP 3

APPENDIX D.1.a

Listing of MFA File ADTAPE3/UN=BOOTS

APPENDIX D.1.a

Listing of MFA File ADTAPE3/UN=BOOTS

a. Job Control Language

```
BOOTS,STMFZ,P6,T30.  
ACCOUNT,PDxxx.  
BEGIN,ATTACH,PLOTLIB.  
ATTACH,TAPE1,LOLAD,ID=BOOTS.  
REQUEST,TAPE3,*PF.  
REQUEST,TAPE13,*PF.  
FTN,R=0.  
MAP,OFF.  
LGO.  
CATALOG,TAPE3,LOLAED,ID=BOOTS.  
CATALOG,TAPE13,PLT,ID=BOOTS.  
BEGIN,PLOT,CALCOMP,TAPE13.
```

APPENDIX D.1.b

Program

```

1      PROGRAM EDITAD(INPUT,OUTPUT,TAPES=INPUT,TAPES=OUTPUT,TAPE1,TAPES,
      * TAPE13)
      COMMON TEMP(2500),COUNT(23000),DATA(23000),IPL,ICNT,NTS(24),
      * NCH,NU,IRD,NCHA,IDIM,NAMEF,DT,NPT,TIME,IFRA(6),ISAM(2)
5      IDIM=23000
      WRITE(6,1000)
      50 CALL RDDTA(1)
      IPL=1
      DO 500 I=1,NCH
10      ICNT=I
      NPT=0
      DO 100 N=1,NCHA
      CALL RDDTA(2)
      CALL EDIT(N)
15      100 CONTINUE
      IF(NPT.EQ.0)GO TO 500
      CALL WRTTPE
      500 CONTINUE
      GO TO 50
20      1000 FORMAT(1H1)
      END

```

```

1      SUBROUTINE EDIT(N)
      COMMON TEMP(2500),COUNT(23000),DATA(23000),IPL,ICNT,NTS(24),
      * NCH,NU,IRD,NCHA,IDIM,NAMEF,DT,NPT,TIME,IFRA(6),ISAM(2)
      IF(NPT.GE.IDIM)GO TO 500
      IF(N.LT.IFRA(1))GO TO 500
5      IF(N.GE.IFRA(6))GO TO 500
      IF(N.GE.IFRA(2).AND.N.LT.IFRA(3))GO TO 500
      IF(N.GE.IFRA(4).AND.N.LT.IFRA(5))GO TO 400
      ISKP=ISAM(2)
10      IF(N.LT.IFRA(2))ISKP=ISAM(1)
      DO 100 I=1,NU,ISKP
      NPT=NPT+1
      DATA(NPT)=TEMP(I)
      IF(NPT.GE.IDIM)GO TO 300
      IF(I+ISKP.GT.NU)GO TO 200
15      100 CONTINUE
      200 GO TO 500
      300 WRITE(6,1)IDIM
      GO TO 500
20      400 TIME=TIME+DT*FLOAT(NU)/FLOAT(NCH)
      500 RETURN
      1 FORMAT(' WARNING -- DATA BLOCK EXCEEDS ',110)
      END

```

```

1      SUBROUTINE RDDTA(ICODE)
      COMMON TEMP(2500),COUNT(23000),DATA(23000),IPL,ICNT,NTS(24),
      * NCH,NU,IRD,NCHA,IDIN,NAMEF,DT,NPT,TIME,IFRA(6),ISAM(2)
      IF(ICODE.NE.1) GO TO 200
5      READ(1)NAMEF
      IF(EOF(1).NE.0.) STOP
      READ(1)IRD,DT,NCH,NCHA
      WRITE(6,1)NAMEF,NCH,DT,NCHA
      IF(IRD.LT.10000)WRITE(6,4)
10     IF(IRD.GE.10000)WRITE(6,5)
      READ(5,3)IFRA,ISAM,INSG
      IF(EOF(5).NE..0)STOP
      DO 100 I=1,24
      NTS(I)=24
15     100 CONTINUE
      IF(INSG.NE.0)READ(5,6)(NTS(I),I=13,24)
      TIME=.0
      IF(ISAM(1).EQ.0)ISAM(1)=1
      IF(ISAM(2).EQ.0)ISAM(2)=1
20     WRITE(6,3)IFRA,ISAM,INSG
      DT=DT*FLOAT(ISAM(2))
      RETURN
200 IF(ICODE.NE.2) GO TO 300
      READ(1) NU,(TEMP(I),I=1,NU)
      IF(EOF(1).NE.0.) STOP
25     RETURN
300 WRITE(6,2)ICODE
      RETURN
      1 FORMAT(///,' FILE NAME ',A10,13X,' NO. OF CHANNELS = ',I5/
30     *      ' TIME INCREMENT,SEC = ',E12.5,' NO. OF DATA SUBSETS = ',
      *      I5//)
      2 FORMAT(' RDDATA ERROR, ICODE = ',I10)
      3 FORMAT(9I5)
      4 FORMAT(' DATA CHANNEL')
35     5 FORMAT(' CALIBRATION CHANNEL')
      6 FORMAT(12A2)
      END

```

```

1      SUBROUTINE PLAT(IPL0T,IRD1)
      COMMON TEMP(2500),COUNT(23000),DATA(23000),IPL,ICNT,NTS(24),
      * NCH,NJ,IRD,NCHA,1DIM,NAMEF,DT,NPT,TIME,IFRA(6),ISAR(2)
      DIMENSION LABEL(4),ITITLE(3)
      IF(IPL0T.GT.1) GO TO 100
      IPL0T=8
      XB=1.75
      YB=.4
      XS=500.
      DX=500.
10     XNI=.0
      XAX=NPT/500+1
      XMA=XSEXAX
      YAX=4.
15     XPAGE=XAX+2.2
      YPAGE=4.75
      FACT=1.
      IUNIT=13
      LABEL(1)=10H BOOTS 390
20     LABEL(2)=10H 6121
      LABEL(3)=10H EDITED DA
      LABEL(4)=10HTA - LOLA2
      MODE=1
      CALL PLTBEG(XPAGE,YPAGE,FACT,IUNIT,LABEL)
      YMI=0.
      YMA=5000.
      DY=1000.
      YS=(YMA-YMI)/YAX
30     CALL PLTSCA(XB,YB,XMI,YMI,XS,YS)
      CALL PLTEND(XMI,XMA,YMI,YMA)
      CALL PLTAXS(DX,DY,XMI,XMA,YMI,YMA,4)
      CALL LABELA(DX,DY,XMI,XMA,YMI,YMA,1.,1.)
      ENCODE(30,1000,ITITLE) IRD1
35     FORMAT(3H ID,I10,8H PLOT,8X,1H)
      TX=XMI
      TY=YMA+.05XYS
      CHT=.1
      CALL PLTSYM(CHT,ITITLE(1),0.,TX,TY)
      TIC=DX*DT*1000.
40     TIM=DT*FLOAT(NPT)*1000.
      TY=YMA+.20XYS
      ENCODE(12,2000,ITITLE)NAMEF
2000    FORMAT(1H ,A10,1H)
      CALL PLTSYM(CHT,ITITLE,0.,TX,TY)
      TX=XMI-XS*1.55
      TY=YMA-YS*.3
      ITITLE(1)=10HTIME, NS)
      CALL PLTSYM(CHT,ITITLE,0.,TX,TY)
      TY=YMA-YS*.45
50     ENCODE(16,3000,ITITLE)TIM
      FORMAT(8H /FRAME=,F7.3,1H)
3000    CALL PLTSYM(CHT,ITITLE,0.,TX,TY)
      TY=YMA-YS*.6
      ENCODE(16,4000,ITITLE)TIC
55     4000    FORMAT(8H /TIC=,F7.3,1H)
      CALL PLTSYM(CHT,ITITLE,0.,TX,TY)
      CALL PLTDTS(MODE,0,COUNT(1),DATA(1),NPT,0)
      CALL PLTPGE
      RETURN
      END
60

```

```

1      SUBROUTINE WRTTPE
      COMMON TEMP(2500),COUNT(23000),DATA(23000),IPL,ICNT,NTS(24),
      * NCH,NJ,IRD,NCHA,IDIM,NAMEF,DT,NPT,TIME,IFRA(6),ISAH(2)
      DO 5 I=1,IDIM
5      COUNT(I)=1
      CONTINUE
      DECODE(10,2000,NAMEF)(NTS(I),I-1,5)
      ENCODE( 6,3000,NDUR )IRD
      DECODE( 6,2000,NDUR )(NTS(I),I-8,10)
10     ENCODE(2,4000,NTS(11))ICNT
      ENCODE( 2,4000,NTS(12))NCH
      WRITE(3)NTS
      WRITE(3) NPT
      WRITE(3)TIME,DT
15     WRITE(6,1000)NTS,NPT,TIME,DT
      CALL PLAT (IPL,IRD)
      WRITE(3) (DATA(J),J=1,NPT)
      WRITE(6,5000)(DATA(J),J=1,20)
      RETURN
20     1000 FORMAT(' NTS = ',24A2,' NPT = ',I10,' START TIME = ',
      * E12.5,' DT = ',E12.5)
      2000 FORMAT(5A2)
      3000 FORMAT(I6)
      4000 FORMAT(I2)
25     5000 FORMAT(10F10.0)
      END

```

APPENDIX D.1.c
Input Card Images

3	15	16	16	16	18	50	1	0
4	5	5	6	6	27	50	2	0
2	13	14	14	14	18	50	1	0
5	6	6	7	7	28	50	2	0
3	4	4	5	5	26	50	2	0
4	15	17	17	17	19	50	1	0

APPENDIX D.2

Sample Output

FILE NAME L2R47 NO. OF CHANNELS = 4
TIME INCREMENT, SEC = .12500E-04 NO. OF DATA SUBSETS = 25

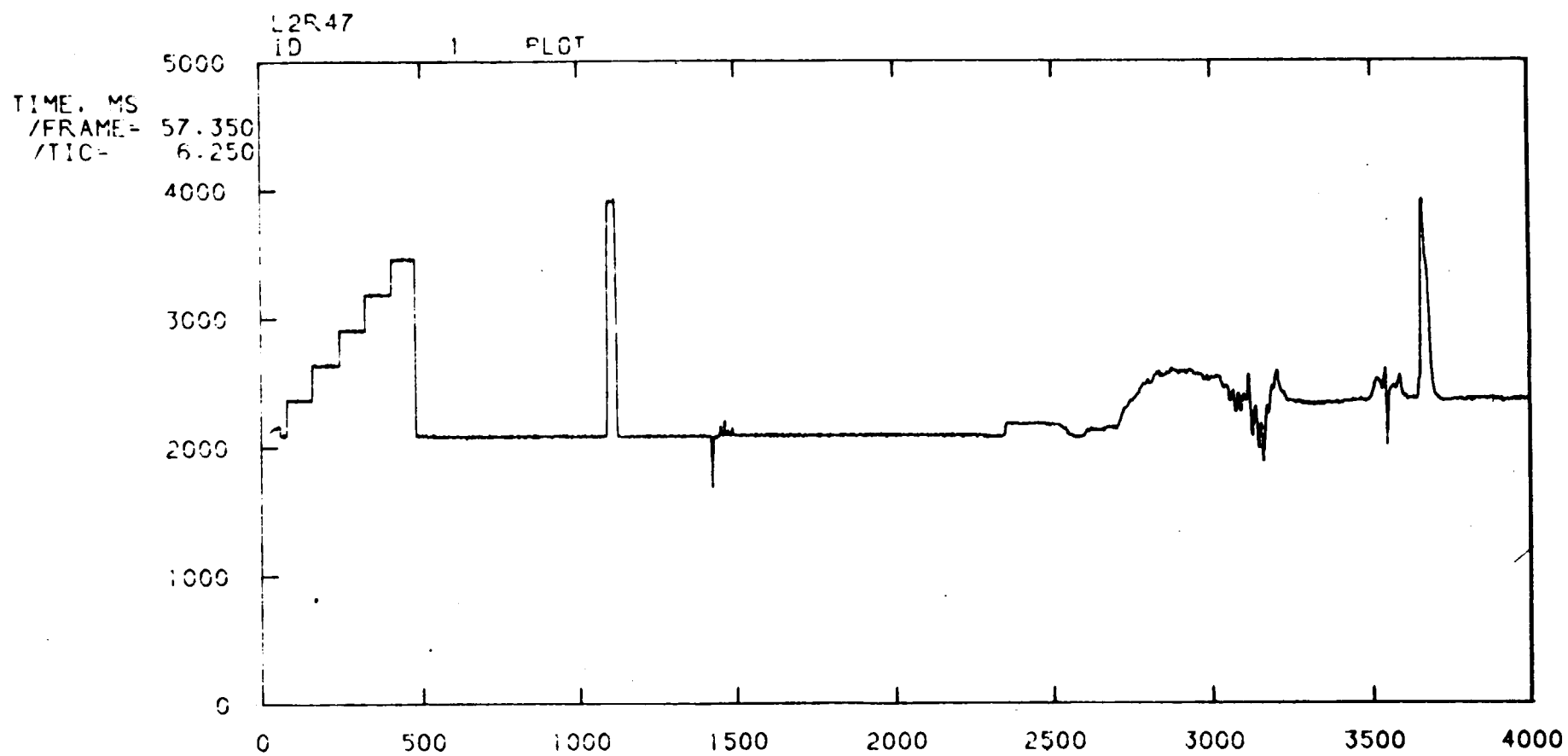
DATA CHANNEL												
3	15	16	16	18	50	1	0					
NTS = L2R47										NPT =	4588 START TIME = 0.	DT = .12500E-04
2121.	2123.	2126.	2130.	2134.	2130.	2130.	2130.	2139.	2133.	2133.		
2142.	2140.	2141.	2152.	2150.	2146.	2151.	2152.	2149.	2149.	2157.		
NTS = L2R47										NPT =	4588 START TIME = 0.	DT = .12500E-04
2036.	2036.	2032.	2039.	2047.	2039.	2033.	2036.	2042.	2033.	2033.		
2036.	2043.	2030.	2030.	2030.	2041.	2033.	2043.	2043.	2041.	2041.		
NTS = L2R47										NPT =	4588 START TIME = 0.	DT = .12500E-04
2624.	2613.	2626.	2628.	2651.	2632.	2644.	2646.	2651.	2653.	2653.		
2679.	2690.	2678.	2669.	2700.	2693.	2680.	2689.	2676.	2691.	2691.		
NTS = L2R47										NPT =	4588 START TIME = 0.	DT = .12500E-04
2433.	2443.	2427.	2440.	2445.	2453.	2456.	2462.	2482.	2496.	2496.		
2499.	2502.	2507.	2517.	2518.	2535.	2513.	2527.	2529.	2531.	2531.		

FILE NAME DP47 NO. OF CHANNELS = 1
TIME INCREMENT, SEC = .12500E-04 NO. OF DATA SUBSETS = 28

DATA CHANNEL												
4	5	5	6	6	27	50	2	0				
NTS = DP47										NPT =	22569 START TIME = 0.	DT = .25000E-04
2036.	2029.	2046.	2030.	2029.	2038.	2044.	2032.	2047.	2033.	2033.		
2030.	2045.	2033.	2045.	2038.	2036.	2041.	2035.	2041.	2033.	2033.		

FILE NAME L2R46 NO. OF CHANNELS = 4
TIME INCREMENT, SEC = .12500E-04 NO. OF DATA SUBSETS = 25

DATA CHANNEL												
2	13	14	14	14	18	50	1	0				
NTS = L2R46										NPT =	8643 START TIME = 0.	DT = .12500E-04
2011.	2007.	2019.	2016.	2004.	2017.	2001.	2015.	2009.	2006.	2006.		
2004.	2011.	2004.	2001.	2006.	2016.	2013.	2009.	2010.	2029.	2029.		
NTS = L2R46										NPT =	8643 START TIME = 0.	DT = .12500E-04
2350.	2336.	2328.	2336.	2338.	2358.	2346.	2351.	2352.	2350.	2350.		
2340.	2350.	2342.	2352.	2336.	2341.	2337.	2344.	2329.	2318.	2318.		
NTS = L2R46										NPT =	8643 START TIME = 0.	DT = .12500E-04
2965.	2978.	2978.	2980.	2973.	2991.	2972.	2967.	2972.	2966.	2966.		
2974.	2971.	2957.	2969.	2976.	2976.	2989.	2984.	2973.	2985.	2985.		
NTS = L2R46										NPT =	8643 START TIME = 0.	DT = .12500E-04
2845.	2833.	2856.	2849.	2830.	2850.	2815.	2839.	2835.	2817.	2817.		
2839.	2817.	2843.	2817.	2833.	2837.	2832.	2864.	2847.	2851.	2851.		



APPENDIX E
IMPLEMENTATION OF STEP 4

APPENDIX E.1

Listing of MFA File ADTAPE4/UN=BOOTS

APPENDIX E.1

Listing of MFA File ADTAPE4/UN=BOOTS

a. Job Control Language

```
BOOTS,STMFZ,P6,MS300000.  
ACCOUNT,PDxxx.  
REQUEST,NEWPL,*PF.  
REQUEST,BIN,*PF.  
BEGIN,ATTACH,POTLIB.  
ATTACH,OLDPL,ADENGR,ID=BOOTS.  
UPDATE,F,N.  
FTN,I=COMPILE,L=0.  
ATTACH,TAPE1,LOLAED,ID=BOOTS.  
LGO.  
EXIT,U.  
BEGIN,PLOT,CALCOMP,TAPE13.  
*EOR
```

b. UPDATE Corrections

```
*IDENT HPAD1  
*EOR
```

c. Input Card Images

```
14      1.      1000      .0      0      1  
$CONVAR NX=50,NY(1)=500,NY(2)=70,NY(3)=150,NY(4)=230,NY(5)=320,  
NY(6)=400,ITZ=1000,IBSE=3700$
```

APPENDIX E.2

Listing of MFZ File ADENGR,ID=BOOTS

1		PROGRAM DATA (INPUT,OUTPUT,TEMP,TAPE1,TAPE2=TEMP,TAPES=INPUT, XTAPE6=OUTPUT,TAPE13,TAPE3,TAPE4)	MAIN	8
	C		C19	2
	C		MAIN	4
5	C	FOR THIS PROGRAM BROAD HAS BEEN MODIFIED SO THAT	HPAD	7
	C	THE ENTIRE DATA SET IS READ IN AT ONE TIME;	HPAD	8
	C	N CANNOT EXCEED 23000;	HPAD	9
	C	SINGLE INTEGRATION CAN BE DONE ON THE ENTIRE DATA SET;	HPAD	10
	C	DOUBLE INTEGRATION CAN BE DONE IF N DOES NOT EXCEED 12500.	HPAD	11
	C		HPAD	12
10		COMMON R(25000),T(23000),P(23000),NOS,LP,LABEL(4),NY(6),Y(6),IQ(5)	HPAD4	1
		1 ,SBL,I,TZ,JP,IX,DELT,IDZ,MOP(10),LLC,B,SA,SB,DTIME,NJ(10),TSTART,	HPAD	3
		2 SC, SKP, XAX, XFAC, YFAC, TIT(30), ISU, KP, YB, XB, NTS(24),ITZ,	COM	4
		3 JPI(50),IZ,ITM,NOSR,N,IPNO(5),SS,KSTS1,KSTS2,YAX,JSU,KU	HPAD	4
		DIMENSION PI(1),PI2(1)	HPAD	5
15		EQUIVALENCE (R(1),PI(1)),(R(12501),PI2(1))	HPAD	6
		DIMENSION S(3), RU(6), AF(6), SIG(3), TG(6), X(6), EQ(6,	MAIN	6
		1 3), F(3,4), SX(6)	MAIN	7
		NAMELIST/CONUAR/SKP,XAX,YAX,XFAC,YFAC,ITM,NX,NY,MOP,SS,ITZ,NS,IBSE	HPAD4	2
		LABEL(1)=10H BOOTS	C2	3
20		LABEL(2)=10H390 6121	HPAD3	1
		LABEL(3)=10H A/D DATA	HPAD	13
		LABEL(4)=10HREDUCTION	C3	2
		WRITE(6,800)	C1	1
		TIT(26)= 1H)	MAIN	9
25		ITM=23000	HPAD3	2
		ITZ= 950	MAIN	11
		LLCS= 1	MAIN	12
		MOP(1)= 1	MAIN	13
		MOP(2)= 3	MAIN	14
30		MOP(5)= 0	MAIN	15
		NX=40	MAIN	16
		NY(1)=16	MAIN	17
		NY(2)=100	MAIN	18
		NY(3)=240	MAIN	19
35		NY(4)=360	MAIN	20
		NY(5)=480	MAIN	21
		NY(6)=600	MAIN	22
		SKP=150.	MAIN	23
		SS= 1.	MAIN	24
40		XAX=7.5	C3	3
		XFAC= 1.	MAIN	26
		YAX= 5.	MAIN	27
		YFAC= 1.	MAIN	28
		NS=6	CAL2	2
45		IBSE=500	CAL4	2
	C		MAIN	29
	C		MAIN	30
	C	READING DATA	MAIN	31
	C		MAIN	32
50		XB=2.	C3	4
		YB=1.5	C3	6
		KSTS1=0	MAIN	35
		KSTS2=0	MAIN	36
55	20	IF(NLK.GT.0)GO TO 21	HPAD2	1
		READ(5,700)IPNO(2),IPNO(3),B,IXS,DLTM,IDZS,NLIST,IFID,NLK	HPAD2	2
		IF (EOF(5) .NE. 0.) STOP	MAIN	38
		IF (NLIST .NE. 0) READ(5,CONUAR)	MAIN	39

```

21 NLK-NLK-1
DO 25 KT=1,10
25 NJ(KT)=0
C
C      INTERPRETING OPTIONS FROM 3-DIGIT CODE
C
60      IF(IPNO(2).EQ.0.AND.IPNO(3).EQ.0)GO TO 660
        II=2
65      IF (IPNO(II).NE.1) GO TO 120
        IDZ=1
        IX=500
        GO TO 200
70      120 IF (IPNO(II).NE.2) GO TO 130
        IDZ=1
        IX=2000
        GO TO 200
75      130 IF (IPNO(II).NE.3) GO TO 140
        IDZ=1
        IX=3000
        GO TO 200
        140 IF (IPNO(II).NE.4) GO TO 150
        IDZ=3
        IX=500
        GO TO 200
80      150 IF (IPNO(II).NE.5) GO TO 160
        IDZ=3
        IX=2000
        GO TO 200
85      160 IF (IPNO(II).NE.6) GO TO 170
        IDZ=3
        IX=3000
        GO TO 200
90      170 IF (IPNO(II).NE.7) GO TO 180
        IDZ=5
        IX=500
        GO TO 200
95      180 IF (IPNO(II).NE.8) GO TO 190
        IDZ=5
        IX=2000
        GO TO 200
100      190 IF (IPNO(II).NE.9) GO TO 670
        IDZ=5
        IX=3000
105      200 II=3
        IF (IPNO(II).NE.1) GO TO 210
        KP=0
        NOP(3)=0
        NOP(4)=0
        GO TO 290
110      210 IF (IPNO(II).NE.2) GO TO 220
        KP=0
        NOP(3)=2
        NOP(4)=0
        GO TO 290
        220 IF (IPNO(II).NE.3) GO TO 230
        KP=0
        NOP(3)=2

```

```

HPAD2      3
C19        3
C19        4
MAIN      40
MAIN      41
MAIN      42
HPAD      15
HPAD      16
MAIN      81
MAIN      82
MAIN      83
MAIN      84
MAIN      85
MAIN      86
MAIN      87
MAIN      88
MAIN      89
MAIN      90
MAIN      91
MAIN      92
MAIN      93
MAIN      94
MAIN      95
MAIN      96
MAIN      97
MAIN      98
MAIN      99
MAIN     100
MAIN     101
MAIN     102
MAIN     103
MAIN     104
MAIN     105
MAIN     106
MAIN     107
MAIN     108
MAIN     109
MAIN     110
MAIN     111
MAIN     112
MAIN     113
MAIN     114
MAIN     115
MAIN     116
MAIN     117
MAIN     118
MAIN     119
MAIN     120
MAIN     121
MAIN     122
MAIN     123
MAIN     124
MAIN     125
MAIN     126
MAIN     127
MAIN     128
MAIN     129

```

115		R0P(4)=2	MAIN	130
		GO TO 230	MAIN	131
	230	IF (IPNO(II).NE.4) GO TO 240	MAIN	132
		KP=2	MAIN	133
		R0P(3)=0	MAIN	134
120		R0P(4)=0	MAIN	135
		GO TO 230	MAIN	136
	240	IF (IPNO(II).NE.5) GO TO 250	MAIN	137
		KP=2	MAIN	138
		R0P(3)=2	MAIN	139
125		R0P(4)=0	MAIN	140
		GO TO 230	MAIN	141
	250	IF (IPNO(II).NE.6) GO TO 260	MAIN	142
		KP=2	MAIN	143
		R0P(3)=2	MAIN	144
130		R0P(4)=2	MAIN	145
		GO TO 230	MAIN	146
	260	IF (IPNO(II).NE.7) GO TO 270	MAIN	147
		KP=1	MAIN	148
		R0P(3)=0	MAIN	149
135		R0P(4)=0	MAIN	150
		GO TO 230	MAIN	151
	270	IF (IPNO(II).NE.8) GO TO 280	MAIN	152
		KP=1	MAIN	153
		R0P(3)=2	MAIN	154
140		R0P(4)=0	MAIN	155
		GO TO 230	MAIN	156
	280	IF (IPNO(II).NE.9) GO TO 670	MAIN	157
		KP=1	MAIN	158
		R0P(3)=2	MAIN	159
145		R0P(4)=2	MAIN	160
		GO TO 230	MAIN	161
	290	IF (IXS.NE.0) IX=IXS	MAIN	162
		IF (IDZS.NE.0) IDZ=IDZS	MAIN	164
		KU=0	MAIN	165
150		ISU=0	MAIN	167
		JSU=0	MAIN	168
	C		MAIN	169
	C	READING FROM TAPE	MAIN	170
	C		MAIN	171
155		NOS=1	HPAD	17
		NOSR=0	HPAD	18
		N=1	HPAD	19
		IZ=0	C19	5
		DO 640 LP=1,NOS	MAIN	178
160		LLC=LLCS	MAIN	179
		IF (KU.EQ.0) I=3	MAIN	180
		CALL DATAIN	HPAD	21
		TZ=DELTA*1000.*FLOAT(IX)-DLTH+TSTART	HPAD	22
		DTIME=FLOAT(IDZ)*DELTA*1000.	HPAD	23
165		J=1	MAIN	194
		IF (KU.EQ.10) GO TO 540	MAIN	195
		IF (LP.GT.1) GO TO 560	MAIN	196
		WRITE(6,710)(NTS(K),K=1,12)	HPAD	24
	C		MAIN	198
170	C	PREDICT METHOD OF CALCULATING CALIBRATION STEPS	MAIN	199
	C		MAIN	200

	350	SUM=0.	MAIN	201
		I=NY(J)	MAIN	202
		IPP=1	MAIN	203
175		ICK=1	MAIN	204
		SUM=0.	MAIN	205
	360	IF (ABS(R(I)-R(I-1)).LT.SKP) GO TO 400	MAIN	206
		IF (ABS(R(I)-R(I-2)).LT.SKP) GO TO 390	MAIN	207
		IF (ABS(R(I+1)-R(I-1)).GT.SKP) GO TO 370	MAIN	208
180		GO TO 390	MAIN	209
	370	IF (ABS(R(I+2)-R(I-1)).GT.SKP) GO TO 380	MAIN	210
		I=I+2	MAIN	211
		GO TO 400	MAIN	212
	380	IF (ICK.GE.10) GO TO 650	MAIN	213
185		ICK=ICK+1	MAIN	214
		I=I+3	MAIN	215
		GO TO 360	MAIN	216
	390	I=I+1	MAIN	217
	400	SUM=SUM+R(I)	MAIN	218
190		SUM=SUM+R(I)*2	MAIN	219
		IPP=IPP+1	MAIN	220
		I=I+1	MAIN	221
		IF (IPP.EQ.NX+1) GO TO 410	MAIN	222
		GO TO 360	MAIN	223
195	410	X(J)=SUM/FLOAT(NX)	MAIN	224
		SX(J)=SQRT(SUM/FLOAT(NX)-(X(J)*2))	MAIN	225
		IF (J.EQ.NS) GO TO 420	CAL2	3
		J=J+1	MAIN	227
		GO TO 350	MAIN	228
200			MAIN	229
	C		MAIN	230
	C		MAIN	231
	C	FORMING EQUATIONS AND GENLSQ	MAIN	232
	420	Y(1)=0.	MAIN	233
		Y(2)=1.XSS	MAIN	234
205		Y(3)=2.XSS	MAIN	235
		Y(4)=3.XSS	MAIN	236
		Y(5)=4.XSS	MAIN	237
		Y(6)=5.XSS	MAIN	238
210		SBL=X(1)	CAL2	4
		WRITE(6,720) (X(M),M=1,NS),(SX(M),M=1,NS)	CAL2	5
		DO 430 M=1,NS	MAIN	241
	430	X(M)=X(M)-SBL	MAIN	242
		DO 440 L=1,6	MAIN	243
		EQ(L,1)=1.	MAIN	244
215		EQ(L,2)=X(L)	MAIN	245
	440	EQ(L,3)=X(L)*2	MAIN	246
		WRITE(6,730)	MAIN	246
		DO 450 L=1,NS	CAL2	6
	450	WRITE(6,740) EQ(L,1),EQ(L,2),EQ(L,3),Y(L)	MAIN	248
220		IF (ABS(X(1)-X(2)).LE.20.) GO TO 460	MAIN	249
		CALL GENLSQ (EQ,6,Y,NS,F,3,3,S,RV,AF,ERMS,SIG,TG,DET,0)	MAIN	251
		SA=S(1)	MAIN	252
		SB=S(2)	MAIN	253
		SC=S(3)	MAIN	254
225		GO TO 470	MAIN	255
	460	SA=0.	MAIN	256
		SB=1.	MAIN	257
		SC=0.	MAIN	258

230	B=1.	MAIN	259
	SIG(1)=0.0	MAIN	260
	SIG(2)=0.0	MAIN	261
	SIG(3)=0.0	MAIN	262
470	WRITE (6,750)	MAIN	263
235	WRITE(6,760)NTS(10),NTS(11),NTS(12),B,SA,SB,SC,SIG(1),SIG(2),	HPAD	26
	* SIG(3)	HPAD	26
	C	MAIN	265
	C	MAIN	266
	C	MAIN	267
	SEARCHING FOR FIDUCIAL	MAIN	268
240	I=I+ITZ	HPAD	27
	IF(IFID.NE.0)GO TO 525	MAIN	269
480	IF (ABS(R(I)-R(I-1)).LT.SKP) GO TO 500	MAIN	270
	IF (ABS(R(I)-R(I-2)).LT.SKP) GO TO 500	MAIN	271
	IF (ABS(R(I+1)-R(I-1)).GT.SKP) GO TO 490	MAIN	272
245	GO TO 510	MAIN	273
490	IF (ABS(R(I+2)-R(I-1)).GT.SKP) GO TO 520	MAIN	274
	I=I+3	MAIN	275
	GO TO 480	MAIN	276
500	I=I+1	MAIN	277
	GO TO 480	MAIN	278
250	510 I=I+2	MAIN	279
	GO TO 480	MAIN	280
	520 WRITE (6,770) I	MAIN	28
	525 SUM=.0	HPAD	3
255	IFS=I+IBSE	CAL4	283
	DO 530 KF=1,100	MAIN	284
	SUM=SUM+R(IFS)	MAIN	285
	IFS=IFS+1	MAIN	286
530	CONTINUE	MAIN	287
260	SBL=SUM/100.	MAIN	288
	WRITE (6,780) SBL	MAIN	289
	I=I+IX	MAIN	1
	540 IF(I.LT.JP)GO TO 560	HPAD1	291
	JPI(LP)=0	MAIN	292
265	KU=10	MAIN	2
	GO TO 680	HPAD1	296
	C	MAIN	297
	C	MAIN	298
	C	MAIN	299
	CALLING SUBROUTINES	MAIN	300
270	560 MIP=MOP(LLC)	MAIN	301
	IF (MIP.EQ.0) GO TO 630	MAIN	302
	GO TO (580,590,570), MIP	MAIN	303
	570 IF (KP.EQ.0) GO TO 620	MAIN	304
	GO TO (600,610), KP	MAIN	305
275	580 CALL PRESS	MAIN	306
	LLC=LLC+1	MAIN	307
	GO TO 560	MAIN	308
	590 CALL INTG	MAIN	309
	LLC=LLC+1	MAIN	29
	GO TO 560	HPAD	30
280	600 WRITE(6,601)	MAIN	311
	601 FORMAT(' THE DECK PLOT1 HAS BEEN YANKED')	MAIN	312
	LLC=LLC+1	MAIN	313
	GO TO 560	MAIN	314
285	610 ISU=ISU+1		
	CALL PLOT2		

	620 LLC=LLC+1	MAIN	315
	GO TO 560	MAIN	316
	630 KU=0	MAIN	317
290	640 CONTINUE	MAIN	318
	CALL DATAS(KN)	HPAD	31
	WRITE(6,790)NTS(10),NTS(11),NTS(12),KN	HPAD	32
	WRITE(6,800)	MAIN	320
	REWIND 2	HPAD	33
	REWIND 4	C21	1
295	GO TO 80	MAIN	322
	C	MAIN	323
	C	MAIN	324
	C	MAIN	325
	650 WRITE(6,810) R(I),R(I+1),R(I+2)	MAIN	326
300	STOP	MAIN	327
	660 READ(5,820) IQ	MAIN	328
	CALL SKIP	HPAD4	3
	GO TO 20	MAIN	330
	670 WRITE(6,830) II,IPNO(II)	MAIN	331
305	STOP	MAIN	332
	680 WRITE(6,840)I,JP	HPAD1	3
	GO TO 20	HPAD1	4
	C	MAIN	333
	700 FORMAT(3X,2I1,F10.3,I10,F10.0,9I5)	HPAD	35
310	710 FORMAT(///,4H ID=,12A2)	HPAD4	4
	720 FORMAT(6H X'S ,6(F10.3,2X) / 5X, 6(F10.3, 2X))	MAIN	336
	730 FORMAT(1H0,26X,18HORIGINAL EQUATIONS)	MAIN	337
	740 FORMAT(1H ,4(E15.8,2X))	MAIN	338
	750 FORMAT(1H0,27HCHANNEL GAGE CALIB CONSTANT,6X,2HSA,11X,2HSE,11X,2H	MAIN	339
315	ISC,9X,6HSIG(1),7X,6HSIG(2),7X,6HSIG(3))	MAIN	340
	760 FORMAT(2X,3A2,3X,F12.4,5X,6(E12.5,1X))	HPAD	37
	770 FORMAT(1H0,19HINDEX TO FIDUCIAL =,I10)	MAIN	342
	780 FORMAT('0BASELINE AVERAGE = ',F9.2)	MAIN	343
320	790 FORMAT(1H ,27HTHIS IS THE END OF CHANNEL ,3A2,' - ',I10,	HPAD	38
	1' DATA POINTS SAUED')	HPAD	39
	800 FORMAT(1H1)	MAIN	345
	810 FORMAT(1H ,36HTHERE IS A LOT OF SOMETHING GOING ON,3X,3(F10.3,3X)	MAIN	346
	1)	MAIN	347
	820 FORMAT(I5)	MAIN	348
325	830 FORMAT(31H0THIS OPTION IS INCORRECT, II =,I5,3X,3X,8HOPTION =,I5)	MAIN	349
	840 FORMAT(' I.GE.JP, I = ',I10,' JP = ',I10)	HPAD1	5
	END	MAIN	350

1	SUBROUTINE DATAF	DATAF	2
	COMMON R(25000),T(23000),P(23000),NOS,LP,LABEL(4),NY(6),Y(6),IQ(5)	HPAD4	1
	1 ,SBL,I,TZ,JP,IX,DELT,ID2,MOP(10),LLC,B,SA,SB,DTIME,NJ(10),TSTART,	HPAD	3
	2 SC, SKP, XAX, XFAC, YFAC, TIT(30), ISU, KP, YB, XB, NTS(24),ITZ,	COM	4
5	3 JPI(50),IZ,ITH,NOSR,N,IPNO(5),SS,KSTS1,KSTS2,YAX,JSU,KU	HPAD	4
	DIMENSION PI(1),PI2(1)	HPAD	5
	EQUIVALENCE (R(1),PI(1)),(R(12501),PI2(1))	HPAD	6
	IF(JSU.EQ.1)GO TO 20	C19	7
	WRITE(4)NTS	C19	8
10	WRITE(4)T(1),DTIME	C19	9
	WRITE(4)N	C19	10
	WRITE(4)(P(IT),IT=1,N)	C19	11
	NJ(LP)=N	C20	1
	GO TO 30	C19	13
15	20 NJ(LP)=0	C19	14
	30 RETURN	C19	15
	END	DATAF	11

1	C	SUBROUTINE DATAIN	HPAD	40
	C	COMMON R(25000),T(23000),P(23000),NOS,LP,LABEL(4),NY(6),Y(6),IQ(5)	HPAD	41
		1 ,SBL,I,TZ,JP,IX,DELT,ID2,MOP(10),LLC,B,SA,SB,DTIME,NJ(10),TSTART,	HPAD	42
5		2 SC, SKP, XAX, XFAC, YFAC, TIT(30), ISU, KP, YB, XB, NTS(24),ITZ,	HPAD4	1
		3 JPI(50),IZ,ITH,NOSR,N,IPNO(5),SS,KSTS1,KSTS2,YAX,JSU,KU	HPAD	3
		DIMENSION PI(1),PI2(1)	COM	4
		EQUIVALENCE (R(1),PI(1)),(R(12501),PI2(1))	HPAD	4
10		READ(1)NTS	HPAD	5
		IF(EOF(1).NE..0)STOP	HPAD	6
		READ(1)JP	HPAD	44
		WRITE(6,1)NTS,JP	HPAD	45
		READ(1)TSTART,DELT	HPAD	46
15		READ(1)(R(I),I=1,JP)	HPAD	47
		RETURN	HPAD	48
	1	FORMAT(1H0,1X,24A2,I10)	HPAD	49
		END	HPAD	50
			HPAD	51
			HPAD	52

1	SUBROUTINE DATAS(KN)	HPAD	53
	DIMENSION NTSD(24)	DATAS	3
	COMMON R(25000),T(23000),P(23000),NOS,LP,LABEL(4),MY(6),Y(6),IQ(5)	HPAD4	1
1	SBL,I,TZ,JP,IX,DELT,IDZ,MOP(10),LLC,B,SA,SD,DTIME,NJ(10),TSTART,	HPAD	3
5	2 SC,SKP,XAX,XFAC,YFAC,TIT(30),ISU,KP,YB,XB,NTS(24),ITZ,	COM	4
	3 JPI(50),IZ,ITH,NOSR,N,IPNO(5),SS,KSTS1,KSTS2,YAX,JSU,KU	HPAD	4
	DIMENSION PI(1),PI2(1)	HPAD	5
	EQUIVALENCE (R(1),PI(1)),(R(12501),PI2(1))	HPAD	6
	JT=0	DATAS	5
10	KN=0	DATAS	8
	NSU=1	DATAS	7
	REWIND 4	DATAS	8
	IF(JSU.EQ.1)GO TO 10	DATAS	9
	NOS1=NOS	DATAS	10
15	GO TO 20	DATAS	11
	10 NOS1=NOS-1	DATAS	12
	20 DO 60 IJ=1,NOS1	DATAS	13
	IF(NJ(IJ).EQ.0)GO TO 50	DATAS	14
	IF(NSU.GT.1)GO TO 30	DATAS	15
20	NSU=2	DATAS	16
	READ(4)NTS	DATAS	17
	READ(4)TT,DTIME	DATAS	18
	GO TO 40	DATAS	19
	30 READ(4)NTSD	DATAS	20
25	READ(4)TTD,DTD	DATAS	21
	40 JIP=JT+NJ(IJ)	DATAS	22
	JT=JT+1	DATAS	23
	READ(4)N	DATAS	24
	READ(4) (P(IU),IU=JT,JIP)	DATAS	25
30	JT=JIP	DATAS	26
	50 KN=KN+NJ(IJ)	DATAS	27
	60 CONTINUE	DATAS	28
	WRITE(3)NTS	DATAS	29
	WRITE(3)KN	DATAS	31
35	WRITE(3)TT,DTIME	C20	2
	WRITE(3)(P(IU),IU=1,KN)	DATAS	32
	RETURN	DATAS	33
	END	DATAS	34

1	C	SUBROUTINE PRESS	PRESS	2
	C	COMMON R(25000),T(23000),P(23000),NOS,LP,LABEL(4),NY(6),Y(6),IQ(5)	PRESS	3
		1,SBL,I,TZ,JP,IX,DELT,IDZ,MOP(10),LLC,B,SA,SB,DTIME,NJ(10),TSTART,	PRESS	4
5		2,SC,SKP,XAX,XFAC,YFAC,TIT(30),ISU,KP,YB,XB,NTS(24),ITZ,	HPAD4	1
		3,JPI(50),IZ,ITH,NOSR,N,IPNO(5),SS,KSTS1,KSTS2,YAX,JSU,KU	HPAD	3
		DIMENSION PI(1),PI2(1)	COM	4
		EQUIVALENCE (R(1),PI(1)),(R(12501),PI2(1))	HPAD	4
			HPAD	5
10	C	CALCULATING PRESSURE	HPAD	6
	C		PRESS	11
	C		PRESS	12
		N=1	PRESS	13
		IZ=IZ+1	HPAD	54
15		IF (IZ.GE.ITH) GO TO 80	C19	16
	30	P(N)=R(I)	PRESS	15
		CF=SA+SB*(P(N)-SBL)+SC*(P(N)-SBL)*X2	PRESS	16
		P(N)=B*CF	PRESS	17
		T(N)=TZ+FLOAT(IZ)*DTIME	PRESS	18
20		IF (IZ.GE.ITH) GO TO 40	C17	3
		IF (I+IDZ.GT.JP) GO TO 40	PRESS	20
		N=N+1	PRESS	21
		I=I+IDZ	PRESS	22
		IZ=IZ+1	PRESS	23
25		GO TO 30	PRESS	24
	40	IF (MOP(3).NE.0) GO TO 90	PRESS	25
		IF (LP.GT.1) GO TO 50	PRESS	26
			PRESS	27
	C	PRINTING PRESSURE	PRESS	28
30	C		PRESS	29
		WRITE(6,100)DTIME	PRESS	30
	50	DO 55 ML=1,N,15	HPAD	55
		MLM=ML+14	C9	1
		IF (MLM.GT.N)MLM=N	C10	1
35		WRITE(6,110)T(ML),(P(MK),MK=ML,MLM)	C19	17
	55	CONTINUE	C9	3
		CALL DATAF	C9	4
			C12	6
	C	ERROR PRINT	PRESS	33
40	C		PRESS	34
		IF (I.GT.JP.AND.LP.EQ.NOS) GO TO 60	PRESS	35
		GO TO 90	PRESS	36
	60	WRITE (6,120) I,JP,N	C19	18
		GO TO 90	PRESS	38
45		JSU=1	PRESS	41
		N=0	PRESS	42
	90	RETURN	PRESS	43
			PRESS	44
	C		PRESS	45
50		100 FORMAT(1H0,48H TIME AND DATA POINTS SAVED - TIME INTERVAL, MS=,	HPAD	56
		* F8.6)	HPAD	57
	110	FORMAT(1X,F10.4,15F8.2)	CAL3	1
	120	FORMAT (1H0,/,25HI IS GREATER THAN JP, I =,I10,3X,4HJP =,I10,3HN	PRESS	48
		1=,I10)	PRESS	49
		END	PRESS	51

1	C	SUBROUTINE INTG	INTG	2
	C	COMMON R(25000),T(23000),P(23000),NOS,LP,LABEL(4),NY(6),Y(6),IQ(5)	INTG	3
		1 ,SBL,I,TZ,JP,IX,DELT,IDZ,MOP(10),LLC,B,SA,SB,DTIME,NJ(10),TSTART,	INTG	4
5		2 SC,SKP,XAX,XFAC,YFAC,TIT(30),ISU,KP,YB,XB,NTS(24),ITZ,	HPAD4	1
		3 JPI(50),IZ,ITH,NOSR,N,IPNO(5),SS,KSTS1,KSTS2,YAX,JSU,KU	HPAD	3
		DIMENSION PI(1),PI2(1)	COM	4
		EQUIVALENCE (R(1),PI(1)),(R(12501),PI2(1))	HPAD	4
10		IF (JSU.EQ.1) GO TO 60	HPAD	5
		IF (LLC.EQ.4.AND.MOP(4).EQ.2) GO TO 30	INTG	6
		IF (LP.GT.1.AND.KU.EQ.0) GO TO 10	INTG	7
		PI(1)=0.0	INTG	8
15		IF (MOP(4).EQ.2) GO TO 10	INTG	9
		WRITE (6,70)	INTG	10
	C		INTG	11
	C	CALCULATION OF FIRST INTEGRAL	INTG	12
	C		INTG	13
20		10 DELP=DELT*FLOAT(IDZ)/1000.	INTG	14
		DO 20 IT=2,N	INTG	15
		20 PI(IT)=PI(IT-1)+.5*DELP*(P(IT-1)+P(IT))	INTG	16
		IF (MOP(4).EQ.2) GO TO 60	INTG	17
	C		INTG	18
25	C	PRINT OF FIRST INTEGRAL	INTG	19
	C		INTG	20
		WRITE(6,80)(T(IT),P(IT),PI(IT),IT-1,N)	INTG	21
		PI(1)=PI(N)	CS	2
		GO TO 60	INTG	23
	C		INTG	24
30	C	CALCULATION OF SECOND INTEGRAL	INTG	25
	C		INTG	26
		30 IF (LP.GT.1.AND.KU.EQ.0) GO TO 40	INTG	27
		WRITE (6,90)	INTG	28
		PI2(1)=0.	INTG	29
35		40 DELP=DELT*FLOAT(IDZ)/1000.	INTG	30
		DO 50 IT=2,N	INTG	31
		50 PI2(IT)=PI2(IT-1)+.5*DELP*(PI(IT-1)+PI(IT))	INTG	32
	C		INTG	33
40	C	PRINT OF FIRST AND SECOND INTEGRAL	INTG	34
	C		INTG	35
		WRITE(6,100)(T(IT),P(IT),PI(IT),PI2(IT),IT-1,N)	INTG	36
		PI2(1)=PI2(N)	CS	3
		PI(1)=PI(N)	INTG	38
45		60 RETURN	INTG	39
	C		INTG	40
		70 FORMAT (1H1,5X,2(4HTIME,10X,8NPRESSURE,8X,8HINTEGRAL,10X))	INTG	41
		80 FORMAT (1H ,6(F13.6,3X))	INTG	42
		90 FORMAT (1H1,5X,4HTIME,10X,8NPRESSURE,8X,8HINTEGRAL,8X,8HINTEGRAL,1	INTG	43
		10X,4HTIME,10X,8NPRESSURE,8X,8HINTEGRAL,8X,8HINTEGRAL)	INTG	44
50		100 FORMAT (1H ,8(F13.6,3X))	INTG	45
		END	INTG	46
			INTG	47

1	C	SUBROUTINE PLOT2	PLOT2	2
	C	COMMON R(25000),T(23000),P(23000),NOS,LP,LABEL(4),NY(6),Y(6),IQ(5)	PLOT2	3
		1 ,SBL,I,TZ,JP,IX,DELT,IDZ,NOP(10),LLC,B,SA,SB,DTIME,NJ(10),TSTART,	PLOT2	4
5		2 SC,SKP,XAX,XFAC,YFAC,TIT(30),ISU,KP,YB,XB,NTS(24),ITZ,	HPAD4	1
		3 JPI(50),IZ,ITH,NOSR,N,IPNO(5),SS,KSTS1,KSTS2,YAX,JSU,KU	HPAD	3
		DIMENSION PI(1),PI2(1)	COM	4
		EQUIVALENCE (R(1),PI(1)),(R(12501),PI2(1))	HPAD	4
10	C	THIS SUBROUTINE PLOTS REGULAR PLOTS	HPAD	5
	C	IF (ISU.GT.1) GO TO 10	HPAD	6
		ISU=ISU+1	PLOT2	7
15		XPAGE=XAX+3.5	PLOT2	8
		YPAGE=YAX+3.5	PLOT2	9
		CALL PLTBEG(XPAGE,YPAGE,1.,13,LABEL)	PLOT2	10
20	10	KN=N	C3	11
		CALL FIXSCA (P(1),KN,YAX,YS,YMI,YMA,DY)	C3	6
		CALL FIXSCA (T(1),KN,XAX,XS,XMI,XMA,DX)	C3	7
		CALL PLTSCA(XB,YB,XMI,YMI,XS,YS)	C2	16
		CALL PLTAXS(DX,DY,XMI,XMA,YMI,YMA,4)	HPAD	58
		TX=XMI-1.5*XS	PLOT2	37
		CHT=.1	PLOT2	38
25		TY=YMA+1.2*YS	C2	17
		ENCODE (25,140,TIT(1))(NTS(IT),IT=1,12)	C2	18
		CALL PLTSYM(CHT,TIT(1),0.,TX,TY)	C4	3
		CALL LABELA (DX,DY,XMI,XMA,YMI,YMA,XFAC,YFAC)	C8	1
		CALL PLTUND(XMI,XMA,YMI,YMA)	PLOT2	43
30		CALL PLTDTS(1,0,T(1),P(1),KN,0)	PLOT2	45
		CALL PLTPGE	C2	19
		IF (LP.NE.NOS) GO TO 130	PLOT2	58
		IF (NOS.EQ.1) GO TO 130	C2	20
35		REWIND 2	C3	8
		IF (JSU.EQ.1) GO TO 100	C2	22
		NOS1=NOS	PLOT2	60
		GO TO 110	HPAD	59
40	100	NOS1=NOS-1	PLOT2	67
	110	DO 120 IJ=1,NOS1	PLOT2	68
		IF (JPI(IJ).EQ.0) GO TO 120	PLOT2	69
		JIP=JPI(IJ)	PLOT2	70
		READ (2) (T(IU),IU=1,JIP),(P(IU),IU=1,JIP)	PLOT2	71
45	120	CONTINUE	PLOT2	72
	130	RETURN	PLOT2	73
	C	140 FORMAT(12A2,1H)	PLOT2	74
		END	PLOT2	75
			HPAD	76
			PLOT2	77
			HPAD	78
			PLOT2	80

1	C	SUBROUTINE SKIP	HPAD	61
			HPAD	62
	C		HPAD	63
		COMMON R(25000),T(23000),P(23000),NOS,LP,LABEL(4),MY(6),Y(6),IQ(5)	HPAD4	1
5		1 ,SBL,I,TZ,JP,IX,DELT,IDZ,MOP(10),LLC,B,SA,S3,DTIME,NJ(10),TSTART,	HPAD	3
		2 SC, SKP, XAX, XFAC, YFAC, TIT(30), ISU, KP, Y3, X3, NTS(24),ITZ, COM		4
		3 JPI(50),IZ,ITH,NOSR,N,IPNO(5),SS,KSTS1,KSTS2,YAX,JSU,KU	HPAD	4
		DIMENSION PI(1),PI2(1)	HPAD	5
		EQUIVALENCE (R(1),PI(1)),(R(12501),PI2(1))	HPAD	6
10		WRITE(6,1)IQ	HPAD	65
	100	CALL DATAIN	HPAD	66
		DO 150 I=1,5	HPAD4	5
		IF(NTS(I).NE.IQ(I))GO TO 100	HPAD4	6
	150	CONTINUE	HPAD4	7
15	200	WRITE(6,2)	HPAD	70
		RETURN	HPAD	71
		1 FORMAT(' SKIP TO CHANNEL ',3A2)	HPAD	72
		2 FORMAT(' END OF CHANNELS TO BE SKIPPED')	HPAD	73
		END	HPAD	74

APPENDIX E.3

Sample Output

LBR47

1 1 4

4588

ID=LBR47 1 1 4
 X'S 2006.180 2365.880 2637.500 2909.480 3188.640 3465.460
 5.965 5.172 6.207 5.188 5.153 5.629

ORIGINAL EQUATIONS

.10000000E+01 0. 0. 0.
 .10000000E+01 .27970000E+03 .78232000E+05 .10000000E+01
 .10000000E+01 .55132000E+03 .30395374E+06 .20000000E+01
 .10000000E+01 .82330000E+03 .67782220E+06 .30000000E+01
 .10000000E+01 .11004000E+04 .12110122E+07 .40000000E+01
 .10000000E+01 .13792000E+04 .19024133E+07 .50000000E+01

CHANNEL GAGE CALIB CONSTANT

SA

SB

SC

SIG(1)

SIG(2)

SIG(3)

1 1 4 1.0000

-.77917E-02

.36549E-02

-.15010E-07

.99777E-02

.33900E-04

.23571E-07

INDEX TO FIDUCIAL = 1069

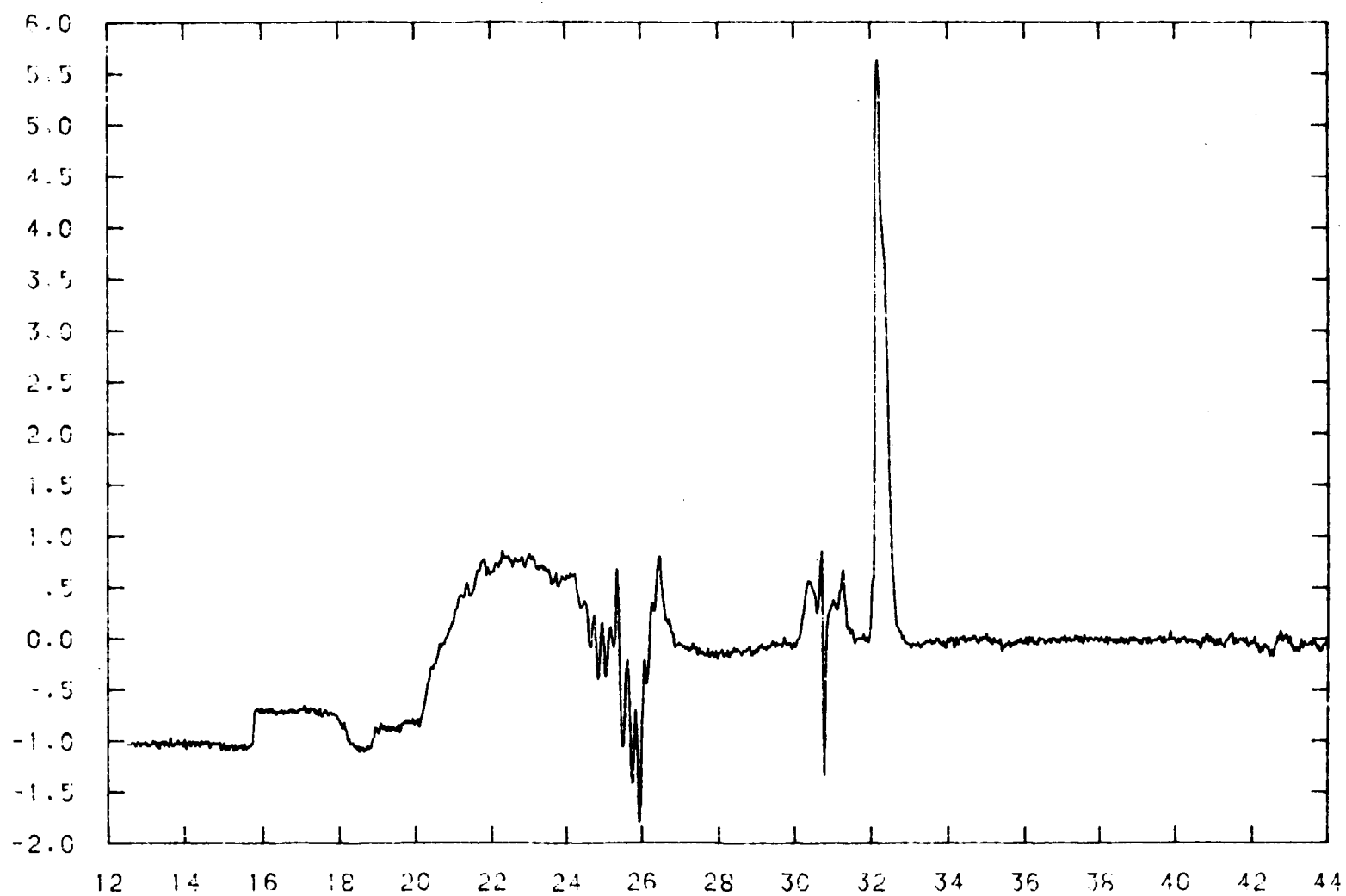
BASELINE AVERAGE = 2369.85

TIME AND DATA POINTS SAVED - TIME INTERVAL, MS = .012500

12.5125	-1.02	-1.03	-1.03	-1.02	-1.02	-1.03	-1.04	-1.03	-1.03	-1.03	-1.02	-1.01	-1.01	-1.00	-1.00	-1.00
12.7000	-1.01	-1.03	-1.05	-1.05	-1.05	-1.02	-1.02	-1.02	-1.00	-1.00	-1.02	-1.01	-1.02	-1.03	-1.05	-1.04
12.8875	-1.02	-1.02	-1.02	-1.03	-1.02	-1.02	-1.03	-1.03	-1.03	-1.02	-1.01	-1.01	-1.03	-1.04	-1.04	-1.03
13.0750	-1.02	-1.03	-1.04	-1.05	-1.03	-1.03	-1.03	-1.03	-1.03	-1.02	-1.00	-1.00	-1.00	-1.02	-1.02	-1.00
13.2625	-1.01	-1.04	-1.05	-1.05	-1.01	-1.01	-1.04	-1.04	-1.07	-1.07	-1.03	-1.01	-1.01	-1.03	-1.03	-1.00
13.4500	-1.00	-1.02	-1.05	-1.04	-1.01	-1.00	-1.00	-1.00	-1.02	-1.03	-1.01	-1.02	-1.04	-1.05	-1.04	-1.00
13.6375	-.96	-.98	-1.02	-1.04	-1.04	-1.05	-1.04	-1.05	-1.05	-1.03	-1.01	-1.02	-1.02	-1.04	-1.03	-1.01
13.8250	-1.00	-.99	-1.00	-1.03	-1.03	-1.03	-1.01	-1.01	-1.01	-1.01	-1.01	-1.02	-1.04	-1.05	-1.04	-1.01
14.0125	-.98	-1.00	-1.04	-1.07	-1.08	-1.05	-1.01	-1.01	-1.01	-1.00	-1.00	-1.00	-1.01	-1.04	-1.05	-1.04
14.2000	-1.02	-1.00	-1.01	-1.01	-1.01	-1.00	-1.02	-1.02	-1.05	-1.05	-1.04	-1.02	-1.01	-1.02	-1.01	-1.01
14.3875	-1.02	-1.04	-1.05	-1.04	-1.01	-1.00	-1.00	-1.00	-1.02	-1.02	-1.02	-1.01	-1.01	-1.02	-1.01	-1.00
14.5750	-1.00	-1.01	-1.02	-1.01	-1.00	-1.01	-1.04	-1.06	-1.06	-1.05	-1.04	-1.01	-1.02	-1.03	-1.03	-1.02
14.7625	-1.01	-1.02	-1.02	-1.03	-1.02	-1.01	-1.02	-1.02	-1.02	-1.03	-1.03	-1.02	-1.02	-1.01	-1.02	-1.04
14.9500	-1.07	-1.00	-1.07	-1.05	-1.04	-1.02	-1.02	-1.02	-1.02	-1.05	-1.09	-1.09	-1.08	-1.04	-1.04	-1.06
15.1375	-1.08	-1.08	-1.05	-1.04	-1.04	-1.05	-1.04	-1.05	-1.03	-1.04	-1.06	-1.08	-1.09	-1.06	-1.04	-1.03
15.3250	-1.06	-1.07	-1.06	-1.07	-1.07	-1.08	-1.06	-1.06	-1.05	-1.05	-1.05	-1.06	-1.04	-1.03	-1.04	-1.07
15.5125	-1.09	-1.06	-1.03	-1.02	-1.02	-1.04	-1.07	-1.08	-1.07	-1.06	-1.05	-1.06	-1.05	-1.04	-1.05	-1.06
15.7000	-1.05	-1.03	-1.02	-1.02	-1.02	-.99	-.99	-.99	-.81	-.74	-.70	-.71	-.71	-.69	-.68	-.68
15.8875	-.69	-.69	-.69	-.71	-.72	-.72	-.71	-.72	-.68	-.67	-.68	-.69	-.72	-.73	-.72	-.71
16.0750	-.70	-.70	-.69	-.69	-.70	-.71	-.72	-.72	-.72	-.69	-.68	-.68	-.69	-.71	-.70	-.69
16.2625	-.69	-.70	-.72	-.72	-.71	-.71	-.71	-.72	-.74	-.74	-.73	-.72	-.71	-.72	-.72	-.71
16.4500	-.72	-.71	-.71	-.70	-.69	-.70	-.73	-.74	-.74	-.74	-.71	-.71	-.71	-.71	-.72	-.71
16.6375	-.72	-.73	-.72	-.71	-.70	-.69	-.69	-.69	-.69	-.70	-.72	-.71	-.71	-.69	-.69	-.71
16.8250	-.72	-.71	-.71	-.71	-.72	-.72	-.71	-.70	-.70	-.71	-.71	-.70	-.68	-.68	-.69	-.69
17.0125	-.69	-.68	-.69	-.69	-.68	-.68	-.65	-.68	-.68	-.71	-.72	-.71	-.68	-.68	-.70	-.72
17.2000	-.72	-.71	-.68	-.68	-.68	-.69	-.69	-.69	-.69	-.69	-.69	-.68	-.69	-.70	-.72	-.74
17.3875	-.73	-.72	-.70	-.71	-.74	-.75	-.73	-.70	-.69	-.69	-.71	-.74	-.76	-.76	-.74	-.73
17.5750	-.73	-.72	-.72	-.70	-.70	-.71	-.72	-.72	-.72	-.73	-.74	-.75	-.74	-.73	-.72	-.72
17.7625	-.72	-.72	-.72	-.74	-.74	-.74	-.74	-.74	-.73	-.74	-.74	-.75	-.75	-.75	-.76	-.76
17.9500	-.76	-.78	-.79	-.79	-.79	-.80	-.82	-.83	-.84	-.84	-.85	-.87	-.88	-.86	-.86	-.83
18.1375	-.82	-.83	-.86	-.89	-.89	-.90	-.93	-.97	-.97	-1.00	-.99	-.99	-1.02	-1.04	-1.03	-1.03
18.3250	-1.02	-1.02	-1.02	-1.02	-1.02	-1.03	-1.05	-1.06	-1.06	-1.06	-1.04	-1.04	-1.07	-1.08	-1.08	-1.06
18.5125	-1.05	-1.08	-1.11	-1.11	-1.07	-1.05	-1.06	-1.09	-1.09	-1.08	-1.06	-1.06	-1.09	-1.11	-1.11	-1.09
18.7000	-1.00	-1.08	-1.09	-1.07	-1.05	-1.04	-1.05	-1.07	-1.07	-1.06	-1.06	-1.06	-1.06	-1.06	-1.05	-1.01
18.8875	-.99	-.97	-.97	-.96	-.93	-.90	-.87	-.87	-.87	-.88	-.88	-.89	-.90	-.92	-.93	-.92
19.0750	-.90	-.87	-.85	-.84	-.83	-.85	-.87	-.89	-.88	-.86	-.85	-.86	-.86	-.87	-.89	-.89
19.2625	-.90	-.90	-.89	-.88	-.86	-.86	-.88	-.88	-.88	-.90	-.91	-.89	-.87	-.88	-.88	-.88
19.4500	-.89	-.87	-.87	-.88	-.89	-.89	-.90	-.90	-.90	-.90	-.87	-.84	-.85	-.89	-.92	-.91
19.6375	-.88	-.85	-.83	-.84	-.84	-.83	-.82	-.82	-.82	-.82	-.81	-.79	-.80	-.81	-.83	-.82
19.8250	-.79	-.80	-.81	-.82	-.81	-.80	-.82	-.83	-.81	-.81	-.79	-.78	-.80	-.82	-.84	-.84
20.0125	-.82	-.80	-.80	-.80	-.79	-.78	-.80	-.84	-.87	-.87	-.87	-.83	-.79	-.77	-.76	-.76

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APPENDIX E.4

Definition of Parameters and Other Control Variables

TABLE E1. INPUT CARD IMAGE

<u>Variable</u>	<u>Format</u>	<u>Column</u>	<u>Description</u>
IPNO(2)	I1	4	Sets IDZ and IX as specified in Table E2.
IDZ			The increment for choosing the input data to be saved (e.g., 5=save every fifth sample.)
IX			The number of samples to skip after the fiducial mark to reach the data which are to be processed.
IPNO(3)	I1	5	Sets KP, MOP(3) and MOP(4) as specified in Table E2.
KP			Plotting option: 0 = no plot, 1 = special plot to be programmed by user, 2 = normal page-size plot.
MOP(3),MOP(4)			Choices for integrating: none, once, or twice.
B	F10.3	6-15	Calibration constant for the gage in engineering units per calibration step.
IXS	I10	16-25	0 = no change to the value set in IPNO(2); 0 ≠ change the value set in IPNO(2) to this value.
DLTM	F10.0	26-35	Time adjustment to be subtracted from the value of TSTART.
IDZS	I5	36-40	0 = no change to the value set in IPNO(2); 0 ≠ change the value set in IPNO(2) to this value.
NLIST	I5	41-45	0 = NAMELIST not used; 1 = NAMELIST used (see Table E3.)
IFID	I5	46-50	0 = fiducial mark is present; 1 = no fiducial mark.
NLK	I5	51-55	Number of contiguous data sets to be processed the same way.

TABLE E2. PARAMETER SETTINGS

<u>Parameter</u>	<u>Value</u>	<u>Description</u>
IPNO(2)*	0	Skip this data set if IPNO(3) = 0 also; otherwise, an error message is printed and processing halts
	1	IDZ = 1 and IX = 500
	2	IDZ = 1 and IX = 2000
	3	IDZ = 1 and IX = 3000
	4	IDZ = 2 and IX = 500
	5	IDZ = 2 and IX = 2000
	6	IDZ = 2 and IX = 3000
	7	IDZ = 5 and IX = 500
	8	IDZ = 5 and IX = 2000
	9	IDZ = 5 and IX = 3000
IPNO(3)**	0	Skip this data set if IPNO(2) = 0 also; otherwise, an error message is printed and processing halts
	1	KP = 0, MOP(3) = 0***, and MOP(4) = 0***
	2	KP = 0, MOP(3) = 2, MOP(4) = 0
	3	KP = 0, MOP(3) = 2, MOP(4) = 2
	4	KP = 1, MOP(3) = 0, MOP(4) = 0
	5	KP = 1, MOP(3) = 2, MOP(4) = 0
	6	KP = 1, MOP(3) = 2, MOP(4) = 2
	7	KP = 2, MOP(3) = 0, MOP(4) = 0
	8	KP = 2, MOP(3) = 2, MOP(4) = 0
	9	KP = 2, MOP(3) = 2, MOP(4) = 2

* If these choices for IDZ and IX are unacceptable, choose the option closest to the desired value and insert the correct values as IDZS and/or IXS on the input card image.

** If IPNO(2) = 0 and IPNO(3) = 0, the array IQ is read in from the next card image with format 5A2. The array IQ must exactly match NAMEF, as defined in the data file created in ADTAPE2, of the next data set to be processed. If IQ and NAMEF do not match, the search will continue to the end-of-file marker.

*** 0 = no; 2 = yes. For one integration MOP(3) = 2 and MOP(4) = 0. For two integrations MOP(3) = 2 and MOP(4) = 2.

TABLE E3. NAMELIST VARIABLES

<u>Variable</u>	<u>Default Value</u>	<u>Description</u>
IBSE	500	Number of samples to skip after the fiducial mark before starting to sample the baseline.
ITM	23000	Maximum number of data samples to be converted to engineering units.
ITZ	950	Number of samples to skip after sampling the last calibration step before starting to search for the fiducial mark.
MOP		Control variable: 0 = end of processing, 1 = conversion to engineering units, 2 = integration, 3 = plotting.
NS	6	Number of calibration steps to be used in the least squares regression.
NX	40	Number of samples to be averaged for each calibration step.
NY	16,100,240, 360,480,600	Sample indices marking the position on each calibration step to start processing data.
SKP	150.	Criterion for eliminating spikes in calibration steps.
SS	1.	Step size of each calibration step, usually, in ohms or volts.
XAX	7.5	Abscissa graph size in inches.
XFAC	1.	Scale factor for the numeric label on the x-axis (e.g., if XFAC = .001 and the number to be printed is 10000, a 10 will be printed.)
YAX	5.	Ordinate graph size in inches.
YFAC	1.	Scale factor for the numeric label on the y-axis, similar to XFAC.

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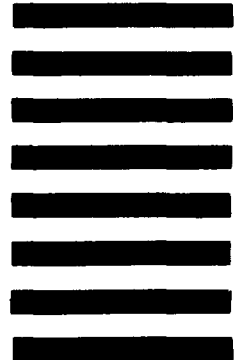


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