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REPORT

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**ANALOGUE-DIGITAL-MAGNETIC
TAPE CONVERSION SYSTEM**

J. R. MORREY
H. S. GILE

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ANALOGUE-DIGITAL-MAGNETIC TAPE CONVERSION SYSTEM

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TABLE OF CONTENTS

LIST OF FIGURES	iv
LIST OF TABLES	v
INTRODUCTION	1
SUMMARY	1
INSTRUMENTATION	4
PAPER TAPE CODING AND FORMAT	7
PROGRAMMING	7
Paper Tape Input Program	13
EDIT Program	17
Computational Programs	19
Current Subprograms (SUBRXX)	21
Special Processing and Output Programs	25
COMPUTER TIME REQUIREMENTS	33
MODIFICATION FOR OTHER ELECTRONIC DATA	
PROCESSING CENTERS	35
PREPARATION OF PERIPHERAL CARDS FOR COMPUTATION	37
RECOMMENDATIONS FOR USERS	49
ACKNOWLEDGMENTS	50
APPENDIX A INSTRUMENTATION	A.1
APPENDIX B PTI PROGRAMS, MEMORY MAPS, LOGIC CHARTS	B.1a
APPENDIX C EDIT PROGRAMS	C.1a
APPENDIX D COMPUTATIONAL PROGRAMS	D.1a
APPENDIX E RECALL PROGRAM	E.1
DISTRIBUTION	F.1

LIST OF FIGURES

1	Flow Chart of Analogue-Digital-Magnetic Tape Conversion System	3
2	Punch Codes	8
3	Paper Tape Format	8
4	Sample Page of "EDIT" Report	9
5	Plot of Spectrum Generated by the "EDIT" Pass	10
6	Retention of Previous Files	12
7	Example of PTI Monitor Output	14
8	Example of Error Report from PTI Pass	15
9	Programmatic Correction of Light Scattering - Lagrange Interpolation	23
10	Example of Spectral Combinations	24
11	Illustration of Smoothing and Derivative Programs	27
12	Example of Scatter Correction and Data Thinning	30
13	Example of Resolution Program RESPLT	32
14	Order of Computational Parameter Cards	48
A.1	Schematic of Scaler	A.1
A.2	Schematic Serial Number Device	A.2
A.3	Modification of Basic System	A.3
A.4	Switching Circuits for Arrest of Cary Spectrophotometer	A.4
B.1	Memory Map of PTI Pass	B.3a
B.2	Logic Charts for PTI Programs: MAIN, CNVRT, CHR01, CHR02	B.4a
B.3	Logic Charts for PTI Programs: CLFLD, CLRCD	B.5a
B.4	Logic Charts for PTI Programs: CHR03, CHR04, CHR06, CHR08, CHR09	B.6a
C.1	Memory Map and Record Formats for EDIT Pass	C.2a
C.2	Logic Charts for EDIT Programs: MAIN, LEADER	C.4a
C.3	Flow Charts for EDIT Programs: BODY, MWRITE, RWRITE	C.5a
C.4	Flow Charts for EDIT Programs: IOTST, READ, WRITE	C.6a
D.1	Locations of Dimensioned and Common Variables in Computational System	D.2a

LIST OF FIGURES (contd)

D.2	Flow Charts for COMPUTATIONAL Programs: MAIN	D.5a
D.3	Flow Charts for COMPUTATIONAL Programs: SUBR04, SUB11, RLOAD, THIN	D.6a
D.4	Logic Charts for COMPUTATIONAL Programs: NWRITE, SMOOTH, RESPLT	D.7a

LIST OF TABLES

B.I	Definitions of Switches [KSW(I)], Tags [KTG(I)], and Counts [LCNT(I)] for PTI Pass	B.1a
B.II	Special Programs Used in the PTI Pass	B.2a
C.I	Definitions of Switches [KSW(I)], Tags [KTG(I)], and Counts [LCNT(I)] for EDIT Pass	C.1a
C.II	Special Programs Used in the EDIT Pass	C.3a
D.I	Definitions of Tags [KTG(I)], Counts [LCNT(I)]	D.1a
D.II	Definitions of Subroutines for Computational System	D.3a

ANALOGUE-DIGITAL-MAGNETIC TAPE CONVERSION SYSTEM

J. R. Morrey and H. S. Gile

INTRODUCTION

With the rapidly increasing availability of high speed computers, efficient and objective interpretation of large quantities of data obtained by recording potentiometers is now convenient. However, this is only true if these data are supplied to a computer without the task of preparing the data by hand. The system described in this document performs this function, and consists of three basic parts:

- Instrumentation for recording analogue data on paper tape and transferring it to magnetic tape
- Computer programs for editing and transferring the data from paper tape to magnetic tape
- A general computational program for performing a variety of calculations on the data.

SUMMARY

The instrumentation needed in the analogue-digital-magnetic tape conversion system consists of an analogue generating instrument, a biquinary scaler, a digital voltmeter (DVM), a serial number device, a tape coupler, and a paper tape punch. The analogue generating equipment, which might be a spectrophotometer, gas chromatograph, X-ray diffraction unit, or any other instrument utilizing a recording potentiometer, must be equipped with a slave potentiometer and a triggering system to initiate the reading and conversion of the voltage across the slide wire. The instrumentation needed to implement the computer programs consists of a 32K computer, capable

of accepting FORTRAN-II and FAP language,* the accessory paper-tape magnetic-tape conversion unit, and a plotter. Since these instruments are normally provided by the Electronic Data Processing Center, they will not be discussed.

In our system the analogue-conversion instruments are mounted in a portable rack and, therefore, can be attached to one of several instruments. Specifically, the system was designed for absorption spectra created by either the Cary model 14 spectrophotometer** or the Perkin Elmer Model 521 spectrophotometer. Other systems are easily adaptable if the nomenclature and record formats used in the associated computer programs are the same and the extra slide wire and triggering systems have been installed.

Figure 1 is a flow chart of the analogue-digital-magnetic tape conversion system. It consists of three phases: 1) the generation of paper tape; 2) generation of magnetic tape; and 3) computational operations. All of the instrumentation described in this report is used in the first phase, and all of the computer programs are used in the second and third phases.

The computational operations are performed in a variety of subprograms and are found in Appendix D. A discussion of their usage is included in the text.

*This system will shortly be available in FORTRAN-IV language (with a minimum amount of SLEUTH-II language) for use on UNIVAC 1107 and 1108 computers.

**This application will be used throughout as an example of the system. The computational system described in pages 19 et seq. and Appendix D are quite specifically for spectra. The programs nevertheless might be quite useful for other considerations.

FIGURE 1. Flow Chart of Analogue-Digital-Magnetic Tape Conversion System

INSTRUMENTATION

The function of the scaler is to provide flexibility in the frequency of data accumulation. For example, it may be desirable to record absorbance every 2 Å one time, and every 50 Å the next. If this flexibility is not needed, the scaler may be omitted from the system. The biquinary scaler has been built specifically for our use because it is compatible with the scales created on chart paper by the Cary Model 14 spectrophotometer and Perkin-Elmer Model 521 spectrophotometer (Appendix A, Figure A.1). For some applications, an octal scaler might serve as well, in which case the available sample increments would be 1,2,4,8,16,32, etc. instead of 1,2,5,10, 25,50,100 which are currently provided by the biquinary scaler. There is no restriction imposed on the increment by the computer programs.

The digital-voltmeter and tape punch were supplied as a system by the Dymec Division of Hewlett-Packard Company. The system, labeled DY-6007, consists of a Dymec Tape Punch Coupler (Model DY-2542, Specification M1) and a Tape Punch and Power Supply (Model DY-2542-2) operated from a Hewlett-Packard Digital Voltmeter (Model hp-405CR, Specification M1). The Coupler converts data received from the DVM to a Friden SFD punch code for a seven level tape punch. Although the Coupler will process over 8 words/sec, the speed of the system is limited by the speed of the DVM which will read a maximum of 5 words/sec.* Some modifications have been made to this system (for reasons that will be described below).**

*A word consists of 7 characters and constitutes one absorbance reading.

**Since this system was put into operation, several transistorized data acquisition systems have been marketed. Any potential user should look carefully at these systems before investing in equipment. However, the "software" in this system should be valuable regardless of the acquisition system acquired.

A circuitry schematic of the serial number device shown in Figure 1 is provided in Appendix A, Figure A.2. It has been built directly into the coupler chassis. Its function is to punch into the paper tape peripheral data which are logically required, thereby precluding the use of peripheral punched cards or the need for hand punched and spliced tape. Considerable effort has gone into its design to minimize such operator errors as forgetting the serial number of entering peripheral data in the improper sequence.

The voltage displayed on the DVM can be made numerically equal to the absorbance by adjusting the reference voltage across the slidewire. This reference voltage, which is conveniently supplied by circuitry built into the biquinary scaler, can be adjusted by a ten-turn precision potentiometer attached to the scaler panel. If desired, corrections from absorbance to absorptivity can also be made by this control if the proper concentration is known. However, it is generally more convenient to make this correction in the computational program discussed below.

The pulse generated by the scaler performs two functions: 1) it actuates the tape punch to record the voltage displayed on the DVM; 2) it subsequently causes the DVM to display the present voltage.*

The Cary Model 14 spectrophotometer has two scales: the first from 0 to 1 and the second from 1 to 2 absorbance units, respectively. In both cases, the voltage across the slidewire will be the same in corresponding pen positions. To distinguish between scales, we have installed a solenoid switch (located in the scaler chassis) to reverse the

*Notice that the punched value was displayed during the previous pulse. This characteristic has been taken into account in the design of the EDIT program.

polarity from plus to minus as the pen travels from the low to high scale. While the pen is changing from one scale to another, the digital voltmeter becomes unbalanced and the values recorded are invalid. Originally an imbalance prevented activation of the tape punch by suppressing the triggering pulse generated by the scaler. This could not be allowed in our system because it would have destroyed the increment-counting sequency needed to calculate the corresponding wavelengths in the EDIT pass. Therefore, the triggering-pulse circuit was made to bypass the DVM entirely. In turn, this necessitated another modification to detect invalid readings from the DVM during imbalance. This was accomplished in the following manner. The character formally used to designate the position of the decimal point was reassigned to punch a "0" when the DVM is unbalanced, i.e. X.XX, XX.X or .XXX, and a "3" if it is balanced, i.e. XXX. A schematic of these changes is given in Appendix A, Figure A.3

We also installed a delay circuit, activated by a change of decimal point in the DVM, that stops both the chart and wavelength drive of the Cary Model 14 for 5 sec when scales are changed. This minimizes the number of data which must be interpolated.

The internal triggering device in the DVM can not be used in applications where the sampling rate is time variant. Consequently, an external triggering device has been designed for the Cary Model 14 as follows:

A small photodiode 1/16 in. diam by 1/2 in. long is installed into a brass block drilled with a 3/64 in. hole for light passage to the photodiode and mounted under the wavelength disk. It is thus shielded so that light from a 6.3 Volt lamp, mounted above the disk, will only reach it when one of the peripherally drilled holes in the disk is aligned with the hole in the photodiode mounting. Fifty equally spaced holes 3/64 in. in diameter allow light to impinge on the photodiode every 2 Å or 7.2° of rotation.

After amplification the resultant pulse is applied to the scaler (Appendix A, Figure A.1 and A.3). The triggering device for the Perkin-Elmer spectrophotometer is an encoder supplied with the instrument that provides a pulse every 0.2 cm^{-1} .

PAPER TAPE CODING AND FORMAT

Figure 2 lists the Friden SFD coding as it appears on paper tape for all characters used by the system; Figure 3 outlines the format generated on paper tape for the Paper Tape Input (PTI) pass (Figure 1). The "leader" is entered manually with the serial number device prior to obtaining the spectrum. The "trailer" is entered manually after obtaining the spectrum and is combined with the "leader" in the PTI pass. Use of the peripheral data contained therein will become apparent on examination of the associated computer programs.

PROGRAMMING

The generation of a permanent magnetic record from paper tape constitutes the second phase of the system (Figure 1). The "Tally" conversion pass simply transfers the record from paper tape to magnetic tape. The "PTI" pass converts the coding of this magnetic tape to one acceptable for calculations and also checks for errors in coding. The EDIT pass causes interpolations to occur where necessary, matches the wavelength with the absorbance, creates a "current master file", an "absorption-spectrum report", and a routine plot (Figures 4 and 5).

During the EDIT pass, the "current master file" is immediately transferred to the "updated master file" before the "change file" is processed to insure against the loss

FIGURE 2. Punch Codes

FIGURE 3. Paper Tape Format

SERIAL NO	32	STARTING WAVELENGTH	25000	ENDING WAVELENGTH	3685	INCREMENT	10	NO OF DATA	2131								
WAVELENGTH,A	25000	24990	24980	24970	24960	24950	24940	24930	24920	24910	24900	24890	24880	24870	24860	24850	24840
ABSORBANCE	0.073	0.076	0.075	0.075	0.074	0.074	0.074	0.074	0.073	0.073	0.073	0.073	0.073	0.074	0.074	0.074	0.074
FREQUENCY,1/CM	4000	4001	4003	4004	4006	4008	4009	4011	4012	4014	4016	4017	4019	4020	4022	4024	4025
WAVELENGTH,A	24830	24820	24810	24800	24790	24780	24770	24760	24750	24740	24730	24720	24710	24700	24690	24680	24670
ABSORBANCE	0.073	0.073	0.073	0.074	0.074	0.075	0.076	0.076	0.076	0.076	0.076	0.076	0.074	0.072	0.071	0.071	0.072
FREQUENCY,1/CM	4027	4029	4030	4032	4033	4035	4037	4038	4040	4042	4043	4045	4046	4048	4050	4051	4053
WAVELENGTH,A	24660	24650	24640	24630	24620	24610	24600	24590	24580	24570	24560	24550	24540	24530	24520	24510	24500
ABSORBANCE	0.072	0.073	0.074	0.074	0.074	0.073	0.074	0.074	0.075	0.074	0.074	0.074	0.073	0.073	0.073	0.073	0.073
FREQUENCY,1/CM	4055	4056	4058	4060	4061	4063	4065	4066	4068	4070	4071	4073	4074	4076	4078	4079	4081
WAVELENGTH,A	24490	24480	24470	24460	24450	24440	24430	24420	24410	24400	24390	24380	24370	24360	24350	24340	24330
ABSORBANCE	0.073	0.073	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.075	0.075	0.075	0.075	0.074	0.073	0.073
FREQUENCY,1/CM	4083	4084	4086	4088	4089	4091	4093	4095	4096	4098	4100	4101	4103	4105	4106	4108	4110
WAVELENGTH,A	24320	24310	24300	24290	24280	24270	24260	24250	24240	24230	24220	24210	24200	24190	24180	24170	24160
ABSORBANCE	0.073	0.073	0.073	0.074	0.074	0.075	0.076	0.076	0.075	0.074	0.074	0.074	0.074	0.074	0.074	0.073	0.072
FREQUENCY,1/CM	4111	4113	4115	4116	4118	4120	4122	4123	4125	4127	4128	4130	4132	4133	4135	4137	4139
WAVELENGTH,A	24150	24140	24130	24120	24110	24100	24090	24080	24070	24060	24050	24040	24030	24020	24010	24000	23990
ABSORBANCE	0.072	0.071	0.071	0.072	0.073	0.073	0.073	0.074	0.075	0.075	0.074	0.074	0.074	0.073	0.073	0.073	0.073
FREQUENCY,1/CM	4140	4142	4144	4145	4147	4149	4151	4152	4154	4156	4158	4159	4161	4163	4164	4166	4168
WAVELENGTH,A	23980	23970	23960	23950	23940	23930	23920	23910	23900	23890	23880	23870	23860	23850	23840	23830	23820
ABSORBANCE	0.073	0.073	0.074	0.075	0.075	0.075	0.074	0.074	0.075	0.076	0.076	0.076	0.076	0.075	0.075	0.075	0.074
FREQUENCY,1/CM	4170	4171	4173	4175	4177	4178	4180	4182	4184	4185	4187	4189	4191	4192	4194	4196	4198
WAVELENGTH,A	23810	23800	23790	23780	23770	23760	23750	23740	23730	23720	23710	23700	23690	23680	23670	23660	23650
ABSORBANCE	0.074	0.074	0.074	0.075	0.076	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.074
FREQUENCY,1/CM	4199	4201	4203	4205	4206	4208	4210	4212	4214	4215	4217	4219	4221	4222	4224	4226	4228
WAVELENGTH,A	23640	23630	23620	23610	23600	23590	23580	23570	23560	23550	23540	23530	23520	23510	23500	23490	23480
ABSORBANCE	0.075	0.074	0.074	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.074	0.074	0.074	0.074	0.074	0.074	0.074
FREQUENCY,1/CM	4230	4231	4233	4235	4237	4239	4240	4242	4244	4246	4248	4249	4251	4253	4255	4257	4258
WAVELENGTH,A	23470	23460	23450	23440	23430	23420	23410	23400	23390	23380	23370	23360	23350	23340	23330	23320	23310
ABSORBANCE	0.075	0.075	0.075	0.075	0.075	0.075	0.074	0.074	0.073	0.073	0.073	0.073	0.073	0.074	0.074	0.074	0.074
FREQUENCY,1/CM	4260	4262	4264	4266	4268	4269	4271	4273	4275	4277	4278	4280	4282	4284	4286	4288	4290
WAVELENGTH,A	23300	23290	23280	23270	23260	23250	23240	23230	23220	23210	23200	23190	23180	23170	23160	23150	23140
ABSORBANCE	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.073	0.073	0.074	0.075	0.075	0.075
FREQUENCY,1/CM	4291	4293	4295	4297	4299	4301	4302	4304	4306	4308	4310	4312	4314	4315	4317	4319	4321

FIGURE 4. Sample Page of "EDIT" Report

FIGURE 5. Plot of Spectrum Generated by the "EDIT" Pass. Both Curves are of the Same Spectrum, Plotted in Free-Run Mode

of previously recorded spectra by a program failure. Additional safeguards are provided by the retention of previously processed files (Figure 6).

Spectral records are transmitted to and from the computer memory via special FAP-coded read and write routines (Appendix B). Each read and write routine calls IOTST, a channel-checking routine, internally to determine the availability of the channel in question for usage. If the channel other than that needed for the read or write must also be tested, IOTST must also be called externally with the appropriate call list.

Three examples are provided below to illustrate the timing when read and write routines are called sequentially on two different channels with logic between call statements:

S = sequence number

A = array number

Example A

```
DO X I = 1, N
  CALL READ (A)
  (OTHER LOGIC)
  X CALL WRITE (B)
```

Example B

```
DO X I = 1, N
  CALL IOTST (B)
  CALL READ (A)
  (OTHER LOGIC)
  X CALL WRITE (B)
```

Example C (triply buffered)

```
DO X I = 1, N
  CALL RETB (A)
  (OTHER LOGIC)
  X CALL WRITE (B)
```

Example A shows the danger of mixing records if proper sequencing is not provided by calling IOTST, as in Example B. Example C illustrates a triply buffered system where optimum efficiency is attained. However, it is evident that if no detaining logic exists between the read and write statements, then Example B may be as efficient as C in time, but more efficient in memory space since the buffering array can be smaller by a factor of 2/3.

Triple buffering is only used in the "EDIT" program in transferring the old master file to the new. In the computational program, space requirements prohibit the use of a triply buffered system.

FIGURE 6. Retention of Previous Files

PAPER TAPE INPUT PROGRAM

The Paper Tape Input Program is a modification of a program used to process paper tape for this installation. It requires three types of cards that serve to control the path of the program, prescribe the format of the output record, and provide on-line printer messages at the beginning and end of the pass.

As spectra are processed in this program, an accompanying output (Figure 7) is generated on tape unit A3, the monitor output unit. Unless the paper-tape generating equipment is extremely reliable, extra programming is needed to allow recovery from occasional failures. This is accomplished in the subroutine CLFLD which examines each word for validity; i.e., word length and validity of characters. If the word has the correct length but one or more invalid characters, its second character is set to zero. This causes the EDIT program to obtain a replacement word (datum) by interpolation. If the word is too long and also has an invalid character, then it is clear that two words have merged as a result of a failure on an end of work marker (in our case, a PI7). It is important to maintain the correct number of words to make certain that all wavelengths and absorbances will ultimately match. This is accomplished in the PTI program.

Should an irrecoverable error occur, then a complete diagnostic is printed; Figure 8 is an example. This provides not only an indication of what the error was, but also sufficient information to locate it exactly on the paper tape.

General flow diagrams along with a list of programs used by the Paper Tape Input system are shown in Appendix B,

```

SPECTRUM STARTED.  SPECTRUM READS(OCTAL NEMONICS)
000004061060      606060606060      020600000060      606060606060      000000010060      606060606060      00000000000060

SPECTRUM PROCESSED SPECTRUM READS(OCTAL NEMONICS)
000004061060      600460606060      020600000060      000600030660      000000010060      000111110660      00000000000060

SPECTRUM STARTED.  SPECTRUM READS(OCTAL NEMONICS)
000004061160      606060606060      020600000060      606060606060      000000010060      606060606060      00000000000060
2 MERGED DATA OCCURRING 4444 INCHES IN FROM BEGINNING OF PAPER TAPE HAVE BEEN UNSCRAMBLED.
2 MERGED DATA OCCURRING 5201 INCHES IN FROM BEGINNING OF PAPER TAPE HAVE BEEN UNSCRAMBLED.

SPECTRUM PROCESSED SPECTRUM READS(OCTAL NEMONICS)
000004061160      600460606060      020600000060      000600101160      000000010060      000111110160      00000000000060

SPECTRUM STARTED.  SPECTRUM READS(OCTAL NEMONICS)
000004070060      606060606060      020600000060      606060606060      000000010060      606060606060      00000000000060
2 MERGED DATA OCCURRING 5674 INCHES IN FROM BEGINNING OF PAPER TAPE HAVE BEEN UNSCRAMBLED.
2 MERGED DATA OCCURRING 5718 INCHES IN FROM BEGINNING OF PAPER TAPE HAVE BEEN UNSCRAMBLED.

SPECTRUM PROCESSED SPECTRUM READS(OCTAL NEMONICS)
000004070060      600460606060      020600000060      000600100560      000000010060      000111110160      00000000000060

SPECTRUM STARTED.  SPECTRUM READS(OCTAL NEMONICS)
000004070160      606060606060      020600000060      606060606060      000000010060      606060606060      00000000000060

SPECTRUM PROCESSED SPECTRUM READS(OCTAL NEMONICS)
000004070160      600460606060      020600000060      000600071160      000000010060      000111110260      00000000000060

SPECTRUM STARTED.  SPECTRUM READS(OCTAL NEMONICS)
000004070260      606060606060      020600000060      606060606060      000000010060      606060606060      00000000000060
2 MERGED DATA OCCURRING 572 INCHES IN FROM BEGINNING OF PAPER TAPE HAVE BEEN UNSCRAMBLED.

SPECTRUM PROCESSED SPECTRUM READS(OCTAL NEMONICS)
000004070260      600460606060      020600000060      000601031160      000000010060      000111100660      00000000000060

SPECTRUM STARTED.  SPECTRUM READS(OCTAL NEMONICS)
000004070360      606060606060      020600000060      606060606060      000000010060      606060606060      00000000000060
2 MERGED DATA OCCURRING 1611 INCHES IN FROM BEGINNING OF PAPER TAPE HAVE BEEN UNSCRAMBLED.
2 MERGED DATA OCCURRING 2051 INCHES IN FROM BEGINNING OF PAPER TAPE HAVE BEEN UNSCRAMBLED.

SPECTRUM PROCESSED SPECTRUM READS(OCTAL NEMONICS)
000004070360      600460606060      020600000060      000601040060      000000010060      000111100660      00000000000060

SPECTRUM STARTED.  SPECTRUM READS(OCTAL NEMONICS)
000004070460      606060606060      020600000060      606060606060      000000010060      606060606060      00000000000060

TRAILER IS MISSING SPECTRUM READS(OCTAL NEMONICS)
000004070460      606060606060      020600000060      606060606060      000000010060      606060606060      00000000000060

```

FIGURE 7. Example of PTI Monitor Output. Merged Data Indicate a Failure in the End-of-Word Character.

TO ANALYST--PARITY ERRORS OR ILLEGAL CHARACTERS HAVE OCCURRED IN FIVE SUCCESSIVE FIELDS OF BODY, EXAMINE PAPER TAPE.

WORD ERRORS SPECTRUM READS(OCTAL NEMONICS) 606060606060 000000010060 606060606060 000000000060

KTG,S 1 2 3 4 5
 000000000000 000000000001 000000000005 411401045447 000000000000
 000764000000 000000000000 000001000000 000000000000 000000000000
 000000005472 000000000001 000000000006 000000000000 000000000000
 0000002001224 606060606060 000000000001 000000000000 000001000000
 000000000000 000000000000 000000000000 000000000000 000000000000
 000000000000 000001000000 000002000000 000000000000 000000000000
 0000000076103 001750000000 000001000000 001130000000 000000000000
 000000000003 000000000000 000000000000 000000000000 000000000000
 000000000000 000000000000 000000000000 000000000004 000000000000
 000001000000 000000000000 000000000000 000000000000 000000000000

LCNTS 1 2 3 4 5
 000000000072 000000000000 000001000001 000000154532 000000000000
 000000000000 000000000000 000000000000 000000000000 000000000000
 000000000000 000000000000 000000000000 000000000000 000000000000
 000000000000 000000000000 000000000000 000000000000 000000000000
 000000000000 000000000000 000000000000 000000000000 000000000000
 000000000000 000000000000 000000000000 000000000000 000000000000
 000000000000 000000000000 000000000000 000000000000 000000000000
 000000000000 000000000000 000000000000 000000000000 000000000000
 000000000000 000000000000 000000000000 000000000000 000000000000

PAPER TAPE IN PROCESS IS NO. 1
 NO. OF WORDS SINCE LAST P11 PERIOD, P12, OR GP. OF 500 DATA= -1
 NO. OF CHARACTERS IN CURRENT WORD= 5
 TOTAL NO. OF CHARACTERS PROCESSED OF THIS PAPER TAPE= 55442
 FIRST 6 CHARACTERS OF CURRENT WORD ARE 000000000000
 THE TOTAL NO. OF ALPHABETIC(0-9) CHARACTERS PROCESSED ON THIS PAPER TAPE IS 39124. TOTAL OF PREVIOUS TAPES= 0.
 THE TOTAL NO. OF INVALID(0-9) CHARACTERS PROCESSED ON THIS PAPER TAPE IS 0. TOTAL OF PREVIOUS TAPES= 0.
 THE TOTAL NO. OF FILL(37,77) CHARACTERS PROCESSED ON THIS PAPER TAPE IS 857. TOTAL OF PREVIOUS TAPES= 31.
 THE TOTAL NO. OF PARITY ERROR(17) CHARACTERS PROCESSED ON THIS PAPER TAPE IS 14. TOTAL OF PREVIOUS TAPES= 0.
 THE TOTAL NO. OF (P11, PERIOD, P12) CHARACTERS PROCESSED ON THIS PAPER TAPE IS 0. TOTAL OF PREVIOUS TAPES= 0.
 THE TOTAL NO. OF WORDS(P17, TAB) CHARACTERS PROCESSED ON THIS PAPER TAPE IS 7817. TOTAL OF PREVIOUS TAPES= 0.

ABOVE SPECTRUM HAS BEEN BYPASSED IN THE P11 PASS.

FIGURE 8. Example of Error Report from P11 Pass. Error occurred 1827.6 ft. into Paper Tape (4 characters/cm).

Figures B.2, B.3, B.4, and Table B.II, respectively. These aids coupled with the listings in Appendix B and the memory map in Figure B.1 should make it possible to follow in detail the logic of the system. For general purposes, however, it will suffice to state that the record from the Tally tape is first read into $PREC(I,J)$ where $J = 1,2$ (see Figure B.1). This system is buffered so that the first record goes into $PREC(I,1)$ where it becomes available for processing. Simultaneously, the second record is read into $PREC(I,2)$. In this way, after the first record is processed (since the second record has already been read), it can be processed immediately. Simultaneously, with the processing of the second record, the third record is read into $PREC(I,1)$.

In the process of converting $PREC(I,J)$, each successive character is read into $FLD(1)$ until six characters have been entered. After their validity has been tested, each word is transferred to $MREC$. As the "leader", "body" containing up to 500 words, or "trailer" is completed in $MREC$, it is transferred to DMY , $BREC(I,J)$ or DMY respectively. After the complete spectrum has been processed, as indicated by a STOP character, the sequence number ($ISEQ=J$) is incremented, DMY is transferred to $BREC(1-10,J)$, and the record is read to tape unit B7 in binary form. This sequence is occasioned by the advisability to limit the size of the binary record to 500 words for efficiency in writing, reading, and computation. The complete spectrum must be processed and stored in memory before being written to B7 because the trailer, which combines to complete the leader in DMY , must be written into each record $BREC(I,J)$ before it is transferred to the tape.

The storage area, $BREC(I,J)$, is located in that portion of memory occupied by subroutine $CLRCD$.

EDIT PROGRAM

The purpose of the EDIT pass is fourfold:

- It individually defines the necessary variables and obtains their values in converted Fortran integers or floating-point numbers from the "Change File"
- From information available in the "leader", it calculates the wavelengths corresponding to the absorbances
- It differentiates the upper scale absorbances from those of the lower scale and interpolates to replace invalid data
- Using the starting wavelength and the increment, it checks for consistency in the calculated and measured ending wavelength.

Details of the program including flow diagrams, definitions of tags, switches, and counts, and program listings are found in Appendix C, and variables defined by the EDIT pass are listed in Table I. Memory maps and record formats are provided in Figure C.1 (Appendix C); logic charts are given in Figures C.2, C.3, C.4; definitions of switches, tags, and counts are listed in Table C.1; and Table C.II lists the various programs used in EDIT.

Both the PTI and EDIT passes have built-in bypass features. Since the computational system does not require that the spectra be entered on the master file sequentially, an error can be corrected on the troublesome spectrum which can be subsequently reprocessed. To accomplish this bypass feature, however, it is necessary to successfully build the complete spectrum into memory and be assured of its validity before it can be transferred to the updated master file. The size of the spectrum that can be processed is naturally limited by the size of the computer memory. The 32K memory,

for which this program was written, will accommodate a spectrum of 9,000 words. The requirement of extra memory space for buffering the input and output rather severely restricts the size of the spectrum, but is essential for efficient use of time on the computer. The entire memory of the 32K computer is currently being used by the EDIT program.

TABLE I. *Variables Defined by the EDIT Pass*

<u>Symbol</u>	<u>Definition</u>
ISER	Serial number of the given spectrum
ISEQ	Sequence number of the sequential group of five hundred data
LWVS	Starting wavelength of spectrum (always the longest wavelength)
LWVE	Ending wavelength of spectrum (always the shortest wavelength)
INC	Wavelength increment between readings
N	Number of readings taken of the spectrum
ISIGN	Sign of the baseline*
BASE	Absolute value of the baseline (for %T spectra on P.E. spectra, BASE represents I° in % fraction of full scale, i.e. .8 = 80% full scale).

*The value of ISIGN also determines which spectrum is being processed:

- 0, Cary spectrum, negative baseline, absorbance
- 1, Cary spectrum, positive baseline, absorbance
- 2, Cary spectrum, negative baseline, percent transmittance
- 3, Cary spectrum, positive baseline, percent transmittance
- 4, Perkin Elmer, Negative baseline, absorbance
- 5, Perkin Elmer, Positive baseline, absorbance
- 6, Perkin Elmer, Negative baseline, percent transmittance
- 7, Perkin Elmer, Positive baseline, percent transmittance

This program is not designed to process ISIGN = 8, or ISIGN = 9. These values must be avoided. ISIGN is always incremented by 1 when the spectrum is processed in EDIT.

An elaborate interpolation scheme was devised to process the data occurring in the region of a transfer from low scale; however, with the acquisition of the plotter and extra hardware to momentarily stop the scan during scale change, it appeared advisable not to attempt any interpolation other than that necessitated by errors in the paper tape or by imbalance indicated on the digital voltmeter at the time of reading. The other errors occurring in the change from low to high scale are replaced by linearly interpolated values. The interpolation function can be modified in subroutine INTERP in the EDIT deck.

COMPUTATIONAL PROGRAMS

This system has been devised with the intention of providing computational versatility. The function of the main program (COMP) is to locate and transfer the desired spectrum to intermediate tapes for further use. If any one of the spectra is not available on the master file, subroutine FAILUR so indicates.

The subroutine ERROR2 is designed to aid the user in finding errors that cause the computation to fail. It may be called from any of the other subroutines; it is controlled through use of KTG(8).

Definitions of specific subroutines, flow diagrams, and program listings of the computational system are provided in Appendix D. The simple diagram in Figure D.1 (Appendix D) serves to show the interrelationships of subprograms between each other and the main program, and Figures D.2-D.4 summarize the logic used. Tables D.I and D.II list the switches, tags, and counts as well as the programs used by the system. The computational problems are categorized by the number of spectra involved. For example, if one spectrum is to be modified

or plotted, it is done in a special program SUBRQ where $1 \leq Q \leq 10$ called by MONOSP; if two spectra are being compared, it is done in a program SUBRQ where $11 \leq Q \leq 20$ called by BISPEC. Programs currently in use, viz, SUBR04, SUBR11, and SUBR21, SUBR31 will be described below. It is intended that others be written for specific computational needs as they arise.* In order for these programs to be compatible with the rest of the system, three conditions must be satisfied:

(1) COMMON storage must be the same as, or compatible with, the COMMON storage of the system; (2) all switches, tags, and counts used in the program must be compatible with those already defined for the system; (3) the subprogram must be able to communicate with the rest of the system through either COMMON or a CALL LIST. For convenience, a map of the system's COMMON statements, which are listed in Table D III (Appendix D), is given in Figure D1.

*This can only be accomplished if the computer memory exceeds 32K. It is currently loaded to capacity.

CURRENT SUBPROGRAMS (SUBRXX)

SUBR02 This subroutine calculates %T or Transmittance from absorbance or absorptivity according to the equation

$$Y \text{ calculated} = 100 \times 10^{-a(Y \text{ meas}-b)}$$

SUBR04 This subroutine searches out a predetermined section of a given spectrum, and alters it according to the equation

$$Y \text{ calculated} = a(Y \text{ measured} - b).$$

By calling subroutine SUBR04, the user may at his option call subroutine SCAT. If a spectrum exhibits a variable baseline due to particulate scattering and the baseline can be reasonably accurately established, SCAT can be used to generate a polynomial which can be subtracted from the spectrum in question. This program uses Lagrangian interpolation:

$$A'(x) = a \left[Y_{\text{meas}} - b - \sum_{j=1}^n \text{DEN}_j \prod_{i \neq j}^n (x - x_i) \right]$$

where

$$\text{DEN}_j = \frac{A_p(x_j)}{\prod_{i \neq j}^n (x_j - x_i)}$$

a, b are parameters already discussed with reference to the linear combination equation and x_i are the wavelengths or energies corresponding

to the absorbances (or y values in general) of the baseline; n is thus the number of values $A_p(X_j)$ entered for the polynomial; DEN_j are values calculated in SCAT proper (see Figure 9).

SUBR11 This subroutine combines two spectra in the specified wavelength range according to the equation

$$Y \text{ calculated} = [a(Y_a - b) + c(Y_b - d)] i$$

All wavelength matching is automatic and is done only where wavelengths actually match. If no wavelengths match, the program will so indicate. An example is shown in Figure 10.

SUBR21 This subroutine combines three spectra in the specified wavelength range according to the equation

$$Y \text{ calculated} = [a(Y_a - b) + c(Y_b - d) + e(Y_c - f)] i$$

All wavelength matching is automatic and is done only where wavelengths actually match. If no matching can occur, the program will so indicate.

SUBR31 This subroutine combines four spectra in the specified wavelength range according to the equation

$$Y \text{ calculated} = [a(Y_a - b) + c(Y_b - d) + e(Y_c - f) + g(Y_d - h)] i$$

All wavelength matching is automatic and is done only where wavelengths actually match. If no matching can occur, the program will so indicate.

FIGURE 9. Programmatic Correction of Light Scattering - Lagrange Interpolation

FIGURE 10. Example of Spectral Combinations - a Percentage of (A) Was Subtracted from (B) to Give D. Since (D) is a Relatively Small Residual of (B), it Shows Considerable Noise. Spectrum (C) Results After Data in (D) Have Been Statistically Averaged.

SPECIAL PROCESSING AND OUTPUT PROGRAMS

There are several programs that can be used simultaneously with the subprograms SUBRXX. Some of these are called in a subprogram, NWRITE, which also serves to prepare and generate output. These programs are briefly described below. The user is referred to the actual program listings and logic maps for details. Normally, however, he will only need to know information presented below and will be able to use the program by referring to the section entitled "Preparation of Peripheral Cards for Computation".

Subroutine Smooth

Whenever spectra are unusually noisy, either as a result of experimental conditions or as a result of combining several spectra (noise increases as $\sqrt{n}$ where n is the number of spectra combined), the subroutine SMOOTH can be called to statistically average the data. We have tried several approaches to accomplish this but generally the most successful (both in terms of efficiency of calculations and results) is the method of convolutions outlined by Savitsky and Golay.⁽¹⁾ The subprogram SMOOTH performs a least-squares fit of a third order polynomial by using a range of data extending from 3 to 12 points symmetrically on each side of the point being smoothed. The range can be chosen by the user, or if not chosen will be calculated to extend over five seconds of running time, within the limits 7 to 25 data (n). (This amounts to about 5 noise cycles on the Cary Spectrophotometer.) The symmetrical range has an advantage over the familiar RC noise filtering circuits generally used because skewing does not result.

(1) Abraham Savitsky and Marcel J. E. Golay, Anal. Chem. 36, 1627 (1964).

The signal to noise ration should be enhanced by a factor of $\sqrt{n}$ with a single pass through SMOOTH. With m passes through SMOOTH, $S/N = n^{m/2}$. Thus, for example, if a spectrum is scanned at 25 Å/sec on increments of 5 Å, a first pass should increase the signal to noise by a factor of 5 and a second by a factor of 25. This would be equivalent to adding 625 separately scanned spectra to obtain an average spectrum if, of course, no long-period excursions occur in the spectrum. Mechanics of the use of SMOOTH are described in the section entitled "Peripheral Cards for the Computational Program".

Figure 11 shows the effect of the smoothing process. It will be noticed that discontinuities, which were intentionally generated, occur on Regions A and B. They provide good tests of the logic. Whenever a single point is far removed from adjacent points, it is treated as an invalid datum in which case a new value is determined by averaging adjacent data and will be completely smoothed out. When two adjacent points lie away from the neighboring points, the spectrum will not be completely smoothed (Region B, Figure 11). Unless the data are so sparse as to describe a peak by only one point (in which case a statistical analysis would be nonsensical), the peak will not be annihilated by the averaging process.

The attenuation of spectral detail is much less if spectra are obtained with a high density of points at a slow scan rate. For optimum usage of statistical averaging, the scan rate should be slow enough to avoid the inclusion of more than a combination of three maxima and minima over a five second interval (the averaging interval designated by the user). The spectrum illustrated in Figure 11 meets this requirement; even though the averaging interval encompasses a small peak

FIGURE 11. Illustration of Smoothing and Derivative Programs

(Region C), very little structural loss occurs as a result of the averaging. This is better shown in the derivative spectrum.

For a Cary 14 the optimum conditions for accumulation of data would be a speed of 5 to 10 Å/sec with sampling every 2 Å.

Subroutine DERINT

The name DERINT derives from "derivative-integral". This program either differentiates or integrates the spectrum at the user's option. It is a simple program employing the following equations:

$$\left. \frac{dy}{dx} \right|_{\left(\frac{x_k + x_{k+1}}{2} \right)} = \frac{(y_{k+1} - y_k)}{(x_{k+1} - x_k)}$$

$$\int_{x_0}^{x_j} y dx \Big|_{\frac{x_{j-1} + x_j}{2}} = \sum_{i=0}^{x_j} y_i (x_{i+1} - x_i)$$

To avoid confusion in digital output on fixed format which is the same as that for the EDIT program, the integral runs only between 0-10 (i.e., when the integral exceeds 10, then a constant 10.0 is subtracted to again bring it between 0 and 10). The actual integral is, therefore, $I = I_{\text{measured}} + 10n$ where n is the number of times it has been reset.

Figure 11 illustrates the use of DERINT. Derivatives of multiply-averaged data are also included to show its utility in determining transitions which are exhibited as shoulders.

The structure will be attenuated most in Region C. The position of the peak is determined by measurement of the inflection point where the second derivative becomes positive. Table II can be used to verify that smoothing does not skew the shoulder.

<u>Times Averaged</u>	<u>λ Spectrum A</u>	<u>λ Spectrum B</u>
0	6560	6572
1	6560	6560
2	6552	6560
3	6560	6564

Considering the fact that the sample increment for Spectrum A was 16 and for B was 8, the results are remarkably consistent.

Subroutine THIN

If data are to be prepared on cards for another program or if for some reason not all of the spectral data are to be represented on a graph or in a numerical report, the data may be thinned in subroutine THIN. This routine is designed to sample data along approximately constant vectorial increments of the actual curve, regardless of whether the sampling is on a wavelength or wavenumber basis. The user simply supplies the desired ΔX and ΔY increments from which $\Delta R = \sqrt{(\Delta X)^2 + (\Delta Y)^2}$ is calculated.

Figure 12 provides an example of the thinning subroutine and the scatter routine.

Subroutine PNCH

The user is referred to the actual program (Appendix D) for the format. It is to be noted that the punch command used in these routines can be made to punch all 80 columns

FIGURE 12. Example of Scatter Correction and Data Thinning (A) Scattered, Unthinned, (B) Thinned and Corrected for Scatter

of the card. (The normal punch command restricts to 73 columns, using the remaining 5 for systems identification.)

Subroutine REPORT

At the user's option, a digital report of the computational results will be supplied by REPORT. This routine is of standard format depicted by Figure 4.

Subroutine NWRITE

With the exception of the main program, subroutine NWRITE is probably the most complicated routine in the system. It essentially serves the purpose of making final preparations of the data by calling subroutines DERINT and THIN as designated, and in providing the numerical report by calling subroutine REPORT. If plots are required, NWRITE also prepares the data for plotting, and calls (in their proper order) the subroutines ORIGIN, SCALE, MODE, TOLP to which reference is given below.

Subroutine RESPLT

The function of RESPLT can be best illustrated; a plot prepared by RESPLT is shown in Figure 13. The user, by supplying peak distribution-parameters for a spectrum, can create by use of RESPLT the original spectrum (which may have been originally comprised of up to four spectra), the distribution curves, i.e.,

$$A_i(x) = \frac{A_{io}}{\left[1 + \left(\frac{x-x_{io}}{B_{io}}\right)^2\right]^2}, \quad \text{or} \quad A_i(x) = \frac{A_{io}}{1 + \left(\frac{x-x_{io}}{B_{io}}\right)^2},$$

$$\text{or} \quad A_i(x) = A_{io} \exp - \left(\frac{x-x_{io}}{B_{io}}\right)^2,$$

and the composite spectrum created by summing the individual distributions, i.e.,

$$A(x) = \sum_i A_i(x).$$

FIGURE 13. Example of Resolution Program RESPLT

Currently, we are working on a nonlinear least squares program that will provide the best set of peak distribution parameters (A_{i0} , B_{i0} , x_{i0}) for a given spectrum from data prepared by this system through use of THIN and PNCH.

COMPUTER TIME REQUIREMENTS

PTI Pass

The time required by the PTI pass is given by the equation

$$t^{\text{sec}} = 10 + 3.43 \times 10^{-3} N$$

where N is the number of data processed. Since there are 14.143 data/ft, the equation in terms of feet (F) is

$$t^{\text{sec}} = 10 + 5.879 \times 10^{-2} F$$

Thus a standard roll of paper tape (1000 ft) requires about 79 sec.

EDIT Pass

The time required by the EDIT Pass when a complete digital report is supplied and results are plotted is given approximately by the equation

$$t^{\text{sec}} = 10 + 4.16 \times 10^{-3} N + 0.1256 M$$

or

$$t^{\text{sec}} = 10 + 7.13 \times 10^{-2} F + 0.1256 M$$

where M is the number of sequences (500 data) on the master file. The approximate total time required to process a new paper tape is

$$t^{\text{sec}} = 20 + 7.59 \times 10^{-3} N + 0.1256 M$$

or

$$t^{\text{sec}} = 20 + 11.29 \times 10^{-2} F + 0.1256 M$$

These equations are good to about ± 40 sec.

Computational Pass

Because of the complexity and versatility of operations performed by the computational program, it is not possible to derive a practically usable equation to determine the computer time requirements. However, some representative runs are tabulated below to provide a basis for estimation

- A = Number of sequences of 500 data scanned to obtain information from master and intermediate files.
- B = Total number of data (absorbances) used for combination.
- C = Total number of points smoothed.
- D = Total number of plotter points generated.
- E = Total number of composite calculations made.
- F = Total number of derivative or integral calculations made.
- G = Total number of points reported.
- H = Total number of scatter corrections made.
- T = Time required for finding spectra and computation in seconds.
- T¹ = Time required for computation only (calculated) in seconds.

<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>	<u>G</u>	<u>H</u>	<u>T</u>	<u>T¹</u>
53	2,000	2,000	1,939	0	746	1,492	0	60	52
4180	78,678	24,586	44,102	0	0	44,102	0	1340	721
2582	1,500	1,500	0	0	0	0	0	280	neg
877	0	0	0	0	0	0	0	130	neg

It is apparent that access-time is an appreciable percentage of the total time when large runs are involved, i.e., when several different problems are calculated and data must be obtained from the master file. Naturally, it is much more economical

to process several problems at once since the one scan for the master file can serve for all problems. Whenever we anticipate making several runs on a set of spectra, we save the B6 created during the first of these runs for the subsequent master file. Since our spectra have on the average 5.77 sequences, about 0.85 sec is required to scan one spectrum on the master file. This provides the reason for obtaining the intermediate file B6.

MODIFICATION FOR OTHER ELECTRONIC DATA PROCESSING CENTERS

The biggest foreseeable difficulty in adapting this system to other data processing centers lies in the reassignment of logical tape units to be compatible with existing practices. Our center uses tape units A2 for Fortran input and A3 for Fortran output. In addition, tape units as indicated in (Figure 1) are used with special READ and WRITE routines as listed in Appendix B and charted in Appendix C. Because of their buffered operation, proper test routines are required before READ statements and Fortran write statements.

If a system is to be expanded to more than channels A and B, then Subroutine IOTST must also be expanded to cover testing of additional channels. The READ and WRITE routines must also be modified as per instructions on their respective listings. Caution must be exercised to make certain that records are constructed in the same pattern as indicated in the appendices (Figures B.1, C.1, D.1) if major changes are made in the READ and WRITE routines.

If the program is to be used by a different computer and plotter ensemble, the following Subroutines must be written and supplied to perform the following functions:

Subroutine ORIGIN(N,M) - This program translates the X and Y axis. N is the name of a Fortran fixed point integer specifying the X origin offset in inches/100; M serves the same purpose for the Y offset.

Subroutine SCALE(J,K) - This program determines the scale in counts, that the plotter will use. J is the name of a Fortran fixed point integer specifying the number of counts per inch on the X axis; i.e., CPI - 100J.

Subroutine MODE(J,K) - This program dictates the plotting mode. J is the name of a Fortran fixed-point integer specifying the mode of the plot: 2 = lines mode, 4 = points mode, 8 = free-run mode. K is the name of a Fortran fixed point integer specifying the symbol printed if the points mode is used.

Subroutine TOLP(X,Y,M) - This program creates a plotter tape of X and Y values. X is the name of a Fortran floating point array for the X coordinate [dimensional to at least X(500)], Y is the corresponding array for the Y coordinate. M is a Fortran fixed point integer designating the number of data to plot.

Subroutine WAIT - This program writes an end of record marker on the plotter tape which causes the plotter to stop for paper change.

Subroutine HALT - This program writes an end of file on the plotter tape, rewinds it, and indicates to the operator that it is to be removed from access.

The current computational program fills a 32K memory to capacity. Thus, additions to the program require a subsequent deletion unless a larger memory is available.

PREPARATION OF PERIPHERAL CARDS FOR COMPUTATION

The reader is referred to the preceeding section and Appendix D for a detailed description of the computational system. Normally, however, if no modification is required, the user need only fill out the parameter cards described below to perform the functions of the present system. Since the first 50 data cards will not need to be modified from run to run, they can be considered as part of the object deck. They provide a means of modifying the "Error" messages to the operator or to the user without re-compiling the "Error" program (ERROR2). Should it be desirable to change one of these "Error" messages, the format is (12A6). For general purposes, then, data card #A will be the first card after the 50 "Error" data cards.

The data cards supplied by the user are outlined on the following pages.

PARAMETER CARDS (See Figure 14)

(Note: All Numbers in the Parameter Cards Are Right Adjusted)

Cards(s) A,B,C,D, SPECTRAL SEARCH

This card (or cards) supplies information to the computer to select all of the spectra to be used in the current processing. This might include several different problems. To save time, all of the spectra to be used are transferred from the master file to an intermediate file as the master file is first scanned.

<u>Columns</u>	<u>Function</u>
1-5	Total number of spectra to be used
6-10	First spectrum serial number
11-15	Second spectrum serial number
:	:

<u>Columns</u>	<u>Function</u>
66-70	13th spectrum serial number If more than 13 spectra are wanted, a second card (B) may be used.
1-5	14th spectrum. Serial number
:	:
66-70	27th spectrum. Serial number If more than 27 spectra are wanted, a third card (C) may be used.
1-5	28th spectrum. Serial number
:	:
66-70	41st spectrum. Serial number If more than 41 spectra are wanted, a fourth card (D) may be used.
1-5	42nd spectrum. Serial number
:	:

No more than 50 spectra can be called in one processing. Note that the total number of spectra listed in these cards should agree with the number in columns 1-5, Card A.

Cards 1,2,3 TITLE

These cards may be used to identify the problem, author, date, etc. All characters are acceptable in columns 1 to 72 inclusive.

Card 4. SERIAL NUMBER(S) FORMAT XXXXXX

<u>Columns</u>	<u>Function</u>
1-6	Serial Number (ISRA) needed for SUBR01-SUBR10
7-12	Serial Number (ISRB) needed for SUBR11-SUBR20
13-18	Serial Number (ISRC) needed for SUBR21-SUBR30
19-24	Serial Number (ISRC) needed for SUBR31-SUBR40

If the computation is to be done on one of the Subroutines SUBR01 to SUBR10, only ISRA is needed; if Subroutine SUBR11 to SUBR20, ISRA and ISRB are needed, etc.

Card 5. COMPUTATION CARD (FPN(1)-FPN(10)) FORMAT XXX.XXX (F7.3)

<u>Columns</u>	<u>Definition</u>	
1-7	FPN(1)	Not defined.
8-14	FPN(2)	Not defined.
15-21	FPN(3)	Beginning wavelength in A(Cary) or Tenth wavenumbers (Perkin Elmer) divided by 100. This datum need only be supplied if a segment of the spectrum is wanted. (Note that the beginning wavelength is larger than the ending wavelength).
22-28	FPN(4)	Ending wavelength in A(Cary) or Tenth wavenumbers (Perkin Elmer). This datum need only be supplied if a segment of the spectrum is wanted.
29-35	FPN(5)	Speed of scan in A/sec(Cary) or Tenth $\text{cm}^{-1}/\text{sec}$ (Perkin Elmer) for ISRA. This datum need only be supplied if the data are to be statistically smoothed. If left blank, it will be set to 25
36-56		Not currently assigned.
57-63	FPN(9)	ΔX thinning vector increment. This datum need not be supplied unless the subroutine THIN is used. It is the increment desired between points along the X axis after thinning. It can be either Angstroms or wavenumbers (Cary) or tenth wavenumbers, millicrons (Perkin Elmer).
64-70	FPN(10)	ΔY thinning vector increment. Not needed unless Subroutine THIN is used.

Card 6. ARITHMETIC FACTOR CARD. FPN(11)-FPN(20) FORMAT XXX.XXX (F7.3)

The linear combination of spectra is accomplished by data supplied on this card.

$$Y = \left[a(Y_a - b) \right]_{\text{ISRA}}$$

SUBR02, SUBR04

$$Y = \left[a(Y_a - b) + c(Y_b - d) \right] i_{\text{ISRA} \quad \text{ISRB}}$$

SUBR11

$$Y = \left[a(Y_a - b) + c(Y_b - d) + e(Y_c - f) \right] i \quad \text{SUBR21}$$

ISRA ISRB ISRC

$$Y = \left[a(Y_a - b) + c(Y_b - d) + e(Y_c - f) + g(Y_d - h) \right] i \quad \text{SUBR31}$$

ISRA ISRB ISRC

1-7	FPN(11)	a of appropriate equation
8-14	FPN(12)	b of appropriate equation
15-21	FPN(13)	c of appropriate equation
22-28	FPN(14)	d of appropriate equation
29-35	FPN(15)	e of appropriate equation
36-42	FPN(16)	f of appropriate equation
43-49	FPN(17)	g of appropriate equation
50-56	FPN(18)	h of appropriate equation
57-63	FPN(19)	i of appropriate equation
64-70	FPN(20)	Not yet assigned. Leave blank.

NOTE: When a spectrum is called only as a dummy, as in the case of creating spectra from resolution curves using RESPLT, if $a = 0$, then make certain that KSW(47) is 04 for free run. Otherwise all data will be thinned out.

If DERINT is called for either an integral or derivative spectrum, estimates for the value of i may be obtained as follows:

for integration

$$\frac{2}{X \text{ Beginning} - X \text{ End}} \leq i \leq \frac{20}{X \text{ Beginning} - X \text{ End}}$$

Intense Spectra Weak Spectra

for differentiation

$$250 \text{ (sharp spectra)} \leq i \leq 50,000 \text{ (broad spectra)}$$

If i is left zero, it is automatically set to 1 by the program.

Card 7. SCATTER CARD. FPN(21)-FPN(30) FORMAT XXX.XXX (F7.3)

This card is to be filled out only if there is to be a correction of the baseline by the Scatter routine. To insure proper interpolation of the polynomial that will be generated as a corrective baseline, it is strongly advised to include at least one value near each extreme of the spectrum and to space the baseline points equidistantly along the original x axis. It is also advisable to work in absorbance rather than % transmission. Note that it is not necessary to correct for a or i in Card 6, i.e., $A = a(y_a - Y_{\text{scatter}}^{-b})i$.

<u>Columns</u>	<u>FPN(21)</u>	<u>Function</u>
1-7	FPN(21)	Absorbance of Y_1 of baseline at X_1
8-14	FPN(22) XXX.XXX	X_1 in Angstroms (Cary)/100 or Tenth wavelengths (P.E.)/100
15-21	FPN(23) XXX.XXX	Absorbance Y_2 of baseline, X_2
22-28	FPN(24) XXX.XXX	X_2
29-35	FPN(25) XXX.XXX	Y_3
36-42	FPN(26) XXX.XXX	X_3
43-49	FPN(27) XXX.XXX	Y_4
50-56	FPN(28) XXX.XXX	X_4
57-63	FPN(29) XXX.XXX	Y_5
64-70	FPN(30) XXX.XXX	X_5

To effect a correction, at least columns 1-28 must contain appropriate data. This would create a linear baseline. If all columns are filled, a fifth order polynomial will be used.

Card 8. FPN(31)-FPN(40) FORMAT XXX.XXX (F7.3)

Not currently assigned.

Card 9. PLOT DIMENSIONS. FPN(41)-FPN(50) FORMAT XXX.XXX (F7.3)

If the plotter is to be used, this card must be punched as follows; if not, the card can be left blank.

<u>Columns</u>	<u>Definition</u>	<u>Function</u>
1-7	FPN(41)	Length of plotting paper in inches along x axis.
8-14	FPN(42)	Width of plotting paper in inches along y axis.
15-21	FPN(43)	Left-hand margin of plot from plotter zero in inches.
22-28	FPN(44)	Wavelength at the left margin Cary: (Angstroms/100) or (wave-numbers/100) Perkin Elmer: (Tenth wavenumbers/100) or (millimicrons/100)
29-35	FPN(45)	Marker interval on the x axis Cary: (Angstroms/10) or (wave-numbers/10) Perkin Elmer: (Tenth wavenumbers/10) or (millimicrons/10)
36-42	FPN(46)	Bottom margin of plot from plotter zero in inches.
43-49	FPN(47)	Scale on x axis Cary: (Angstroms/10) per inch or (wavenumbers/10) per inch. Perkin Elmer: (Tenth wavenumbers/10) per inch or (millimicrons/10) per inch.
50-56	FPN(48)	Scale of Y axis in Absorbance units or Percent T units per inch. Remember to consider the factor i in Card 6. For example, the absorbance at plotting time is the Y of the equation in Card 6. If DERINT is to be used to integrate, the scale of the Y axis should be
	FPN(48)	$\sim \frac{10}{\sqrt{KSW(43)}}$

<u>Columns</u>	<u>Definition</u>	<u>Function</u>
		If a derivative curve is to be generated,
		$\frac{FPN(19) \times 10^{-4}}{KSW(43)} \leq FPN(48) \leq \frac{FPN(19) \times 10^{-2}}{KSW(43)}$
57-63	FPN(49)	Height of Y axis border from X axis in inches. Note: If Y axis border is not required, this can still be used to indicate the height of the marker on x axis. [(.03) FPN(40)] If left zero, no marker results.
64-70	FPN(50)	Marker interval on Y axis in units/marker.

Card 10. LOGIC CONTROL CARD (KSW(1)-KSW(25))

Format for each entry on this card is XX(I2).

<u>Columns</u>	<u>Definition</u>	<u>Function</u>
1-2	KSW(1)	Number of Subroutine to be used for computation; i.e., if SUBR01 is to be called, columns 1-2 should contain 01; if SUBR11 is to be called, columns 1-2 should contain 11, etc.
3-4	KSW(2)	If the plotter is to be used, columns 3-4 must contain 01; if not, they are blank. (See discussion of plotter below).
5-6	KSW(3)	If wavenumber is to be plotted, insert 01; otherwise, leave blank.
7-8	KSW(4)	Blank.
9-10	KSW(5)	Blank.
11-12	KSW(6)	Set to 01 if differential spectrum is wanted. Note: Also provide proper value in Card 11, columns 25-26. Set to 02 if integrated spectrum is wanted.

<u>Columns</u>	<u>Definition</u>	<u>Function</u>
13-14	KSW(7)	Set to 01 if inverse x is wanted in integral or differential spectrum. Example: If the differential spectrum of a Cary spectrum is wanted on a wavenumber basis, then KSW(7) = 01. Otherwise, leave blank. Note: KWS(7) is used for calculation; not for plot. It is possible to calculate a λ based derivative or integral and plot on cm^{-1} basis (or any combination).
15-16	KSW(8)	Not yet assigned. Leave blank.
17-18	KSW(9)	If the plot of the following computation is to be on the same paper, insert 01; otherwise, leave blank.
19-20	KSW(10)	If another computational pass follows, insert 01; otherwise, leave blank.
21-22	KSW(11)	Not yet assigned. Leave blank.
23-24	KSW(12)	Not yet assigned. Leave blank.
25-26	KSW(13)	Not yet assigned. Leave blank.
27-28	KSW(14)	If 01, PNCH is called to prepare cards for external usage (6 PE12.5), I5.
29-30	KSW(15)	Not yet assigned. Leave blank.
31-32	KSW(16)	If a scatter correction is wanted, set to 01 and make certain appropriate values are on Card 7.
33-50	KSW(17)- KSW(25)	Not yet assigned. Leave blank.

Card 11. LOGIC CONTROL CARD KSW(26)-KSW(50)

<u>Columns</u>	<u>Definition</u>	<u>Function</u>
1-2	KSW(26)	If set to 01(T_3), 02 (Lorentzian), or 03 (Gaussian), RESPLT will generate resolution curves. If KSW(26) is >00, then parametric data cards for resolution as shown below must be included after Card 11 and before the next job.

<u>Columns</u>	<u>Definition</u>	<u>Function</u>
3-4	KSW(27)	If Subroutine THIN is wanted, set to 01 and make certain that appropriate values are in columns 57-70 of Card #5 (FPN(9), FPN(10)).
5-20	KSW(28) KSW(35)	Not yet assigned. Leave blank.
21-22	KSW(36)	Bypass switch to smooth for spurious data.
23-24	KSW(37)	Number of points wanted for averaging in SMOOTH Version II. If left blank or zero, program will calculate value.
25-26	KSW(38)	If Subroutine SMOOTH is wanted, set to 1,2,3....., depending on the number of times the data should be smoothed. Note: For derivative spectra, the data should be smoothed at least once and perhaps as many as 4 times, depending on the random noise in the original spectrum.
27-28	KSW(39)	If two or more spectra are to be superimposed on one plot, their serial numbers should be displaced so as not to superimpose. The displacement downward in increments of 0.2 in. is given by $0.2 \times \text{KSW}(39)$.
29-30	KSW(40)	If paper sizes for the different problems of this run are different, set $\text{KSW}(40) = 01$. This provides instructions to the operator to select the proper sized paper for this problem.
31-32	KSW(41)	Length of x axis in inches. If blank, then width will automatically be the width of the spectrum.
33-34	KSW(42)	If a marked border is desired on all four sides of plot, insert 01. Otherwise, leave blank. Note: If $\text{KSW}(42) = 01$, make certain $\text{KSW}(50) = 0$.

<u>Columns</u>	<u>Definition</u>	<u>Function</u>
35-36	KSW(43)	Set to the maximum height of peak in inches from x axis for plot. This provides a safeguard against plotting into other spectra which may be above. Note: $KSW(43) + FPN(46) \leq FPN(42)$
37-38	KSW(44)	If a digital report is not wanted, insert 01; otherwise, leave zero.
39-40	KSW(45)	Plotter resolution on x axis (usually 03-05) indicating 300 to 500 counts/in.
41-42	KSW(46)	Plotter resolution on Y axis (usually 03-05).
43-44	KSW(47)	Plotter mode: 2 = lines, 4 = points, 8 = free run. Note: Free run mode should not be used if accuracy is desired.
45-46	KSW(48)	Designates the character to plot. Used for points mode, i.e., if $KSW(47) = 4$

Numbers Head

Symbol Head

0	.	+
1	1	o
2	2	□
3	3	△
4	4	▽
5	5	◇
6	6	★
7	7	□
8	8	◇
9	9	×
10	0	◇
11	—	o

47-48	KSW(49)	If the X axis border line is not wanted, insert 01; otherwise, leave blank.
49-50	KSW(50)	If the Y axis border line is not wanted, insert 01; otherwise, leave blank.

If a resolution plot is to be made, the parameter cards supplying three parameters for each distribution curve must be supplied as a package behind Card 11 and before the next problem.

Card R1

<u>Columns</u>	<u>Definition</u>	<u>Function</u>
1-4	NPAR	Number of parameters, numbers of distribution curves x 3. NPAR = 3 x no. of cards -1.

Card R2 (FORMATS X.XXXXXXXE±XX)

<u>Columns</u>	<u>Definition</u>	<u>Function</u>
12-24	A(I)	x_i^o center
29-41	A(I+1)	B_i^o half width/2
46-58	A(I+2)	y_i^o absorbance

Cards RI follow where $2 \leq I \leq \text{NPAR} + 1$.

RECALL PROGRAM

Appendix E lists a program that can be used to recall spectra from the master file. This program will generate plots and reports identical to that generated by the EDIT pass. Up to 100 spectra can be recalled at one processing. Instructions for its use are given as comment cards at the beginning of the main program (Page E1).

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APPENDIX A

INSTRUMENTATION

FIGURE A.1. Schematic of Scaler

FIGURE A.2. Schematic Serial Number Device

APPENDIX B

PTI PROGRAMS, MEMORY MAPS, LOGIC CHARTS

TABLE B.1. Definitions of Switches [KSW(I)], Tags [KTG(I)], and Counts [LCNT(I)] for PTI Pass

Switch, Tag Count	Function	Subroutines Where Set* or Used
KSW(1)	Determines mode of output record; 0=BCD, 1=Binary	PARA*, CHR01, MERGE
KSW(2)	Determines the output record length in words	PARA*, CHR01
KSW(3)	Determines whether MREC or RECD is used; 0=MREC, 1=RECD	PARA*, CHR01, CHR02
KSW(4)	Determines record type; 00=no record type; otherwise A2 record type	PARA*, CHR01
KSW(5)	Determines whether B Label is wanted; 0=No, 1=Yes (output tape)	PARA*, MAIN
KSW(6)	Character used to fill out unused portions of fields and records	PARA*, PARB
KSW(7)	Determines whether an output record will be written; 0=Yes, 1=No	PARA*, CHR01
KSW(8)	Determines paper tape code; 5=Standard 5 channel, 8=Standard 8 channel	PARA*
KSW(9)	Signals use of debug TRACE routine; 0=No, 1=Yes	PARA*, CHR02, CNVRT, CLRCD, CHR01
KSW(10)	Determines whether memory dump will occur at end of run; 0=No, 1=Yes	PARA*, MAIN
KSW(11)	Multiple file input (Setup #7) if nonzero	PARA*, CHR01, CNVRT, RESET
KTG(1)	Count of number of fields (PI1, TAB, PERIOD, PI7, PI2, STOP)	CHR02*, CHR03, CHR09, CLRCD, SPEC
KTG(2)	Current paper tape number (File Number)	CNVRT*, SPEC
KTG(3)	Counts the number of characters in a field	CHR09*, CNVRT*, CLFLD, SPEC, CHR02*, CHR03*, CHR01
KTG(4)	Address of the conversion table (CNTAB)	CNVRT*, SPEC
KTG(5)	Signals end of field on input tape when not zero	CLRCD, PARB, SPEC, CNVRT*, CLRCD, PARA
KTG(6)	Number of fields in input record (Maximum number)	PARB, SPEC, CHR02, PARA*
KTG(7)	Switch to bypass input field; 0=Do not bypass, 1=Bypass	CHR02*, SPEC
KTG(8)	Bypass writing RECB; 0=Do not bypass, 1=Bypass	CHR01*, CLRCD*, SPEC
KTG(9)	Starting address of input record	SPEC
KTG(10)	Word count of input record	SPEC
KTG(13)	Count for skipping paper tape character	CHR02*, CHR03
KTG(14)	Storage for converted character	CNVRT*
KTG(15)	Storage for current converted character	CHR04*, CHR06*, CNVRT*, CHR08
KTG(16)	Character count of the current record	CHR01*, CHR03*, CNVRT*
KTG(17)	Output fill character used for fill words	CHR02, CHR01, PARB*
KTG(18)	Number of words used in FLD(I)	CHR02, PARB*
KTG(19)	Starting address of current output record (first word)	CHR02, CHR01*
KTG(20)	Output area code (Fortran Integer)	CHR01*, CLRCD
KTG(21)	Tag set not equal to zero when invalid character is detected	CLFLD*, CHR04*, CHR09*
KTG(22)	Tag set not equal to zero if field is too long or short	CHR03*
KTG(23)	Tag set not equal to zero if parity error is found in input record	CHR06*, CLFLD*, CHR09*
KTG(24)	Tag set for monitor mode; 1=9Pac, 2=Fortran	
KTG(25)	Tag set for input tape unit; 2=Fortran	STMON*, PARA
KTG(26)	Tag set equal to the size of the output record	CHR07*
KTG(44)	Form of KTG(15) used for logic of CLFLD and CLRCD--Leader, Trailer	CHR08*, SPEC, CLRCD*
KTG(45)	Form of KTG(15) used for logic of CLFLD AND CLRCD--Leader, Trailer	CHR08*, CLRCD*
KTG(46)	Tag set in CLFLD to bypass spectrum	CLFLD*, CHR08*
KTG(47)	Signals detection of "STOP" Code	CHR08*, CHR09, CLRCD
LCNT(1)	Counts the number of paper tape records read	MERGE*, CNVRT*, MAIN, RESET*
LCNT(2)	Counts the number of magnetic tape records written	MERGE*, CHR01*
LCNT(3)	Counts the number of field parameter cards read	PARB, PARA*
LCNT(4)	Counts the total number of characters processed	RESET*, CNVRT*, MAIN, CHR09
LCNT(13)	Number of "Data" characters counted	CNVRT*
LCNT(14)	Number of "Invalid" characters counted	CNVRT*
LCNT(15)	Number of "Fill" characters counted	CNVRT*
LCNT(16)	Number of input parity errors counted	CNVRT*
LCNT(18)	Number of "Character Type 8" characters counted PI1, PI2, PERIOD	CNVRT*
LCNT(19)	Number of "Character Type 9" characters counted PI7, TAB	CNVRT*
LCNT(20)	Number of "Character Type 10" characters counted BLANK CHARACTERS	CNVRT*
LCNT(23)	Number of Data Characters	
LCNT(24)	Number of Invalid Characters	
LCNT(25)	Number of Fill Characters	
LCNT(26)	Number of Parity Errors	
LCNT(28)	Number of "Character Type 8" PI1, PI2, PERIOD	
LCNT(29)	Number of "Character Type 9" PI7, TAB	
LCNT(30)	Number of "Character Type 10" SPACE	
LCNT(32)	Number of Read Errors detected	RESET*, MERGE, MAIN, CHR01*
LCNT(33)	Total number of debug lines	CHR01*
LCNT(34)	Debug line counter	CHR01*
LCNT(41)	Number of successive parity errors detected	CLFLD*
LCNT(43)	Number of successive fields with wrong number of characters	CLFLD*

NOTE: All Switches, Tags and Counts are set equal to zero upon entering the main program.

TABLE B.II. Special Programs Used in the PTI Pass

Program	Subprograms Called	Function of Subprogram
*MAIN	*STMON	Set monitor switch
	*PARA	Process parameter cards
	*PARB	Process parameter cards
	*BLAB	Set up label for output
	*CLPRE	Dummy routine
	*CNVRT	See Figure 5
	*QUIT	Dummy routine
	*BINDP	Convert binary to BCD
	*CNBFL	Convert binary to F.P.
	*SRERR	Signals error
	*EXIT	Ends PTI pass
	*DUMP	Dumps memory
*STMON	*IOTST	Tests input-output
	*BINDP	See above
	*DVL01	
*PARA	*MOVE	Moves word without conversion
*PARB		
*BLAB**	**FLIP	Inverts record in memory
	**WRBCD	Writes record in BCD
*CNVRT	*CHR01	See flow chart
	*CHR02	See flow chart
	*CHR03	Processes characters 0-9
	*CHR04	Processes invalid characters
	*CHR05	Processes fill dummy characters
	*CHR06	Processes parity errors
	**CHR07	
	***CHR08	Processes PI1, PI2, PERIOD
	***CHR09	Processes TAB, PI7
	*CHR10	Processes blanks (dummy)
	**CNTAB	Table for character conversion
	*READ	Reads binary from A5
	*TRACE	Causes debug dump
	*SRERR	See above
	*IOTST	See above
BINDP		
CNBFL		

*Part of basic PTI package

**Not used by this system

***Modified or written specifically for this system

Program	Subprograms Called	Function of Subprogram
*SRERR	*IOTST	See above
	*BINDP	See above
	*DVL01	Moves values for debug print
*IOTST		Has entry points at IOTST, IOCHK, IOINT, RADDR, UTTST
*DVL01	RADDR	
***MOVE		
**FLIP		
**WRBCD		
*CHR01	*CHR02	See above
	***CLRCD	Transfers record from MRE C to DMY or BREC. See Figure 6
	*TRACE	Write record from BREC to B7
	**WRBCD	See above
	*WRBIN	See above
	SRERR	See above
*CHR02	***CLFLD	Examines errors which occur in the paper tape. Allows processing to continue unless 5 successive errors
	*TRACE	See above
	*SRERR	See above
*CHR03		
*CHR04	*CHR03	See above
*CHR06	*CHR03	See above
***CHR08	*CHR01	See above
***CHR09	*CHR02	See above
	*CHR01	
***CLRCD	*MVFLD	Moves a field from one location in memory to another
	*TRACE	See above
	*BINDP	See above
	*WRBIN	See above
	*IOTST	See above
	*IOCHK	See above
	*SRERR	See above
	***SPEC	Writes map of processing
***CLFLD	***BFINT	Converts binary to Fortran integer
	***SPEC	See above
***SPEC

RECORD FORMATS

TALLY TAPE	PREC(I,J)			FLD(I,J)			MREC(I,J)			DMY(I,J)			BREC(I,J)			CHANGE FILE
	Oct. Loc.	I	J Var.	Oct. Loc.	I	J Var.	Oct. Loc.	I	J Var.	Oct. Loc.	I	J Var.	Oct.* Loc.	I	J Var.	
Leader	77233	1	1	66161	1	1	76103	1	1	52401	1	1	21105	1	1 ABS	Leader
Body	77163	57	1	66160	2	1	75117	501	1	52376	4	1	20245	417	1 ABS (500)	Trailer
Body (160 words)	76724	200	1 ISER	NOT USED			74134	1000	1	Leader-trailer merged, ISER, ISEQ, LWS, LMVE, INC, N, BASE			20233	427	1 ISER	Body (500)
:	76725	1	2				74133	1	2				20232	1	2 ABS (501)	Leader
:	76653	57	2				NOT USED						120 ABS (11501D)			Trailer
Body	76414	200	2 ISER				72164	1000	2	52370	10	1	16172	427	2 ISER	Body (500)
Trailer	76413	1	3				72163	1	3	52367	1	2	:	:	:	
Leader	NOT USED			NOT USED			NOT USED			NOT USED			1224	1	120 ABS (11501D)	
Body													3525	427	20 ISER	
				64212	100	10	70214	1000	3	51720	1025					

FIGURE B.1. Memory Map of PTI Pass

```

graph LR
    Start((Start)) --> Init[Initialize Control Counts Switches Tags]
    Init --> SetMon[Set Monitor Switch  
(Call STMON)]
    SetMon --> SetParam[Set Up Parameters  
(Call PARA)  
(Call PARB)]
    SetParam --> WantB{Want "B" Label?}
    WantB -- No --> Precall[Precall  
(Call CLPRE)]
    Precall --> SetConv[Set Up Conversion Table  
(Call CNVRT)]
    SetConv --> EndJob[Perform End-of-Job Operations  
Rewind, Print, etc.  
(Call QUIT)  
(Call PARA)]
    EndJob --> RunPac{Run on Pac Mode?}
    RunPac -- Yes --> Halt7((Halt 7))
    RunPac -- No --> DumpMem{Dump Memory?}
    DumpMem -- Yes --> CallDump((Call DUMP))
    DumpMem -- No --> CallExit((Call EXIT))
    CallExit --> End[End]
    WantB -- Yes --> SetUpB[Set Up "B" Label]
    SetUpB --> Precall
  
```

```

graph LR
    Start((Start)) --> Init[Call CHRO2 Initialize Character and Word Count if First Time Through]
    Init --> FirstTime{First Time Through?}
    FirstTime -- Yes --> Store[Store No. of Fields, Max. Output Length, Record Type]
    Store --> BypassWrite1{Bypass Write Logic?}
    BypassWrite1 -- Yes --> InitField[Initialize Field Counter, Character per Record]
    BypassWrite1 -- No --> SetupWrite[Set up Write Logic]
    SetupWrite --> InitField
    InitField --> BypassWrite2{Bypass Write?}
    BypassWrite2 -- Yes --> ReturnCNVRT1((Return to CNVRT))
    BypassWrite2 -- No --> ResetRECD[Reset RECD]
    ResetRECD --> ReturnCNVRT1
    FirstTime -- No --> NoRecord{NO RECORD CURRENTLY IN RECD}
    NoRecord -- Yes --> Out1((Out))
    Out1 --> ReturnCNVRT1
    NoRecord -- No --> CallCLRCO[Call CLRCO]
    CallCLRCO --> BypassWrite3{Bypass Write?}
    BypassWrite3 -- Yes --> InitField
    BypassWrite3 -- No --> SetupWriteRecord[Set up and Write Record]
    SetupWriteRecord --> InitField
  
```

```

graph LR
    Start([Start]) --> D1{First Time Through ?  
(SWRN)}
    D1 -- Yes --> P1[Set Up Instructions for Using MREC as Intermediate Storage Area]
    P1 --> D2{Is Character Count Zero ?}
    D2 -- No --> D3{Is Word Completed ?}
    D3 -- No --> P2[Transfer Character To FLD (1)]
    P2 --> D4{Is Number of Fields > 0 ?  
(KTG(3))}
    D4 -- Yes --> D5{Is Maximum No. Of Fields Exceeded ?}
    D5 -- Yes --> P3[Adjust for Any Illegal Characters, Parity Errors, Wrong Word Length  
(Call CLFLD)]
    D5 -- No --> P3
    P3 --> P4[Increment Field Count (KTG(1))  
Set Character Count Zero (KTG(3))  
Set KTG(12) = 1  
KTG(13) = 1]
    P4 --> P5[Return To Calling Program]
    D1 -- No --> P4
    D2 -- Yes --> P4
    D3 -- Yes --> P4
    D4 -- No --> E1([Error  
Call SRRER  
Halt])
    
```

Numerical character detected in CONVET-CHG03 is called to place the character in FLD(1). If this character causes the legal length of the field to be exceeded, an error flag (KTF(22)) is set. The program then returns directly to CONVET to process next character.

Erroneous character detected in CMMVT--Program is channeled to CHRO4 or CHRO0 to set the error flag (KTC(21) or KTC(23)). CHRO3 is then called to place the character in FLD(1). Program then returns to CMMVT to examine the next character.

ans of word detected (P17 or TAB)--CHRO9 is called which in turn calls CHRO2. CHRO2 transfers the work to XREC and calls CLFILE to examine the validity of the word. Program calls SPEC if the word is invalid to write pertinent diagnostic data. If the word is legal, program returns directly to CHRO9 and in turn to CHWT to process next character.

End of leader (P&R00), body (P12), trailer (P11 or JTOP) detected--CHP00 is called which in turn calls CHP01 which calls CH02 which calls CH03 to examine the validity of the last word (P11, P12, P&R00 and JTOP are also word markers). Depending on what character triggered CH00, CH03, called by CH00 upon return from CH02, moves the leader from H00 to J00, moves the body from H00 to B00, or moves the trailer from H00 to T00, making up the complete leader, and transfers the leader to B00 to be associated with each group of 300 data. Finally, it writes all of H00 in multiples of 300 data to BT for BIT.

FIGURE B.2. Logic Charts for PTI Programs: MAIN, CNVRT, CHR01, CHR02

SUBROUTINE CLRCD

SUBROUTINE CHRO3
(NUMERICAL) SUBROUTINE CHRO4
(INVALID) SUBROUTINE CHRO6
(PARITY ERROR) SUBROUTINE CHRO8
(P11, P12, PERIOD) SUBROUTINE CHRO9
(WORD MARKER)

FIGURE B.4. Logic Charts for PTI Programs: CHRO3, CHRO4, CHRO6, CHRO8, CHRO9

C			B.1	BNWL-343	00002
C					00003
C					00004
*	FAP				00005
*		BFINT - CONVERT BINARY INTEGER TO FORTRAN INTEGER			00006
*		CALL LIST - A,I			00007
*		A - BINARY INTEGER			00008
*		I - FORTRAN INTEGER			00009
	COUNT	80			00010
	ENTRY	BFINT			00011
	BCI	1,BFINT			00012
BFINT	CAL*	1,4			00013
	ALS	18			00014
	SLW*	2,4			00015
	TRA	3,4			00016
*		FOLLOW WITH COMMON			00017
*		SYS405 - COMMON STORAGE ASSIGNMENTS - GENERAL SYSTEM			00018
*		PROGRAM SWITCHES AND TAGS			00019
LCNT	COMMON	50	CONTROL COUNTS		00020
KSW	COMMON	50	SWITCHES SET BY PARAMETER		00021
KTG	COMMON	50	TAGS SET BY PROGRAM		00022
*		INPUT-OUTPUT AREAS			00023
PREC	COMMON	600	PAPER TAPE RECORDS		00024
MREC	COMMON	3000	MAGNETIC TAPE RECORDS		00025
*		NOT ASSIGNED			00026
ROO	COMMON	50			00027
*		INTERMEDIATE RECORD AREA			00028
RECD	COMMON	1000	INTERMEDIATE RECORD		00029
*		WORKING STORAGE LOCATIONS			00030
FLD	COMMON	1000	FIELD FROM INPUT		00031
WFLD	COMMON	1000	MODIFIED FIELD		00032
TAG	COMMON	500	FIELD TAGS		00033
*		FIELD ROUTINE PARAMETERS			00034
LGT	COMMON	500	LENGTH OF FIELD		00035
LST	COMMON	500	LEFT SHIFT INSTRUCTION		00036
MSKL	COMMON	500	MASK - LEFT WORD		00037
MSKR	COMMON	500	MASK - RIGHT WORD		00038
STC	COMMON	500	STARTING CHARACTER		00039
STW	COMMON	500	STARTING WORD NUMBER		00040
WWC	COMMON	500	WHOLE WORD COUNT		00041
*		CONSTANTS			00042
DMY	COMMON	250			00043
IDY	COMMON	250			00044
	END				00045
C					00046-

		B.2	BNWL-343	
C				00047
C				00048
C				00049
*	FAP			00050
	ENTRY	CHRO8		00051
	BCI	1,CHRO8		00052
CHRO8	SXA	OUT,4	SAVE INDEX REGISTER	00053
*		MOVE FLAG FROM CONVERSION CELL TO KTG-43		00054
	CAL	KTG-14		00055
	LAS	A		00056
	TRA	XAD		00057
	TRA	XAB		00058
	LAS	E		00059
	TRA	*+2		00060
	TRA	*+2		00061
	TRA	XAA		00062
	NZT	KTG-46		00063
	TRA	XAA		00064
	CLA	KTG-14		00065
	ARS	18		00066
	STO	KTG-43		00067
	CALL	CHRO1		00068
	STZ	KTG-46		00069
	TRA	XAE		00070
XAD	LAS	C		00071
	TRA	*+2		00072
	TRA	*+2		00073
	TRA	XAA		00074
	CAL	D		00075
	STO	KTG-46		00076
	TRA	XAA		00077
XAB	CALL	CHRO1		00078
	CLA	KTG-14		00079
	ARS	18		00080
	STO	KTG-43		00081
	STL	KTG-44		00082
	TRA	OUT		00083
XAA	CLA	KTG-14		00084
	ARS	18		00085
	STO	KTG-43		00086
	CALL	CHRO1		00087
XAE	CAL	KTG-43		00088
	LAS	B		00089
	TRA	OUT		00090
	STZ	KTG-45		00091
OUT	AXT	** ,4		00092
	TRA	1,4		00093
A	PZE	,,8		00094
B	PZE	2		00095
C	PZE	,,16		00096
D	PZE	,,1		00097
E	PZE	,,2		00098
C				00099-

C		B.3	BNWL-343	00100
C				00101
C				00102
*		FOLLOW WITH COMMON		00103
*		SYS405 - COMMON STORAGE ASSIGNMENTS - GENERAL SYSTEM		00104
*		PROGRAM SWITCHES AND TAGS		00105
	LCNT	COMMON 50	CONTROL COUNTS	00106
	KSW	COMMON 50	SWITCHES SET BY PARAMETER	00107
	KTG	COMMON 50	TAGS SET BY PROGRAM	00108
*		INPUT-OUTPUT AREAS		00109
	PREC	COMMON 600	PAPER TAPE RECORDS	00110
	MREC	COMMON 3000	MAGNETIC TAPE RECORDS	00111
*		NOT ASSIGNED		00112
	ROO	COMMON 50		00113
*		INTERMEDIATE RECORD AREA		00114
	RECD	COMMON 1000	INTERMEDIATE RECORD	00115
*		WORKING STORAGE LOCATIONS		00116
	FLD	COMMON 1000	FIELD FROM INPUT	00117
	WFLD	COMMON 1000	MODIFIED FIELD	00118
	TAG	COMMON 500	FIELD TAGS	00119
*		FIELD ROUTINE PARAMETERS		00120
	LGT	COMMON 500	LENGTH OF FIELD	00121
	LST	COMMON 500	LEFT SHIFT INSTRUCTION	00122
	MSKL	COMMON 500	MASK - LEFT WORD	00123
	MSKR	COMMON 500	MASK - RIGHT WORD	00124
	STC	COMMON 500	STARTING CHARACTER	00125
	STW	COMMON 500	STARTING WORD NUMBER	00126
	WWC	COMMON 500	WHOLE WORD COUNT	00127
*		CONSTANTS		00128
	DMY	COMMON 250		00129
	IDY	COMMON 250		00130
		END		00131
C				00132
C				00133
C				00134
C				00135
*	LIST8			00136
*	SYMBOL TABLE			00137
*	LABEL			00138
CCHR9	CHR09	IS CALLED AT WORD MARKER TIME. LENGTH OF WORD IS EXAMINED.		00139
C		IF TOO LONG, CAUSED BY A PARITY ERROR OR ILLEGAL CHARACTER IN		00140
C		PLACE OF A WORD MARKER, THEN CHR02 IS CALLED ENOUGH TIMES TO		00141
C		RECOVER THE ORIGINAL NUMBER OF WORDS. CLFLD TAKES CARE OF WHAT		00142
C		SHOULD GO INTO THE WORDS.		00143
	SUBROUTINE CHR09			00144
C	FOLLOW BY COMMON			00145
C	PROGRAM SWITCHES AND TAGS			00146
	DIMENSION LCNT(50),KSW(50),KTG(50)			00147
	COMMON LCNT,KSW,KTG			00148
C	INPUT - OUTPUT AREAS			00149
	DIMENSION PREC(600),MREC(3000)			00150
	COMMON PREC,MREC			00151
C	NOT ASSIGNED			00152
	DIMENSION ROO(50)			00153
	COMMON ROO			00154
C	INTERMEDIATE RECORD AREA			00155
C				00156-

C		B.4	BNWL-343	00157
C				00158
C				00159
	DIMENSION RECD(1000)			00160
	COMMON RECD			00161
C	WORKING STORAGE			00162
	DIMENSION FLD(1000),WFLD(1000),TAG(500)			00163
	COMMON FLD,WFLD,TAG			00164
C	FIELD ROUTINE PARAMETERS			00165
	DIMENSION LGT(500),LST(500),MSKL(500),MSKR(500),STC(500),STW(500),			00166
	XWWC(500)			00167
	COMMON LGT,LST,MSKL,MSKR,STC,STW,WWC			00168
C	CONSTANTS			00169
	DIMENSION DMY(250),IDY(250)			00170
	COMMON DMY,IDY			00171
C	END OF COMMON			00172
	IF (KTG(47)-1)6,7,7			00173
	7 KTG(21)=0			00174
	KTG(23)=0			00175
	GO TO 1000			00176
	6 CALL BFINT(KTG(3),ICNT)			00177
	N=ICNT/5			00178
	ISAVE=KTG(3)			00179
	DO 10 I=1,N			00180
	KTG(3)=ISAVE			00181
	CALL CHR02			00182
	CALL BFINT(KTG(1),JCNT)			00183
	IF(JCNT)20,20,30			00184
	20 CALL TRACE(9)			00185
	GO TO 40			00186
	30 IF(JCNT-501)10,40,40			00187
	40 CALL CHR01			00188
	10 CONTINUE			00189
	IF(N-1)1000,1000,50			00190
	50 CALL BFINT(LCNT(4),LEN)			00191
	LINCH=FLOATF(LEN)/10.16			00192
	CALL IOTST(1)			00193
	WRITE OUTPUT TAPE 3,55,N,LINCH			00194
	55 FORMAT(1H ,12,22H MERGED DATA OCCURRING,16,62H INCHES IN FROM BEGI			00195
	XNNING OF PAPER TAPE HAVE BEEN UNSCRAMBLED.)			00196
	1000 RETURN			00197
	END			00198
C				00199
C				00200
C				00201
C				00202
*	LIST8			00203
*	SYMBOL TABLE			00204
*	LABEL			00205
CCLFLD	TESTS PTI WORDS FOR ERRORS.			00206
	SUBROUTINE CLFLD(XYZ)			00207
C	PROGRAM SWITCHES AND TAGS			00208
	DIMENSION LCNT(50),KSW(50),KTG(50)			00209
	COMMON LCNT,KSW,KTG			00210
C	INPUT - OUTPUT AREAS			00211
	DIMENSION PREC(600),MREC(3000)			00212
	COMMON PREC,MREC			00213
C	NOT ASSIGNED			00214
	DIMENSION ROO(50)			00215
C				00216~

C		B.5	BNWL-343	00217
C				00218
C				00219
	COMMON ROO			00220
C	INTERMEDIATE RECORD AREA			00221
	DIMENSION RECD(1000)			00222
	COMMON RECD			00223
C	WORKING STORAGE			00224
	DIMENSION FLD(1000),WFLD(1000),TAG(500)			00225
	COMMON FLD,WFLD,TAG			00226
C	FIELD ROUTINE PARAMETERS			00227
	DIMENSION LGT(500),LST(500),MSKL(500),MSKR(500),STC(500),STW(500),			00228
	XWWC(500)			00229
	COMMON LGT,LST,MSKL,MSKR,STC,STW,WWC			00230
C	CONSTANTS			00231
	DIMENSION DMY(250),IDY(250)			00232
	COMMON DMY,IDY			00233
C	VALID VALUES OF KTG(44) ARE 1(PERIOD),2(PI1),4(BODY),8(PI2),16(STO			00234
C	P).EOF SETS KTG(44) TO 2. ALWAYS SET TO 2 OR 4 UPON EXIT FROM CLRC			00235
C	D. WHEN PI2 IS DETECTED, UNLESS KTG(47) IS NON ZERO, PRECEEDING DA			00236
C	TA ARE TREATED AS DATA. (KTG(44)=4 ON ENTRY INTO CLFLD) HOWEVER,			00237
C	BEFORE PROGRAM RETURNS TO CNVRT FOR OTHER DATA, KTG(44) IS SET TO			00238
C	8 IN CHR08. THUS DATA FOLLOWING PI2 AND PRECEEDING TTHE SUBSEQUENT			00239
C	PI1 OR STOP ARE TREATED AS TRAILER.			00240
	CALL BFINT(KTG(44),KSG)			00241
	IF(KSG)91,91,200			00242
200	IF(KSG-16)250,260,91			00243
250	IF (KTG(47))1000,260,1000			00244
260	GO TO (1,1,91,5,91,91,91,2,91,91,91,91,91,91,2),KSG			00245
91	CALL IOTST(1)			00246
	WRITE OUTPUT TAPE 3,93			00247
93	FORMAT(1H1,37HKTG(44) IS ILLEGAL. PROGRAM PROBLEMS.)			00248
	GO TO 90			00249
C				00250
C	LEADER--TRAILER			00251
C				00252
B	1 VDR=432521242551			00253
	GO TO 3			00254
B	2 VDR=635121314351			00255
	3 IF(KTG(23))80,70,80			00256
C	KTG(23) IS DIFFERENT FROM ZERO IF A PARITY ERROR HAS OCCURRED IN			00257
C	THE FIELD IN QUESTION.			00258
70	IF(KTG(21))75,76,75			00259
75	CALL IOTST(1)			00260
B	FLD(2)=FLD(1)			00261
	WRITE OUTPUT TAPE 3,17,VDR			00262
17	FORMAT(1H1, 42HAN INVALID CHARACTER HAS OCCURRED IN SOME ,A6,33H I			00263
	XNFORMATION. RECHECK PAPER TAPE.)			00264
	GO TO 90			00265
76	CALL BFINT(KTG(3),ICNT)			00266
	IF(ICNT-5)77,1000,77			00267
77	CALL IOTST(1)			00268
B	FLD(2)=FLD(1)			00269
	WRITE OUTPUT TAPE 3,18,VDR			00270
18	FORMAT (1H1,56HTHERE IS AN ILLEGAL NUMBER OF CHARACTERS IN A FIELD			00271
	XOF A ,A6,21H. RECHECK PAPER TAPE.)			00272
C				00273-

C		B.6	BNWL-343	00274
C				00275
C				00276
				00277
	GO TO 90			00278
80	CALL IOTST(1)			00279
B	FLD(2)=FLD(1)			00280
	WRITE OUTPUT TAPE 3,7,VDR			00281
	7 FORMAT(1H1,36HA PARITY ERROR HAS OCCURRED IN SOME ,A6,33H INFORMAT			00282
	XION. RECHECK PAPER TAPE.)			00283
90	CALL SPEC(3)			00284
	GO TO 120			00285
C				00286
C	BODY			00287
C				00288
	5 IF(KTG(21))10,20,10			00289
C	KTG(21) SIGNALS AN INVALID CHARACTER IF DIFFERENT FROM ZERO.			00290
20	IF(KTG(23))10,30,10			00291
30	LCNT(41)=0			00292
	GO TO 50			00293
B 10	FLD(2)=FLD(1)			00294
	FLD(1)=0.0			00295
	LCNT(41) = LCNT(41) + 1			00296
	IF(LCNT(41)-5)50,60,60			00297
60	CALL IOTST(1)			00298
	WRITE OUTPUT TAPE 3,27			00299
27	FORMAT(1H1,116HTO ANALYST--PARITY ERRORS OR ILLEGAL CHARACTERS HAV			00300
	XE OCCURRED IN FIVE SUCCESSIVE FIELDS OF BODY. EXAMINE PAPER TAPE.)			00301
	GO TO 90			00302
50	CALL BFINT(KTG(3),ICNT)			00303
	IF (ICNT-5)100,110,100			00304
110	LCNT(43)=0			00305
	GO TO 120			00306
B 100	FLD(2)=FLD(1)			00307
	FLD(1)=0.0			00308
	LCNT(43)=LCNT(43) + 1			00309
	IF (LCNT(43)-5)120,130,130			00310
130	CALL IOTST(1)			00311
	WRITE OUTPUT TAPE 3,37			00312
37	FORMAT(1H1,108H TO ANALYST--THE NUMBER OF CHARACTERS IN FIVE SUCCE			00313
	XSSIVE BODY FIELDS WAS DIFFERENT THAN 5. CHECK PAPER TAPE.)			00314
	GO TO 90			00315
120	KTG(21)=0			00316
	KTG(23)=0			00317
1000	RETURN			00318
	END			00319-
C				

C		B.7	BNWL-343	00320
C				00321
C				00322
*	FAP			00323
	ENTRY	CLRCD		00324
	BCI	1,CLRCD		00325
CLRCD	SXA	OUT,1	SAVE INDEX REGISTERS	00326
	SXA	OUT+1,2		00327
	SXA	OUT+2,4		00328
	STI	CP20		00329
*		ESTABLISH NUMBER OF FIELDS		00330
	STL	KTG-7	SET IGNORE SWITCH	00331
	CLA	KTG		00332
	SUB	=1		00333
	STO	CP1		00334
	ZET	KTG-4		00335
	TRA	BBA		00336
	CAL	KTG-46		00337
	LAS	CF1		00338
	TRA	*+1		00339
	TRA	AAA		00340
*		TEST FOR TYPE OF RECORD		00341
	LDI	KTG-43		00342
	RNT	1		00343
	TRA	BAA	NOT FIRST PART OF LEADER	00344
*		PLACE BLANKS IN DMY		00345
	LXA	=10,1		00346
	CAL	CP13		00347
	SLW	DMY+1,1		00348
	TIX	*-1,1,1		00349
*		MOVE ISER FROM 1ST POSITION IN MREC TO 1ST IN DMY		00350
	CALL	MVFLD,CF5,MREC,CFE3,KTG-19,CF1,DMY,CF10,CF1,CF1		00351
*		MOVE LWVS FROM 6TH POSITION IN MREC TO 8TH POSITION IN DMY		00352
*		(SIXTH AND SEVENTH POSITIONS LEFT IN DMY FOR ISEQ)		00353
	CALL	MVFLD,CF5,MREC,CFE3,KTG-19,CF6,DMY,CF10,CF1,CF8		00354
*		MOVE INC FROM 11TH POSITION IN MREC TO 18 POSITION IN DMY		00355
*		POSITIONS 13-17 RESERVED FOR LWVE)		00356
	CALL	MVFLD,CF5,MREC,CFE3,KTG-19,CF11,DMY,CF10,CF1,CF18		00357
*		MOVE ISIG AND BASE FROM 16TH POSITION IN MREC TO 28TH IN DMY		00358
*		(POSITIONS 23-27 RESERVED FOR N)		00359
	CALL	MVFLD,CF5,MREC,CFE3,KTG-19,CF16,DMY,CF10,CF1,CF28		00360
	CLA	=4		00361
	STO	KTG-43		00362
	NZT	KSW-8		00363
	TRA	*+3		00364
	CALL	TRACE,CF5		00365
	CALL	SPEC,CF1	SPECTRUM INITIATED	00366
	TRA	ZAA		00367
AAA	LDI	KTG-43		00368
	RNT	20		00369
	TRA	OUT		00370
	TRA	BBA		00371
*		TEST FOR TRAILER (LAST OF LEADER)		00372
BAA	RNT	2		00373
	TRA	EAA	RECORD PART OF BODY	00374
C				00375-

		B.8	BNWL-343	
C				00376
C				00377
C				00378
BBA	NZT	KTG-44		00379
	TRA	BXA		00380
*		MOVE LWVE FROM MREC TO DMY		00381
	CALL	MVFLD,CF5,MREC,CFE3,KTG-19,CF1,DMY,CF10,CF1,CF13		00382
*		MOVE N FROM MREC TO DMY		00383
	CALL	MVFLD,CF5,MREC,CFE3,KTG-19,CF6,DMY,CF10,CF1,CF23		00384
*		MOVE LEADER TO RECORDS (BREC(427,CP11))		00385
	CLA	CF1	INITIALIZE RECORD COUNTER TO 1	00386
	STO	CP16		00387
CAA	CLA	CP16		00388
	ARS	18		00389
	STO	CP21		00390
	CALL	BINDP,CP21,CP17,CP18		00391
*		MOVE ISEQ (CP16) TO DMY		00392
	CALL	MVFLD,CF2,CP18,CF1,CF1,		00393
	ETC	CF5,DMY,CF10,CF1,CF6		00394
	CALL	MVFLD,CF60,DMY,CF10,CF1,		00395
	ETC	CF1,BREC,CP12,CP16,CF1		00396
*		WRITE COMPLETED RECORD		00397
	NZT	KSW-8		00398
	TRA	*+3		00399
	CALL	TRACE,CF7		00400
	ZET	KTG-45		00401
	TRA	CDA		00402
	CALL	WRINT,BREC,CP12,CP16,CP12,CP8		00403
	CALL	IOTST,CF2		00404
	CALL	IOCHK,CF17,CP8		00405
	LXD	CP8,1		00406
	TRA	*+6,1		00407
	TRA	QBA	5	00408
	TRA	OUT	4	00409
	TRA	QAA	3	00410
	TRA	CCA	2	00411
	TRA	CCA	1	00412
	TRA	OUT	0	00413
*		TEST FOR MORE RECORDS		00414
CCA	CLA	CP16	ADD ONE TO RECORD COUNTER	00415
	ADD	CF1	THEN SUBTRACT CP11 WHICH IS NUMBER	00416
	STO	CP16	OF RECORDS PLUS 1	00417
	SUB	CP11		00418
	TMI	CAA	RETURN FOR NEXT RECORD	00419
	CALL	SPEC,CF2	SPECTRUM PROCESSED	00420
	TRA	CDA		00421
BXA	CALL	SPEC,CF5	TRAILER IS MISSING	00422
	NZT	KSW-8		00423
	TRA	*+3		00424
	CALL	TRACE,CF9		00425
CDA	CLA	=2		00426
	STO	KTG-43		00427
	CLA	CF1	RESET NO OF RECDS IN BREC	00428
	STO	CP11		00429
	STO	CP16		00430
C				00431-

C			B.9	BNWL-343	00432
C					00433
C					00434
	ZAA	STZ	KTG-44		00435
	OUT	AXT	** ,1		00436
		AXT	** ,2		00437
		AXT	** ,4		00438
		LDI	CP20		00439
		TRA	1 ,4		00440
*			MOVE BODY RECORD FROM MREC TO BREC		00441
*			BLANK OUT AREA FOR NEXT RECORD		00442
	EAA	NZT	KSW-8		00443
		TRA	*+3		00444
		CALL	TRACE,CF8		00445
		CLA	CF20	TEST-MAXIMUM ALLOWABLE SEQUENCE	00446
		SUB	CP11		00447
		TMI	DBG		00448
		CAL	CP12		00449
		ARS	18		00450
		SLW	CP12T		00451
		AXT	BREC,1	PUT ADDRESS OF BREC IN AC	00452
		PXA	0,1		00453
		LXD	CP11,1	LOAD XR1 WITH SUBARRAY CODE	00454
		SUB	CP12T		00455
		TIx	*-1,1,1		00456
		ADD	=1	ADD ARRAY SIZE AND ONE TO GET	00457
		ADD	CP12T		00458
		STA	EBA	SAVE THIS ADDRESS FOR STORING BLANKS	00459
		LXD	CP12,1	LOAD XR1 WITH ARRAY SIZE	00460
		CAL	CP13	PICK UP BLANK	00461
	EBA	SLW	** ,1	STORE IN CURRENT AREA	00462
		TIx	*-1,1,1		00463
*			MOVE RECORD FROM MREC TO BREC		00464
		CALL	MVFLD,CP14,MREC,CFE3,KTG-19,CF1,		00465
		ETC	BREC,CP12,CP11,CP15		00466
		TRA	DBB		00467
DBG		CALL	SPEC,CF4	POSSIBLE SPECTRA MERGE	00468
*			BLANK OUT MREC		00469
	DBB	CAL	CFE3		00470
		ARS	18		00471
		SLW	CAE3		00472
		AXT	MREC,1		00473
		PXA	0,1		00474
		SUB	CAE3		00475
		ADD	=1		00476
		ADD	CP12T		00477
		STA	FBA		00478
		LXD	CP12,1		00479
		CAL	CP13		00480
	FBA	SLW	** ,1		00481
		TIx	*-1,1,1		00482
*			INCREMENT CONSTANTS FOR NEXT RECORD		00483
		CAL	CP11	ADD ONE TO RECORD COUNTER	00484
		ADD	CF1		00485
C					00486-

C			B.10	BNWL-343	00487
C					00488
C					00489
	STO	CP11			00490
	NZT	KSW-8			00491
	TRA	*+3			00492
	CALL	TRACE,CF6			00493
	TRA	ZAA	TRANSFER TO RETURN		00494
*		REDUNDANCY			00495
* QBA	CALL	SRERR,CF3			00496
*		END OF TAPE			00497
* QAA	CALL	SRERR,CF4			00498
*		STORAGE AREA			00499
BREC	BES	8540			00500
	PZE	0			00501
BRECS	EQU	BREC-8539			00502
*		CONSTANTS			00503
CF1	PZE	,,1			00504
CF2	PZE	,,2			00505
CF3	PZE	,,3			00506
CF4	PZE	,,4			00507
CF5	PZE	,,5			00508
CF6	PZE	,,6			00509
CF7	PZE	,,7			00510
CF8	PZE	,,8			00511
CF9	PZE	,,9			00512
CF11	PZE	,,11			00513
CF10	PZE	,,10			00514
CF13	PZE	,,13			00515
CF16	PZE	,,16			00516
CF17	PZE	,,17			00517
CF18	PZE	,,18			00518
CF19	PZE	,,19			00519
CF20	PZE	,,20			00520
CF21	PZE	,,21			00521
CF23	PZE	,,23			00522
CF25	PZE	,,25			00523
CF26	PZE	,,26			00524
CF28	PZE	,,28			00525
CF31	PZE	,,31			00526
CF60	PZE	,,60			00527
CAE3	PZE	0			00528
CFE3	PZE	,,1000			00529
CP7	PZE	0			00530
CP8	PZE	0			00531
CP11	PZE	,,1	SUBRECORD WITHIN BREC		00532
CP12	PZE	,,427	SUBRECORD SIZE		00533
CP12T	PZE	0			00534
CP13	BCI	1,	BLANK		00535
CP14	PZE	,,2500	CHARACTERS IN BODY		00536
CP15	PZE	,,61	START OF BODY RECORD		00537
CP16	PZE	0	RECORD COUNTER,MOVE LEADER AND WRITE		00538
CP17	PZE	0			00539
CP18	PZE				00540
C					00541-

C			B.11	BNWL-343	00542
C					00543
C					00544
	CP1	PZE	0	NUMBER OF FIELDS	00545
	CP20	PZE	0		00546
	CP21	PZE	0		00547
		PZE	0		00548
*			FOLLOW WITH COMMON		00549
*			SYS405 - COMMON STORAGE ASSIGNMENTS - GENERAL SYSTEM		00550
*			PROGRAM SWITCHES AND TAGS		00551
	LCNT	COMMON	50	CONTROL COUNTS	00552
	KSW	COMMON	50	SWITCHES SET BY PARAMETER	00553
	KTG	COMMON	50	TAGS SET BY PROGRAM	00554
*			INPUT-OUTPUT AREAS		00555
	PREC	COMMON	600	PAPER TAPE RECORDS	00556
	MREC	COMMON	3000	MAGNETIC TAPE RECORDS	00557
*			NOT ASSIGNED		00558
	ROO	COMMON	50		00559
*			INTERMEDIATE RECORD AREA		00560
	RECD	COMMON	1000	INTERMEDIATE RECORD	00561
*			WORKING STORAGE LOCATIONS		00562
	FLD	COMMON	1000	FIELD FROM INPUT	00563
	WFLD	COMMON	1000	MODIFIED FIELD	00564
	TAG	COMMON	500	FIELD TAGS	00565
*			FIELD ROUTINE PARAMETERS		00566
	LGT	COMMON	500	LENGTH OF FIELD	00567
	LST	COMMON	500	LEFT SHIFT INSTRUCTION	00568
	MSKL	COMMON	500	MASK - LEFT WORD	00569
	MSKR	COMMON	500	MASK - RIGHT WORD	00570
	STC	COMMON	500	STARTING CHARACTER	00571
	STW	COMMON	500	STARTING WORD NUMBER	00572
	WWC	COMMON	500	WHOLE WORD COUNT	00573
*			CONSTANTS		00574
	DMY	COMMON	250		00575
	IDY	COMMON	250		00576
			END		00577
C					00578
C					00579
C					00580
C					00581
*	FAP				00582
*			CNTAB - CAQ CONVERSION TABLE		00583
	COUNT		100		00584
	ENTRY		CNTAB		00585
*			09-21-61		00586
*			CONSTANT FROM COMMON		00587
	CK1	BOOL	77312	KTG-3	00588
	CNTAB	SXA	OUT,4		00589
		CLA*	1,4		00590
		PDX	0,4		00591
		XEC	AA,4		00592
		SXA	CK1,4		00593
	OUT	AXT	** ,4		00594
		TRA	2,4		00595
C					00596-

C			B.12	BNWL-343	00597
C					00598
C					00599
*			PICK UP TABLE ADDRESSES		00600
	AXT		TB01,4		00601
AA	PZE		0		00602
*			STANDARD 8 CHANNEL TABLE		00603
TB01	PZE	3,,32	00,HYPHEN,40		00604
	PZE	3,,1	01,1		00605
	PZE	3,,2	02,2		00606
	PZE	4	03		00607
	PZE	3,,4	04,4		00608
	PZE	4	05		00609
	PZE	4	06		00610
	PZE	3,,7	07,7		00611
	PZE	3,,8	10,8		00612
	PZE	4	11		00613
	PZE	8,,8	12		00614
	PZE	8,,16	13, STOP END OF SPECTRUM		00615
	PZE	4	14		00616
	PZE	9	15-BEGIN FIELD		00617
	PZE	4	16		00618
	PZE	6	17-PARITY ERROR		00619
	PZE	10	20, BLANK		00620
	PZE	4	21		00621
	PZE	4	22		00622
	PZE	3,,3	23,3		00623
	PZE	4	24		00624
	PZE	3,,5	25,5		00625
	PZE	3,,6	26,6		00626
	PZE	4	27		00627
	PZE	4	30		00628
	PZE	3,,9	31,9		00629
	PZE	8,,2	32,BEGIN RECORD		00630
	PZE	4	33		00631
	PZE	4	34		00632
	PZE	4	35		00633
	PZE	4	36		00634
	PZE	5	37,FILL CHARACTER		00635
	PZE	3,,0	40,0		00636
	PZE	4	41		00637
	PZE	4	42		00638
	PZE	4	43		00639
	PZE	4	44		00640
	PZE	4	45		00641
	PZE	4	46		00642
	PZE	4	47		00643
	PZE	4	50		00644
	PZE	4	51		00645
	PZE	4	52		00646
	PZE	8,,1	53,		00647
	PZE	4	54		00648
	PZE	4	55		00649
	PZE	4	56		00650
C					00651-

C			B.13	BNWL-343	00652
C					00653
C					00654
	PZE	4	57		00655
	PZE	4	60		00656
	PZE	4	61		00657
	PZE	4	62		00658
	PZE	4	63		00659
	PZE	4	64		00660
	PZE	4	65		00661
	PZE	4	66		00662
	PZE	4	67		00663
	PZE	4	70		00664
	PZE	4	71		00665
	PZE	4	72		00666
	PZE	4	73		00667
	PZE	4	74		00668
	PZE	4	75		00669
	PZE	9	76 TAB		00670
	PZE	5	77, FILL CHARACTER		00671
	END				00672
C					00673
C					00674
C					00675
C					00676
*	FAP				00677
*			MVFLD - MOVE FIELD FROM ONE ASCENDING ARRAY TO ANOTHER		00678
*			04-05-63		00679
*			CALLING SEQUENCE A,B,C,D,E,F,G,H,I		00680
*			A - NUMBER OF CHARACTERS TO MOVE		00681
*			B - ARRAY NAME - FROM		00682
*			C - SUB ARRAY SIZE - FROM		00683
*			D - SUB ARRAY CODE - FROM		00684
*			E - STARTING INCREMENT - FROM		00685
*			F - ARRAY NAME TO		00686
*			G - SUB ARRAY SIZE TO		00687
*			H - SUB ARRAY CODE TO		00688
*			I - STARTING INCREMENT TO		00689
*			MOVFL - MOVE FIELD FROM ONE RECORD TO ANOTHER		00690
*			CALLING SEQUENCE A,B,C,D,E		00691
*			A - NUMBER OF CHARACTERS TO MOVE		00692
*			B - SYMBOL, STARTING ADDRESS, -FROM		00693
*			C - STARTING CHARACTER NUMBER - FROM		00694
*			D - SYMBOL, STARTING ADDRESS, TO		00695
*			E - STARTING CHARACTER NUMBER, TO		00696
	COUNT	200			00697
	ENTRY	MOVFL			00698
	ENTRY	MVFLD			00699
	BCI	1, MVFLD			00700
MOVFL	SXA	OUT, 1	SAVE INDEX REGISTERS		00701
	SXA	OUT+1, 2			00702
	SXA	OUT+2, 4			00703
	CAL	CI1	SET EXIT		00704
C					00705-

		B.14	BNWL-343	
C				00706
C				00707
C				00708
*	SLW	OUT+3		00709
		STORE INFORMATION FROM CALL LIST		00710
	CLA*	1,4		00711
	ARS	18		00712
	SLW	CP1	CHARACTERS TO MOVE	00713
	CAL	2,4		00714
	STA	CP2	STARTING ADDRESS, FROM	00715
	CLA*	3,4		00716
	ARS	18		00717
	STO	CP3	STARTING INCREMENT, FROM	00718
	CAL	4,4		00719
	STA	CP4	STARTING ADDRESS, TO	00720
	CLA*	5,4		00721
	ARS	18		00722
	STO	CP5	STARTING INCREMENT, TO	00723
	TRA	ATA		00724
MVFLD	SXA	OUT+1	SAVE INDEX REGISTERS	00725
	SXA	OUT+1,2		00726
	SXA	OUT+2,4		00727
*		COMPUTE AND STORE INFORMATION FROM CALL LIST		00728
	CLA*	1,4		00729
	ARS	18		00730
	STO	CP1	CHARACTERS TO MOVE	00731
*		INFORMATION LOCATING FIELD IN INPUT		00732
	CLA*	3,4		00733
	ARS	18		00734
	STO	CP6	ARRAY CONSTANT	00735
	CLA*	4,4		00736
	PDX	0,1		00737
	CAL	2,4	STARTING ADDRESS	00738
	ANA	CM1		00739
	SUB	CP6		00740
	TIX	*-1,1,1		00741
	ADD	=1		00742
	STO	CP2		00743
	CLA*	5,4		00744
	ARS	18		00745
	STO	CP3	STARTING CHARACTER, INPUT	00746
	CLA*	7,4		00747
	ARS	18		00748
	STO	CP6	ARRAY CONSTANT	00749
	CLA*	8,4		00750
	PDX	0,1	ARRAY INDEX	00751
	CAL	6,4		00752
	ANA	CM1		00753
	SUB	CP6		00754
	TIX	*-1,1,1		00755
	ADD	=1		00756
	STO	CP4		00757
	CAL*	9,4		00758
	ARS	18		00759
C				00760-

C		B.15	BNWL-343	00761
C				00762
C				00763
	STO	CP5	STARTING CHARACTER, OUTPUT	00764
	CAL	CI2	SET EXIT	00765
	SLW	OUT+3		00766
*			COMPUTE PARAMETERS TO PICK UP FIELD -	00767
*			STARTING WORD AND CHARACTER NUMBER	00768
ATA	CLA	CP3		00769
	SUB	=1		00770
	XCA			00771
	PXD	0,0		00772
	DVP	=6		00773
	ADD	=1		00774
	STO	CP7	STARTING CHARACTER NUMBER	00775
	XCA			00776
	ADD	CP2	STARTING ADDRESS	00777
	SUB	=1		00778
	STA	CP16		00779
*			COMPUTE STARTING WORD NUMBER	00780
	CLA	CP5	STARTING CHARACTER NUMBER	00781
	SUB	=1		00782
	XCA			00783
	PXD	0,0		00784
	DVP	=6		00785
	STO	CP11		00786
	XCA			00787
	ADD	CP4	STARTING ADDRESS, OUTPUT	00788
	STA	HBB1		00789
	STA	HBB2		00790
	STA	HCA3		00791
	STA	HDB1		00792
	STA	HDB2		00793
*			SET UP INPUT ADDRESSES	00794
	CLA	CP7		00795
	SUB	=1		00796
	SUB	CP11		00797
	TMI	BAA		00798
	TZE	BAA		00799
	CLA	CP16		00800
	ADD	=1		00801
	STO	CP16		00802
BAA	CLA	CP16		00803
	STA	HAA1		00804
	STA	HCA1		00805
	STA	HDA1		00806
	ADD	=1		00807
	STA	HAA2		00808
	STA	HCA2		00809
	STA	HDA2		00810
*			CHOOSE LEFT SHIFT	00811
	CLA	=6		00812
	ADD	CP7		00813
	SUB	CP11		00814
C				00815-

		B.16	BNWL-343	00816
C				00817
C				00818
C	PAX	0,1		00819
	CAL	SFTA,1		00820
	SLW	CI11		00821
*		CHOOSE LEFT MASK		00822
	LXA	CP11,1		00823
	CAL	TML,1		00824
	SLW	CM2		00825
*		TEST FOR NO. WORDS FIELD IN OUTPUT		00826
	CLA	CP1	LENGTH	00827
	ADD	CP11	CHAR. TO SKIP WITHIN WRD, OUTPUT	00828
	SUB	=6		00829
	TMI	GBA	FIELD IS CONTAINED IN	00830
	TZE	GBA	* LEFT WORD	00831
*		COMPUTE NO. OF WHOLE WORDS AND NUMBER OF		00832
*		CHARACTERS IN RIGHT WORD		00833
	CAS	=6		00834
	TRA	GCA		00835
	TRA	*+1		00836
	STZ	CP12		00837
	XCA			00838
	PXD	0,0		00839
	DVP	=6		00840
	STO	CP13		00841
	TRA	GCB		00842
GCA	XCA			00843
	PXD	0,0		00844
	DVP	=6		00845
	STO	CP13		00846
	STQ	CP12		00847
	TNZ	GCB		00848
*		ADJUST COUNT FOR FULL RIGHT WORD		00849
	CLA	CP12		00850
	SUB	=1		00851
	STO	CP12		00852
GCB	LXA	CP13,1		00853
	CAL	TMR,1		00854
	SLW	CM3		00855
	AXT	HBA,4		00856
	SXA	SWA,4		00857
	TRA	HAA		00858
*		FIELD IS IN LEFT WORD		00859
GBA	CLA	CP1		00860
	ADD	CP11		00861
	PAX	0,1		00862
	CAL	TMR,1	SET RIGHT MASK	00863
	SLW	CM3		00864
	CLA	CP14		00865
	STO	CP12		00866
	AXT	HGA,4		00867
	SXA	SWA,4		00868
*		SET UP LEFT WORD		00869
C				00870-

C			B.17	BNWL-343	00871
C					00872
C					00873
	HAA	AXT	0,4		00874
	HAA1	CAL	**		00875
	HAA2	LDQ	**		00876
		XEC	CI11		00877
	SWA	TRA	**		00878
*			MULTIPLE WORD OUTPUT		00879
	HBA	ANA	CM2	LEFT MASK	00880
		SLW	CP15	SAVE MASKED WORD	00881
		CAL	CM2		00882
		COM			00883
		SLW	CM4		00884
	HBB1	CAL	**		00885
		ANA	CM4	COMPLEMENT LEFT MASK	00886
		ORA	CP15		00887
	HBB2	SLW	**		00888
*			TEST FOR ADDITIONAL WORDS		00889
		NZT	CP12	WHOLE WORD COUNT	00890
		TRA	HDA	SET UP RIGHT WORD	00891
*			MOVE WHOLE WORDS		00892
		LXA	CP12,2	INITIALIZE WROD COUNTER	00893
	HCA	TXI	**1,4,-1		00894
	HCA1	CAL	** ,4		00895
	HCA2	LDQ	** ,4		00896
		XEC	CI11		00897
	HCA3	SLW	** ,4		00898
		TIX	HCA,2,1	TEST FOR MORE WORDS	00899
*			SET UP RIGHT WORD		00900
	HDA	TXI	**1,4,-1		00901
	HDA1	CAL	** ,4		00902
	HDA2	LDQ	** ,4		00903
		XEC	CI11		00904
		ANA	CM3		00905
	HDB	SLW	CP15		00906
		CAL	CM3		00907
		COM			00908
		SLW	CM5		00909
	HDB1	CAL	** ,4		00910
		ANA	CM5		00911
		ORA	CP15		00912
	HDB2	SLW	** ,4		00913
		TRA	OUT		00914
*			FIELD IS CONTAINED IN A SINGLE WORD		00915
	HGA	SLW	CP15		00916
		CAL	CM2	BUILD COMPOSITE MASK	00917
		ANA	CM3		00918
		ANS	CP15	MASK SHIFTED WORD	00919
		COM		MASK FOR RECORD	00920
		SLW	CM5		00921
		TRA	HDB1		00922
OUT	AXT	AXT	** ,1		00923
		AXT	** ,2		00924
C					00925-

C			B.18	BNWL-343	00926
C					00927
C					00928
	AXT	** ,4			00929
	TRA	10 ,4			00930
*		SHIFT INSTRUCTION TABLE			00931
	LGL	30	12		00932
	LGL	24	11		00933
	LGL	18	10		00934
	LGL	12	9		00935
	LGL	6	8		00936
	LGL	36	7		00937
	LGL	30	6		00938
	LGL	24	5		00939
	LGL	18	4		00940
	LGL	12	3		00941
	LGL	6	2		00942
	NOP		1		00943
SFTA	NOP		0		00944
*		LEFT MASK TABLE			00945
	OCT	777777777777	12		00946
	OCT	000000000077	11		00947
	OCT	000000007777	10		00948
	OCT	000000777777	9		00949
	OCT	000077777777	8		00950
	OCT	007777777777	7		00951
	OCT	777777777777	6		00952
	OCT	000000000077	5		00953
	OCT	000000007777	4		00954
	OCT	000000777777	3		00955
	OCT	000077777777	2		00956
	OCT	007777777777	1		00957
TML	OCT	777777777777	0		00958
*		RIGHT MASK TABLE			00959
	OCT	777777777777	12		00960
	OCT	777777777700	11		00961
	OCT	777777770000	10		00962
	OCT	777777000000	9		00963
	OCT	777700000000	8		00964
	OCT	770000000000	7		00965
	OCT	777777777777	6		00966
	OCT	777777777700	5		00967
	OCT	777777770000	4		00968
	OCT	777777000000	3		00969
	OCT	777700000000	2		00970
	OCT	770000000000	1		00971
TMR	OCT	777777777777			00972
*		CONSTANTS			00973
CI1	TRA	6 ,4	EXIT FOR MOVFL		00974
CI2	TRA	10 ,4	EXIT FOR MVFLD		00975
CI11	PZE	0	LEFT SHIFT, FIELD TO OUTPUT		00976
CM1	OCT	000000077777			00977
CM2	PZE	0	LEFT MASK, FLD TO OUTPUT		00978
CM3	PZE	0	RIGHT MASK, FLD TO OUTPUT		00979
CM4	PZE	0	COMPLEMENT, LEFT MASK		00980
C					00981-

C			B.19	BNWL-343	00982
C					00983
C					00984
CM5	PZE	0	COMPLEMENT, RIGHT MASK		00985
CP1	PZE	0	NUMBER CHARACTERS TO MOVE		00986
CP2	PZE	0	STARTING ADDRESS-FROM		00987
CP3	PZE	0	STARTING CHARACTER-FROM		00988
CP4	PZE	0	STARTING ADDRESS-TO		00989
CP5	PZE	0	STARTING CHARACTER-TO		00990
CP6	PZE	0	ARRAY CONSTANT\$ ADDRESS		00991
CP7	PZE		STARTING CHARACTER WITHIN WORD		00992
CP11	PZE	0	CHAR. TO SKIP WITHIN WORD, OUTPUT		00993
CP12	PZE	0	WHOLE WORD COUNT, OUTPUT		00994
CP13	PZE	0	CHARACTERS IN RIGHT WORD		00995
CP14	MZE	0	MINUS ZERO		00996
CP15	PZE	0	TEMPORARY STORAGE		00997
CP16	PZE	0	TEMP. STO. FOR INPUT ADDR.		00998
	END				00999
C					01000
C					01001
C					01002
C					01003
*	FAP				01004
*			READ - READ TAPE RECORD TO FORTRAN ARRAY		01005
*			CALL LIST A,B,C,D,E		01006
*			A - ARRAY ADDRESS		01007
*			B-WORD CONSTANT FOR ARRAY		01008
*			C - SUB-ARRAY CODE		01009
*			D - WORD COUNT - TESTED READ		01010
*			E - ERROR CODE		01011
C			TO CHANGE THIS ROUTINE TO A READ6 FOR EXAMPLE, FIVE CARDS ARE CHANGED		01012
C			ENTRY RETB5 TO ENTRY READ6, BCI 1, RETB5 TO BCI 1, READ6, RETB5 SXA		01013
C			TO READ6 SXA OUT,1,CSBR DEC 3 TO CSBR DEC 2, XTAPENO A		01014
C			X TAPENO B6B		01015
C			SUBROUTINE RETB5 IS TRIPLY BUFFERED WHEREAS THE OTHERS, IE. READ4, RE		01016
C			READ6, READ7, READ8, AND READ9 ARE DOUBLY BUFFERED AS INDICATED BY CSBR.		01017
C			TH FOLLOWING ROUTINE IS FOR READING LONG RECORDS AND USING BUFFER LO		01018
	COUNT	220			01019
	ENTRY	RETB5			01020
	BCI	1, RETB5			01021
RETB5	SXA	OUT,1			01022
	SXA	OUT+1,2			01023
	SXA	OUT+2,4			01024
*			SET UP CONSTANTS FROM CALL LIST		01025
	CAL	1,4	ARRAY ADDRESS		01026
	STA	CADR			01027
	CLA*	2,4	ARRAY CONSTANT		01028
	STO	CWCA			01029
*			TEST RUN IN SWITCH		01030
	CLA*	5,4			01031
	TZE	GAA			01032
*			TEST PREVIOUS I-O		01033
BAA	CALL	IOTST, CHSW			01034
*			TEST ERROR CODE		01035
C					01036-

		B.20	BNWL-343	
C				01037
C				01038
C				01039
	CALL	IOCHK,CP3,CP4		01040
	LDC	CP4,4		01041
	TRA	**1,4		01042
	TRA	OUT	0	01043
	TRA	BBA	1	01044
	TRA	BBA	2	01045
	TRA	OUT	3	01046
	TRA	QAA	4 - END OF FILE	01047
	TRA	QAA	5	01048
*		ADD ONE TO RECORD COUNT		01049
BBA	CLA	CNT		01050
	ADD	=1		01051
	STO	CNT		01052
*		SAVE SUB ARRAY CODE		01053
	CLA	CTSC		01054
	ALS	18		01055
	STO	CARC		01056
*		READ NEXT RECORD		01057
	CLA	CTSC	SET NEXT RECORD CODE	01058
	CAS	CSBR		01059
	TRA	**3		01060
	TRA	**2		01061
	TRA	**2		01062
	PXD	0,0		01063
	ADD	=1		01064
	STO	CTSC		01065
	LXA	CTSC,1		01066
	CLA	CADR	* FOR READ	01067
	ALS	18		01068
CCA	SUB	CWCA		01069
	TIX	CCA,1,1		01070
	ARS	18		01071
	ADD	=1		01072
	STA	CMNDA		01073
*		SAVE READ COMMAND BEFORE EXECUTION		01074
	CAL	CMNDA		01075
CCB1	NOP			01076
*		READ NEXT RECORD		01077
CCB	RTDX			01078
	RCHX	CMNDA		01079
*		SET I-O TEST TRIGGER FOR READ		01080
CCB3	NOP		SET READ TRIGGER	01081
*		SAVE LAST RTBX COMMAND		01082
	CAL	CCB		01083
CCB4	NOP			01084
*		SET UNIT TABLE CONSTANT FOR IOTST		01085
	CLA	CP3		01086
CCB5	NOP			01087
*		SET CURRENT I-O FLAG		01088
CCB8	NOP			01089
	OUT	** ,1		01090
	AXT	** ,2		01091
C				01092-

C			B.21	BNWL-343	01093
C					01094
C					01095
	AXT	** ,4			01096
*		RETURN VALUES C,D,E TO CALL LIST			01097
	CLA	CARC			01098
	STO*	3,4			01099
CCB9	NOP				01100
	STO*	4,4			01101
	CLA	CP4			01102
	STO*	5,4			01103
	TRA	6,4			01104
*		RUN-IN-SET UP CONSTANTS			01105
GAA	STL	SWRN			01106
*		SET UP INSTRUCTION TABLE			01107
	CALL	RADDR,CRDR			01108
	CLA	CRDR			01109
	ADD	=3			01110
	STA	CI1	R03		01111
	ADD	=1			01112
	STA	CI2	R04		01113
	ADD	=3			01114
	STA	CI5	R07		01115
	ADD	=1			01116
	STA	CI6	R08		01117
	ADD	=1			01118
	STA	CI7	R09		01119
	ADD	=1			01120
	STA	CI8	R10		01121
	ADD	=3			01122
	STA	CI13	R13		01123
	ADD	=1			01124
	STA	CI14	R14		01125
	ADD	=1			01126
	STA	CI9	R15		01127
	ADD	=1			01128
	STA	CI10	R16		01129
	ADD	=27			01130
	STA	CI15	R43		01131
	ADD	=1			01132
	STA	CI16	R44		01133
	CLA	CWCA	SET WORD COUNT EQUAL TO		01134
	STD	CMNDA			01135
	CLA	CADR	COMPUTE STARTING ADDRESS		01136
	ALS	18	* ARRAY SIZE		01137
	SUB	CWCA	* FOR READ		01138
	ARS	18			01139
	ADD	=1			01140
	STA	CMNDA	STORE IN COMMAND AND		01141
*		SET UP UNIT CODE			01142
	CAL	CCB			01143
	ANA	CM1			01144
	SLW	CP2			01145
	CALL	UTTST,CP2,CP3			01146
	LDI	CCB	TEST FOR CHANNEL		01147
C					01148-

C			B.22	BNWL-343	01149
C					01150
C					01151
	RNT	2000			01152
	TRA	GAC	READ TO CHANNEL A		01153
	CLA	CF2			01154
	STO	CHSW	* CHANNEL B		01155
	CLA	CP3			01156
	ADD	CF10			01157
	STO	CP3			01158
	CAL	CI2			01159
	SLW	CCB1			01160
	CAL	CI6			01161
	SLW	CCB3			01162
	CAL	CI8			01163
	SLW	CCB4			01164
	CAL	CI10			01165
	SLW	CCB5			01166
	CAL	CI16	SET CURRNET I-O FLAG CH.B		01167
	SLW	CCB8			01168
	CAL	CI14			01169
	SLW	CCB9			01170
	TRA	GBA			01171
GAC	CLA	CF1			01172
	STO	CHSW	* CHANNEL A		01173
	CAL	CI1			01174
	SLW	CCB1			01175
	CAL	CI5			01176
	SLW	CCB3			01177
	CAL	CI7			01178
	SLW	CCB4			01179
	CAL	CI9			01180
	SLW	CCB5			01181
	CAL	CI15	SET CURRENT I-O FLAG CH.A		01182
	SLW	CCB8			01183
	CAL	CI13			01184
	SLW	CCB9			01185
*		READ FIRST RECORD			01186
GBA	CALL	IOTST,CHSW	TEST LAST I-O		01187
	CALL	IOINT,CP3			01188
	CAL	CMNDA			01189
	XEC	CCB1			01190
	RTDX				01191
	RCHX	CMNDA			01192
	XEC	CCB3			01193
	CAL	CCB			01194
	XEC	CCB4			01195
	CLA	CP3			01196
	XEC	CCB5			01197
	XEC	CCB8			01198
	CLA	=1			01199
	STO	CTSC			01200
	TRA	BAA			01201
*		END OF FILE - RESET RUN IN SWITCH			01202
QAA	STZ	SWRN			01203
C					01204-

C			B.23	BNWL-343	01205
C					01206
C					01207
	TRA	OUT			01208
*		INSTRUCTION TABLE			01209
	CI1	SLW	**	R03	01210
	CI2	SLW	**	R04	01211
	CI5	STZ	**	R07	01212
	CI6	STZ	**	R08	01213
	CI7	STO	**	R09	01214
	CI8	STO	**	R10	01215
	CI9	STO	**	R15	01216
	CI10	STO	**	R16	01217
	CI13	CLA	**	R13	01218
	CI14	CLA	**	R14	01219
	CI15	STL	**	R43	01220
	CI16	STL	**	R44	01221
	CMNDA	IORT	**,**		01222
*		CONSTANTS			01223
	CADR	PZE	0	ARRAY ADDRESS	01224
	CARC	PZE	0	SUB ARRAY CODE	01225
	CF1	PZE	,,1		01226
	CF2	PZE	,,2		01227
	CF10	PZE	,,10		01228
	CHSW	PZE	0	CHANNEL SWITCH, A=1, B=2	01229
	CM1	OCT	77		01230
	CM2	OCT	3000		01231
	CNT	PZE	0	RECORD COUNT	01232
	CP2	PZE	0	UNIT TEST	01233
	CP3	PZE	0	UNIT CODE	01234
	CP4	PZE	0	ERROR CODE	01235
	CP5	PZE	0	WORD COUNT TESTED READ	01236
	CRDR	PZE	0	R00 ADDRESS	01237
	CSBR	DEC	3	NUMBER OF SUB ARRAYS	01238
	CTSC	PZE	0	TEST CODE	01239
	CTWC	PZE	0	READ=0, WRITE=1	01240
	CWCA	PZE	0	WORD CONSTANT FOR ARRAY	01241
	SWRN	PZE	0	RUN IN SWITCH	01242
X	TAPENO	A5B			01243
	END				01244
C					01245
C					01246
C					01247
C					01248
*	LIST8				01249
*	SYMBOL TABLE				01250
*	LABEL				01251
CSPEC	LISTS SPECTRA AS FIRST DETECTED AND AFTER COMPLETION. ALSO INDIC-				01252
CATES	ABNORMALITIES.				01253
	SUBROUTINE SPEC(K)				01254
C	FOLLOW BY COMMON				01255
C	PROGRAM SWITCHES AND TAGS				01256
	DIMENSION LCNT(50),KSW(50),KTG(50)				01257
	COMMON LCNT,KSW,KTG				01258
C	INPUT - OUTPUT AREAS				01259
	DIMENSION PREC(600),MREC(3000)				01260
C					01261-

C		B.24	BNWL-343	01262
C				01263
C				01264
	COMMON PREC,MREC			01265
C	NOT ASSIGNED			01266
	DIMENSION ROO(50)			01267
	COMMON ROO			01268
C	INTERMEDIATE RECORD AREA			01269
	DIMENSION RECD(1000)			01270
	COMMON RECD			01271
C	WORKING STORAGE			01272
	DIMENSION FLD(1000),WFLD(1000),TAG(500)			01273
	COMMON FLD,WFLD,TAG			01274
C	FIELD ROUTINE PARAMETERS			01275
	DIMENSION LGT(500),LST(500),MSKL(500),MSKR(500),STC(500),STW(500),			01276
	XWWC(500)			01277
	COMMON LGT,LST,MSKL,MSKR,STC,STW,WWC			01278
C	CONSTANTS			01279
	DIMENSION DMY(250),IDY(250)			01280
	COMMON DMY,IDY			01281
C	END OF COMMON			01282
C	K=1, CALLED AT DMY CONSTRUCTION TIME			01283
C	K=2, CALLED AT READOUT COMPLETION TIME			01284
C	K=3, CALLED AT CLFLD TIME			01285
C	K=4, CALLED AT BREC BLANKOUT TIME			01286
C	K=5, CALLED WHEN TRAILER IS MISSING			01287
	CALL IOTST(1)			01288
	5 IF(IPNT-1)973,974,974			01289
	973 PRINT 806			01290
	806 FORMAT(1H1)			01291
	DO 909 JKL=1,5			01292
	807 FORMAT(1H ,87H TO OPERATOR-- THERE WILL BE OUTPUT ON A3 FROM ABSO			01293
	X10. PLEASE SAVE FOR TAPE-TO-PRINTER.)			01294
	909 PRINT 807			01295
	IPNT=1			01296
	974 K=XMINUF(5,K)			01297
	K=XMAXUF(1,K)			01298
	GO TO (10,20,30,40,25),K			01299
B	10 REP1=624725236351			01300
B	REP2=644460626321			01301
B	REP3=516325243360			01302
	GO TO 50			01303
B	20 REP1=624725236351			01304
B	REP2=644460475146			01305
B	REP3=232562622524			01306
	GO TO 50			01307
B	25 REP1=635121314325			01308
B	REP2=516031626044			01309
B	REP3=316262314527			01310
	GO TO 50			01311
	30 CALL BFINT(KTG(44),KSG)			01312
	IF(KSG-2)35,32,35			01313
B	32 REP1=664651246025			01314
B	REP2=514651604751			01315
B	REP3=256531466462			01316
	GO TO 50			01317
C				01318-

C		B.25	BNWL-343	01319
C				01320
C				01321
B	35	REP1=664651246025		01322
B		REP2=515146516260		01323
B		REP3=606060606060		01324
		GO TO 50		01325
B	40	REP1=634646604421		01326
B		REP2=457060622550		01327
B		REP3=642545232562		01328
		WRITE OUTPUT TAPE 3,12		01329
	12	FORMAT(1H1,104HA A SPECTRUM HAS EXCEEDED 20 SEQUENCES (10000 DATA)		01330
		X POSSIBLE MERGE OF TWO SPECTRA CAUSED BY P11 FAILURE.,/ 95H BETWEE		01331
		KN. IF SO, ISER,LWVS,INC, AND BASE OF SECOND WILL APPEAR IN ,SPECT		01332
		XRUM READS,, STATEMENT.)		01333
	50	J=19		01334
B		BLA=606060606060		01335
		DO 52 I=1,7		01336
		CALL MVFLD(6,BLA,1,1,1,DMY,10,2,J)		01337
	52	J=J+6		01338
		DO 51 I=1,7		01339
		GO TO (1,2,3,4,6,7,8),I		01340
	1	JL1=5		01341
		JL2=1		01342
		JL3=55		01343
		GO TO 51		01344
	2	JL1=2		01345
		JL2=6		01346
		JL3=49		01347
		GO TO 51		01348
	3	JL1=5		01349
		JL2=8		01350
		JL3=43		01351
		GO TO 51		01352
	4	JL1=5		01353
		JL2=13		01354
		JL3=37		01355
		GO TO 51		01356
	6	JL1=5		01357
		JL2=18		01358
		JL3=31		01359
		GO TO 51		01360
	7	JL1=5		01361
		JL2=23		01362
		JL3=25		01363
		GO TO 51		01364
	8	JL1=5		01365
		JL2=28		01366
		JL3=19		01367
	51	CALL MVFLD(JL1,DMY,10,1,JL2,DMY,10,2,JL3)		01368
		WRITE OUTPUT TAPE 3,67,REP1,REP2,REP3,(DMY(I),I=11,17)		01369
	67	FORMAT(1H0,3A6,31H SPECTRUM READS(OCTAL NEMONICS),/7016)		01370
		GO TO (1000,1000,70,70,1000),K		01371
	70	WRITE OUTPUT TAPE 3,9		01372
		9 FORMAT(1H0,5HKTG,S,10X,1H1,16X,1H2,16X,1H3,16X,1H4,16X,1H5)		01373
C				01374-

C		B.26	BNWL-343	01375
C				01376
C				01377
	DO 920 I=1,50,5			01378
	IMAX=I+4			01379
	925 FORMAT(10X,5(013,4X))			01380
	920 WRITE OUTPUT TAPE 3,925,(KTG(J),J=1,IMAX)			01381
	WRITE OUTPUT TAPE 3,29			01382
	29 FORMAT(1H0,5HLCNTS,10X,1H1,16X,1H2,16X,1H3,16X,1H4,17X,1H5)			01383
	DO 930 I=1,50,5			01384
	IMAX=I+4			01385
	930 WRITE OUTPUT TAPE 3,925,(LCNT(J),J=1,IMAX)			01386
	CALL BFINT(KTG(2),NTG)			01387
	WRITE OUTPUT TAPE 3,200,NTG			01388
	200 FORMAT(1H0, 29H PAPER TAPE IN PROCESS IS NO.,I5)			01389
	CALL BFINT(KTG(1),NTG)			01390
	NTG=NTG-1			01391
	WRITE OUTPUT TAPE 3,201,NTG			01392
	201 FORMAT(1H , 59H NO. OF WORDS SINCE LAST P11,PERIOD,P12,OR GP. OF 5			01393
	X00 DATA=,I7)			01394
	CALL BFINT(KTG(3),NTG)			01395
	WRITE OUTPUT TAPE 3,202,NTG			01396
	202 FORMAT(1H ,34H NO OF CHARACTERS IN CURRENT WORD=,I6)			01397
	CALL BFINT(LCNT(4),NTG)			01398
	WRITE OUTPUT TAPE 3,203,NTG			01399
	203 FORMAT(1H ,53H TOTAL NO OF CHARACTERS PROCESSED OF THIS PAPER TAPE			01400
	X=,I8)			01401
	WRITE OUTPUT TAPE 3, 204,FLD(2)			01402
	204 FORMAT(1H ,40H FIRST 6 CHARACTERS OF CURRENT WORD ARE ,013)			01403
	DO 241 I=1,7			01404
	GO TO (233,234,235,236,238,239,240),I			01405
B	233 RP1=606045644425			01406
B	RP2=513123214374			01407
B	RP3=004011346060			01408
	CALL BFINT(LCNT(13),NTG)			01409
	CALL BFINT(LCNT(23),NVG)			01410
	GO TO 241			01411
B	234 RP1=603145652143			01412
B	RP2=312474214347			01413
B	RP3=302122256334			01414
	CALL BFINT(LCNT(14),NTG)			01415
	CALL BFINT(LCNT(24),NVG)			01416
	GO TO 241			01417
B	235 RP1=606060263143			01418
B	RP2=437403077307			01419
B	RP3=073460606060			01420
	CALL BFINT(LCNT(15),NTG)			01421
	CALL BFINT(LCNT(25),NVG)			01422
	GO TO 241			01423
B	236 RP1=604721513163			01424
B	RP2=706025515146			01425
B	RP3=517401073460			01426
	CALL BFINT(LCNT(16),NTG)			01427
	CALL BFINT(LCNT(26),NVG)			01428
C				01429-

C		B.27	BNWL-343	01430
C				01431
C				01432
	GO TO 241			01433
B 238	RP1=744731017347			01434
B	RP2=255131462473			01435
B	RP3=473102346060			01436
	CALL BFINT(LCNT(18),NTG)			01437
	CALL BFINT(LCNT(28),NVG)			01438
	GO TO 241			01439
B 239	RP1=606066465124			01440
B	RP2=627447310773			01441
B	RP3=632122346060			01442
	CALL BFINT(LCNT(19),NTG)			01443
	CALL BFINT(LCNT(29),NVG)			01444
	GO TO 241			01445
B 240	RP1=606060606247			01446
B	RP2=212325627402			01447
B	RP3=003460606060			01448
	CALL BFINT(LCNT(20),NTG)			01449
	CALL BFINT(LCNT(30),NVG)			01450
241	WRITE OUTPUT TAPE 3, 242,RP1,RP2,RP3,NTG,NVG			01451
242	FORMAT(1H ,17H THE TOTAL NO OF ,3A6, 45H CHARACTERS PROCESSED ON			01452
	THIS PAPER TAPE IS ,17,26H. TOTAL OF PREVIOUS TAPES=,17)			01453
	WRITE OUTPUT TAPE 3,929			01454
929	FORMAT(1H0, 50H ABOVE SPECTRUM HAS BEEN BYPASSED IN THE PTI PASS.)			01455
	LCNT(44)=LCNT(44)+1			01456
	IF(LCNT(44)-5)92,92,140			01457
92	KTG(46)=1			01458
C	ALTHOUGH KTG(7),(8),(16) ARE NOT NORMALLY FORTRAN INTEGERS, NO HAR			01459
C	M RESULTS FOR NON-ZERO TESTING			01460
	KTG(16)=KTG(16)+1			01461
	KTG(7)=1			01462
	KTG(8)=1			01463
1000	RETURN			01464
140	PRINT 47			01465
47	FORMAT(1H0,116HTO OPERATOR--ERRORS INDICATE POSSIBLE TALLY FAILURE			01466
	X. REPROCESS PAPER TAPE AND TRY ABS010 AGAIN. IF SECOND TRIAL PROD,			01467
	X/116H UCES THE SAME PATTERN ONLINE, PRESS START TO CONTINUE ABS010			01468
	X. FOLLOW WITH ABS020 TO RECOVER ALL POSSIBLE PROCESSING,/117H IF T			01469
	XHE ABOVE MESSAGE AND SUBSEQUENT PAUSE REOCCUR TEN OR MORE TIMES, T			01470
	XTERMINATE ABS010 BY PUTTING AN END OF FILE ON ,/60H B7. REWIND IT			01471
	XAND PROCEED DIRECTLY TO ABS020 USING THIS B7.)			01472
	LCNT(44)=0			01473
150	PAUSE			01474
	GO TO 1000			01475
	END			01476
C				01477-

C		B.28	BNWL-343	01478
C				01479
C				01480
C	THE FOLLOWING LISTING IS FOR THE GENERAL WRITE ROUTINES FOR LONG BINA			01481
C	RECORDS. SEE THE LISTING ON THE READ ROUTINES TO UNDERSTAND CHANGES R			01482
C	FOR VARIOUS TAPES.			01483
C	THIS LISTING SERVES FOR WRITE4, WRITE6, WRITE7, WRITE8, WRITE9			01484
C	WRITE4 IS FOR TAPE UNIT A4, WRITE6, FOR TAPE UNIT B6, WRITE7 FOR B7,			01485
C	FOR B8, AND WRITE9 FOR B9			01486
*	FAP			01487
*	WRITE-WRITE TAPE RECORD FROM FORTRAN ARRAY			01488
*	CALL LIST -			01489
*	A- ARRAY ADDRESS			01490
*	B- WORD CONSTANT			01491
*	C- SUB-ARRAY CODE			01492
*	D- WORD COUNT			01493
*	E- ERROR CODE			01494
	COUNT 150			01495
	ENTRY WRITE7			01496
	BCI 1,WRITE7			01497
WRITE7	SXA OUT,1			01498
	SXA OUT+1,2			01499
	SXA OUT+2,4			01500
*	SET UP INFORMATION FROM CALL LIST			01501
	CAL 1,4			01502
	ADD =1			01503
	STA CP2			01504
	CLA* 2,4			01505
	STO CP3			01506
	CLA* 3,4			01507
	STO CP4			01508
	CLA* 4,4			01509
	STO CP5			01510
*	TEST RUN-IN SWITCH			01511
	CLA* 5,4			01512
	TZE GAA			01513
*	TEST PREVIOUS I-O			01514
CAA	CALL IOTST,CHSW			01515
	CALL IOCHK,CP8,CP6			01516
	LDC CP6,4			01517
	TRA *+1,4			01518
	TRA OUT	0		01519
	TRA CAB	1		01520
	TRA CAB	2		01521
	TRA OUT	3		01522
	TRA OUT	4		01523
	TRA OUT	5		01524
*	SET UP WRITE COMMAND			01525
CAB	LXD CP4,1			01526
	CLA CP2			01527
	ALS 18			01528
	SUB CP3			01529
	TIX *-1,1,1			01530
C				01531-

C			B.29	BNWL-343	01532
*					01533
C					01534
	ARS	18			01535
	STA	CMNDA			01536
	CLA	CP5			01537
	STD	CMNDA			01538
	CAL	CMNDA			01539
CCB1	NOP		STORE CMND BEFORE XEC		01540
*		WRITE RECORD			01541
CCB	WTDX				01542
	RCHX	CMNDA			01543
CCB3	NOP		STORE WRITE TRIGGER		01544
	CAL	CCB			01545
CCB4	NOP		STORE LAST WRITE COMMAND		01546
*		SET CURRENT I-O FLAG			01547
CCB5	NOP				01548
*		SET UNIT TABLE CONSTANT FORIOTST			01549
	CLA	CP8			01550
CCB6	NOP				01551
*		COUNT RECORD WRITTEN			01552
	CLA	CNT			01553
	ADD	=1			01554
	STO	CNT			01555
*		RESTORE INDEX REGISTERS AND RETURN			01556
OUT	AXT	** ,1			01557
	AXT	** ,2			01558
	AXT	** ,4			01559
*		RETURN ERROR CODE TO CALL LIST			01560
	CLA	CP6			01561
	STO*	5 ,4			01562
	TRA	6 ,4			01563
*		RUN-IN BRANCH - SET CHANNEL CONSTANTS			01564
GAA	STL	SWRN			01565
*		SET UP INSTRUCTION TABLE			01566
	CALL	RADDR,CRDR			01567
	CLA	CRDR			01568
	ADD	=7			01569
	STA	CI5	R07		01570
	ADD	=1			01571
	STA	CI6	R08		01572
	ADD	=15			01573
	STA	CI1	R23		01574
	ADD	=1			01575
	STA	CI2	R24		01576
	ADD	=5			01577
	STA	CI7	R29		01578
	ADD	=1			01579
	STA	CI8	R30		01580
	ADD	=3			01581
	STA	CI11	R33		01582
	ADD	=1			01583
	STA	CI12	R34		01584
	ADD	=9			01585
	STA	CI9	R43		01586
C					01587-

C			B.30	BNWL-343	01588
C					01589
C					01590
	ADD	=1			01591
	STA	CI10	R44		01592
	CAL	CCB			01593
	ANA	CM1			01594
	SLW	CP7			01595
	CALL	UTTST,CP7,CP8			01596
	LDI	CCB	TEST FOR CHANNEL		01597
	RNT	2000			01598
	TRA	GCA	CHANNEL A		01599
	CLA	CF2			01600
	STO	CHSW	* CHANNEL B		01601
	CLA	CP8			01602
	ADD	CF10			01603
	STO	CP8			01604
	CAL	CI2			01605
	SLW	CCB1			01606
	CAL	CI6			01607
	SLW	CCB3			01608
	CAL	CI8			01609
	SLW	CCB4			01610
	CAL	CI10			01611
	SLW	CCB5			01612
	CAL	CI12			01613
	SLW	CCB6			01614
	CALL	IOINT,CP8			01615
	TRA	CAA			01616
GCA	CLA	CF1			01617
	STO	CHSW	* CHANNEL A		01618
	CAL	CI1			01619
	SLW	CCB1			01620
	CAL	CI5			01621
	SLW	CCB3			01622
	CAL	CI7			01623
	SLW	CCB4			01624
	CAL	CI9			01625
	SLW	CCB5			01626
	CAL	CI11			01627
	SLW	CCB6			01628
	CALL	IOINT,CP8			01629
	TRA	CAA			01630
*		INSTRUCTION TABLE			01631
CI1	SLW	0	R23		01632
CI2	SLW	0	R24		01633
CI5	STL	0	R07		01634
CI6	STL	0	R08		01635
CI7	SLW	0	R29		01636
CI8	SLW	0	R30		01637
CI9	STL	0	R43		01638
CI10	STL	0	R44		01639
CI11	STO	**	R33		01640
CI12	STO	**	R34		01641
C					01642-

C		B.31	BNWL-343	01643
C				01644
C				01645
*		CONSTANTS		01646
CF1	PZE	,,1		01647
CF2	PZE	,,2		01648
CF10	PZE	,,10		01649
CHSW	PZE	0	CH.A=1, CH.B=2	01650
CM1	OCT	77		01651
CMNDA	IOCT	**,,**		01652
CNT	PZE	0	COUNT OF RECORDS WRITTEN	01653
CP1	OCT	20		01654
CP2	PZE	0	ARRAY ADDRESS +1	01655
CP3	PZE	0	WORD CONSTANT	01656
CP4	PZE	0	SUB ARRAY CODE	01657
CP5	PZE	0	WORD COUNT	01658
CP6	PZE	0	ERROR CODE	01659
CP7	PZE	0	UNIT TEST	01660
CP8	PZE	0	UNIT CODE	01661
CRDR	PZE	0	ADDRESS R00	01662
SWRN	PZE	0	RUN-IN IF ZERO	01663
X	TAPENO	B7B		01664
	END			01665
C				01666-

APPENDIX C

EDIT PROGRAMS

TABLE C.1. Definitions of Switches [KSW(I)], Tags [KTG(I)], and Counts [LCNT(I)] for EDIT Pass

Switch, Tag, Count	Function	Subroutines Where Set* or Used
**KSW(1)	Transfer Current Master File to Updated Master File; 2=Yes, 1=No	MAIN
KSW(2)	Provide a list of spectra on Current Master File; 1=Yes, 2=No	MAIN
KSW(3)	Provide a memory dump at end of pass; 1=Yes, 0=No	MAIN
KSW(4)	Plotter option 0 or negative = bypass plot	MWRITE
KSW(5)	2 Lines Mode Plot, 4 Points Mode, 8 Free Run	PLOTT
KSW(6)	Thinning Constant for Plot n = max ship of n/500 inches	PLOTT
KTG(1)	Signals that an error has occurred; 1=Read failure on A5, 2=Write failure on B6, 3=End of file on B6, 4=Read failure on B7, 5=ISER conversion failure, 6=ISEQ conversion failure, 7=Illegal ISEQ, 8=LWVS conversion failure, 9=LWVE conversion failure, 10=INC conversion failure, 11=N conversion failure, 12=ISIGN conversion failure, 13=BASE conversion failure, 14=ISCA conversion failure, 15=IVLD conversion failure, 16=ABS(1) conversion failure, 17=Illegal ISCA, 19=End of file on B6	MAIN*, LEADER*, BODY*, MWRITE*, ERROR*
KTG(2)	Signals that an error has occurred in LEADER; 2=Yes, 1=No	MAIN, LEADER*
KTG(3)	Signals that an error has occurred in BODY; 2=Yes, 1=No	MAIN, BODY*
KTG(4)	Signals that an error has occurred in MWRITE; 2=Bypass, 3=End	LEADER, MWRITE*
KTG(5)	Not used	
KTG(6)	Not used	
KTG(7)	Not used	
KTG(8)	Signals that an error has occurred in RWRITE; 2=Yes, 1=No	MAIN, RWRITE*
KTG(9)	Not used	
KTG(10)	Cause spectrum to be bypassed; If ISER=KTG(10), Yes; otherwise, No	MAIN*, LEADER*
KTG(11)	Not used	
KTG(12-19)	Not used	
KTG(20)	Used to communicate the value of N1 between BODY and RWRITE	BODY*, RWRITE
KTG(21-24)	Not used	
KTG(25)	MWRITE TAG, (Now obsolete)	LEADER*, RWRITE*
KTG(26-50)	Not used	
LCNT(1)	Causes initialization of subroutine READ5 if zero; otherwise, not	MAIN*
LCNT(2)	Causes initialization of subroutine WRITE6 if zero; otherwise, not	MAIN*
LCNT(3)	Causes initialization of subroutine READ7 if zero; otherwise, not	MAIN*
LCNT(4)	Not used	
LCNT(5)	Counts the passes through subroutine LEADER	LEADER*
LCNT(6)	Count of number of plots	PLOTT*, MAIN
LCNT(7)	Not used	
LCNT(8)	Not used	
LCNT(9)	Provides a running count of the data processed in a given spectrum	BODY*, ERROR, LEADER*, RWRITE
LCNT(10)	Not used	

** All switches are set by the data parameter card.

RECORD FORMATS

TAPE** B7	RECJ(I,J)**				RECA(I)**				ISER....				RECB(I,J)				TAPES A5, B6
	Oct.* Loc.	I	J	Var.	Oct. Loc.	I	J	Var.	Oct. Loc.	I	J	Var.	Oct. Loc.	I	J	Var.	
Leader	03005	1	1	ABS	77233	1	1		76235	1	1	ABS	74251	1	1		ISER
Trailer													74241	9	1	ABS	ISEQ
Body (500)					77110	84	1	ABS									LWVS
													73256	508	1	ABS	LWVE
									75252	500	1	ABS	73255	509	1	LWV	INC
Body (500)	02022	500	1	ABS(1)					75251	1	1	LWV	72272	1008	1	LWV	N
	02015	505	1	BASE									72256	1020	1	ISER	ISIGN
																	BASE
	02010	510	1	ISER					74266	500	1	LWV	INTERMEDIATE RECORDS				IDX(4)
	02007	1	2	ABS					74265	1	1	IDX					IDX(3)
									74264	2	1	IDX					IDX(2)
									74263	3	1	IDX					IDX(1)
					76250	500	1	ABS(1)	74262	4	1	IDX	INTERMEDIATE RECORDS				LWV(500)
									74261			BASE					.
									74260			ISIGN					LWV(1)
									74257			N					ABS(500)
	01024	500	2	ABS(1)	76244	505	1	BASE	74256			INC	32345	9	18	ABS	.
	01017	505	2	BASE					74255			LWVE	31462	508	18	ABS	ABS(1)
									74254			LWVS	31461	509	18	LWV	8 blanks
									74253			ISEQ	30376	1008	18	LWV	ISER
	01012	510	2	ISER	76236	510	1	ISER	74252			ISER	30369	1020	18	ISER	etc.

*Relative to beginning address of EDIT

**Variables not separated into discrete words.

FIGURE C.1. Memory Map and Record Formats for EDIT Pass

TABLE C.II. *Special Programs Used in the EDIT Pass*

Program	Subprograms Called	Function of Subprogram
*MAIN	*IOTST	Input-output channel test routine
	*RETB5	Reads binary records from channel A, tape 5. Triply buffered.
	MOVE	Moves word without conversion
	*WRITE6	Writes binary records to channel B, tape 6.
	IOCHK	Input-output channel check routine
	*READ7	Reads binary records from channel B, tape 7.
	*LEADER	Processes the leader of the spectrum
	*BODY	Processes the body of the spectrum
	BSR	Back spaces one record on B7
	RWRITE	Writes the EDIT report onto channel A, tape 3.
	ERROR	Diagnostic program
	*MWRITE	Writes binary records from RECB(I,J) to channel B, tape 6.
	**HALT	Ends file on plotter tape
	EXIT	Exits program
	DUMP	Dumps memory and exits program
*LEADER	MVFLD	Moves a field from one location to another in memory
	BCFIN	Converts BCD to Fortran integer
	BCFLT	Converts BCD to Fortran floating point number
	IOTST	See above
*BODY	*MWRITE	Writes record from RECB(1020,J) to B6
	MVFLD	See above
	BCFIN	See above
	BCFLT	See above
	INTERP	Interpolates linearly between absorbances
INTERP	*IOTST	See above
	*MWRITE	See above
*MWRITE	*WRITE6	See above
	*IOTST	See above
	*IOCHK	See above
	MOVE	See above
	TRANQ	See above
	PLOTT	Plots spectrum
RWRITE	*IOTST	See above
*ERROR	*IOTST	See above
	PDUMP	Dumps memory without exiting from the program
PLOT	**SCALE	Sets scale of plot
	**ORIGIN	Sets origin of plot
	**MODE	Sets mode of plot
	THIN	Thins data for plot
	**WAIT	Halts plotter
	**TOLP	Plots data

FIGURE C.2. Logic Charts for EDIT Programs: MAIN, LEADER

SUBROUTINE BODY

* Note: Subroutine INTERP Interpolates Linearly Between the Last and Present Valid Data.

SUBROUTINE MWRITE

SUBROUTINE RWRITE

FIGURE C.3. Flow Charts for EDIT Programs: BODY, MWRITE, RWRITE

NOTE: IOTST Tries to Recover Last Record if it Failed to Write or Read. IOCHK Examines the Tags set by IOTST to Determine any Failures, End of File, or End of Tape.

NOTE: The Subarray Code J is not Altered in Write.

FIGURE C.4. Flow Charts for EDIT Programs: IOTST, READ, WRITE

C		C.1	BNWL-343	01667
C				01668
C				01669
*	LIST8			01670
*	SYMBOL TABLE			01671
*	LABEL			01672
CEDIT				01673
C	THIS EDIT PASS WILL HANDLE A MAXIMUM OF 9000 DATA PER SPECTRUM.			01674
C	SUBROUTINES BCFIN AND BCFLT MUST BE LOW IN MEMORY TO WORK. MAX			01675
C	LOCATION IN MEMORY IS 5000 DECIMAL.			01676
C	EDIT PROGRAM FOR BUILD-UP OF ABSORPTION SPECTRA MASTER FILE			01677
C	COMPILED BY JR. MORREY			01678
C	MAIN PROGRAM			01679
C	PART A - TRANSFER OF DATA FROM MASTER FILE TO UPDATED MASTER FILE			01680
C	TO BE ACCOMPLISHED BY SUBROUTINES READ5 AND WRITE6			01681
C	PROGRAM SWITCHES AND TAGS			01682
	DIMENSION LCNT(50),KSW(50),KTG(50)			01683
	COMMON LCNT,KSW,KTG			01684
C	INPUT AREA - FROM PTI			01685
	DIMENSION RECA(510)			01686
	COMMON RECA			01687
C	MASTER FILE RECORD - OUTPUT AREA			01688
	DIMENSION ABS(500),LWV(500),IDX(4)			01689
	COMMON ABS, LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			01690
	DIMENSION RECB(1020,18)			01691
	COMMON RECB			01692
	DIMENSION RECJ(510,2)			01693
	DO 3 I=1,50			01694
	LCNT(I)=0			01695
	KSW(I)=0			01696
	3 KTG(I)=0			01697
	READ INPUT TAPE 2,4,(KSW(I),I=1,10)			01698
	4 FORMAT(10I1)			01699
C	KSW(1)=1 IF NO DATA HAVE YET BEEN RECORDED ON THE CURRENT MASTER			01700
C	FILE, OTHER WISE, KSW(1)=2* KSW(2)=1 FOR OBTAINING MASTER FILE			01701
C	LIST, OTHERWISE KSW(2)=2			01702
	PRINT 5			01703
	5 FORMAT(1H1,5X,58HCHECK TAPE LOADINGS--FOLLOW INSTRUCTIONS ON PROCE			01704
	XDURE CARD)			01705
	WRITE OUTPUT TAPE 3,9			01706
	9 FORMAT(1H1,35X,49HABSORPTION SPECTRA REPORT,HEAVY ELEMENT CHEMISTR			01707
	XY)			01708
	PAUSE			01709
	REWIND 5			01710
	REWIND 6			01711
	REWIND 7			01712
	K=KSW(1)			01713
	GO TO(50,20),K			01714
20	K=KSW(2)			01715
	GO TO (22,25),K			01716
22	WRITE OUTPUT TAPE 3,10			01717
10	FORMAT(1H0,27X,65HLISTING OF ABSORPTION SPECTRA ON CURRENT (NOT UP			01718
	XDATED)MASTER FILE)			01719
C				01720-

C		C.2	BNWL-343	01721
C				01722
C				01723
	WRITE OUTPUT TAPE 3,12			01724
12	FORMAT(1H0,11X,9H SERIAL NO,2X,11H SEQUENCE NO,2X,19H STARTING WAVELE			01725
	XNGTH,2X,17H ENDING WAVELENGTH,2X,9H INCREMENT,2X,10H NO OF DATA,2X,8H			01726
	XBASELINE/1H)			01727
25	IER=LCNT(1)			01728
	CALL RETB5(RECB,1020,J,IWD,IER)			01729
	LCNT(1)=IER			01730
	GO TO (30,30,50,50,40),IER			01731
30	K=KSW(2)			01732
	GO TO (35,31),K			01733
35	CALL MOVE(RECB(1019,J),ISEQ)			01734
	IF(ISEQ-1)31,3025,31			01735
3025	CALL MOVE(RECB(1020,J),ISER)			01736
	CALL MOVE(RECB(1018,J),LWVS)			01737
	CALL MOVE(RECB(1017,J),LWVE)			01738
	CALL MOVE(RECB(1016,J),INC)			01739
	CALL MOVE(RECB(1015,J),N)			01740
	CALL MOVE(RECB(1013,J),BASE)			01741
	CALL IOTST(1)			01742
	WRITE OUTPUT TAPE 3,14,ISER,ISEQ,LWVS,LWVE,INC,N,BASE			01743
14	FORMAT(119,I10,I19,I20,I14,I12,F11.3)			01744
31	IER=LCNT(2)			01745
	CALL WRITE6(RECB,1020,J,IWD,IER)			01746
	LCNT(2)=IER			01747
	GO TO (25,25,48,48,45),IER			01748
40	KTG(1)=1			01749
	GO TO 43			01750
45	KTG(1)=2			01751
	GO TO 43			01752
48	KTG(1)=3			01753
43	CALL ERROR			01754
	GO TO 1230			01755
C	PART B OF EDITING PASS-CONVERSION OF DATA (A) DETECT INVALID DATA			01756
C	(B) INTERPOLATE FOR REPLACEMENT OF INVALID DATA (C) ARRANGE FOR PROP			01757
C	ER SCALE (D) PAIR WAVELENGTH WITH ABSORBANCE (E) STORE ON PERMANENT			01758
C	FILE			01759
50	IER=LCNT(3)			01760
	CALL IOTST(3)			01761
	CALL READ7(RECJ,510,J,IWD,IER)			01762
	LCNT(3)=IER			01763
	GO TO (100,100,1200,1200,400),IER			01764
400	KTG(1)=4			01765
	GO TO 41			01766
100	DO 51 I=1,510			01767
51	RECA(I)=RECJ(I,J)			01768
C	RECA COMES FROM THE MAGNETIC TAPE GENERATED BY THE PTI PASS (B7)			01769
C	(TAPE NO 7) IOTST AND IOCHK ARE TEST ROUTINES FOR READING, ARGU-			01770
C	MENTS ARE RESPECTIVELY CHANNEL, TAPE NO, AND ERROR INTEGER, VALUES			01771
C	OF ERROR INTEGER ARE AS FOLLOWS (1) OK, (2) CHECK BUT RECOVERED, (3) END			01772
C				01773-

C		C.3	BNWL-343	01774
C				01775
C				01776
C	TAPE (WRITE ONLY),(4)END FILE(READ ONLY),(5)INPUT-OUTPUT FAILURE			01777
C	ARGUMENTS OF READ SUBROUTINE ARE (A)ARRAY NAME (B)NO OF WORDS IN			01778
C	ARRAY,(C) SUB ARRAY,(D) WORD COUNT(LEAVE DUMMY FOR THIS JOB,			01779
C	(E) ERROR FLAG			01780
	CALL LEADER			01781
	IF(KTG(10)-ISER)701,50,701			01782
701	K=KTG(2)			01783
	GO TO (800,47,41),K			01784
800	CALL BODY			01785
	K=KTG(3)			01786
	GO TO (820,47,41),K			01787
820	CALL RWRITE			01788
	K=KTG(8)			01789
	GO TO (50,47),K			01790
47	CALL ERROR			01791
	KTG(10)=ISER			01792
	LCNT(1)=0			01793
	LCNT(2)=0			01794
	LCNT(3)=0			01795
	CALL IOTST(3)			01796
	CALL BSR			01797
	GO TO 50			01798
41	CALL ERROR			01799
1200	IF(KTG(10))1230,1220,1230			01800
1220	CALL MWRITE			01801
1230	END FILE 6			01802
	REWIND 5			01803
	REWIND 6			01804
	REWIND 7			01805
	CALL HALT			01806
	PRINT 21			01807
21	FORMAT(1H1,117HIF NO WRITE FAILURES ARE INDICATED ABOVE ONLINE,JOB			01808
	XIS COMPLETE.REMOVE REELS ON A5,B6,B7,AND PRESS START FOR NEXT JOB.			01809
	X)			01810
	PRINT 23,LCNT(6)			01811
23	FORMAT(1H1,10H THERE ARE,I5,66H PLOTS ON B5. PLEASE ENTER THIS NU			01812
	MBER ON THE PLOTTER TAPE LABEL.)			01813
	PAUSE			01814
	IF (KSW(3))1400,1400,1500			01815
1400	CALL EXIT			01816
1500	CALL DUMP			01817
	END			01818
C				01819-

C		C.4	BNWL-343	01820
C				01821
C				01822
*	LIST8			01823
*	SYMBOL TABLE			01824
*	LABEL			01825
CBODY				01826
	SUBROUTINE BODY			01827
C	SUBROUTINE BODY PROCESSES THE ABSORBANCE AND CALCULATES THE			01828
C	WAVELENGTH WHICH CORRESPONDS* IT ALSO INTERPOLATES THROUGH SUB-			01829
C	ROUTINE INTERP *			01830
C	PROGRAM SWITCHES AND TAGS			01831
	DIMENSION LCNT(50),KSW(50),KTG(50)			01832
	COMMON LCNT,KSW,KTG			01833
C	INPUT AREA - FROM PTI			01834
	DIMENSION RECA(510)			01835
	COMMON RECA			01836
C	MASTER FILE RECORD - OUTPUT AREA			01837
	DIMENSION ABS(500),LWV(500),IDX(4)			01838
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			01839
	DIMENSION RECB(1020,18)			01840
	COMMON RECB			01841
	KTG(3)=1			01842
800	IF(N-500*ISEQ)850,875,875			01843
850	N1=N-(ISEQ-1)*500			01844
	IF(N1)4462,4462,900			01845
4462	CALL IOTST(1)			01846
	WRITE OUTPUT TAPE 3,4463,ISER,ISEQ,N			01847
4463	FORMAT(1H1,79HISEQ TOO LARGE. PROBABLE MERGE WITH ADJACENT SPECTRU			01848
	XM. SPECTRUM BYPASSED. ISER=,16,6H ISEQ=,16,3H N=,16)			01849
	GO TO 1200			01850
875	N1=500			01851
900	LA=61			01852
	LB=62			01853
	LC=63			01854
	KTG(20)=N1			01855
	JO=0			01856
	LD=LCNT(9)			01857
	JCHE=0			01858
	DO 975 I=1,N1			01859
	LD=LD+1			01860
	JCHE=JCHE+1			01861
953	LWV(I)=LWVS-(I-1)*INC-INC*(ISEQ-1)*500			01862
C	ISCA IS THE INTEGER WHICH DETERMINES THE ABSORBANCE SCALE, IF ISCA			01863
C	IS GREATER THAN ZERO,THE ABSORBANCE IS OF THE FORM 0.XXX, IF ISCA			01864
C	IS ZERO,THE ABSORBANCE IS OF THE FORM 1.XXX			01865
	CALL MVFLD(1,RECA,510,1,LA,ISC,1,1,1)			01866
	CALL BCFIN(ISC,1,1,1,50,ISCA,KFL)			01867
	IF(KFL)445,920,445			01868
445	NDIG=N-(ISEQ-1)*500-JCHE+1			01869
	IF(NDIG-6)448,448,450			01870
448	MDIG=NDIG*INC			01871
	CALL IOTST(1)			01872
C				01873-

C		C.5	BNWL-343	01874
C				01875
C				01876
	WRITE OUTPUT TAPE 3,10,MDIG			01877
	10 FORMAT(1H1, 95HSCALE CHAR. FAILED TO CONVERT. PROBABLE P17 FAILURE			01878
	X. N READJUSTED TO PROCESS. PROBABLE ERROR OF, 16,11H A OR CM-1.)			01879
	KTG(20)=1			01880
	N=(ISEQ-1)*500+JCHE-1			01881
	LWVE=LWVE+MDIG			01882
	DO 449 I=1,ISEQ			01883
	CALL MOVE(N,RECB(1015,1))			01884
	449 CALL MOVE(LWVE,RECB(1017,1))			01885
	GO TO 976			01886
	450 KTG(1)=14			01887
	GO TO 1200			01888
	920 CALL MVFLD(1,RECA,510,1,LB,IVL,1,1,1)			01889
	CALL BCFIN(IVL,1,1,1,50,IVLD,KFL)			01890
	IF(KFL)430,949,430			01891
	430 KTG(1)=15			01892
	GO TO 1200			01893
	949 CALL MVFLD(3,RECA,510,1,LC,AB1,1,1,1)			01894
C	BCFLT CONVERTS BCI TO FLOATING POINT INFORMATION (SAME ARGUMENTS,			01895
C	AS BCFIN)			01896
	CALL BCFLT(AB1,1,1,3,47,ABS1,KFL)			01897
	IF(KFL)410,960,410			01898
	410 KTG(1)=16			01899
	GO TO 1200			01900
C	IVLD IS ZERO IF DATA ARE INVALID,THREE OR MORE IF VALID.			01901
	960 IF(IVLD-3)980,950,950			01902
	980 JO=JO+1			01903
	GO TO 971			01904
	950 IF(ISCA)977,990,985			01905
	977 KTG(1)=17			01906
	GO TO 1200			01907
	990 ADD=1.0			01908
	GO TO 987			01909
	985 ADD=0.0			01910
	987 GO TO (50,50,51,51,54,54,51,51),ISIGN			01911
	50 ABS(I)=ABS1+ADD-BASE			01912
	GO TO 991			01913
	51 ABS(I)=100.*ABS1/BASE			01914
	GO TO 991			01915
	54 ABS(I)=MIN1F(2.0,LOG10F(BASE/ABS1))			01916
	991 IF (JO)971,971,965			01917
	965 CALL INTERP(JO,I)			01918
	JO=0			01919
	971 LA=LA+5			01920
	LB=LB+5			01921
	LC=LC+5			01922
	975 CONTINUE			01923
	976 LCNT(9)=LD			01924
	CALL IOTST(2)			01925
C				01926-

C		C.6	BNWL-343	01927
C				01928
C				01929
	DO 200 J=1,1020			01930
B 200	RECB(J,ISEQ)=606060606060			01931
	CALL MVFLD(6120,ISER,1,1,1,RECB,1020,ISEQ,1)			01932
1000	RETURN			01933
1200	KTG(3)=2			01934
	GO TO 976			01935
	END			01936
C				01937
C				01938
C				01939
C				01940
*	FAP			01941
	ENTRY BSR	BACKSPACE ONE PHYSICAL RECORD ON		01942
X	TAPENO B7B	TAPE B-7 BINARY		01943
BSR	BSRX	STANDARD FORTRAN ENTRY CALL BSR		01944
	TRA 1,4			01945
	END			01946
C				01947
C				01948
C				01949
C				01950
*	LIST8			01951
*	SYMBOL TABLE			01952
*	LABEL			01953
CERRO				01954
	SUBROUTINE ERROR			01955
C	SUBROUTINE ERROR PROVIDES THE PROPER OUTPUT FOR DIAGNOSIS IN			01956
C	CASE THERE IS AN ERROR IN THE EDIT PROGRAM			01957
C	PROGRAM SWITCHES AND TAGS			01958
	DIMENSION LCNT(50),KSW(50),KTG(50)			01959
	COMMON LCNT,KSW,KTG			01960
C	INPUT AREA - FROM PTI			01961
	DIMENSION RECA(510)			01962
	COMMON RECA			01963
C	MASTER FILE RECORD - OUTPUT AREA			01964
	DIMENSION ABS(500),LWV(500),IDX(4)			01965
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			01966
	DIMENSION RECB(1020,18)			01967
	COMMON RECB			01968
	K=KTG(1)			01969
	CALL IOTST(3)			01970
	IF(KTG(1))7,7,5			01971
	7 WRITE OUTPUT TAPE 3,72			01972
	72 FORMAT(1H1, 24H KTG(1) IS PROBABLY ZERO)			01973
	GO TO 400			01974
	5 GO TO (10,20,30,40,50,60,70,80,90,100,110,120,130,140,150,160,170,			01975
	X180,20,200),K			01976
C				01977
C	READ AND WRITE FAILURE INDICATIONS			01978
C				01979
C	CURRENT MASTER FILE,A5,READ			01980
C				01981-

	C.7	BNWL-343	
C			01982
C			01983
C			01984
B	10 BAMA=236451512545		01985
B	BAMB=636044216263		01986
B	BAMC=255160606060		01987
B	FILE=606021056060		01988
B	ACTION=605125212460		01989
	WRITE OUTPUT TAPE 3,15,ACTION,FILE,BAMA,BAMB,BAMC		01990
	15 FORMAT(1H1,A6,21H FAILURE ON TAPE UNIT,A6,2H--,3A6)		01991
	GO TO 300		01992
C	UPDATED MASTER FILE, B6, WRITE		01993
B	20 BAMA=644724216325		01994
B	BAMB=246044216263		01995
B	BAMC=255160606060		01996
B	FILE=606022066060		01997
B	ACTION=606651316325		01998
B	BOB=212262000200		01999
	21 WRITE OUTPUT TAPE 3,15,ACTION,FILE,BAMA,BAMB,BAMC		02000
	PRINT 27,ACTION,FILE,BOB		02001
	27 FORMAT(1H1,A6,21H FAILURE ON TAPE UNIT,A6,35H. CHANGE BAD TAPE AND		02002
	X RESTART PASS ,A6)		02003
	PAUSE		02004
	GO TO 1000		02005
	30 WRITE OUTPUT TAPE 3,35		02006
	35 FORMAT (1H1, 68HTHERE WAS AN END FILE FAILURE ON THE READ COMMAND		02007
	XOF THE MASTER FILE)		02008
	GO TO 1000		02009
C	CHANGE FILE,B7, WRITE		02010
B	40 BAMA=606060606060		02011
B	BAMB=233021452725		02012
B	BAMC=602631432560		02013
B	FILE=606022076060		02014
B	ACTION=605125212460		02015
B	BOB=212262000100		02016
	GO TO 21		02017
	200 WRITE OUTPUT TAPE 3,205		02018
	205 FORMAT(1H1, 54H MASTER FILE COMPLETELY FILLED. CHANGED TAPES ON (B		02019
	X6).)		02020
	PRINT 207		02021
	207 FORMAT(1H1,116HMASTER FILE (B6) IS COMPLETELY FILLED.REPLACE WITH		02022
	XNEW,LABLED TAPE. ENTER REEL NO OF FILLED TAPE HERE-----AND SAVE.)		02023
	PRINT 208		02024
	208 FORMAT(1H1,23HPRESS START TO PROCEED.)		02025
	END FILE 6		02026
	PAUSE		02027
	REWIND 6		02028
	GO TO 1000		02029
C			02030
C	IMPROPER CHARACTER CONVERSION		02031
C			02032
C	SERIAL NUMBER		02033
B	50 BAMA=606060606060		02034
B	BAMB=622551312143		02035
C			02036-

C		C.8	BNWL-343	02037
C				02038
C				02039
B	BAMC=604546336060			02040
B	51 TYP A=314563252725			02041
B	TYPB=516060606060			02042
	52 WRITE OUTPUT TAPE 3,55,BAMA,BAMB,BAMC,TYP A,TYPB			02043
B	55 FORMAT(1H1,3A6,26H FAILED TO CONVERT TO A(N),2A6)			02044
	GO TO 400			02045
C	SEQUENCE NUMBER			02046
B	60 BAMA=606060606060			02047
B	BAMB=622550642545			02048
B	BAMC=232560454633			02049
	GO TO 51			02050
C	STARTING WAVELENGTH			02051
B	80 BAMA=626321516331			02052
B	BAMB=452760662165			02053
B	BAMC=254325452763			02054
	GO TO 51			02055
C	ENDING WAVELENGTH			02056
B	90 BAMA=254524314527			02057
B	BAMB=606066216525			02058
B	BAMC=432545276330			02059
	GO TO 51			02060
C	INCREMENT			02061
B	100 BAMA=314523512544			02062
B	BAMB=254563606060			02063
B	BAMC=606060606060			02064
	GO TO 51			02065
C	DATA COUNT (N)			02066
B	110 BAMA=242163216023			02067
B	BAMB=466445636074			02068
B	BAMC=453460606060			02069
	GO TO 51			02070
C	BASELINE SIGN			02071
B	120 BAMA=222162254331			02072
B	BAMB=452560623127			02073
	BAMC=456060606060			02074
	GO TO 51			02075
C	BASELINE			02076
B	130 BAMA=606060606060			02077
B	BAMB=222162254331			02078
B	BAMC=452560606060			02079
B	131 TYP A=264346216331			02080
B	TYPB=454746314563			02081
	GO TO 52			02082
	140 WRITE OUTPUT TAPE 3,145			02083
	145 FORMAT(1H1,108HA SCALE INDICATOR FAILED TO CONVERT. N IS EITHER GR			02084
	XEATER THAN 6 TOO LARGE OR PI7 HAS FAILED 6 OR MORE TIMES.)			02085
	GO TO 600			02086
C				02087
C	IMPROPER VALUES			02088
C				02089
C	VALIDITY INDICATOR			02090
B	150 BAMA=652143312431			02091
C				02092-

C		C.9	BNWL-343	02093
C				02094
C				02095
B	BAMB=637060314524			02096
B	BAMC=312321634651			02097
B	151 TYPB=314563252725			02098
B	TYPB=516060606060			02099
	152 WRITE OUTPUT TAPE 3,55,BAMA,BAMB,BAMC,TYPB			02100
	GO TO 600			02101
C	ABSORBANCE			02102
B	160 BAMA=606060214560			02103
B	BAMB=212263465122			02104
B	BAMC=214523256060			02105
B	TYPB=264346216331			02106
B	TYPB=454746314563			02107
	GO TO 152			02108
C	SCALE FACTOR			02109
B	170 BAMA=606060606060			02110
B	BAMB=622321432560			02111
B	BAMC=262123634651			02112
	171 WRITE OUTPUT TAPE 3,175,BAMA,BAMB,BAMC			02113
	175 FORMAT(1H1,3A6,51H IS AN IMPROPER INTEGER. CHECK PAPER TAPE FOR ER			02114
	XROR)			02115
	GO TO 600			02116
C	VALIDITY INDICATOR			02117
B	180 BAMA=652143312431			02118
B	BAMB=637060314524			02119
B	BAMC=312321634651			02120
	GO TO 171			02121
	70 WRITE OUTPUT TAPE 3,75			02122
	75 FORMAT(1H1,46HA SEQUENCE NUMBER IS NEGATIVE. PROGRAM FAILURE)			02123
	GO TO 600			02124
	400 WRITE OUTPUT TAPE 3,22,ISER,LWVS,LWVE,INC			02125
	22 FORMAT(1H1,9H SERIAL NO,I6,23H STARTING WAVELENGTH,I6,21H END			02126
	XING WAVELENGTH,I6,13H INCREMENT,I6,14H NO OF DATA,I6)			02127
	WRITE OUTPUT TAPE 3,24			02128
	24 FORMAT(1H 110H(DISREGARD VALUES TO THE RIGHT OF THE VARIABLE LISTE			02129
	XD IN THE ERROR STATEMENT. THEY PERTAIN TO PREVIOUS RECORD))			02130
	GO TO 1000			02131
	600 WRITE OUTPUT TAPE 3,22,ISER,LWVS,LWVE,INC			02132
	WRITE OUTPUT TAPE 3,26,LCNT(9)			02133
	26 FORMAT(1H0,22H PROGRAM STOPPED ON THE,I6,9H TH DATUM)			02134
	300 CALL IOTST(3)			02135
	CALL PDUMP			02136
	1000 KTG(1)=0			02137
	RETURN			02138
	END			02139
C				02140-

C		C.10	BNWL-343	02141
C				02142
C				02143
*	LIST8			02144
	SUBROUTINE INTERP(JO,I)			02145
C	SUBROUTINE ROUTINE INTERPOLATES WHEN DATA ARE FOUND INVALID			02146
C	PROGRAM SWITCHES AND TAGS			02147
	DIMENSION LCNT(50),KSW(50),KTG(50)			02148
	COMMON LCNT,KSW,KTG			02149
C	INPUT AREA - FROM PTI			02150
	DIMENSION RECA(510)			02151
	COMMON RECA			02152
C	MASTER FILE RECORD - OUTPUT AREA			02153
	DIMENSION ABS(500),LWV(500),IDX(4)			02154
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			02155
	KK=I-(JO+1)			02156
	LL=JO+1			02157
	DO 945J=1,JO			02158
	II=1-J			02159
	JJ=1-(J-1)			02160
	945 ABS(II)=ABS(JJ)-((ABS(I)-ABS(KK))/FLOATF(LL))			02161
	RETURN			02162
	END			02163
C				02164
C				02165
C				02166
C				02167
*	FAP			02168
*	IOTST - TEST READ OR WRITE			02169
*	09-06-63			02170
*	CALL LIST-CHANNEL CODE 1=A, 2=B, 3=BOTH			02171
	COUNT	400		02172
	ENTRY	IOTST		02173
	ENTRY	IOCHK		02174
	ENTRY	IOINT		02175
	ENTRY	RADDR		02176
	ENTRY	UTTST		02177
	BCI	1,IOTST		02178
IOTST	SXA	OUT,1	SAVE INDEX REGISTERS	02179
	SXA	OUT+1,2		02180
	SXA	OUT+2,4		02181
	CLA*	1,4	STORE CHANNEL CODE	02182
	ARS	18		02183
	STO	CP1		02184
	XEC*	\$(TES)		02185
*	TEST RUN IN SWITCH			02186
	ZET	SW1		02187
	TRA	AAA5		02188
	STL	SW1		02189
	TRCA	*+1		02190
	TRCB	*+1		02191
	TEFA	*+1		02192
	TEFB	*+1		02193
C				02194-

C			C.11	BNWL-343	02195
C					02196
C					02197
	ETTA				02198
	NOP				02199
	ETTB				02200
	NOP				02201
	BTTA				02202
	NOP				02203
	BTTB				02204
	NOP				02205
AAA5	LDI	CP1			02206
	RNT	1			02207
	TRA	BAA	NOT A CHANNEL		02208
*		TEST CHANNEL A			02209
	NZT	R41	RUN IN SWITCH CH. A		02210
	TRA	ARA			02211
	NZT	R43			02212
	TRA	BAA	NO CURRENT CH. A I-O		02213
	TCOA	*			02214
	ZET	R07			02215
	TRA	AMA	LAST CH. A I-O WAS WRITE		02216
	SCHA	R05			02217
	TRCA	*+2	TEST LAST READ CH. A		02218
	TRA	ADA	NORMAL TRANSFER		02219
AAB	AXT	10,1			02220
	LXD	R15,4			02221
	CAL	TTAB,4			02222
	ORS	R47			02223
	CLA	R09			02224
	STA	*+1			02225
	BSR	**			02226
	XEC	R09			02227
	RCHA	R03			02228
	TCOA	*			02229
	SCHA	R05			02230
	TRCA	*+2			02231
	TRA	ADA	NORMAL TRANSFER		02232
	TIX	*-7,1,1			02233
	CAL	TTAB,4			02234
	ORS	R50			02235
	STZ	R43			02236
	TRA	BAA			02237
*		GET AND STORE STARTING ADDRESS AND WORD COUNT			02238
ADA	TEFA	AQA			02239
	CAL	R03			02240
	STA	CP2			02241
	CAL	R05			02242
	STA	CP3			02243
	CLA	CP3			02244
	SUB	CP2			02245
	ALS	18			02246
	STO	R13			02247
	STZ	R43	RESET I-O FLAG		02248
C					02249-

C	C.12	BNWL-343	
C			02250
C			02251
C			02252
	TRA BAA		02253
AQA	LXD R15,4		02254
	CAL TTAB,4		02255
	ORS R49		02256
	STZ R43		02257
	TRA BAA		02258
*	TEST LAST WRITE FROM CHANNEL A		02259
AMA	SCHA R25		02260
	TRCA **2		02261
	TRA APA	NORMAL TRANSFER	02262
AMB	AXT 10,1		02263
	LXD R33,4		02264
	CAL TTAB,4		02265
	ORS R47		02266
	CLA R29		02267
	STA **1		02268
	BSR **	TRY TO REWRITE LAST RECORD	02269
	XEC R29	* 5 TIMES	02270
	RCHA R23		02271
	TCOA *		02272
	SCHA R25		02273
	TRCA **2		02274
	TRA APA		02275
	TIJ *-7,1,1		02276
	CAL TTAB,4		02277
	ORS R50		02278
	STZ R43		02279
	TRA BAA		02280
APA	ETTA		02281
	TRA **2	END OF TAPE	02282
	TRA APB		02283
	LXD R33,4		02284
	CAL TTAB,4		02285
	ORS R48		02286
APB	STZ R43		02287
	TRA BAA		02288
ARA	STL R41		02289
	TRA BAA		02290
BAA	LDI CP1	TEST FOR B CHANNEL CODE	02291
	RNT 2		02292
	TRA OUT		02293
*	TEST CHANNEL B		02294
	NZT R42	RUN IN SWITCH CH. B	02295
	TRA DRA		02296
	NZT R44		02297
	TRA OUT	NO CURRENT CH. B I-O	02298
	TCOB *		02299
	ZET R08		02300
	TRA BMA	LAST CH.B I-O WAS WRITE	02301
	SCHB R06		02302
C			02303-

C		C.13	BNWL-343	02304
C				02305
C				02306
		TEST LAST READ CH.B		02307
		NORMAL TRANSFER		02308
BAB	TRCB	++2		02309
	TRA	BCA		02310
	AXT	10,1		02311
	LXD	R16,4		02312
	CAL	TTAB,4		02313
	ORS	R47		02314
	CAL	R10		02315
	STA	++1		02316
	BSR	**		02317
	XEC	R10		02318
	RCHB	R04		02319
	TCOB	*		02320
	SCHB	R06		02321
	TRCB	++2		02322
	TRA	BCA		02323
	TIX	*-7,1,1		02324
	CAL	TTAB,4		02325
	ORS	R50		02326
	STZ	R44		02327
	TRA	OUT		02328
*		GET AND STORE STARTING ADDRESSES AND WORD COUNT		02329
BCA	TEFB	BQA		02330
	CAL	R04		02331
	STA	CP2		02332
	CAL	R06		02333
	STA	CP3		02334
	CLA	CP3		02335
	SUB	CP2		02336
	ALS	18		02337
	STO	R14		02338
	STZ	R44	RESET I-O FLAG	02339
	TRA	OUT		02340
BMA	SCHB	R26		02341
	TRCB	++2		02342
	TRA	BPA		02343
BMB	AXT	10,1		02344
	LXD	R34,4		02345
	CAL	TTAB,4		02346
	ORS	R47		02347
	CLA	R30		02348
	STA	++1		02349
	BSR	**		02350
	XEC	R30	TRY TO REWRITE LAST RECORD	02351
	RCHB	R24		02352
	TCOB	*		02353
	SCHB	R26		02354
	TRCB	++2		02355
	TRA	BPA		02356
	TIX	*-7,1,1		02357-
	CAL	TTAB,4		
C				

C		C.14	BNWL-343	02358
C				02359
C				02360
	ORS	R50		02361
	STZ	R44		02362
	TRA	OUT		02363
BPA	ETTB			02364
	TRA	*+2		02365
	TRA	BPB		02366
	LXD	R34,4		02367
	CAL	TTAB,4		02368
	ORS	R48		02369
BPB	STZ	R44	RESET I-O FLAG	02370
OUT	AXT	**,1		02371
	AXT	**,2		02372
	AXT	**,4		02373
	TRA	2,4		02374
BQA	LXD	R16,4		02375
	CAL	TTAB,4		02376
	ORS	R49		02377
	STZ	R44	RESET I-O FLAG	02378
	TRA	OUT		02379
DRA	STL	R42		02380
	TRA	OUT		02381
RADDR	SXA	ROUT,4		02382
	AXT	R00,4		02383
	PXA	0,4		02384
ROUT	AXT	**,4		02385
	STA*	1,4		02386
	TRA	2,4		02387
UTTST	SXA	UZA,4		02388
	CAL*	1,4		02389
	PAX	0,4		02390
	CLA	UTAB,4		02391
UZA	AXT	**,4		02392
	STO*	2,4		02393
	TRA	3,4		02394
IOCHK	SXA	TZA,4		02395
	CLA*	1,4		02396
	PDX	0,4		02397
	CAL	R50		02398
	ANA	TTAB,4		02399
	TNZ	TAA	IO FAILURE	02400
	CAL	R49		02401
	ANA	TTAB,4		02402
	TNZ	TBA	END OF FILE	02403
	CAL	R48		02404
	ANA	TTAB,4		02405
	TNZ	TCA	END OF TAPE	02406
	CAL	R47		02407
	ANA	TTAB,4		02408
	TNZ	TDA	IO CHECK BUT RECOVERY	02409
C				02410-

C			C.15	BNWL-343	02411
C					02412
C					02413
	CLA	CF1			02414
	STO	CP20	FORTTRAN ONE		02415
TZA	AXT	** ,4			02416
	CLA	CP20			02417
	STO*	2 ,4			02418
	TRA	3 ,4			02419
TAA	CLA	CF5			02420
	STO	CP20			02421
	CAL	TTAB ,4			02422
	COM				02423
	ANS	R50			02424
	TRA	TZA			02425
TBA	CLA	CF4			02426
	STO	CP20			02427
	CAL	TTAB ,4			02428
	COM				02429
	ANS	R49			02430
	TRA	TZA			02431
TCA	CLA	CF3			02432
	STO	CP20			02433
	CAL	TTAB ,4			02434
	COM				02435
	ANS	R48			02436
TDA	CLA	CF2			02437
	STO	CP20			02438
	CAL	TTAB ,4			02439
	COM				02440
	ANS	R47			02441
	TRA	TZA			02442
*		IOINT - INITIALIZE TAG WORDS			02443
*		CALL LIST - UNIT CODE			02444
	IOINT SXA	VZA ,4			02445
	CLA*	1 ,4			02446
	PDX	0 ,4			02447
	CAL	TTAB ,4			02448
	COM				02449
	ANS	R47			02450
	ANS	R48			02451
	ANS	R49			02452
	ANS	R50			02453
VZA	AXT	** ,4			02454
	TRA	2 ,4			02455
*		CONSTANTS			02456
	CF1 PZE	, ,1			02457
	CF2 PZE	, ,2			02458
	CF3 PZE	, ,3			02459
	CF4 PZE	, ,4			02460
	CF5 PZE	, ,5			02461
CP1	PZE	0	CHANNEL CODE		02462
C					02463-

C			C.16	BNWL-343	02464
C					02465
CP2	PZE	0	I-O STARTING ADDRESS		02466
CP3	PZE	0	I-O ADDRESS AFTER XEC		02467
CP6	PZE	0	UNIT CODE FOR MESSAGE		02468
CP7	OCT	000002000000	READ CODE FOR MESSAGE		02469
CP8	OCT	000001000000	WRITE CODE FOR MESSAGE		02470
CP9	OCT	000000007000	MASK		02471
CP10	OCT	000000000007	MASK		02472
CP11	PZE	0	TEMP STORAGE		02473
CP20	PZE	0	STORAGE FOR ERROR CODE		02474
*		R TABLE			02475
R00	PZE	0			02476
R01	PZE	0			02477
R02	PZE	0			02478
R03	PZE	0	READ CMND-BEFORE XEC-CH.A		02479
R04	PZE	0	READ CMND-BEFORE XEC-CH.B		02480
R05	PZE	0	READ CMND-AFTER XEC-CH.A		02481
R06	PZE	0	READ CMND-AFTER XEC-CH.B		02482
R07	PZE	0	0=READ, NOT 0=WRITE CH.A		02483
R08	PZE	0	0=READ, NOT 0=WRITE CH.B		02484
R09	PZE	0	LAST READ TAPE CH.A		02485
R10	PZE	0	LAST READ TAPE CH.B		02486
R11	PZE	0	START. ADDRESS LAST TESTED READ,A		02487
R12	PZE	0	START. ADDRESS LAST TESTED READ,B		02488
R13	PZE	0	WORD COUNT, LAST TESTED READ,A		02489
R14	PZE	0	WORD COUNT, LAST TESTED READ,B		02490
R15	PZE	0	UNIT CODE, READ, A		02491
R16	PZE	0	UNIT CODE, READ, B		02492
R17	PZE	0			02493
R18	PZE	0			02494
R19	PZE	0	WORD COUNT CURRENT WRITE CH.A		02495
R20	PZE	0	WORD COUNT CURRENT WRITE CH.B		02496
R21	PZE	0	STARTING ADDRESS,WRITE,CH.A		02497
R22	PZE	0	STARTING ADDRESS,WRITE,CH.B		02498
R23	PZE	0	WRITE CMND-BEFORE XEC-CH.A		02499
R24	PZE	0	WRITE CMND-BEFORE XEC-CH.B		02500
R25	PZE	0	WRITE CMND-AFTER XEC-CH.A		02501
R26	PZE	0	WRITE CMND-AFTER XEC-CH.B		02502
R27	PZE	0			02503
R28	PZE	0			02504
R29	PZE	0	LAST WRITE TAPE -CH.A		02505
R30	PZE	0	LAST WRITE TAPE -CH.B		02506
R31	PZE	0			02507
R32	PZE	0			02508
R33	PZE	0	UNIT CODE, WRITE, A		02509
R34	PZE	0	UNIT CODE, WRITE, B		02510
R35	PZE	0			02511
R36	PZE	0			02512
R37	PZE	0			02513
R38	PZE	0			02514
R39	PZE	0			02515
R40	PZE	0			02516
R41	PZE	0	RUN IN CH. A IF ZERO		02517
C					02518
					02519-


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C
C
C
R42 PZE 0
R43 PZE 0
R44 PZE 0
R45 PZE 0
R46 PZE 0
R47 PZE 0
R48 PZE 0
R49 PZE 0
R50 PZE 0
*
OCT 2000000
OCT 1000000
OCT 1000000
OCT 2000000
OCT 1000000
OCT 400000
OCT 200000
OCT 100000
OCT 40000
OCT 20000
OCT 10000
OCT 4000
OCT 2000
OCT 1000
OCT 400
OCT 200
OCT 100
OCT 40
OCT 20
OCT 10
OCT 4
OCT 2
OCT 1
TTAB PZE 0
*
UNIT TABLE
PZE ,10
PZE ,9
PZE ,8
PZE ,7
PZE ,6
PZE ,5
PZE ,4
PZE ,3
PZE ,2
PZE ,1
PZE 0
PZE 0
PZE 0
PZE 0
PZE 0
PZE 0
PZE ,10
PZE ,9

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C.17

BNWL-343

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RUN IN CH. B IF ZERO
CURRENT I-O CH.A IF NON ZERO
CURRENT I-O CH.B IF NON ZERO

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I-O CHECK TAGS
END OF TAPE TAGS
END OF FILE TAGS
I-O FAILURE TAGS

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C			C.18	BNWL-343	02574
C					02575
C					02576
	PZE	,,8	10		02577
	PZE	,,7	07		02578
	PZE	,,6	06		02579
	PZE	,,5	05		02580
	PZE	,,4	04		02581
	PZE	,,3	03		02582
	PZE	,,2	02		02583
	PZE	,,1	01		02584
UTAB	PZE	0	00		02585
SW1	PZE	0		RUN IN SWITCH	02586
	END				02587
E					02588
E					02589
@					02590
C					02591
*	LIST8				02592
*	SYMBOL TABLE				02593
*	LABEL				02594
CLEAD					02595
	SUBROUTINE LEADER				02596
C	SUBROUTINE LEADER PROCESSES THE TAPE LEADER WHICH INCLUDES				02597
C	SERIAL NO, SEQUENCE NO, STARTING WAVELENGTH, ENDING WAVE-				02598
C	LENGTH, INCREMENT, NO OF DATA, BASELINE SIGN, AND BASELINE.				02599
	DIMENSION LCNT(50), KSW(50), KTG(50)				02600
	COMMON LCNT, KSW, KTG				02601
C	INPUT AREA - FROM PTI				02602
	DIMENSION RECA(510)				02603
	COMMON RECA				02604
C	MASTER FILE RECORD - OUTPUT AREA				02605
	DIMENSION ABS(500), LWV(500), IDX(4)				02606
	COMMON ABS, LWV, IDX, BASE, ISIGN, N, INC, LWVE, LWVS, ISEQ, ISER				02607
	DIMENSION RECB(1020, 18)				02608
	COMMON RECB				02609
	KTG(2)=1				02610
	LCNT(5)=LCNT(5)+1				02611
C	LCNT(5) COUNTS PASSES THROUGH SUBROUTINE LEADER				02612
100	CALL MVFLD(5, RECA, 510, 1, 1, ISE, 1, 1, 1)				02613
C	MVFLD IS A SUBROUTINE WHICH MOVES PORTIONS OF A RECORD TO ANOTHER				02614
C	LOCATION IN STORAGE. ARGUMENTS ARE AS FOLLOWS (A) CHARACTERS TO				02615
C	MOVE (B) ARRAY NAME FROM WHICH CHARACTERS ARE TAKEN (C) NO OF WORDS				02616
C	IN ORIGINAL ARRAY, (D) SUB ARRAY, (E) STARTING CHARACTER IN ORIGINAL				02617
C	ARRAY FROM WHICH FIELD IS TO BE TRANSFERRED, (F) NAME OF NEW ARRAY				02618
C	TO WHICH FIELD IS TO BE TRANSFERRED, (G) NO OF WORDS IN NEW ARRAY,				02619
C	(H) SUB ARRAY, (I) LOCATION OF STARTING CHARACTER IN NEW ARRAY. SUBR				02620
C	OUTINE MVFLD WORKS ONLY FROM LOW TO HIGH IN MEMORY.				02621
C	ISER IS A 5 CHARACTER SERIAL NO				02622
	CALL BCFIN(ISE, 1, 1, 5, 50, ISER, KFL)				02623
C	BCFIN CONVERTS BCI TO FORTRAN INTEGER (A) ARRAY NAME, (B) NO WORDS				02624
C	IN ARRAY (C) STARTING CHARACTER OF WORD, (D) LENGTH OF WORD, (E) DECIMAL				02625
C	FACTOR BIAS (47=10-3, 50=10-0, 52=10+2 ETC) USE 50 FOR INTEGER, (F) NAME				02626
C	(G) FLAG (NOT EQUAL TO ZERO IF BCI CANNOT BE CONVERTED TO INTEGER.				02627
C					02628-

C		C.19	BNWL-343	02629
C				02630
C				02631
C	FAILURE GENERALLY INDICATES THAT THE CHARACTER IS NON NUMERICAL.			02632
	IF(KFL)420,200,420			02633
	420 KTG(1)=5			02634
	GO TO 1200			02635
	200 CALL MVFLD(2,RECA,510,1,6,ISQ,1,1,1)			02636
	CALL BCFIN(ISQ,1,1,2,50,ISTS,KFL)			02637
C	ISEQ IS A SEQUENCE NO WHICH ALLOWS A SPECTRUM TO BE BROKEN INTO			02638
C	RECORDS OF 510 WORDS FOR PROCESSING			02639
	IF(KFL)440,300,440			02640
	440 KTG(1) =6			02641
	ISEQ=ISTS			02642
	GO TO 1200			02643
	300 IF(ISTS-1)460,594,850			02644
	850 ISEQ=ISTS			02645
	GO TO 800			02646
	460 KTG(1)=7			02647
	ISEQ=ISTS			02648
	GO TO 1200			02649
	594 KTG(25)=18			02650
	600 IF (LCNT(5)-1)605,605,705			02651
	705 IF(KTG(10))602,707,602			02652
	602 KTG(10)=0			02653
	GO TO 605			02654
	707 ISERSA=ISER			02655
	CALL MWRITE			02656
	ISER=ISERSA			02657
	IF (KTG(4)-1)605,605,1400			02658
	1400 KTG(2)=KTG(4)			02659
	GO TO 1000			02660
	605 LCNT(9)=0			02661
	ISEQ=ISTS			02662
	CALL MVFLD(5,RECA,510,1,8,LWS,1,1,1)			02663
C	LWVS IS THE STARTING WAVELENGTH OF SPECTRUM			02664
	CALL BCFIN(LWS,1,1,5,50,LWVS,KFL)			02665
	IF(KFL)480,650,480			02666
	480 KTG(1)=8			02667
	GO TO 1200			02668
	650 CALL MVFLD(5,RECA,510,1,13,LWE,1,1,1)			02669
C	LWVE IS THE ENDING WAVELENGTH OF SPECTRUM			02670
	CALL BCFIN(LWE,1,1,5,50,LWVE,KFL)			02671
	IF(KFL)490,700,490			02672
	490 KTG(1)=9			02673
	GO TO 1200			02674
	700 CALL MVFLD (5,RECA,510,1,18,IN,1,1,1)			02675
C	INC IS THE WAVELENGTH INCREMENT BETWEEN SAMPLES			02676
	CALL BCFIN(IN,1,1,5,50,INC,KFL)			02677
	IF(KFL)470,750,470			02678
	470 KTG(1)=10			02679
	GO TO 1200			02680
	750 CALL MVFLD(5,RECA,510,1,23,NU,1,1,1)			02681
C	N IS THE TOTAL NUMBER OF SAMPLES PER SPECTRUM			02682
	CALL BCFIN(NU,1,1,5,50,N,KFL)			02683
C				02684-

C		C.20	BNWL-343	02685
C				02686
C				02687
	IF(KFL)450,775,450			02688
450	KTG(1)=11			02689
	GO TO 1200			02690
775	CALL MVFLD(1,RECA,510,1,28,ISIG,1,1,1)			02691
	CALL BCFIN(1SIG,1,1,1,50,ISIGN,KFL)			02692
C	ISIGN IS USED FOR THREE PURPOSES.(1)PROVIDE SIGN ON BASE LINE,(2)			02693
C	INDICATE WHETHER PERKIN-ELMER OR CARY SPECTRUM AND (3) INDICATE			02694
C	WHETHER ABSORBANCE OR PERCENT TRANSMISSION. CODE IS AS FOLLOWS.			02695
C	0=NEG. BASELINE, CARY, ABSORBANCE			02696
C	1=POS. BASELINE, CARY, ABSORBANCE			02697
C	2=NEG. BASELINE,CARY, PERCENT TRANSMISSION.			02698
C	3=POS. BASELINE,CARY, PERCENT TRANSMISSION.			02699
C	4=NEG. BASELINE, P.E., ABSORBANCE			02700
C	5=POS. BASELINE, P.E., ABSORBANCE			02701
C	6=NEG. BASELINE, P.E., PERCENT TRANSMISSION.			02702
C	7=POS. BASELINE, P.E., PERCENT TRANSMISSION.			02703
	IF(KFL)430,780,430			02704
780	CALL MVFLD(4,RECA,510,1,29,BAS,1,1,1)			02705
	CALL BCFLT(BAS,1,1,4,47,BASE,KFL)			02706
C	BASE IS THE BASE LINE FOR THE SPECTRUM			02707
	IF(KFL)410,790,410			02708
430	KTG(1)=12			02709
	GO TO 1200			02710
410	KTG(1)=13			02711
	GO TO 1200			02712
790	ISIGN=ISIGN+1			02713
797	IF(ISIGN-2)795,800,798			02714
795	BASE = -BASE			02715
	GO TO 800			02716
798	IF(BASE)800,799,800			02717
799	BASE=1.0			02718
800	IF(1SER)817,817,8001			02719
8001	IF(1SEQ-18)801,801,8002			02720
8002	CALL IOTST(1)			02721
	WRITE OUTPUT TAPE 3, 8004,1SER,1SEQ			02722
	1SER=0			02723
	1SEQ=18			02724
8004	FORMAT(1H1,10H SERIAL NO.,16,13H,SEQUENCE NO.,16,55H HAS BEEN			02725
	XBYPASSED BECAUSE OF INSUFFICIENT MEMORY.)			02726
	GO TO 1200			02727
801	IF(LWVS) 817,817,802			02728
802	IF(LWVE) 817,817,803			02729
803	IF (INC) 817,817,804			02730
804	IF(N) 817,817,805			02731
805	IF(N-9000)900,900,820			02732
817	CALL IOTST(1)			02733
	WRITE OUTPUT TAPE 3,818,1SER,1SEQ,LWVS,LWVE,INC,N			02734
818	FORMAT(1H1,38H THERE IS AN INVALID PERIPHERAL DATUM.,6H 1SER=,15,6			02735
	XH 1SEQ=,15,6H LWVS=,15,6H LWVE=,15,5H INC=,15,3H N=,15,18H SPECTRU			02736
	XM OMITTED.)			02737
	KTG(10)=1SER			02738
C				02739-

C		C.21	BNWL-343	02740
C				02741
C				02742
				02743
	820	LWVE=LWVE+INC*(N-9000)		02744
		N=9000		02745
		CALL IOTST(1)		02746
		WRITE OUTPUT TAPE 3,830,ISER		02747
	830	FORMAT(1H1,16H SPECTRUM NUMBER,I8,92H HAS BEEN SHORTENED TO 9000		02748
		XVALUES BECAUSE IT WAS TOO LONG TO BE PROCESSED BY THIS PROGRAM.)		02749
		GO TO 1000		02750
C		TEST FOR CONSISTENCY OF LWVS, LWVE, INC, N.		02751
	900	LTEST=(LWVS-N*INC-LWVE)/INC		02752
		IF(LTEST)910,1000,920		02753
	910	KTEST=-XMAXOF(LTEST,-6)		02754
		GO TO 930		02755
	920	KTEST=XMINOF(LTEST,6)		02756
	930	GO TO(940,940,940,940,940,950),KTEST		02757
	940	IF(LTEST)960,1000,970		02758
	960	NTEST=(LWVS-LWVE)/INC		02759
		ITEST=(N-NTEST)*INC		02760
		CALL IOTST(1)		02761
		WRITE OUTPUT TAPE 3,975,ITEST,N,NTEST,ISER		02762
	975	FORMAT(1H1,25H THERE MAY BE AN ERROR OF,I4,46H ANGSTROMS OR TENTHW		02763
		XAVENUMBERS. N CHANGED FROM,I6,3H TO,I6,17H TO PROCESS SPECT,I6)		02764
		N=NTEST		02765
		GO TO 1000		02766
	970	LETST= LWVS-N*INC		02767
		ITEST=LETST-LWVE		02768
		CALL IOTST(1)		02769
		WRITE OUTPUT TAPE 3,976,ITEST,LWVE,LETST,ISER		02770
	976	FORMAT(1H1,25H THERE MAY BE AN ERROR OF,I4,46H ANGST. OR TENTHWAVE		02771
		XNUMBERS. LWVE CHANGED FROM,I6,3H TO,I6,17H TO PROCESS SPECT,I6)		02772
		LWVE=LETST		02773
		GO TO 1000		02774
	950	CALL IOTST(1)		02775
		WRITE OUTPUT TAPE 3,977, ISER,LWVS,LWVE,INC,N		02776
	977	FORMAT(1H1, 31HLEADER INFORMATION FOR SPECTRUM,I6,31H IS GROSSLY I		02777
		XNCONSISTENT. LWVS=,I6,7H ,LWVE=,I6,6H ,INC=,I4,4H ,N=,I6,9H.BYPASS		02778
		XED)		02779
		GO TO 1200		02780
	1000	RETURN		02781
	1200	KTG(2) = 2		02782
		GO TO 1000		02783
		END		02784
C				02785-

C		C.22	BNWL-343	02786
C				02787
C				02788
*	FAP			02789
*		MOVE - MOVE WORD WITHOUT CONVERSION		02790
	COUNT	6		02791
	ENTRY	MOVE		02792
	BCI	1,MOVE		02793
MOVE	CLA*	1,4		02794
	STO*	2,4		02795
	TRA	3,4		02796
	END			02797
	GO TO	1000		02798
	END			02799
C				02800
C				02801
C				02802
C				02803
*	LIST8			02804
*	SYMBOL TABLE			02805
*	LABEL			02806
CMRIT				02807
	SUBROUTINE MWRITE			02808
C	SUBROUTINE MWRITE PROVIDES THE PROPER OUTPUT TO MASTER FILE (UP-			02809
C	DATED) BY USE OF WRITE2 AND PROPER OUTPUT TO REPORT IF NO			02810
C	ERROR HAS OCCURRED IN READING AND WRITING			02811
C	PROGRAM SWITCHES AND TAGS			02812
	DIMENSION LCNT(50),KSW(50),KTG(50)			02813
	COMMON LCNT,KSW,KTG			02814
C	INPUT AREA - FROM PT1			02815
	DIMENSION RECA(510)			02816
	COMMON RECA			02817
C	MASTER FILE RECORD - OUTPUT AREA			02818
	DIMENSION ABS(500),LWV(500),IDX(4)			02819
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			02820
	DIMENSION RECB(1020,18)			02821
	COMMON RECB			02822
	DIMENSION IRE(500)			02823
	KTG(4)=1			02824
	CALL IOTST(2)			02825
	IER=0			02826
	DO 22 K=1,ISEQ			02827
	CALL WRITE6(RECB,1020,K,1020,IER)			02828
	GO TO (22,22,26,26,25),IER			02829
26	KTG(1)=20			02830
	KTG(4)=2			02831
22	CONTINUE			02832
	CALL MOVE (RECB(1020,1),ISER)			02833
	CALL IOTST(1)			02834
	WRITE OUTPUT TAPE 3,1472,ISER,ISEQ,LWVS,LWVE,INC,ISIGN,BASE,N			02835
1472	FORMAT(1H0,34HSPECTRUM NOW ON MASTER FILE. ISEQ=1,12,			02836
	X6H LWVS=15,6H LWVE=,15,5H INC=13,7H ISIGN=,11, 6H BASE=,F6,3,3H N=			02837
	X,15)			02838
C				02839-

C		C.23	BNWL-343	02840
C				02841
C				02842
	16	IF(KSW(4))1000,1000,40		02843
	40	KPT=0		02844
		ISMAX=ISEQ		02845
	1008	DO 1004 KP=1,ISMAX		02846
	36	CALL TRANQ(RECB,KP)		02847
		N1=N-(ISEQ-1)*500		02848
		N1=XMINOF(N1,500)		02849
	1004	CALL PLOTT(KPT,KP,N1)		02850
		IF(KPT)1010,1010,1000		02851
	1010	KPT=1		02852
		CALL IOTST(1)		02853
		WRITE OUTPUT TAPE 3,46,KSW(5)		02854
	46	FORMAT(1H0,32HA PLOT WAS ALSO GENERATED. MODE=,12)		02855
		GO TO 1008		02856
	25	KTG(1)=19		02857
	1200	KTG(4)=3		02858
	1000	RETURN		02859
		END		02860
C				02861
C				02862
C				02863
C				02864
*	LIST8			02865
*	SYMBOL TABLE			02866
*	LABEL			02867
	CPLOTTER ROUTINE FOR STANDARD PLOT OF SPECTRUM ON 8 1/2 X 11 INCH PAPER			02868
	CKSW(5) DICTATES PLOTTING MODE.2=LINES.4=POINTS WITH DECIMAL.8=FREE RUN.			02869
	C KSW(6) INDICATES THE MAXIMUM DISTANCE SKIPPED IN THINING DATA.			02870
	C MAXIMUM DISTANCE IS KSW(6)/500 INCHES.			02871
	SUBROUTINE PLOTT (KPT,IKK,N1)			02872
	C USED FOR ROUTINE PLOTS OF ABSORBANCE VS WAVELENGTH(BOTTOM) AND			02873
	C WAVENUMBERS (TOP)			02874
	C KPT=0 WAVELENGTH, KPT=1, WAVENUMBER			02875
	C IKK (SEQUENCE NO.)			02876
	C N1=NO. OF DATA			02877
	C PROGRAM SWITCHES AND TAGS			02878
	DIMENSION LCNT(50),KSW(50),KTG(50)			02879
	COMMON LCNT,KSW,KTG			02880
	C INPUT AREA - FROM PTI			02881
	DIMENSION RECA(510)			02882
	COMMON RECA			02883
	C MASTER FILE RECORD - OUTPUT AREA			02884
	DIMENSION ABS(500),LWV(500),IDX(4)			02885
	COMMON ABS, LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			02886
	DIMENSION RECB(1020,18)			02887
	COMMON RECB			02888
	DIMENSION X(11),Y(11)			02889
	C DETERMINE WHETHER BOARDER NEEDED			02890
	IF(KPT)1064,1064,19			02891
	1064	IF(1KK-1)19,10,19		02892
C				02893-

C		C.24	BNWL-343	02894
C				02895
C				02896
C				02897
	SET UP AND PLOT X AND Y AXES			02898
10	CALL SCALE(5,5)			02899
	CALL ORIGIN(0,0)			02900
	CALL MODE (2,1)			02901
	Y(1)=0.0			02902
	DO 35 K=1,2			02903
	X(1)=5118.11			02904
	DO 30 I=1,14			02905
	CALL TOLP(X,Y,1)			02906
	Y(1)=Y(1)+50.			02907
	CALL TOLP(X,Y,1)			02908
	Y(1)=Y(1)-50.			02909
	CALL TOLP(X,Y,1)			02910
30	X(1)=X(1)-393.70			02911
	X(1)=0.0			02912
	DO 40 I=1,5			02913
	CALL TOLP(X,Y,1)			02914
	X(1)=X(1)+50.			02915
	CALL TOLP(X,Y,1)			02916
	X(1)=X(1)-50.			02917
	CALL TOLP(X,Y,1)			02918
40	Y(1)=Y(1)+393.70			02919
	CALL MODE(2,1)			02920
35	Y(1)=1771.65			02921
C	SET UP ABSCISSAL NUMBERS (FIRST DIGITS)			02922
	DO 85 K=1,2			02923
	X(1)=-80.			02924
	DO 50 I=1,13			02925
	GO TO (59,69),K			02926
59	Y(1)=-35.			02927
	GO TO (85,85,85,85,900,900,900,900),ISIGN			02928
900	GO TO (50,50,50,61,61,62,62,62,63,63,64,64,64),I			02929
69	Y(1)=1736.65			02930
	GO TO (810,810,810,810,85,85,85,85),ISIGN			02931
810	GO TO (50,50,50,61,61,62,62,62,63,63,64,64,64),I			02932
61	NP1=1			02933
	GO TO 100			02934
62	NP1=2			02935
	GO TO 100			02936
63	NP1=3			02937
	GO TO 100			02938
64	NP1=4			02939
100	CALL MODE (4,NP1)			02940
	CALL TOLP(X,Y,1)			02941
50	X(1)=X(1)+393.7			02942
85	CONTINUE			02943
C	SET UP ABSCISSAL NUMBERS (SECOND DIGIT)			02944
	DO 151 K=1,2			02945
	X(1)=-40.			02946
	DO 150 I=1,13			02947-
C				

	C.25	BNWL-343	
C			02948
C			02949
C			02950
	GO TO (117,118),K		02951
117	Y(1)=-35.		02952
	GO TO (820,820,820,820,920,920,920,920),ISIGN		02953
820	GO TO (150,150,150,150,121,121,121,121,121,122,122,122,122),I		02954
920	GO TO (150,124,128,122,126,120,124,128,122,126,120,124,128),I		02955
118	Y(1)=1736.65		02956
	GO TO (830,830,830,830,930,930,930,930),ISIGN		02957
830	GO TO (150,124,128,122,126,120,124,128,122,126,120,124,128),I		02958
930	GO TO (150,150,150,121,121,122,122,122,123,123,124,150,150),I		02959
120	NP1=10		02960
	GO TO 170		02961
121	NP1=1		02962
	GO TO 170		02963
122	NP1=2		02964
	GO TO 170		02965
123	NP1=3		02966
	GO TO 170		02967
124	NP1=4		02968
	GO TO 170		02969
126	NP1=6		02970
	GO TO 170		02971
128	NP1=8		02972
170	CALL MODE (4,NP1)		02973
	CALL TOLP (X,Y,1)		02974
150	X(1)=X(1)+393.7		02975
151	CONTINUE		02976
C	SET UP ABCISSAL NUMBERS (THIRD DIGIT)		02977
	DO 285 K=1,2		02978
	X(1)=0.0		02979
175	DO 249 I=1,13		02980
	GO TO (176,177),K		02981
176	Y(1)=-35.		02982
	GO TO (840,840,840,840,180,180,180,180),ISIGN		02983
840	GO TO (182,184,186,188,180,182,184,186,188,180,182,184,186),I		02984
177	Y(1)=1736.65		02985
	GO TO (180,180,180,180,179,179,179,179),ISIGN		02986
179	GO TO (180,184,188,182,186,180,184,188,182,186,180,249,249),I		02987
180	NP1=10		02988
	GO TO 190		02989
182	NP1=2		02990
	GO TO 190		02991
184	NP1=4		02992
	GO TO 190		02993
186	NP1=6		02994
	GO TO 190		02995
188	NP1=8		02996
190	CALL MODE(4,NP1)		02997
	CALL TOLP (X,Y,1)		02998
249	X(1)=X(1)+393.7		02999
285	CONTINUE		03000
C			03001-

C		C.26	BNWL-343	03002
C				03003
C				03004
C	SET UP ABCISSAL NUMBERS(FOURTH AND FIFTH DIGITS)			03005
	X2=40.			03006
	DO 389 J=1,2			03007
	DO 385 K=1,2			03008
	X(1)=X2			03009
375	DO 350 I=1,13			03010
	GO TO (376,377),K			03011
376	Y(1)=-35.			03012
	GO TO 380			03013
377	Y(1)=1736.65			03014
380	CALL MODE(4,10)			03015
	CALL TOLP(X,Y,1)			03016
350	X(1)=X(1)+393.7			03017
385	CONTINUE			03018
389	X2=80.			03019
C	SET UP ORDINATE NUMBERS.			03020
	Y(1)=0.0			03021
	DO 401 K=1,2			03022
402	X(1)=-40.			03023
	DO 220 I=1,5			03024
	GO TO (850,850,860,860,850,850,860,860),ISIGN			03025
850	GO TO (230,230,231,231,232),I			03026
860	GO TO (220,220,220,220,231),I			03027
230	NP1=10			03028
	GO TO 260			03029
231	NP1=1			03030
	GO TO 260			03031
232	NP1=2			03032
260	CALL MODE(4,NP1)			03033
	CALL TOLP(X,Y,1)			03034
220	Y(1)=Y(1)+393.7			03035
	X(1)=0.0			03036
	DO 226 I=1,5			03037
	Y(1)=Y(1)-393.7			03038
	GO TO (224,224,225,225,224,224,225,225),ISIGN			03039
224	CALL MODE(4,0)			03040
	GO TO 228			03041
225	GO TO (240,247,245,242,240),I			03042
240	NP1=10			03043
	GO TO 227			03044
242	NP1=2			03045
	GO TO 227			03046
245	NP1=5			03047
	GO TO 227			03048
247	NP1=7			03049
227	CALL MODE(4,NP1)			03050
228	CALL TOLP(X,Y,1)			03051
226	CONTINUE			03052
	X(1)=40.			03053
	DO 280 I=1,5			03054
	GO TO (290,300,290,300,290),I			03055
C				03056-

C		C.27	BNWL-343	03057
C				03058
C				03059
	290	NP1=10		03060
		GO TO 310		03061
	300	NP1=5		03062
	310	CALL MODE(4, NP1)		03063
		CALL TOLP(X, Y, 1)		03064
	280	Y(1)=Y(1)+393.7		03065
	401	Y(1)=1771.65		03066
C		PLACEMENT OF SERIAL NUMBER ON THE PLOT		03067
		X(1)=4525.		03068
		Y(1)=-100.		03069
		NDIV=10000		03070
		INTG=ISER		03071
		DO 420 I=1,5		03072
		NP1=INTG/NDIV		03073
		IF(NP1)412,413,412		03074
	413	NP1=10		03075
	412	CALL MODE(4, NP1)		03076
		CALL TOLP(X, Y, 1)		03077
		X(1)=X(1)+50.		03078
		IF(NP1-10)415,420,415		03079
	415	INTG=INTG-NP1*NDIV		03080
	420	NDIV=NDIV/10		03081
C		SET UP AND PLOT WAVELENGTHS		03082
C		SETUP THINNING PARAMETERS FOR SUBROUTINE THIN		03083
	19	IF(IKK-1)70,70,72		03084
	70	Y(3)=-9999.0		03085
		KINDX=0		03086
		KTRN=0		03087
	72	IF(KPT) 6033,23,6033		03088
	23	GO TO (832,832,832,832,833,833,833,833),ISIGN		03089
	832	GAP=0.19685022*FLOATF(INC)		03090
		GO TO 835		03091
	833	GAP=0.09842*FLOATF(INC)		03092
	835	KMAX=FLOATF(KSW(6))/GAP		03093
		DO 503 I=1,N1		03094
		GO TO (710,710,715,715,720,720,725,725),ISIGN		03095
	710	Y(1)=ABS(I)*787.401		03096
		GO TO 711		03097
	715	Y(1)=15.748*ABS(I)		03098
	711	X(1)=0.19685022*(FLOATF(LWV(I))-2000.)		03099
		GO TO 500		03100
	720	Q=1771.65+787.40*ABS(I)		03101
		Y(1)=MIN1F(Q,3543.300)		03102
		GO TO 721		03103
	725	Q=15.748*ABS(I)+1771.65		03104
		Y(1)=MIN1F(Q,3543.300)		03105
	721	X(1)=0.09842*FLOATF(LWV(I))		03106
	500	CALL THIN (X, Y, KMAX, KTRN, KINDX)		03107
		IF(KTRN)503,501,503		03108
	501	Y(1)=MAX1F(0.0, Y(1))		03109
		Y(1)=MIN1F(3543.3, Y(1))		03110
		IF(IKK-1)505,502,505		03111
C				03112-

C		C.28	BNWL-343	03113
C				03114
C				03115
	502	IF(I-1)505,504,505		03116
	504	CALL MODE(2,1)		03117
		CALL TOLP(X,Y,1)		03118
		CALL MODE(KSW(5),0)		03119
	505	CALL TOLP(X,Y,1)		03120
	503	CONTINUE		03121
		GO TO 604		03122
C		CALCULATE AND PLOT WAVENUMBERS VS ABSORBANCE		03123
	6033	DO 603 I=1,N1		03124
		GO TO (730,730,735,735,740,740,745,745),ISIGN		03125
	730	Y(1)=1771.65 + 787.40*ABS(I)		03126
		GO TO 731		03127
	735	Y(1)=1771.65 + 15.7480*ABS(I)		03128
	731	X(1)=9.84252*10.**6/FLOATF(LWV(I))		03129
		GO TO 600		03130
	740	Q= 787.40*ABS(I)		03131
		Y(1)= MIN1F(Q,1750.)		03132
		GO TO 741		03133
	745	Q=15.748*ABS(I)		03134
		Y(1)= MIN1F(Q,1750.)		03135
	741	X(1)=9.8425*(10.**6)/FLOATF(LWV(I))		03136
	600	GAP=X(1)*FLOATF(INC)/FLOATF(LWV(I))		03137
		KMAX=FLOATF(KSW(6))/GAP		03138
		CALL THIN (X,Y,KMAX,KTRN,KINDX)		03139
		IF (KTRN)603,601,603		03140
	601	Y(1)=MAX1F(Y(1),0.0)		03141
		IF(IKK-1)605,602,605		03142
	602	IF(I-1)605,607,605		03143
	607	CALL MODE(2,1)		03144
		CALL TOLP(X,Y,1)		03145
		CALL MODE(KSW(5),0)		03146
	605	CALL TOLP(X,Y,1)		03147
	603	CONTINUE		03148
C		TEST FOR END OF SPECTRUM		03149
	604	NQ=N-500*ISEQ		03150
		IF(NQ)700,700,1000		03151
	700	DO 705 KKK=1,10		03152
	705	CALL MODE(2,1)		03153
		CALL TOLP(X,Y,1)		03154
		IF(KPT)706,1000,706		03155
	706	NP1=LCNT(6)+1		03156
		X(1)=5000.		03157
		Y(1)=3750.		03158
		CALL MODE(4,NP1)		03159
		CALL TOLP(X,Y,1)		03160
		CALL WAIT		03161
		LCNT(6)=LCNT(6)+1		03162
	1000	RETURN		03163
		END		03164
C				03165-

C		C.29	BNWL-343	03166
C				03167
C				03168
*	LIST8			03169
*	SYMBOL TABLE			03170
*	LABEL			03171
CRWRI				03172
	SUBROUTINE RWRITE			03173
C	PROGRAM SWITCHES AND TAGS			03174
	DIMENSION LCNT(50),KSW(50),KTG(50)			03175
	COMMON LCNT,KSW,KTG			03176
C	INPUT AREA - FROM PTI			03177
	DIMENSION RECA(510)			03178
	COMMON RECA			03179
C	MASTER FILE RECORD - OUTPUT AREA			03180
	DIMENSION ABS(500),LWV(500),IDX(4)			03181
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			03182
	DIMENSION RECB(1020,18)			03183
	COMMON RECB			03184
	DIMENSION IRE(500)			03185
	KTG(8)=1			03186
	CALL IOTST(1)			03187
10	WRITE OUTPUT TAPE 3,20,ISER,LWVS,LWVE,INC,N			03188
20	FORMAT(1H1,9H SERIAL NO,I6,23H STARTING WAVELENGTH,I6,21H	END		03189
	XING WAVELENGTH,I6,13H INCREMENT,I6,14H NO OF DATA,I6)			03190
	LIN=0			03191
	LPG=1			03192
27	N1 = KTG(20)			03193
	GO TO (28,28,28,28,500,500,500,500),ISIGN			03194
28	DO 29 I=1,N1			03195
29	IRE(I)=1.E+8/FLOATF(LWV(I))			03196
	GO TO(31,31,36,36),ISIGN			03197
36	DO 341 J=1,N1			03198
341	ABS(J)=MIN1F(100.,ABS(J))			03199
	GO TO 31			03200
500	DO 511 I=1,N1			03201
	IRE(I)=1.E+8/FLOATF(LWV(I))			03202
	IF(ISIGN-6)508,508,509			03203
508	ABS(I)= MIN1F(ABS(I),2.000)			03204
	GO TO 511			03205
509	ABS(I)=MIN1F(ABS(I),100.)			03206
511	CONTINUE			03207
31	DO 1020 I=1,N1,17			03208
	IF(LIN-42)1019,1018,1018			03209
1018	LPG=LPG+1			03210
	WRITE OUTPUT TAPE 3,45,ISER,LPG			03211
45	FORMAT (1H1,10X,13H SERIAL NUMBER,I6,5X,9H CONTINUED,50X,4H PAGE,I3)			03212
	LIN = 0			03213
1019	KEND=XMINOF(N1,I+16)			03214
	GO TO (32,32,32,32,37,37,37,37),ISIGN			03215
32	WRITE OUTPUT TAPE 3,30,(LWV(J),J=1,KEND)			03216
30	FORMAT(1H0,3X,12HWAVELENGTH,A,17I6)			03217
	GO TO 510			03218
37	WRITE OUTPUT TAPE 3,43,(IRE(J),J=1,KEND)			03219
43	FORMAT(1H0,2X,13HWAVELENGTH,MU,17I6)			03220
510	GO TO (33,33,34,34,33,33,34,34),ISIGN			03221
C				03222-

C		C.30	BNWL-343	03223
C				03224
C				03225
	40	FORMAT(1H,5X,10HABSORBANCE,17F6.3)		03226
	33	WRITE OUTPUT TAPE 3,40,(ABS(J),J=1,KEND)		03227
		GO TO 520		03228
	34	WRITE OUTPUT TAPE 3,39,(ABS(J),J=1,KEND)		03229
	39	FORMAT(1H,5X,10HPERCENT T.,17F6.1)		03230
	520	GO TO (38,38,38,38,42,42,42,42),ISIGN		03231
	38	WRITE OUTPUT TAPE 3,35,(IRE(J),J=1,KEND)		03232
	35	FORMAT(1H,15HWAVENUMBER,1/CM,17I6)		03233
		GO TO 44		03234
	42	WRITE OUTPUT TAPE 3,47,(LWV(J),J=1,KEND)		03235
	47	FORMAT(1H,15HTENTHWAVENUMBER,17I6)		03236
	44	LIN=LIN+4		03237
	1020	CONTINUE		03238
		IF(N-LCNT(9))1025,1025,1001		03239
	1025	KTG(25)=ISEQ		03240
	1001	RETURN		03241
		END		03242
C				03243
G				03244
C				03245
C				03246
*		LIST8		03247
*		LABEL		03248
CTHIN		THINS DATA FOR PLOTTING ON STANDARD 8X11 PAPER. GAPS NO WIDER THAN		03249
C		1/20 TH INCH		03250
		SUBROUTINE THIN(X,Y,KMAX,KTRN,K)		03251
		DIMENSION X(3),Y(3)		03252
		YTST=ABS(Y(1)-Y(3))		03253
		IF(YTST-3.)10,10,100		03254
	10	IF(K-KMAX)30,30,105		03255
	30	KTRN=1		03256
		K=K+1		03257
		GO TO 900		03258
	100	IF(K)105,105,107		03259
	107	Y(2)=Y(1)		03260
		X(2)=X(1)		03261
		Y(1)=Y(3)		03262
		X(1)=X(3)		03263
		Y(1)=MAX1F(Y(1),0.0)		03264
		Y(1)=MIN1F(3543.3,Y(1))		03265
		CALL TOLP(X,Y,1)		03266
		X(1)=X(2)		03267
		Y(1)=Y(2)		03268
	105	K=0		03269
		KTRN=0		03270
	900	Y(3)=Y(1)		03271
		X(3)=X(1)		03272
	1000	RETURN		03273
		END		03274
C				03275-

C		C.31	BNWL-343	03276
C				03277
C				03278
*	LIST8			03279
*	SYMBOL TABLE			03280
*	LABEL			03281
CTRAQ	TRANB			03282
CTRAQ	TRANQ(RECQ,J) TRANSFERS DATA FROM RECQ(1020,J) TO VARIABLES AS			03283
C	INDICATED IN THE PROGRAM.			03284
	SUBROUTINE TRANQ(RECQ,J)			03285
C	PROGRAM SWITCHES AND TAGS			03286
	DIMENSION LCNT(50),KSW(50),KTG(50)			03287
	COMMON LCNT,KSW,KTG			03288
C	INPUT AREA - FROM PTI			03289
	DIMENSION RECA(510)			03290
	COMMON RECA			03291
C	MASTER FILE RECORD - OUTPUT AREA			03292
	DIMENSION ABS(500),LWV(500),IDX(4)			03293
	COMMON ABS, LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			03294
	DIMENSION RECB(1020,18)			03295
	COMMON RECB			03296
	DIMENSION RECQ(1020,18)			03297
	CALL MOVE(RECQ(1019,J),ISEQ)			03298
	CALL MOVE(RECQ(1018,J),LWVS)			03299
	CALL MOVE(RECQ(1017,J),LWVE)			03300
	CALL MOVE(RECQ(1016,J),INC)			03301
	CALL MOVE(RECQ(1015,J),N)			03302
	CALL MOVE(RECQ(1014,J),ISIGN)			03303
	BASE=RECQ(1013,J)			03304
	JJJ=1			03305
	DO 26 I=1009,1012			03306
	CALL MOVE(RECQ(I,J),IDX(JJJ))			03307
26	JJJ=JJJ+1			03308
	JJJ=1			03309
	DO 27 I=9,508			03310
	ABS(JJJ)=RECQ(I,J)			03311
27	JJJ=JJJ+1			03312
	JJJ=1			03313
	DO 28 I=509,1008			03314
	CALL MOVE(RECQ(I,J),LWV(JJJ))			03315
28	JJJ=JJJ+1			03316
	RETURN			03317
	END			03318
C				03319-

APPENDIX D

COMPUTATIONAL PROGRAMS

TABLE D.I. Definitions of Tags [KTG(I)], Counts [LCNT(I)]

Tag, Count	Function	Subroutines Where Set* or Used
A. KTG(I) I=1,50		
a. (1)	Signals location and transferral of first requested spectrum to A4. 1=main program entered, 2=spectrum located, 3=transferred to A4	MAIN*,FAILUR
b. (2)	Signals location and transferral of second spectrum to tape B7. 1=main program entered, 2=spectrum located, 3=transferred to B7	MAIN*,FAILUR
c. (3)	Signals location and transferral of third spectrum to tape B8. 1=main program entered, 2=spectrum located, 3=transferred to B8	MAIN*,FAILUR
d. (4)	Signals location and transferral of fourth spectrum to tape B9. 1=main program entered, 2=spectrum located, 3=transferred to B9	MAIN*,FAILUR
e. (5)	Signals that an error has occurred. Used in ERROR2	MAIN*,SUBR11*,RLOAD*,SUBR21 ERROR2,SUBR31
f. (6)	Not used	
g. (8)	Signals that program has been in subroutine ERROR2; Bypass current record; 0=No, different from 0,Yes	ERROR2,SUBR11,SUBR21,SUBR31
h. (30)	Signals end of spectrum	NWRITE*,COMP
B. LCNT(I) I=1,50		
a. (6) LCNT(6)	Count of Plots	
b. (38)	Signals first entry into subroutine READ6; 0=Yes	MAIN*
c. (39)	Signals first entry into subroutine WRITE9; 0=Yes	MAIN*
d. (40)	Signals first entry into subroutine READ9; 0=Yes	RLOAD*
e. (41)	Signals first entry into subroutine READ4; 0=Yes	RLOAD*
f. (42)	Signals first entry into subroutine WRITE4; 0=Yes	MAIN*
g. (43)	Signals first entry into subroutine READ5; 0=Yes	MAIN*
h. (46)	Signals first entry into subroutine WRITE6; 0=Yes	RLOAD*
i. (47)	Signals first entry into subroutine READ7; 0=Yes	RLOAD*
j. (48)	Signals first entry into subroutine WRITE7; 0=Yes	MAIN*
k. (49)	Signals first entry into subroutine READ8; 0=Yes	RLOAD*
l. (50)	Signals first entry into subroutine WRITE8; 0=Yes	MAIN*

Note: For switches (KSW(I)) and Floating Point Numbers (FPN(I)) refer to the section entitled "Preparation of Peripheral Cards for Computations".

D.1a

BNWL-343

RECORD FORMATS AND LOCATIONS OF COMMON

VARIABLE	RECA		ISRA...		ISRB...		ISRC...		ISRD...		ISRR...	
	1	2	ISER...	ISRA...	ISRB...	ISRC...	ISRD...	ISRR...	ISRB...	ISRC...	ISRD...	ISRR...
First absorbance; ABS, ABSA, etc.	77141	75144	73161	71175	67211	65225	63241	61255				
500th absorbance; ABS, ABSA, etc.	76166	74172	72176	70212	66226	64242	62256	60272				
First wavelength; LWV, LWVA, etc.	76165	74161	72175	70211	66225	64241	62255	60271				
500th wavelength; LWV, LWVA, etc.	75172	73175	71212	67226	65242	63256	61272	57306				
First reserve IDX, IDXA, IDXB, etc.	75171	73174	71211	67225	65241	63255	61271	57305				
Fourth reserve IDX, DXA, IDXB, etc.	75166	73172	71206	67222	65235	63251	61266	57302				
Baseline; BASE, BASA, BASB, etc.	75165	73171	71205	67221	65235	63251	61265	57301				
Sign of baseline; ISIGN, ISNA, etc.	75164	73170	71204	67220	65234	63250	61264	57300				
Number of data; N, NA, NB, NC, etc.	75163	73167	71203	67217	65233	63247	61263	57277				
Wavelength increment; INC, etc.	75162	73166	71202	67216	65232	63246	61262	57276				
Ending wavelength; LWVE, LWEA, etc.	75161	73165	71201	67215	65231	63245	61261	57275				
Beginning wavelength; LWVS, etc.	75160	73164	71200	67214	65230	63244	61260	57274				
Sequence number; ISEQ, ISQA, etc.	75157	73163	71177	67213	65227	63243	61257	57273				
Serial number; ISER, ISRA, etc.	75156	73162	71176	67212	65226	63242	61256	57272				

FIGURE D.1. Locations of Dimensioned and Common Variables in Computational System

TABLE D.II. Definitions of Subroutines for Computational System

<u>Program</u>	<u>Subprograms Called</u>	
**MAIN	HELPER	Lists load-points of subroutines in memory
	IOTST	*Determines availability of tape channels for use
	READ5	*Reads binary record from tape unit A5
	MOVE	*Moves records unchanged in coding
	TRANS	Moves record into ISER...
	WRITE6	*Writes binary record to tape unit B6
	IOCHK	*Detects read or write failures
	READ6	*Reads binary record from B6
	FAILUR	Signals failure to find all spectra wanted on B6
	ERROR2	Classifies errors committed
	MONOSP	Calls subroutine SUBRXX 1 $\leq$ XX $\leq$ 10
	WRITE4	*Writes binary record to tape unit A4
	WRITE7	*Writes binary record to tape unit A7
	BISPEC	Calls subroutines SUBRXX 11 $\leq$ XX $\leq$ 20
	WRITE8	*Writes binary record to tape unit B8
	WRITE9	*Writes binary record to tape unit B9
	TRISPE	Calls subroutines SUBRXX 21 $\leq$ XX $\leq$ 30
	QUATSP	Calls subroutines SUBRXX 31 $\leq$ XX $\leq$ 41
	HALT	***Ends file to plotter tape (B5)
	EXIT	Ends job
FAILUR	IOTST	*See above
MONOSP	SUBR01	Dummy subroutine
	SUBR02	**Single spectrum
	SUBR03	Dummy subroutine
	SUBR04	**Single spectrum
	SUBR05-SUBR20	Dummy subroutine
BISPEC	SUBR11	**Two spectra
	SUBR12-SUBR20	Dummy subroutines
TRIPSE	SUBR21	**Three spectra
	SUBR22-SUBR30	Dummy subroutines
QUATSP	SUBR31	**Four spectra
	SUBR32-40	Dummy subroutines
SUBR04	SCAT	**Makes correction for scattered light
	CALIM	Chooses right number of data in record
	NWRITE	**Prepares, writes and plots data

*These programs are discussed further in the section on the EDIT PROGRAM: flow diagrams are available in Appendix C.

**These programs are discussed further in the section on the COMPUTATIONAL PROGRAM: flow diagrams are available in this appendix.

***These are systems plotter programs not listed in this document; see the section on COMPUTATIONAL PROGRAM for additional details.

TABLE D.II. (Contd)

Program	Subprograms Called	
SUBR11	RLOAD	Reads records from auxiliary files for merging
	ERROR2	See above
	MATCH3	Matches wavelengths for computation
	CALIM	See above
	NWRITE	See above
SUBR21	RLOAD	See above
	ERROR2	See above
	MATCH3	See above
	CALIM	See above
	NWRITE	**See above
SUBR31	RLOAD	See above
	ERROR2	See above
	MATCH3	See above
	CALIM	See above
	NWRITE	**See above
RLOAD	READ4	See above
	ERROR2	See above
	MOVE	See above
	TRANS	See above
	CALIM	See above
	READ7	See above
	READ8	See above
	READ9	See above
TRANS	MOVE	See above
NWRITE	IOTST	*See above
	CNV	Converts datum for plotting
	DERINT	**Tapes derivative on integral
	THIN	**Thins data
	REPORT	**Provides numerical report of data
	MODE	***Set mode of plotting
	ORIGIN	***Sets origin on plotter
	SCALE	***Sets scales on plotter
	TOLP	***Plots data
	PNCH	**
	SMOOTH	**
	RESPLT	**
	WAIT	Halts plotter for paper change
RESPLT	TOLP	***See above
	REPORT	See above
	MODE	***See above
ERROR2	IOTST	*See above
	PDUMP	Dumps memory

*These programs are discussed further in the section on the EDIT PROGRAM; flow diagrams are available in Appendix C.

**These programs are discussed further in the section on the COMPUTATIONAL PROGRAM; flow diagrams are available in this appendix.

***These are systems plotter programs not listed in this document; see the section on COMPUTATIONAL PROGRAM for additional details.

MAIN COMPUTATIONAL PROGRAM (COMP)

NOTE: Subroutines SUBR21, and SUBR31 are Extended Versions of Logic in Subroutine SUBR11 for Three and Four Spectra Respectively.

FIGURE D.3. Flow Charts for COMPUTATIONAL Programs: SUBR04, SUBR11, RLOAD, THIN

FIGURE D.4. Logic Charts for COMPUTATIONAL Programs: NWRITE, SMOOTH, RESPLT

C		D.1	BNWL-343	03320
C				03321
C				03322
*	LIST8			03323
*	SYMBOL TABLE			03324
*	LABEL			03325
CCOMP				03326
C	MAIN COMPUTATIONAL PROGRAM FOR ABSORPTION SPECTRA,J.R. MORREY			03327
C	PROGRAM SWITCHES AND TAGS			03328
	DIMENSION LCNT(50),KSW(50),KTG(50),FPN(50)			03329
	COMMON LCNT,KSW,KTG,FPN			03330
C	INTERMEDIATE RECORD AREA			03331
	DIMENSION RECA(1020,2)			03332
	COMMON RECA			03333
C	INPUT AREA FROM MASTER OR AUXILIARY FILES			03334
	DIMENSION ABS(500),LWV(500),IDX(4)			03335
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			03336
	DIMENSION ABSA(500),LWVA(500),IDXA(4)			03337
	COMMON ABSA,LWVA,IDXA,BASA,ISNA,NA,INCA,LWEA,LWSA,ISQA,ISRA			03338
	DIMENSION ABSB(500),LWVB(500),IDXB(4)			03339
	COMMON ABSB,LWVB,IDXB,BASB,ISNB,NB,INCB,LWEB,LWSB,ISQB,ISRB			03340
	DIMENSION ABSC(500),LWVC(500),IDXC(4)			03341
	COMMON ABSC,LWVC,IDXC,BASC,ISNC,NC,INCC,LWEC,LWSC,ISQC,ISRC			03342
	DIMENSION ABSD(500),LWVD(500),IDXD(4)			03343
	COMMON ABSD,LWVD,IDXD,BASD,ISND,ND,INCD,LWED,LWSD,ISQD,ISRD			03344
C	OUTPUT AREA			03345
	DIMENSION ABSR(500),LWVR(500),IDXR(4)			03346
	COMMON ABSR,LWVR,IDXR,BASR,ISNR,NR,INCR,LWER,LWSR,ISQR,ISRR			03347
C	TITLE INPUT AREA			03348
	DIMENSION TITA(12),TITB(12),TITC(12)			03349
	COMMON TITA,TITB,TITC			03350
	DIMENSION ESIGN(12,50)			03351
	COMMON ESIGN			03352
	DIMENSION ISP(50),ISAVE(50)			03353
	CALL HELPER			03354
	READ INPUT TAPE 2,11,((ESIGN(I,J),I=1,12),J=1,50)			03355
	PRINT 21			03356
21	FORMAT(1H1, 76HMOUNT TAPES AS PER INSTRUCTION ON PROCEDURE CARD AN			03357
	XD PRESS START TO PROCEED.)			03358
	PAUSE			03359
23	REWIND 4			03360
	REWIND 5			03361
	REWIND 6			03362
	REWIND 7			03363
	REWIND 8			03364
	REWIND 9			03365
	READ INPUT TAPE 2,15,NS,(ISP(I),I=1,NS)			03366
15	FORMAT(14I5)			03367
	LSQ=0			03368
	ISAVE=0			03369
	NS=XMINOF(NS,50)			03370
	NS=XMAXOF(NS,1)			03371
C				03372-

C		D.2	BNWL-343	03373
C				03374
C				03375
	DO 602 I=1,NS			03376
	IF(ISP(I)-0)605,605,602			03377
602	CONTINUE			03378
	GO TO 6020			03379
605	NS=I-1			03380
	IF(NS)608,608,600			03381
608	KTG(5)=30			03382
	CALL ERROR2			03383
	GO TO 1000			03384
6020	IF(ISP(NS+1)-0)600,600,6010			03385
6010	NS=NS+1			03386
	GO TO 6020			03387
600	IER=LCNT(43)			03388
	CALL IOTST(2)			03389
	CALL READ5(RECA,1020,J,IWD,IER)			03390
	LCNT(43)=IER			03391
	GO TO (610,610,620,620,250) ,IER			03392
250	KTG(5)=13			03393
	CALL IOTST(3)			03394
	CALL ERROR2			03395
	GO TO 690			03396
610	CALL MOVE(RECA(1020,J),ISER)			03397
	CALL MOVE(RECA(1019,J),ISEQ)			03398
	DO 640 I=1,NS			03399
	IF(ISER-ISP(I))640,650,640			03400
650	IER=LCNT(46)			03401
	IF(ISEQ-1)660,660,665			03402
C	GUARANTEE AGAINST DUPLICATE LOADING OF SPECTRA AND OMISSION OF OTHER			03403
660	DO 652 K=1,LSQ			03404
	IF(ISEK-ISAVE(K))652,600,652			03405
652	CONTINUE			03406
665	CALL WRITE6(RECA,1020,J,IWD,IER)			03407
	LCNT(46)=IER			03408
	GO TO (601,601,620,620,670),IER			03409
670	KTG(5)=16			03410
	CALL IOTST(3)			03411
	CALL ERROR2			03412
690	REWIND 5			03413
	REWIND 6			03414
	GO TO 28			03415
601	IF(ISEQ-1)600,667,600			03416
667	LSQ=LSQ+1			03417
	ISAVE(LSQ)=ISER			03418
	GO TO 600			03419
640	CONTINUE			03420
	IF(NS-LSQ)620,620,600			03421
620	END FILE 6			03422
	REWIND 6			03423
	REWIND 5			03424
	LCNT(6)=0			03425
25	DO 8 I=1,50			03426
	KTG(I)=0			03427
C				03428-

	D.3	BNWL-343	
C			03429
C			03430
C			03431
	IF(I-6)17,18,17		03432
	17 LCNT(I)=0		03433
	18 KSW(I)=0		03434
	8 FPN(I)=0.0		03435
	CALL IOTST(3)		03436
	READ INPUT TAPE 2,11,TITA,TITB,TITC		03437
	11 FORMAT(12A6)		03438
	READ INPUT TAPE 2,12,ISRA,ISRB,ISRC,ISRD		03439
	12 FORMAT(4I6)		03440
C	ISRA,ETC, ARE SERIAL NUMBERS TO BE LOCATED ON MASTER FILE FOR		03441
C	CALCULATION PURPOSES		03442
	READ INPUT TAPE 2,13,(FPN(I),I=1,50)		03443
	13 FORMAT(10F7.3)		03444
	IF(FPN(19))5963,5962,5963		03445
	5962 FPN(19)=1.0		03446
	5963 READ INPUT TAPE 2,10,(KSW(I),I=1,50)		03447
	10 FORMAT(25I2)		03448
C	KSW(10) DETERMINES WHETHER ALL DATA CARDS HAVE BEEN FED IN. IT		03449
C	MUST BE (0) ON THE NEXT LAST CARD OF RUN.(POSITION 20)		03450
	WRITE OUTPUT TAPE 3,19,TITA		03451
	WRITE OUTPUT TAPE 3,20,TITB,TITC		03452
	19 FORMAT(1H1, 23X,12A6)		03453
	20 FORMAT(1H0, 23X,12A6)		03454
C	PERIPHERAL DATA OUTPUT		03455
C	SERIAL NUMBERS		03456
	WRITE OUTPUT TAPE 3,1,ISRA,ISRB,ISRC,ISRD		03457
	1 FORMAT(1H ,5X,5HISRA=,15,5X,5HISRB=,15,5X,5HISRC=,15,5X,5HISRD=,15		03458
	X)		03459
C	COMBINATION EQUATION		03460
	WRITE OUTPUT TAPE 3,2,(FPN(I),I=11,19)		03461
	2 FORMAT(19H COMBINING EQUATION,74H Y=(,E10.3,4H(YA-,E10.3,2H)+,E10.		03462
	X3,4H(YB-,E10.3,2H)+,E10.3,4H(YC-,E10.3,2H)+,E10.3,4H(YD-,E10.3,2H)		03463
	X),E10.3)		03464
C	PLOTTER SCALES AND RESOLUTION		03465
	WRITE OUTPUT TAPE 3,3,KSW(45),KSW(46)		03466
	3 FORMAT(1H ,21HPLOTTER RESOLUTION IS,12,27H00 COUNTS PER INCH FOR X		03467
	XAND,12,24H00 COUNTS PER INCH FOR Y)		03468
	WRITE OUTPUT TAPE 3,6		03469
	6 FORMAT(1H0,11X,16HCARY 14 SPECTRUM,13X,25HPERKIN-ELMER 521 SPECTRU		03470
	XM)		03471
	IF(KSW(3))4,4,5		03472
B	4 B01=602145276263		03473
B	B02=514644626060		03474
B	B03=606325456330		03475
B	B04=662165254564		03476
B	B05=442225516260		03477
	GO TO 40		03478
B	5 B01=606621652545		03479
B	B02=644422255163		03480
B	B03=604431434331		03481
B	B04=443123514645		03482
B	B05=626060606060		03483
C			03484-

C		D.4	BNWL-343	03485
C				03486
C				03487
B	40	B001=613145233060		03488
B		B002=614421514260		03489
B		B06=676223214325		03490
B		B07=706223214325		03491
B		B08=644531636260		03492
B		B09=606060606060		03493
		MFO=100.*FPN(44)		03494
		WRITE OUTPUT TAPE 3,70,MFO,B01,B02,MFO,B03,B04,B05		03495
	70	FORMAT(1H,4X,12HPLOT ORIGIN=,I5,2A6,5X,12HPLOT ORIGIN=,I5,3A6)		03496
		SFOO=10.*FPN(47)		03497
		WRITE OUTPUT TAPE 3,71,B06,SFOO,B01,B02,B001,B06,SFOO,B03,B04,B05,		03498
		XB001		03499
	71	FORMAT(1H,2X,A6,1H=,E9.3,3A6,2X,A6,1H=,E9.3,4A6)		03500
		SFOO=10.*FPN(45)		03501
		WRITE OUTPUT TAPE 3,71,B06,SFOO,B01,B02,B002,B06,SFOO,B03,B04,B05,		03502
		X002		03503
		SFOO=FPN(48)		03504
		WRITE OUTPUT TAPE 3,71,B07,SFOO,B09,B08,B001,B07,SFOO,B09,B09,B08,		03505
		XB001		03506
		SFOO=FPN(50)		03507
		WRITE OUTPUT TAPE 3,71,B07,SFOO,B09,B08,B002,B07,SFOO,B09,B09,B08,		03508
		XB002		03509
C		LISTING OF KSW + FPN VALUES		03510
		DO 49 I=1,2		03511
		MN=1		03512
		MX=10		03513
		GO TO(42,43),I		03514
	42	WRITE OUTPUT TAPE 3,44		03515
	44	FORMAT(1H,28X,16HLISTING OF KSW-S)		03516
		GO TO 46		03517
	43	WRITE OUTPUT TAPE 3,45		03518
	45	FORMAT(1H,28X,16HLISTING OF FPN-S)		03519
	46	DO 48 K=1,5		03520
		GO TO(47,37),I		03521
	47	WRITE OUTPUT TAPE 3,32,MN,(KSW(J),J=MN,MX),MX		03522
	32	FORMAT(I3,I10,9I5,I6)		03523
		GO TO 35		03524
	37	WRITE OUTPUT TAPE 3,33,MN,(FPN(J),J=MN,MX),MX		03525
	33	FORMAT(I3,10F7.3,I6)		03526
	35	MN=MN+10		03527
	48	MX=MX+10		03528
	49	CONTINUE		03529
	50	KTG(1)=1		03530
		KTG(2)=1		03531
		KTG(3)=1		03532
		KTG(4)=1		03533
		KMAP=XMINUF((XABSF(KSW(1))-1)/10+1),4)		03534
C		KTG(30) IS SET IN NWRITE WHENEVER A PROBLEM IS COMPLETED.		03535
	100	IF(KTG(30))101,101,1000		03536
	101	IER=LCNT(38)		03537
		CALL IOTST(3)		03538
C				03539-

	D.5	BNWL-343	
C			03540
C			03541
C			03542
	CALL READ6(RECA,1020,J,IWD,IER)		03543
	LCNT(38)=IER		03544
	GO TO(150,150,200,200,670),IER		03545
200	DO 201 I=1,KMAP		03546
	IF(KTG(1)-1)5000,5000,201		03547
201	CONTINUE		03548
	GO TO (1000,502,503,504),KMAP		03549
5000	CALL FAILUR(ISAVE,LSQ)		03550
	GO TO 1000		03551
150	CALL MOVE(RECA(1020,J),ISER)		03552
	GO TO (102,202,302,402),KMAP		03553
C	MONOSPECTRUM		03554
102	IF(ISER-ISRA)101,135,101		03555
135	CALL TRANS(RECA,J,ISEQ,LWVS,LWVE,INC,N,ISIGN,BASE,IDX,ABS,LWV)		03556
	KTG(1)=2		03557
	CALL MONOSP		03558
	GO TO 100		03559
C	BISPECTRA		03560
202	IF(ISER-ISRA)206,203,206		03561
206	IF(ISER-ISRB)205,204,205		03562
203	KTG(1)=2		03563
	IER=LCNT(42)		03564
	CALL WRITE4(RECA,1020,J,IWD,IER)		03565
	LCNT(42)=IER		03566
C	SPECTRA ISRA, ISRB, ISRC, AND ISRD WILL BE STORED ON TAPE UNITS		03567
C	(A4),(B7),(B8),(B9), RESPECTIVELY		03568
	IF(IER-2)101,101,2601		03569
B2601	TAPE=606021046060		03570
260	CALL IOTST(3)		03571
	PRINT 2605,TAPE		03572
2605	FORMAT(1H1,9HTAPE UNIT,A6,41H IS BAD. CHANGE TAPE AND RESTART PROG		03573
	XRAM.)		03574
	PAUSE		03575
	GO TO 1000		03576
205	KTAP=XMINOF(KTG(1),KTG(2))		03577
	IF(KTAP-1)101,101,502		03578
204	KTG(2)=2		03579
	IER=LCNT(48)		03580
	CALL WRITE7(RECA,1020,J,IWD,IER)		03581
	LCNT(48)=IER		03582
	IF(IER-2)101,101,2602		03583
B2602	TAPE=606022076060		03584
	GO TO 260		03585
C	TRISPECTRA		03586
302	IF(ISER-ISRA)301,203,301		03587
301	IF(ISER-ISRB)305,204,305		03588
305	IF(ISER-ISRC)307,306,307		03589
306	KTG(3)=2		03590
	IER=LCNT(50)		03591
	CALL WRITE8(RECA,1020,J,IWD,IER)		03592
C			03593-

C		D.6	BNWL-343	03594
C				03595
C				03596
	LCNT(50)=IER			03597
	IF(IER-2)101,101,2603			03598
B2603	TAPE=606022106060			03599
	GO TO 260			03600
307	KTAP=XMINOF(KTG(1),KTG(2),KTG(3))			03601
	IF(KTAP-1)101,101,503			03602
C	QUATRASPECTRA			03603
402	IF(ISER-ISRA)401,203,401			03604
401	IF(ISER-ISRB)405,204,405			03605
405	IF(ISER-ISRC)407,306,407			03606
407	IF(ISER-ISRD)408,409,408			03607
409	KTG(4)=2			03608
	IER=LCNT(39)			03609
	CALL WRITE9(RECA,1020,J,IWD,IER)			03610
	LCNT(39)=IER			03611
	IF(IER-2)101,101,2604			03612
B2604	TAPE=606022116060			03613
	GO TO 260			03614
408	KTAP=XMINOF(KTG(1),KTG(2),KTG(3),KTG(4))			03615
	IF(KTAP-1)101,101,504			03616
504	END FILE 9			03617
	REWIND 9			03618
503	END FILE 8			03619
	REWIND 8			03620
502	END FILE 7			03621
	REWIND 7			03622
	END FILE 4			03623
	REWIND 4			03624
	GO TO (1000,700,800,900),KMAP			03625
700	CALL BISPEC			03626
	GO TO 1000			03627
800	CALL TRISPE			03628
	GO TO 1000			03629
900	CALL QUATSP			03630
1000	REWIND 6			03631
	REWIND 4			03632
	REWIND 7			03633
	REWIND 8			03634
	REWIND 9			03635
	IF(KSW(10)-1)1110,25,1110			03636
1110	PRINT 22			03637
22	FORMAT(1H0,34HREMOVE TAPES. PROCEED TO NEXT JOB.)			03638
	IF (KSW(2)-1)28,27,27			03639
27	CALL HALT			03640
	PRINT 4600,LCNT(6)			03641
4600	FORMAT(1H0,39HPLEASE ENTER ON PLOTTER TAPE LABEL-- ,14,6H PLOTS)			03642
28	PAUSE			03643
	CALL EXIT			03644
1200	END			03645
C				03646-

C		D.7	BNWL-343	03647
C				03648
C				03649
*	LIST8			03650
*	SYMBOL TABLE			03651
	SUBROUTINE BISPEC			03652
C	PROGRAM SWITCHES AND TAGS			03653
	DIMENSION LCNT(50),KSW(50),KTG(50),FPN(50)			03654
	COMMON LCNT,KSW,KTG,FPN			03655
C	INTERMEDIATE RECORD AREA			03656
	DIMENSION RECA(1020,2)			03657
	COMMON RECA			03658
C	INPUT AREA FROM MASTER OR AUXILIARY FILES			03659
	DIMENSION ABS(500),LWV(500),IDX(4)			03660
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			03661
	DIMENSION ABSA(500),LWVA(500),IDXA(4)			03662
	COMMON ABSA,LWVA,IDXA,BASA,ISNA,NA,INCA,LWEA,LWSA,ISQA,ISRA			03663
	DIMENSION ABSB(500),LWVB(500),IDXB(4)			03664
	COMMON ABSB,LWVB,IDXB,BASB,ISNB,NB,INCB,LWEB,LWSB,ISQB,ISRB			03665
	DIMENSION ABSC(500),LWVC(500),IDXC(4)			03666
	COMMON ABSC,LWVC,IDXC,BASC,ISNC,NC,INCC,LWEC,LWSC,ISQC,ISRC			03667
	DIMENSION ABSD(500),LWVD(500),IDXD(4)			03668
	COMMON ABSD,LWVD,IDXD,BASD,ISND,ND,INCD,LWED,LWSD,ISQD,ISRD			03669
C	OUTPUT AREA			03670
	DIMENSION ABSR(500),LWVR(500),IDXR(4)			03671
	COMMON ABSR,LWVR,IDXR,BASR,ISNR,NR,INCR,LWER,LWSR,ISQR,ISRR			03672
C	TITLE INPUT AREA			03673
	DIMENSION TITA(12),TITB(12),TITC(12)			03674
	COMMON TITA,TITB,TITC			03675
	K=KSW(1)-10			03676
	GO TO (1,2,3,4,5,6,7,8,9,10),K			03677
	1 CALL SUBR11			03678
	RETURN			03679
	2 CALL SUBR12			03680
	RETURN			03681
	3 CALL SUBR13			03682
	RETURN			03683
	4 CALL SUBR14			03684
	RETURN			03685
	5 CALL SUBR15			03686
	RETURN			03687
	6 CALL SUBR16			03688
	RETURN			03689
	7 CALL SUBR17			03690
	RETURN			03691
	8 CALL SUBR18			03692
	RETURN			03693
	9 CALL SUBR19			03694
	RETURN			03695
	10 CALL SUBR20			03696
	RETURN			03697
	END			03698
C				03699-

C		D.8	BNWL-343	03700
C				03701
C				03702
*	LIST8			03703
*	SYMBOL TABLE			03704
*	LABEL			03705
CCALI	SUBROUTINE CALIM(NV,ISDQ,NV1,NN,LEN)			03706
	NN=0			03708
	IF(NV-(ISDQ*LEN))100,200,200			03709
100	NV1=NV-LEN*(ISDQ-1)			03710
	NN=1			03711
	GO TO 1000			03712
200	NV1=LEN			03713
1000	RETURN			03714
	END			03715
C				03716
C				03717
C				03718
C				03719
*	LIST8			03720
*	SYMBOL TABLE			03721
*	LABEL			03722
CCNV	CONVERTS X AND Y VALUES FOR PLOTTING			03723
	SUBROUTINE CNV(L,X,XN,XX,LO,FX,Y,YM,YN,YX,FY,K)			03724
C	L= X VALUE TO CONVERT			03725
C	X= CONVERTED VALUE			03726
C	XN= MINIMUM ALLOWABLE VALUE OF X			03727
C	XX= MAXIMUM ALLOWABLE VALUE OF X			03728
C	LO=VALUE OF L AT ORIGIN			03729
C	FX=MULTIPLICATION FACTOR FOR X			03730
C	Y=Y VALUE TO CONVERT			03731
C	YM=CONVERTED VALUE			03732
C	YN=MINIMUM ALLOWABLE VALUE OF Y			03733
C	YX=MAXIMUM ALLOWABLE VALUE OF Y			03734
C	FY=MULTIPLICATION FACTOR FOR Y			03735
C	K=INVERSION TAG FOR X. K=0,NO INVERSION			03736
	YM=Y*FY			03737
	YM=MIN1F(YM,YX)			03738
	YM=MAX1F(YM,YN)			03739
	IF(K)20,10,20			03740
10	X=(FLOATF(L)-FLOATF(LO))*FX			03741
	GO TO 30			03742
20	X=(1.E+08/FLOATF(L)-FLOATF(LO))*FX			03743
30	X=MIN1F(X,XX)			03744
	X=MAX1F(X,XN)			03745
	RETURN			03746
	END			03747
C				03748-

C		D.9	BNWL-343	03749
C				03750
C				03751
*	LIST8			03752
*	SYMBOL TABLE			03753
*	LABEL			03754
C	CDERINT DIFFERENTIATES OR INTEGRATES, DEPENDING ON THE VALUE OF K			03755
	SUBROUTINE DERINT(IX,Y,N,I,N1,K,N2)			03756
C	IX=X ARRAY			03757
C	Y=YARRAY			03758
C	N=TOTAL NO OF DATA			03759
C	I=SEQUENCE NO.			03760
C	N1=NO OF DATA FOR THIS SEQUENCE			03761
C	K=1,DIFFERENTIATE, K=2, INTEGRATE			03762
C	N2 PRODUCES X IF 0, OTHERWISE, INVERSE OF X			03763
	DIMENSION IX(500),Y(500)			03764
	IF(I-1)20,10,20			03765
10	YINT=0.0			03766
20	N3=N1-1			03767
	DO 50 I=1,N3			03768
	IF(N2)25,26,25			03769
26	DX=IX(I+1)-IX(I)			03770
	GO TO 30			03771
25	DX=1.E8*(1./FLOATF(IX(I+1))-1./FLOATF(IX(I)))			03772
30	IF(K-1)35,35,40			03773
35	Y(I)=(Y(I+1)-Y(I))/DX			03774
	GO TO 50			03775
40	Y(I)=YINT+Y(I)*ABSF(DX)			03776
	YINT=Y(I)			03777
	IF(YINT-9.999)50,50,43			03778
43	YINT=YINT-10.			03779
50	IX(I)=FLOATF(IX(I))+DX/2.			03780
	RETURN			03781
	END			03782
C				03783
C				03784
C				03785
C				03786
*	LIST8			03787
*	SYMBOL TABLE			03788
	SUBROUTINE ERROR2			03789
C	PROGRAM SWITCHES AND TAGS			03790
	DIMENSION LCNT(50),KSW(50),KTG(50),FPN(50)			03791
	COMMON LCNT,KSW,KTG,FPN			03792
C	INTERMEDIATE RECORD AREA			03793
	DIMENSION RECA(1020,2)			03794
	COMMON RECA			03795
C	INPUT AREA FROM MASTER OR AUXILIARY FILES			03796
	DIMENSION ABS(500),LWV(500),IDX(4)			03797
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			03798
	DIMENSION ABSA(500),LWVA(500),IDXA(4)			03799
	COMMON ABSA,LWVA,IDXA,BASA,ISNA,NA,INCA,LWEA,LWSA,ISQA,ISRA			03800
	DIMENSION ABSB(500),LWVB(500),IDXB(4)			03801
C				03802-

C		D.10	BNWL-343	03803
C				03804
C				03805
	COMMON	ABSB,LWVB,IDXB,BASB,ISNB,NB,INCB,LWEB,LWSB,ISQB,ISRB		03806
	DIMENSION	ABSC(500),LWVC(500),IDXC(4)		03807
	COMMON	ABSC,LWVC,IDXC,BASC,ISNC,NC,INCC,LWEC,LWSC,ISQC,ISRC		03808
	DIMENSION	ABSD(500),LWVD(500),IDX(4)		03809
	COMMON	ABSD,LWVD,IDX,BASD,ISND,ND,INCD,LWED,LWSD,ISQD,ISRD		03810
C		OUTPUT AREA		03811
	DIMENSION	ABSR(500),LWVR(500),IDXR(4)		03812
	COMMON	ABSR,LWVR,IDXR,BASR,ISNR,NR,INCR,LWER,LWSR,ISQR,ISRR		03813
C		TITLE INPUT AREA		03814
	DIMENSION	TITA(12),TITB(12),TITC(12)		03815
	COMMON	TITA,TITB,TITC		03816
	DIMENSION	ESIGN(12,50)		03817
	COMMON	ESIGN		03818
	1 FORMAT	(12A6)		03819
	2 FORMAT	(1H 5HISRA=,I5,6H ISQA=,I2,6H INCA=,I3,4H NA=,I5,6H ISRB=,I5		03820
	X,6H ISQB=,I2,6H INCB=,I3,4H NB=,I5,6H ISRR=,I5,6H ISQR=,I2,6H INCR			03821
	X=,I3,4H NR=,I5)			03822
	3 FORMAT	(1H ,9H KTG(40)=,I5,9H KTG(41)=,I5,9H KTG(42)=,I5,9H KTG(43)		03823
	X,I5,9H KTG(44)=,I5,9H KTG(45)=,I5,9H KTG(46)=,I5)			03824
	5 FORMAT	(1H ,9H KTG(47)=,I5,9H KTG(48)=,I5,9H KTG(49)=,I5,9H KTG(50)		03825
	X=,I5)			03826
	KTG(8) = 1			03827
	LIF = KTG(5)			03828
C	ERROR MESSAGE			03829
	WRITE OUTPUT TAPE	3,1,(ESIGN(I,LIF),I=1,12)		03830
	IF(LIF - 29)	100,100,30		03831
	30 IF(LIF - 39)	200,200,100		03832
	100 WRITE OUTPUT TAPE	3,2,ISRA,ISQA,INCA,NA,ISRB,ISQB,INCB,NB,ISRR,ISQ		03833
	XR,INCR,NR			03834
	WRITE OUTPUT TAPE	3,3,(KTG(I),I=40,46)		03835
	WRITE OUTPUT TAPE	3,5,(KTG(I),I=47,50)		03836
	IF(LIF - 9)	150,150,105		03837
	105 IF(LIF - 29)	160,160,150		03838
	150 CALL IOTST(3)			03839
	CALL PDUMP			03840
	GO TO 200			03841
	160 PRINT 1,(ESIGN(I,LIF),I=1,12)			03842
	PAUSE	11111		03843
	200 RETURN			03844
	END			03845-
C				03846-

C		D.11	BNWL-343	03847
C				03848
C				03849
*	LIST8			03850
*	SYMBOL TABLE			03851
*	LABEL			03852
CFAIL				03853
	SUBROUTINE FAILUR(ISAVE,LSQ)			03854
C	PROGRAM SWITCHES AND TAGS			03855
	DIMENSION LCNT(50),KSW(50),KTG(50),FPN(50)			03856
	COMMON LCNT,KSW,KTG,FPN			03857
C	INTERMEDIATE RECORD AREA			03858
	DIMENSION RECA(1020,2)			03859
	COMMON RECA			03860
C	INPUT AREA FROM MASTER OR AUXILIARY FILES			03861
	DIMENSION ABS(500),LWV(500),IDX(4)			03862
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			03863
	DIMENSION ABSA(500),LWVA(500),IDXA(4)			03864
	COMMON ABSA,LWVA,IDXA,BASA,ISNA,NA,INCA,LWEA,LWSA,ISQA,ISRA			03865
	DIMENSION ABSB(500),LWVB(500),IDXB(4)			03866
	COMMON ABSB,LWVB,IDXB,BASB,ISNB,NB,INCB,LWEB,LWSB,ISQB,ISRB			03867
	DIMENSION ABSC(500),LWVC(500),IDXC(4)			03868
	COMMON ABSC,LWVC,IDXC,BASC,ISNC,NC,INCC,LWEC,LWSC,ISQC,ISRC			03869
	DIMENSION ABSD(500),LWVD(500),IDXD(4)			03870
	COMMON ABSD,LWVD,IDXD,BASD,ISND,ND,INCD,LWED,LWSD,ISQD,ISRD			03871
C	OUTPUT AREA			03872
	DIMENSION ABSR(500),LWVR(500),IDXR(4)			03873
	COMMON ABSR,LWVR,IDXR,BASR,ISNR,NR,INCR,LWER,LWSR,ISQR,ISRR			03874
C	TITLE INPUT AREA			03875
	DIMENSION TITA(12),TITB(12),TITC(12)			03876
	COMMON TITA,TITB,TITC			03877
	DIMENSION ISAVE(50),IMIS(4)			03878
	IM=0			03879
	CALL IOTST(3)			03880
	IF(KTG(1)-1)20,20,24			03881
20	IM=IM+1			03882
	IMIS(IM)=ISRA			03883
24	IF(ISRB)25,1200,25			03884
25	IF(KTG(2)-1)40,40,34			03885
40	IM=IM+1			03886
	IMIS(IM)=ISRB			03887
34	IF(ISRC)35,1200,35			03888
35	IF(KTG(3)-1)60,60,64			03889
60	IM=IM+1			03890
	IMIS(IM)=ISRC			03891
64	IF(ISRD)65,1200,65			03892
65	IF(KTG(4)-1)80,80,1200			03893
80	IM=IM+1			03894
	IMIS(IM)=ISRD			03895
1200	DO 1250 I=1,LSQ			03896
	DO 1251 J=1,IM			03897
	IF(IMIS(J)-ISAVE(I))1251,1275,1251			03898
1251	CONTINUE			03899
1250	CONTINUE			03900
500	WRITE OUTPUT TAPE 3,12,(IMIS(I),I=1,IM)			03901
C				03902-

C		D.12	BNWL-343	03903
C				03904
C				03905
	12	FORMAT(1H0, 83H THE FOLLOWING SPECTRA ARE NOT FOUND ON B6. IF OTHE		03906
		XR FILES ARE AVAILABLE, TRY THEM.,4I6)		03907
	1300	WRITE OUTPUT TAPE 3,1201,LSQ,(ISAVE(J),J=1,LSQ)		03908
	1201	FORMAT(1H0,10H THERE ARE,15,32H SPECTRA ON TAPE UNIT B6 LABELED,12		03909
		XI6,/2016,/1816)		03910
	1000	RETURN		03911
	1275	PRINT 13		03912
	13	FORMAT(1H0, 96HBAD TRANSFER OF DATA TO B6. RESTART JOB ONCE. IF SE		03913
		XCOND TRY, PRESS START TO PROCEED TO NEXT JOB.)		03914
		PAUSE		03915
		GO TO 500		03916
		END		03917
C				03918
C				03919
C				03920
C				03921
*		LIST8		03922
*		SYMBOL TABLE		03923
*		LABEL		03924
CNWR				03925
		SUBROUTINE NWRITE(ISDR,ISDQ,LWDS,LWDE,IXX,NV,ND2,LWDR,ABDR)		03926
C		PROGRAM SWITCHES AND TAGS		03927
		DIMENSION LCNT(50),KSW(50),KTG(50),FPN(50)		03928
		COMMON LCNT,KSW,KTG,FPN		03929
C		INTERMEDIATE RECORD AREA		03930
		DIMENSION RECA(1020,2)		03931
		COMMON RECA		03932
C		INPUT AREA FROM MASTER OR AUXILIARY FILES		03933
		DIMENSION ABS(500),LWV(500),IDX(4)		03934
		COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER		03935
		DIMENSION ABSA(500),LWVA(500),IDXA(4)		03936
		COMMON ABSA,LWVA,IDXA,BASA,ISNA,NA,INCA,LWEA,LWSA,ISQA,ISRA		03937
		DIMENSION ABSB(500),LWVB(500),IDXB(4)		03938
		COMMON ABSB,LWVB,IDXB,BASB,ISNB,NB,INCB,LWEB,LWSB,ISQB,ISRB		03939
		DIMENSION ABSC(500),LWVC(500),IDXC(4)		03940
		COMMON ABSC,LWVC,IDXC,BASC,ISNC,NC,INCC,LWEC,LWSC,ISQC,ISRC		03941
		DIMENSION ABSD(500),LWVD(500),IDXD(4)		03942
		COMMON ABSD,LWVD,IDXD,BASD,ISND,ND,INCD,LWED,LWSD,ISQD,ISRD		03943
C		OUTPUT AREA		03944
		DIMENSION ABSR(500),LWVR(500),IDXR(4)		03945
		COMMON ABSR,LWVR,IDXR,BASR,ISNR,NR,INCR,LWER,LWSR,ISQR,ISRR		03946
C		TITLE INPUT AREA		03947
		DIMENSION TITA(12),TITB(12),TITC(12)		03948
		COMMON TITA,TITB,TITC		03949
		DIMENSION WV(500),AB(500),LWDR(500),ABDR(500),IRE(500),IDC(4)		03950
		ND1=ND2		03951
		IF(KSW(38))5,6,5		03952
	5	CALL SMOOTH(FPN(5),ND1,ABDR,IXX,ISDQ,KSW(37))		03953
	6	IF(KSW(1)-10)2900,2900,2911		03954
	2911	ISIGN=ISNA		03955
	2900	IF(KSW(6))2903,2902,2903		03956
C				03957-

C	D.13	BNWL-343	03958
C			03959
C			03960
	2903 CALL DERINT(LWDR,ABDR,NV,ISDQ,ND1,KSW(6),KSW(7))		03961
	2902 IF(KSW(27))3442,3441,3442		03962
	3442 CALL THIN(LWDR,ABDR,ND1,KSW ,FPN ,KSAVE,ISDQ,IXX,IRE)		03963
	3441 IF(KSW(44)-1)10,1021,10		03964
	10 CALL IOTST(2)		03965
	CALL REPORT(ISDR,LWDS,LWDE,IXX,NV,ND1,LWDR,ABDR,IRE,ISIGN)		03966
C	OPTION TO PUNCH CARDS		03967
	1021 IF(KSW(14))5452,1022,5452		03968
	5452 IF(KSW(3))5453,5454,5453		03969
	5453 DO 5457 I=1,ND1		03970
	5457 WVL(I)=10.*8/FLOATF(LWDR(I))		03971
	GO TO 5458		03972
	5454 DO 5459 I=1,ND1		03973
	5459 WVL(I)=LWDR(I)		03974
	5458 CALL PNCH(WVL,ABDR,ND1,ISDR,ISDQ)		03975
	1022 IF(KSW(2)-1)1000,301,301		03976
	301 CALL IOTST(2)		03977
	IF(ISDQ-1)300,310,300		03978
	310 MOY = 100.*FPN(46)		03979
	FPN(47)=10.*FPN(47)		03980
	MOX1=FPN(44)*100.		03981
	311 FPX=100.*FLOATF(KSW(45))/FPN(47)		03982
	FPY=100.*FLOATF(KSW(46))/FPN(48)		03983
	AB(1)=0.0		03984
	IF(KSW(3))200,320,200		03985
	320 WVL=LWDS-MOX1		03986
	GO TO 335		03987
	200 WVL=10.*8/FLOATF(LWDE)-FLOATF(MOX1)		03988
	335 MOX=100.*FPN(43)		03989
	WVMT=FLOATF(KSW(41))*FPN(47)		03990
	WVLT=MAX1F(WVLT,WVMT)		03991
C	TEST TO SEE IF THE PLOT WILL FIT ON THE PAPER PROVIDED.		03992
	ABMX=100*KSW(43)*KSW(46)		03993
	ABMN=-100.*FLOATF(KSW(46))*FPN(46)		03994
	WVMX=100.*FLOATF(KSW(45))*FPN(41)-FPN(43)		03995
	WVMN=0.0		03996
	XP=WVLT*FPX/(100.*FLOATF(KSW(45)))+FPN(43)		03997
	IF(XP-FPN(41))50,50,51		03998
	51 LST=LCNT(6)+1		03999
	CALL IOTST(3)		04000
	PRINT 52,LST		04001
	52 FORMAT(1H1,23HPART OR ALL OF PLOT NO.,I3, 91H IS MISSING. WOULD NO		04002
	XT FIT ON PAPER. ANALYST,CHECK CONSISTENCY OF RELEVANT KSW-S AND FP		04003
	XN-S.)		04004
	KSW(2)=0		04005
	GO TO 540		04006
	50 YP=FLOATF(KSW(43))+FPN(46)		04007
	IF(YP-FPN(42))53,53,51		04008
	53 IF (FPN(45))336,338,336		04009
	338 FPN(45)=FPN(47)/10.		04010
C			04011-

C		D.14	BNWL-343	04012
C				04013
C				04014
	336	IF(FPN(50))341,346,341		04015
	346	FPN(50)=FPN(48)		04016
	341	NX=3.005*(WVLT/(10.*FPN(45)))		04017
		NX=XMINOF(NX,500)		04018
		NX1=NX/3		04019
		NY=3.005*(FPN(49)*FPN(48)/FPN(50))		04020
		WVL(1)=FLOATF(NX1)*FPN(45)*10.*FPX		04021
		CALL IOTST(2)		04022
		CALL MODE(2,1)		04023
		CALL ORIGIN(MOX,MOY)		04024
C		TEST ON ACCEPTABILITY OF RESOLUTIONS KSW(45) AND KS-(46)		04025
		IF (ABMX-9900.)700,700,710		04026
	710	KSW(46)=KSW(46)-1		04027
B	720	V=607060606060		04028
		WRITE OUTPUT TAPE 3,730,V,KSW(46)		04029
	730	FORMAT(1H0,17HRESOLUTION ON THE,A2,26H AXIS HAD TO BE CHANGED TO,I		04030
		X3,41H00 COUNTS PER INCH TO ACCOMODATE PLOTTER.)		04031
		GO TO 311		04032
	700	IF(9900.+ABMN)710,750,750		04033
	750	IF(WVMX-9900.)760,760,770		04034
	770	KSW(45)=KSW(45)-1		04035
B		Z=606760606060		04036
		WRITE OUTPUT TAPE 3,730,Z,KSW(45)		04037
		GO TO 311		04038
	760	SY=FPN(49)*FPY*FPN(48)		04039
		IF(WVL(1)-9900.)780,780,770		04040
	780	IF(SY-9900.)790,790,710		04041
	790	CALL SCALE (KSW(45),KSW(46))		04042
		IF(KSW(49)-1)337,342,337		04043
	337	DO 340 I=2,NX,3		04044
		J=I-1		04045
		WVL(I)=WVL(J)		04046
		AB(I)=0.03*FPN(49)*FPY*FPN(48)		04047
		WVL(I+1)=WVL(I)		04048
		AB(I+1)=0.0		04049
		WVL(I+2)=WVL(I)-FPN(45)*10.*FPX		04050
	340	AB(I+2)=0.00		04051
		CALL TOLP(WVL,AB,NX)		04052
	342	IF(KSW(50)-1)343,351,343		04053
	343	WVL(1)=0.0		04054
		AB(1)=0.0		04055
		DO 350 I=2,NY,3		04056
		J=I-1		04057
		AB(I)=AB(J)+FPN(50)*FPY		04058
		WVL(I)=0.0		04059
		AB(I+1)=AB(I)		04060
		WVL(I+1)=0.03*WVLT*FPX		04061
		AB(I+2)=AB(I)		04062
		REFY=AB(I+2)		04063
	350	WVL(I+2)=0.0		04064
C				04065-

C		D.15	BNWL-343	04066
C				04067
C				04068
	CALL TOLP(WVL,AB,NY)			04069
C	BOARDER ALL THE WAY AROUND PLOT			04070
	IF(KSW(42))210,351,210			04071
210	AB(1)=REFY			04072
	WVL(1)=0.0			04073
	DO 220 I=2,NX,3			04074
	J=I-1			04075
	WVL(I)=WVL(J)			04076
	AB(I)=AB(J)-0.03*FPN(49)*FPY*FPN(48)			04077
	WVL(I+1)=WVL(I)			04078
	AB(I+1)=AB(I)			04079
	WVL(I+2)=WVL(I+1)+10.*FPN(45)*FPX			04080
220	AB(I+2)=AB(I)			04081
	CALL TOLP(WVL,AB,NX)			04082
	WVL(1)=FLOATF(NX1)*FPN(45)*FPX*10.			04083
	DO 230 I=2,NY,3			04084
	J=I-1			04085
	WVL(I)=WVL(J)-.03*WVLT*FPX			04086
	AB(I)=AB(J)			04087
	WVL(I+1)=WVL(I)			04088
	AB(I+1)=AB(J)			04089
	WVL(I+2)=WVL(I)			04090
230	AB(I+2)=AB(I+1)-FPN(50)*FPY			04091
	CALL TOLP(WVL,AB,NY)			04092
	CALL TOLP(WVL,0.0,1)			04093
C	ENTERING THE SERIAL NUMBERS ON THE PLOT			04094
351	Y=-KSW(46)*20*(KSW(39)+1)			04095
	X=WVLT*FPX-300.*FLOATF(KSW(45))			04096
	NDIV=10000			04097
	INTG=ISRA			04098
	DO 3000 K=1,4			04099
	DO 3050 J=1,5			04100
	NP1=INTG/NDIV			04101
	IF(NP1)3020,3030,3020			04102
3030	NP1=10			04103
3020	CALL MODE(4,NP1)			04104
	CALL TOLP(X,Y,1)			04105
	X=X+10.*FLOATF(KSW(45))			04106
	IF(NP1-10)3040,3050,3040			04107
3040	INTG=INTG-NP1*NDIV			04108
3050	NDIV=NDIV/10			04109
	GO TO (3060,3070,3080,3090),K			04110
3060	INTG=ISRB			04111
	GO TO 3090			04112
3070	INTG=ISRC			04113
	GO TO 3090			04114
3080	INTG=ISRD			04115
3090	X=X+30.*FLOATF(KSW(45))			04116
3000	NDIV=10000			04117
	CALL MODE(KSW(47),KSW(48))			04118
C				04119-

C		D.16	BNWL-343	04120
C				04121
C				04122
	300	IF(KSW(47)-4)4000,4000,402		04123
	402	DO 410 I=1,ND1		04124
	410	CALL CNV(LWDR(I),WVL(I),WVMN,WVMX,MOX1,FPX,ABDR(I),AB(I),ABMN,ABMX		04125
		X,FPY,KSW(3))		04126
		GO TO 520		04127
	4000	CALL CNV(LWDR(1),WVL(1),WVMN,WVMX,MOX1,FPX,ABDR(1),AB(1),ABMN,ABMX		04128
		X,FPY,KSW(3))		04129
		LT=0		04130
		J=2		04131
		DO 4200 I=2,ND1		04132
		Q= ABSF(ABDR(I)-ABDR(I-1))		04133
		IF(Q)4150,4150,4300		04134
	4150	LT=1		04135
		GO TO 4200		04136
	4300	IF(LT-1)4302,4301,4302		04137
	4301	CALL CNV(LWDR(I-1),WVL(J),WVMN,WVMX,MOX1,FPX,ABDR(I-1),AB(J),ABMN,		04138
		XABMX,FPY,KSW(3))		04139
		J=J+1		04140
	4302	CALL CNV(LWDR(I),WVL(J),WVMN,WVMX,MOX1,FPX,ABDR(I),AB(J),ABMN,ABMX		04141
		X,FPY,KSW(3))		04142
		LT=0		04143
		J=J+1		04144
	4200	CONTINUE		04145
	4101	ND1=J-1		04146
	520	CALL IOTST(2)		04147
		CALL TOLP(WVL,AB,ND1)		04148
	540	CONTINUE		04149
C		PLOTTER OPTION FOR RESOLVED SPECTRA		04150
	5456	IF(KSW(26))5450,5450,5001		04151
	5001	CALL RESPLT(ISDR,LWDS,LWDE,IXX,NV,ND1,LWDR,ABDR,IRE,ISIGN,AB,WVL,I		04152
		XSDQ,WVMN,WVMX,ABMN,ABMX,FPX,FPY,MOX1,KSW(26))		04153
		CALL MODE(KSW(47),KSW(48))		04154
	5450	IF(NV-ISDQ*500)599,599,1000		04155
	599	KTG(30)=1		04156
	600	IF(KSW(9)-1) 605,1000,1000		04157
	605	LCNT(6)=LCNT(6)+1		04158
	606	CALL ORIGIN(0,0)		04159
		CALL SCALE(1,1)		04160
		X=90.*FPN(41)		04161
		Y=90.*FPN(42)		04162
		NP1=LCNT(6)		04163
		CALL MODE(4,NP1)		04164
		CALL TOLP(X,Y,1)		04165
		CALL WAIT		04166
		IF(KSW(40))607,1000,607		04167
	607	PRINT 610,LCNT(6),FPN(42),FPN(41)		04168
	610	FORMAT(1H0,11HPLOT NUMBER,I4,9H REQUIRES,F4.1,2H X,F4.1,84H INCH P		04169
		XAPER. IF NOT ALREADY INDICATED,PLEASE NOTE TO PLOTTER OPERATOR ON		04170
		XPLOT LABEL.)		04171
		END		04172
C				04173-

C		D.17	BNWL-343	04174
C				04175
C				04176
*	LIST8			04177
*	SYMBOL TABLE			04178
*	LABEL			04179
CMAT	SUBROUTINE IN MATCH3			04180
	SUBROUTINE MAT(I,IR,K)			04181
	F=I			04182
	FR=IR			04183
	IRO=IR			04184
	FRO=FR			04185
	DO 20 J=1,10			04186
	DF=FR/F-FLOATF(IR/I)			04187
	IF(DF-1.E-5)100,100,18			04188
18	IR=(J+1)*IRO			04189
20	FR=FLOATF(J+1)*FRO			04190
	K=1			04191
100	RETURN			04192
	END			04193
C				04194
C				04195
C				04196
C				04197
*	LIST8			04198
*	SYMBOL TABLE			04199
*	LABEL			04200
CMAT3	- MATCH3 FINDS INCR WHICH IS AN INTEGRAL FACTOR OF IA,IB,IC,ID			04201
	SUBROUTINE MATCH3(IA,IB,IC,ID,INCR)			04202
C	IF TWO SPECTRA ONLY,SET IC,ID= IA, IF THREE,SET ID=IA IN CALL LIST			04203
	INCR=XMAXUF(IA,IB,IC,ID,1)			04204
	CALL MAT(IA, INCR,KET)			04205
	CALL MAT(IB, INCR,KET)			04206
	CALL MAT(IC, INCR,KET)			04207
	CALL MAT(ID, INCR,KET)			04208
	IF(KET)10,20,10			04209
10	WRITE OUTPUT TAPE 3,11,IA,IB,IC,INCR			04210
11	FORMAT(1H0,30HCOMMON INCREMENT NOT FOUND. IA=,15,4H IB=,15,4H IC=,1			04211
	X5,4H ID=,15)			04212
20	RETURN			04213
	END			04214
C				04215-

C		D.18	BNWL-343	04216
C				04217
C				04218
*	LIST8			04219
*	SYMBOL TABLE			04220
	SUBROUTINE MONOSP			04221
C	PROGRAM SWITCHES AND TAGS			04222
	DIMENSION LCNT(50),KSW(50),KTG(50),FPN(50)			04223
	COMMON LCNT,KSW,KTG,FPN			04224
C	INTERMEDIATE RECORD AREA			04225
	DIMENSION RECA(1020,2)			04226
	COMMON RECA			04227
C	INPUT AREA FROM MASTER OR AUXILIARY FILES			04228
	DIMENSION ABS(500),LWV(500),IDX(4)			04229
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			04230
	DIMENSION ABSA(500),LWVA(500),IDXA(4)			04231
	COMMON ABSA,LWVA,IDXA,BASA,ISNA,NA,INCA,LWEA,LWSA,ISQA,ISRA			04232
	DIMENSION ABSB(500),LWVB(500),IDXB(4)			04233
	COMMON ABSB,LWVB,IDXB,BASB,ISNB,NB,INCB,LWEB,LWSB,ISQB,ISRB			04234
	DIMENSION ABSC(500),LWVC(500),IDXC(4)			04235
	COMMON ABSC,LWVC,IDXC,BASC,ISNC,NC,INCC,LWEC,LWSC,ISQC,ISRC			04236
	DIMENSION ABSD(500),LWVD(500),IDXD(4)			04237
	COMMON ABSD,LWVD,IDXD,BASD,ISND,ND,INCD,LWED,LWSD,ISQD,ISRD			04238
C	OUTPUT AREA			04239
	DIMENSION ABSR(500),LWVR(500),IDXR(4)			04240
	COMMON ABSR,LWVR,IDXR,BASR,ISNR,NR,INCR,LWER,LWSR,ISQR,ISRR			04241
C	TITLE INPUT AREA			04242
	DIMENSION TITA(12),TITB(12),TITC(12)			04243
	COMMON TITA,TITB,TITC			04244
	K=KSW(1)			04245
	GO TO (1,2,3,4,5,6,7,8,9,10),K			04246
	1 CALL SUBR01			04247
	RETURN			04248
	2 CALL SUBR02			04249
	RETURN			04250
	3 CALL SUBR03			04251
	RETURN			04252
	4 CALL SUBR04			04253
	RETURN			04254
	5 CALL SUBR05			04255
	RETURN			04256
	6 CALL SUBR06			04257
	RETURN			04258
	7 CALL SUBR07			04259
	RETURN			04260
	8 CALL SUBR08			04261
	RETURN			04262
	9 CALL SUBR09			04263
	RETURN			04264
	10 CALL SUBR10			04265
	RETURN			04266
	END			04267
C				04268-

C		D.19	BNWL-343	04269
C				04270
C				04271
*	LABEL			04272
CPNCH	THIS VERSION PUNCHES DATA FOR RESOLUTION, BIGGERS AND DUANE			04273
	SUBROUTINE PNCH(X,Y,N,ISER,ISEQ)			04274
C	N=NUMBER OF DATA			04275
	DIMENSION X(500),Y(500),TEMP(6)			04276
	IF(ISEQ-2)10,20,20			04277
10	CALL IOTST(3)			04278
	PRINT 14			04279
14	FORMAT(1H ,113H NOTICE TO CONTROL---CARDS PUNCHED FOR THIS RUN MAY			04280
	X NOT HAVE STANDARD IDENT IN COLUMNS 73-80. PLEASE SAVE ANYWAY.)			04281
	M=1			04282
	PUNCH 13,ISER			04283
13	FORMAT(20H DATA FOR SERIAL NO.,I6, 8H FOLLOW.)			04284
20	DO 30 I=1,N			04285
	TEMP(M)=X(I)			04286
	TEMP(M+1)=Y(I)			04287
	M=M+2			04288
	IF(M-7)30,50,50			04289
50	PUNCH 12,(TEMP(J),J=1,6),ISER			04290
12	FORMAT(1P6E12.5,I7)			04291
	M=1			04292
30	CONTINUE			04293
	RETURN			04294
	END			04295
C				04296
C				04297
C				04298
C				04299
*	LIST8			04300
*	SYMBOL TABLE			04301
	SUBROUTINE QUATSP			04302
C	PROGRAM SWITCHES AND TAGS			04303
	DIMENSION LCNT(50),KSW(50),KTG(50),FPN(50)			04304
	COMMON LCNT,KSW,KTG,FPN			04305
C	INTERMEDIATE RECORD AREA			04306
	DIMENSION RECA(1020,2)			04307
	COMMON RECA			04308
C	INPUT AREA FROM MASTER OR AUXILIARY FILES			04309
	DIMENSION ABS(500),LWV(500),IDX(4)			04310
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			04311
	DIMENSION ABSA(500),LWVA(500),IDXA(4)			04312
	COMMON ABSA,LWVA,IDXA,BASA,ISNA,NA,INCA,LWEA,LWSA,ISQA,ISRA			04313
	DIMENSION ABSB(500),LWVB(500),IDXB(4)			04314
	COMMON ABSB,LWVB,IDXB,BASB,ISNB,NB,INCB,LWEB,LWSB,ISQB,ISRB			04315
	DIMENSION ABSC(500),LWVC(500),IDXC(4)			04316
	COMMON ABSC,LWVC,IDXC,BASC,ISNC,NC,INCC,LWEC,LWSC,ISQC,ISRC			04317
	DIMENSION ABSD(500),LWVD(500),IDXD(4)			04318
	COMMON ABSD,LWVD,IDXD,BASD,ISND,ND,INCD,LWED,LWSD,ISQD,ISRD			04319
C	OUTPUT AREA			04320
	DIMENSION ABSR(500),LWVR(500),IDXR(4)			04321
	COMMON ABSR,LWVR,IDXR,BASR,ISNR,NR,INCR,LWER,LWSR,ISQR,ISRR			04322
C				04323-

C		D.20	BNWL-343	04324
C				04325
C				04326
C				04327
	TITLE INPUT AREA			04328
	DIMENSION TITA(12),TITB(12),TITC(12)			04329
	COMMON TITA,TITB,TITC			04330
	K=KSW(1)-30			04331
	GO TO (1,2,3,4,5,6,7,8,9,10),K			04332
1	CALL SUBR31			04333
	RETURN			04334
2	CALL SUBR32			04335
	RETURN			04336
3	CALL SUBR33			04337
	RETURN			04338
4	CALL SUBR34			04339
	RETURN			04340
5	CALL SUBR35			04341
	RETURN			04342
6	CALL SUBR36			04343
	RETURN			04344
7	CALL SUBR37			04345
	RETURN			04346
8	CALL SUBR38			04347
	RETURN			04348
9	CALL SUBR39			04349
	RETURN			04350
10	CALL SUBR40			04351
	RETURN			04352
	END			04353
C				04354
C				04355
C				04356
C				04357
*	LIST8			04358
*	SYMBOL TABLE			04359
*	LABEL			04360
CRLOA				04361
	SUBROUTINE RLOAD(JJ)			04362
C	SUBROUTINE RLOAD(JJ) IS USED TO READ TAPE UNITS A4,B7,B8,AND B9.			04363
C	PROGRAM SWITCHES AND TAGS			04364
	DIMENSION LCNT(50),KSW(50),KTG(50),FPN(50)			04365
	COMMON LCNT,KSW,KTG,FPN			04366
C	INTERMEDIATE RECORD AREA			04367
	DIMENSION RECA(1020,2)			04368
	COMMON RECA			04369
C	INPUT AREA FROM MASTER OR AUXILIARY FILES			04370
	DIMENSION ABS(500),LWV(500),IDX(4)			04371
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			04372
	DIMENSION ABSA(500),LWVA(500),IDXA(4)			04373
	COMMON ABSA,LWVA,IDXA,BASA,ISNA,NA,INCA,LWEA,LWSA,ISQA,ISRA			04374
	DIMENSION ABSB(500),LWVB(500),IDXB(4)			04375
	COMMON ABSB,LWVB,IDXB,BASB,ISNB,NB,INCB,LWEB,LWSB,ISQB,ISRB			04376
	DIMENSION ABSC(500),LWVC(500),IDXC(4)			04377
	COMMON ABSC,LWVC,IDXC,BASC,ISNC,NC,INCC,LWEC,LWSC,ISQC,ISRC			04378-

C		D.21	BNWL-343	04379
C				04380
C				04381
	DIMENSION ABSD(500),LWVD(500),IDX(4)			04382
	COMMON ABSD,LWVD,IDX,BASD,ISND,ND,INCD,LWED,LWSD,ISQD,ISRD			04383
C	OUTPUT AREA			04384
	DIMENSION ABSR(500),LWVR(500),IDXR(4)			04385
	COMMON ABSR,LWVR,IDXR,BASR,ISNR,NR,INCR,LWER,LWSR,ISQR,ISRR			04386
C	TITLE INPUT AREA			04387
	DIMENSION TITA(12),TITB(12),TITC(12)			04388
	COMMON TITA,TITB,TITC			04389
	DIMENSION RECB(1020,2)			04390
	DIMENSION RECC(1020,2)			04391
	DIMENSION RECD(1020,2)			04392
C	JJ=1,A4,RECA,ISRA			04393
C	JJ=2,B7,RECB,ISRB			04394
C	JJ=3,B8,RECC,ISRC			04395
C	JJ=4,B9,RECD,ISRD			04396
	10 GO TO (11,21,31,41),JJ			04397
	11 IER=LCNT(41)			04398
	CALL READ4(RECA,1020,J,IWD,IER)			04399
	LCNT(41)=IER			04400
	GO TO (150,150,300,343,300),IER			04401
	343 KTG(5)=3			04402
	CALL ERROR2			04403
	GO TO 1000			04404
	150 CALL MOVE(RECA(1020,J),ISRA)			04405
	CALL TRANS(RECA,J,ISQA,LWSA,LWEA,INCA,NA,ISNA,BASA,IDX,ABSA,LWVA)			04406
	CALL CALIM(NA,ISQA,NA1,NN,500)			04407
	GO TO 1000			04408
	21 IER=LCNT(47)			04409
	CALL READ7(RECB,1020,K,IWD,IER)			04410
	LCNT(47)=IER			04411
	GO TO (155,155,305,344,305),IER			04412
	344 KTG(5)=4			04413
	CALL ERROR2			04414
	GO TO 1000			04415
	155 CALL MOVE(RECB(1020,K),ISRB)			04416
	CALL TRANS(RECB,K,ISQB,LWSB,LWEB,INCB,NB,ISNB,BASB,IDX,ABSB,LWVB)			04417
	CALL CALIM(NB,ISQB,NB1,NN,500)			04418
	GO TO 1000			04419
	300 KTG(5)=14			04420
	CALL ERROR2			04421
	GO TO 1000			04422
	305 KTG(5)=15			04423
	CALL ERROR2			04424
	31 IER=LCNT(49)			04425
	CALL READ8(RECC,1020,L,IWD,IER)			04426
	LCNT(49)=IER			04427
	GO TO (255,255,405,444,405),IER			04428
	444 KTG(5)=5			04429
	CALL ERROR2			04430
	GO TO 1000			04431
	255 CALL MOVE(RECC(1020,L),ISRC)			04432
	CALL TRANS(RECC,L,ISQC,LWSC,LWEC,INCC,NC,ISNC,BASC,IDX,ABSC,LWVC)			04433
C				04434-

C		D.22	BNWL-343	04435
C				04436
C				04437
	CALL CALIM(NC,ISQC,NC1,NN,500)			04438
	GO TO 1000			04439
405	KTG(5)=13			04440
	CALL ERROR2			04441
	GO TO 1000			04442
41	IER=LCNT(40)			04443
	CALL READ9(RECD,1020,M,IWD,IER)			04444
	LCNT(40)=IER			04445
	GO TO (355,355,505,544,505),IER			04446
544	KTG(5)=7			04447
	CALL ERROR2			04448
	GO TO 1000			04449
355	CALL MOVE(RECD(1020,M),ISRD)			04450
	CALL TRANS(RECD,M,ISQD,LWSD,LWED,INCD,ND,ISND,BASD,IDX,ABSD,LWVD)			04451
	CALL CALIM(ND,ISQD,ND1,NN,500)			04452
	GO TO 1000			04453
505	KTG(5)=34			04454
	CALL ERROR2			04455
1000	RETURN			04456
	END			04457
C				04458
C				04459
C				04460
C				04461
*	LIST8			04462
*	SYMBOL TABLE			04463
*	LABEL			04464
CREPO	REPORT PROVIDES THE NUMERICAL OUTPUT FROM THE COMPUTATIONAL SERIES			04465
	SUBROUTINE REPORT(ISDR,LWDS,LWDE,IXX,NV,ND1,LWDR,ABDR,IRE,ISIGN)			04466
	DIMENSION LWDR(500),ABDR(500),IRE(500)			04467
10	WRITE OUTPUT TAPE 3,20,ISDR,LWDS,LWDE,IXX,NV			04468
20	FORMAT(1H1,9H SERIAL NO,16,23H STARTING WAVELENGTH,16,21H	END		04469
	XING WAVELENGTH,16,13H INCREMENT,16,14H NO OF DATA,16)			04470
	LIN=0			04471
	LPG=1			04472
	DO 29 I=1,ND1			04473
29	IRE(I) = 10.**8/FLOATF(LWDR(I))			04474
	DO 1020 I=1,ND1,17			04475
	IF(LIN-42)1019,1018,1018			04476
1018	LPG=LPG+1			04477
	WRITE OUTPUT TAPE 3,45,ISDR,LPG			04478
	45 FORMAT (1H1,10X,13H SERIAL NUMBER,16,5X,9H CONTINUED,50X,4H PAGE,13)			04479
	LIN = 0			04480
1019	KEND=XMINOF(ND1,I+16)			04481
	GO TO (2000,2000,2010,2010,2020,2020,2030,2030),ISIGN			04482
C	CARY ABSORBANCE			04483
2000	WRITE OUTPUT TAPE 3,30,(LWDR(J),J=1,KEND)			04484
30	FORMAT(1H0,3X,12H WAVELENGTH,A,17I6)			04485
	WRITE OUTPUT TAPE 3,40,(ABDR(J),J=1,KEND)			04486
40	FORMAT(1H ,5X,10H ABSORBANCE,17F6.3)			04487
	WRITE OUTPUT TAPE 3,35,(IRE(J),J=1,KEND)			04488
C				04489-

C	D.23	BNWL-343	04490
C			04491
C			04492
	35	FORMAT(1H,1X,14HFREQUENCY,1/CM,17I6)	04493
		GO TO 2040	04494
C		CARY PERCENT T	04495
	2010	WRITE OUTPUT TAPE 3,30,(LWDR(J),J=I,KEND)	04496
		WRITE OUTPUT TAPE 3,2050,(ABDR(J),J=I,KEND)	04497
		WRITE OUTPUT TAPE 3,35,(IRE(J),J=I,KEND)	04498
	2050	FORMAT(1H,6X,9HPERCENT T,17F6.1)	04499
		GO TO 2040	04500
C		PERKIN-ELMER ABSORBANCE	04501
	2020	WRITE OUTPUT TAPE 3,2060,(LWDR(J),J=I,KEND)	04502
		WRITE OUTPUT TAPE 3,40,(ABDR(J),J=I,KEND)	04503
		WRITE OUTPUT TAPE 3,2070,(IRE(J),J=I,KEND)	04504
	2060	FORMAT(1H0,15HTENTHWAVENUMBER,17I6)	04505
	2070	FORMAT(1H,3X,12HMILLIMICRONS,17I6)	04506
		GO TO 2040	04507
C		PERKIN ELMER PERCENT T	04508
	2030	WRITE OUTPUT TAPE 3,2060,(LWDR(J),J=I,KEND)	04509
		WRITE OUTPUT TAPE 3,2050,(ABDR(J),J=I,KEND)	04510
		WRITE OUTPUT TAPE 3,2070,(IRE(J),J=I,KEND)	04511
	2040	LIN=LIN+4	04512
	1020	CONTINUE	04513
		RETURN	04514
		END	04515
C			04516
C			04517
C			04518
C			04519
*		LIST8	04520
*		SYMBOL TABLE	04521
*		LABEL	04522
		CRESPLT PLOTS RESOLVED SPECTRAL EVELOPES AND DISTRIBUTION CURVES	04523
		SUBROUTINE RESPLT(ISDR,LWDS,LWDE,IXX,NV,ND1,LWDR,ABDR,IRE,ISIGN,AB	04524
		X,WVL,ISDQ,WVMN,WVMX,ABMN,ABMX,FPX,FPY,MOX1,KFOR)	04525
		DIMENSION AB(500),WVL(500),ABDR(500),LWDR(500),A(102),IRE(500)	04526
		GO TO(10,10,50,50,10,10,50,50),ISIGN	04527
	50	WRITE OUTPUT TAPE 3,51	04528
	51	FORMAT(1H0,51H RESOLUTION PROGRAM CAN NOT HANDLE PERCENT T.SORRY.)	04529
		GO TO 1000	04530
	10	IF(ISDQ-2)920,930,930	04531
	920	READ INPUT TAPE 2,921,NPAR	04532
	921	FORMAT(I4)	04533
		NPAR=XMINOF(NPAR,100)	04534
		KFORM=XMINOF(KFOR,3)	04535
		KFORM=XMAXOF(KFOR,1)	04536
		DO 410 J=1,NPAR,3	04537
	925	READ INPUT TAPE 2,922,DMY,DMY,A(J),DMY,A(J+1),DMY,{A(J+2),DMY}	04538
	922	FORMAT(A6,A2,3(E14.7,A2))	04539
		GO TO(401,402,403),KFORM	04540
	401	ALP= SQRTF(2.) -1.	04541
		GO TO 410	04542
	402	ALP=1.0	04543
C			04544-

C		D.24	BNWL-343	04545
C				04546
C				04547
	GO TO 410			04548
	403 ALP=LOGF(2.0)			04549
	410 A(J+1)=ALP/(A(J+1))**2			04550
C	PLOT SPECTRAL RESOLUTION CURVES- FIRST DISTRIBUTIONS, THEN ENVELOPES.			04551
C	CALCULATE INDIVIDUAL DISTRIBUTIONS			04552
	930 DO 119 I=1,ND1			04553
	LWDR(I)=WVL(I)/FPX+FLOATF(MOX1)			04554
	119 ABDR(I)=0.0			04555
	CALL MODE(4,0)			04556
	DO 100 J=1,NPAR,3			04557
	K=1			04558
	KFORM=KFORM			04559
	DO 200 K1=1,ND1			04560
	GO TO(110,115,120),KFORM			04561
	110 AB(K)=A(J+2)/(1.+A(J+1))*(FLOATF(LWDR(K1))-A(J))**2)**2			04562
	GO TO 125			04563
	115 AB(K)=A(J+2)/(1.+A(J+1))*(FLOATF(LWDR(K1))-A(J))**2)			04564
	GO TO 125			04565
	120 AB(K)=A(J+2)*EXP(-A(J+1)*(FLOATF(LWDR(K1))-A(J))**2)			04566
	125 ABDR(K1)=ABDR(K1)+AB(K)			04567
	IF(AB(K)*FPY-0.001*ABMX)200,200,130			04568
	130 X=WVL(K1)			04569
	Y=AB(K)*FPY			04570
	IRE(K)=LWDR(K1)			04571
	Y=MIN1F(Y,ABMX)			04572
	Y=MAX1F(Y,ABMN)			04573
	K=K+1			04574
	170 CALL TOLP(X,Y,1)			04575
	200 NRS=K-1			04576
	IF(NRS)100,100,161			04577
	161 WRITE OUTPUT TAPE 3,160,A(J),A(J+1),A(J+2)			04578
	160 FORMAT(1H1,59H CONTRIBUTION FROM FOLLOWING RESOLUTION PEAK IS BELO			04579
	XW.,NUO=,F8.2,4H BU=,E10.3,5H AO=,F10.3)			04580
	CALL REPORT(ISDR,LWDS,LWDE,IXX,NV,NRS,IRE,AB,IRE,ISIGN)			04581
	100 CONTINUE			04582
C	PLOT OF COMPOSITE SPECTRUM			04583
	DO 300 K=1,ND1			04584
	X=WVL(K)			04585
	Y=ABDR(K)*FPY			04586
	Y=MAX1F(Y,ABMN)			04587
	Y=MIN1F(Y,ABMX)			04588
	270 CALL TOLP(X,Y,1)			04589
	300 CONTINUE			04590
	WRITE OUTPUT TAPE 3,260			04591
	260 FORMAT(1H1,51H FOLLOWING OUTPUT IS FOR COMPOSITE RESOLUTION CURVE)			04592
	CALL REPORT(ISDR,LWDS,LWDE,IXX,NV,ND1,LWDR,ABDR,LWDR,ISIGN)			04593
	1000 RETURN			04594
	END			04595
C				04596-

C	D.25	BNWL-343	04597
C			04598
C			04599
*	LIST8		04600
*	SYMBOL TABLE		04601
*	LABEL		04602
C	CSMOOTH		04603
C	SAVITSKY CONVOLUTION MODIFICATION FOR QUARTIC AND QUINTIC EQUATIONS		04604
C	DATED 8/2/66		04605
C	AVERAGING OVER 5 SECONDS -- A MINIMUM OF 7 POINTS AND A MAXIMUM OF 25.		04606
	SUBROUTINE SMOOTH(F,M,AB,IN,ISQ,J)		04607
C	CSMOOTH IS A SUBROUTINE WHICH IS DESIGNED TO AVERAGE SPECTRAL DATA THUS		04608
C	TAKING OUT UNNECESSARY NOISE. IF THE SWITCH KSW(38) ON THE LAST		04609
C	DATUM CARD OF A PROBLEM IN COLUMNS 25 AND 26 IS IS DIFFERENT FROM		04610
C	BLANK OR ZERO, SMOOTH WILL BE CALLED IN NWRITE.		04611
C	F IS THE SPEED AT WHICH THE SPECTRUM WAS TAKEN IN ANGST/SEC.		04612
C	M IS THE TOTAL NUMBER OF DATA TO BE SMOOTHED.		04613
C	AB IS THE ARRAY TO BE SMOOTHED. MAXIMUM ARRAY IS AB(500)		04614
C	IN IS THE INCREMENT ASSOCIATED WITH THE ARRAY AB.		04615
C	ISQ IS THE SEQUENCE NO. OF THE SPECTRUM BEING SMOOTHED		04616
C	J IS THE NO. OF DATA TO USE ADJACENT TO THE SMOOTHED POINT. IF		04617
C	LEFT ZERO, IT WILL BE CALCULATED BY PROGRAM TO INCLUDE 5 SECONDS		04618
C	OF OPERATION IN ACCUMULATION OF DATA.(LIMITS--7 TO 25)		04619
C	FOLLOW BY COMPUTATIONAL COMMON		04620
C	PROGRAM SWITCHES AND TAGS		04621
	DIMENSION LCNT(50),KSW(50),KTG(50),FPN(50)		04622
	COMMON LCNT,KSW,KTG,FPN		04623
C	INTERMEDIATE RECORD AREA		04624
	DIMENSION RECA(1020,2)		04625
	COMMON RECA		04626
C	INPUT AREA FROM MASTER OR AUXILIARY FILES		04627
	DIMENSION ABS(500),LWV(500),IDX(4)		04628
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER		04629
	DIMENSION ABSA(500),LWVA(500),IDXA(4)		04630
	COMMON ABSA,LWVA,IDXA,BASA,ISNA,NA,INCA,LWEA,LWSA,ISQA,ISRA		04631
	DIMENSION ABSB(500),LWVB(500),IDXB(4)		04632
	COMMON ABSB,LWVB,IDXB,BASB,ISNB,NB,INCB,LWEB,LWSB,ISQB,ISRB		04633
	DIMENSION ABSC(500),LWVC(500),IDXC(4)		04634
	COMMON ABSC,LWVC,IDXC,BASC,ISNC,NC,INCC,LWEC,LWSC,ISQC,ISRC		04635
	DIMENSION ABSD(500),LWVD(500),IDXD(4)		04636
	COMMON ABSD,LWVD,IDXD,BASD,ISND,ND,INCD,LWED,LWSD,ISQD,ISRD		04637
C	OUTPUT AREA		04638
	DIMENSION ABSR(500),LWVR(500),IDXR(4)		04639
	COMMON ABSR,LWVR,IDXR,BASR,ISNR,NR,INCR,LWER,LWSR,ISQR,ISRR		04640
C	TITLE INPUT AREA		04641
	DIMENSION TITA(12),TITB(12),TITC(12)		04642
	COMMON TITA,TITB,TITC		04643
	DIMENSION ESIGN(12,50)		04644
	COMMON ESIGN		04645
	DIMENSION AB(500)		04646
	DIMENSION TE(25),C(13)		04647
	IF(ISQ-1)10,201,10		04648
10	NNB=1		04649
	NE=M-NNC		04650
	GO TO 327		04651
C			04652-

C		D.26	BNWL-343	04653
C				04654
C				04655
	201	KS=KSW(38)		04656
		FSP=F		04657
		IF(FSP)203,202,203		04658
	202	FSP=25.		04659
	203	IF(J)204,205,204		04660
	205	J=FSP*5./FLOATF(IN)		04661
	204	J=XMAXOF(J,7)		04662
		J=XMINOF(J,25)		04663
C		ASSURE J IS ODD		04664
	40	N2=J/2		04665
		N3=2*N2		04666
		IF(N3-J)250,3,250		04667
	3	J=J+1		04668
	250	NNB=J/2+1		04669
	252	NNC=J/2		04670
		NE = M - NNC		04671
		JB=13-NNC		04672
		JB1=JB+1		04673
		JE=13+NNC		04674
		NO=XMAXOF((J-5)/2,1)		04675
		NO=XMINOF(NO,10)		04676
		GO TO(407,409,411,413,415,417,419,421,423,425),NO		04677
	407	C(1)=131.		04678
		C(2)=75.		04679
		C(3)=-30.		04680
		C(4)=5		04681
		N2=4		04682
		WS2=231.		04683
		GO TO 327		04684
	409	C(1)=179.		04685
		C(2)=135.		04686
		C(3)=30.		04687
		C(4)=-55.		04688
		C(5)=15.		04689
		N2=5		04690
		WS2=429.		04691
		GO TO 327		04692
	411	C(1)=143.		04693
		C(2)=120.		04694
		C(3)=60.		04695
		C(4)=-10.		04696
		C(5)=-45.		04697
		C(6)=18.		04698
		N2=6		04699
		WS2=429.		04700
		GO TO 327		04701
	413	C(1)=677.		04702
		C(2)=600.		04703
		C(3)=390.		04704
		C(4)=110.		04705
C				04706-

C
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D.27

BNWL-343

C(5)=-135.
C(6)=-198.
C(7)=110.
N2=7
WS2=2431.
GO TO 327
415 C(1)=11063.
C(2)=10125.
C(3)=7500.
C(4)=3755.
C(5)=-165.
C(6)=-2937.
C(7)=-2860.
C(8)=2145.
N2=8
WS2=46189.
GO TO 327
417 C(1)=883.
C(2)=825.
C(3)=660.
C(4)=415.
C(5)=135.
C(6)=-117.
C(7)=-260.
C(8)=-195.
C(9)=195.
N2=9
WS2=4199.
GO TO 327
419 C(1)=1393.
C(2)=1320.
C(3)=1110.
C(4)=790.
C(5)=405.
C(6)=18.
C(7)=-290.
C(8)=-420.
C(9)=-255.
C(10)=340.
N2=10.
WS2=7429.
GO TO 327
421 C(1)=44003.
C(2)=42120.
C(3)=36660.
C(4)=28190.
C(5)=17655.
C(6)=6378.
C(7)=-3940.
C(8)=-11220.
C(9)=-13005.
C(10)=-6460.

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D.28

BNWL-343

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      C(11)=11628.
      N2=11
      WS2=260015.
      GO TO 327
423  C(1)=1011.
      C(2)=975.
      C(3)=870.
      C(4)=705.
      C(5)=495.
      C(6)=261.
      C(7)=30.
      C(8)=-165.
      C(9)=-285.
      C(10)=-285.
      C(11)=-114.
      C(12)=285.
      N2=12.
      WS2=6555.
      GO TO 327
425  C(1)=4253.
      C(2)=4125.
      C(3)=3750.
      C(4)=3155.
      C(5)=2385.
      C(6)=1503.
      C(7)=590.
      C(8)=-255.
      C(9)=-915.
      C(10)=+1255.
      C(11)=-1122.
      C(12)=-345.
      C(13)= 1265.
      N2=13
      WS2=30015.
327  DO 20 K1=1,KS
      IF(1SQ-1)224,220,224
220  I1=0
      DO 222 I=JB1,JE
      I1=I1+1
222  TE(I)=AB(I1)
      GO TO 232
224  DO 228 I=JB1,8
      I1=I+NNC
228  TE(I)=TE(I1)
      I1=0
      DO 230 I=14,JE
      I1=I1+1
230  TE(I)=AB(I1)
232  DO 19 I = NNB,NE
      DO 260 L1=JB1,JE
      L2=L1-1
260  TE(L2)=TE(L1)

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C		D.29	BNWL-343	04819
C				04820
C				04821
	L2=L2+1			04822
	L3=I+NNC			04823
	TE(L2)=AB(L3)			04824
C	TEST FOR SPURIOUS POINTS			04825
	IF(KSW(36))270,261,270			04826
261	J1=L2-4			04827
	J2=L2-3			04828
	J3=L2-2			04829
	J4=L2-1			04830
	J5=L2			04831
	J6=L3-1			04832
	A=(TE(J1)+TE(J5))/2.			04833
	B=(TE(J5)-TE(J1))/4.			04834
	V4=(TE(J4)-A-B)**2			04835
	V=V4+(TE(J2)-A+B)**2+(TE(J3)-A)**2			04836
	RA=V4/V			04837
	IF(RA-G.95)270,262,262			04838
262	TE(J4)=(TE(J3)+TE(J5))/2.			04839
	AB(J6)=TE(J4)			04840
270	ADD=TE(13)*C(1)			04841
	DO 280 I2=2,N2			04842
	I3=14-I2			04843
	I4=12+I2			04844
280	ADD=ADD+C(I2)*(TE(I3)+TE(I4))			04845
430	AB(I)=ADD/WS2			04846
19	CONTINUE			04847
20	CONTINUE			04848
1000	RETURN			04849
	END			04850
C				04851
C				04852
C				04853
C				04854
*	LIST8			04855
*	SYMBOL TABLE			04856
*	LABEL			04857
CSCAT				04858
	SUBROUTINE SCAT(B,DEN,KDV,IPCT)			04859
C	LOGIC TO SET UP FOR SCATTER CORRECTIONS			04860
C	B(I,J) REPRESENTS THE ITH ABSORBANCE IF J=1 AND THE ITH WAVELENGT			04861
C	IF J IS 2			04862
C	UP TO FIVE SETS OF DATA ARE TO BE HANDLED BY THIS PROGRAM.			04863
C	THIS IS A LAGRANGIAN INTERPOLATION METHOD TO FIT UP TO 5 POINTS T			04864
C	A POLYNOMIAL. SCAT EVALUATES THE COEFFICIENTS WHICH WILL LATER BE			04865
C	USED BY THE CALLING PROGRAM)			04866
C	PROGRAM SWITCHES AND TAGS			04867
	DIMENSION LCNT(50),KSW(50),KTG(50),FPN(50)			04868
	COMMON LCNT,KSW,KTG,FPN			04869
	DIMENSION DEN(5),B(5,2)			04870
	CALL IOTST(2)			04871
	KS=21			04872
C				04873-

C		D.30	BNWL-343	04874
C				04875
C				04876
	KY=22			04877
	DO 5 I=1,5			04878
	DEN(I)=1.			04879
	B(I,1)=FPN(KS)			04880
	B(I,2)=FPN(KY)/100.			04881
	KS=KS+2			04882
5	KY=KY+2			04883
	IPCT=0			04884
	DO 10 I=1,5			04885
	IF(B(I,2))11,11,10			04886
10	IPCT=IPCT+1			04887
11	IF(IPCT-2)900,100,100			04888
100	DO 20 J=1,IPCT			04889
	DO 30 I=1,IPCT			04890
	IF(J-I)37,30,37			04891
37	DEN(J)=DEN(J)/(B(J,2)-B(I,2))			04892
30	CONTINUE			04893
	DEN(J)=DEN(J)*B(J,1)			04894
20	CONTINUE			04895
	WRITE OUTPUT TAPE 3,230			04896
230	FORMAT(1H0,112H THE COMBINATION EQUATION ABOVE HAS BEEN MODIFIED.			04897
	XSCATTER CORRECTION HAS BEEN MADE BY LAGRANGIAN EXTRAPOLATION.)			04898
	WRITE OUTPUT TAPE 3,240			04899
240	FORMAT(1H0,108HY IN ABSORBANCE X IN MICRONS (VALUES BELOW			04900
	XARE THOSE USED FOR THE LAGRANGIAN POLYNOMIAL SCATTER FIT.)			04901
	WRITE OUTPUT TAPE 3,232,((B(I,J),J=1,2),1,DEN(I),I=1,IPCT)			04902
232	FORMAT(F12.3,F19.4,5X,4HDEN(I,2H)=E13.6)			04903
	GO TO 1000			04904
900	WRITE OUTPUT TAPE 3,901			04905
901	FORMAT(1H0, 82H NOT ENOUGH DATA ARE AVAILABLE TO CALCULATE SCATTE			04906
	X. CHECK FPN(21) THROUGH FPN(24))			04907
	KDV=0			04908
1000	RETURN			04909
	END			04910
C				04911
C				04912
C				04913
C				04914
CUS01				04915
	SUBROUTINE SUBR01			04916
	I=01			04917
	CALL SUBDMY(I)			04918
	RETURN			04919
	END			04920
				04921
				04922
				04923
				04924
*	LABEL			04925
CSDMY				04926
	SUBROUTINE SUBDMY(I)			04927
C				04928-

C		D.31	BNWL-343	04929
C				04930
C				04931
C				04932
	WRITE OUTPUT TAPE 3,1,1			04933
	1 FORMAT(1H1,15H SUBROUTINE SUBR,I2,33H HAS BEEN CALLED BUT NOT WRITTEN.)			04934
	RETURN			04935
	END			04936
C				04937
C				04938
C				04939
C				04940
*	LIST8			04941
*	SYMBOL TABLE			04942
*	LABEL			04943
CSUB2				04944
	SUBROUTINE SUBR02			04945
C	SUBROUTINE SUBR02 CALCULATES THE PERCENT TRANSMISSION OR TRANSMITTANCE FROM ABSORBANCE OR ABSORPTIVITY.			04946
C	PROGRAM SWITCHES AND TAGS			04947
C	DIMENSION LCNT(50),KSW(50),KTG(50),FPN(50)			04948
	COMMON LCNT,KSW,KTG,FPN			04949
C	INTERMEDIATE RECORD AREA			04950
	DIMENSION RECA(1020,2)			04951
	COMMON RECA			04952
C	INPUT AREA FROM MASTER OR AUXILIARY FILES			04953
	DIMENSION ABS(500),LWV(500),IDX(4)			04954
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,IN3,LWVE,LWVS,ISEQ,ISER			04955
	DIMENSION ABSA(500),LWVA(500),IDXA(4)			04956
	COMMON ABSA,LWVA,IDXA,BASA,ISNA,NA,INCA,LWEA,LWSA,ISQA,ISRA			04957
	DIMENSION ABSB(500),LWVB(500),IDXB(4)			04958
	COMMON ABSB,LWVB,IDXB,BASB,ISNB,NB,INCB,LWEB,LWSB,ISQB,ISRB			04959
	DIMENSION ABSC(500),LWVC(500),IDXC(4)			04960
	COMMON ABSC,LWVC,IDXC,BASC,ISNC,NC,INCC,LWEC,LWSC,ISQC,ISRC			04961
	DIMENSION ABSD(500),LWVD(500),IDXD(4)			04962
	COMMON ABSD,LWVD,IDXD,BASD,ISND,ND,INCD,LWED,LWSD,ISQD,ISRD			04963
C	OUTPUT AREA			04964
	DIMENSION ABSR(500),LWVR(500),IDXR(4)			04965
	COMMON ABSR,LWVR,IDXR,BASRY,ISNR,NR,INCR,LWER,LWSR,ISQR,ISRR			04966
C	TITLE INPUT AREA			04967
	DIMENSION TITA(12),TITB(12),TITC(12)			04968
	COMMON TITA,TITB,TITC			04969
	CALL IOTST(3)			04970
	WRITE OUTPUT TAPE 3,10,TITA,TITB,TITC			04971
10	FORMAT(12A6)			04972
	WRITE OUTPUT TAPE 3,12,ISER			04973
12	FORMAT(1H1,35X,49H PERCENT TRANSMISSION CALCULATION--SPECTRUM NUMBER,16)			04974
	WRITE OUTPUT TAPE 3,14,ISER,ISEQ,LWVO,LWVE,INC			04975
14	FORMAT(1H0,10H SERIAL NO=,I6,12H SEQUENCE NO=,I6,20H STARTING WAVELENGTH=,I6,18H ENDING WAVELENGTH=,I6,21H WAVELENGTH INCREMENT=,I4)			04976
	WRITE OUTPUT TAPE 3,16,N,FPN(11)			04977
16	FORMAT(1H,23H NUMBER OF MEASUREMENTS=,I6,14H BASELINE=0.000,18H ALTERNATION FACTOR=,F5.3)			04978
	CALL CALIMIN,ISEQ,N1,NN,500)			04979
C				04980
				04981
				04982
				04983
				04984-

C		D.32	BNWL-343	04985
C				04986
C				04987
	DO 50 I=1,N1			04988
	ABSA(I)= FPN(11)*(ABS(I)-FPN(12))			04989
50	ABSB(I) = 100./EXP(2.303*ABSA(I))			04990
	CALL NWRITE(ISER,ISEQ,LWVS,LWVE,INC,N,N1,LWV,ABSB)			04991
	RETURN			04992
	END			04993
C				04994
C				04995
C				04996
C				04997
*	LIST8			04998
*	SYMBOL TABLE			04999
*	LABEL			05000
CSUB4				05001
	SUBROUTINE SUBR04			05002
C	USED TO FIND A SECTION OF A SPECTRUM AND TRANSFER IT TO ABSA-LWVA			05003
C	FPN(3) IS THE BEGINNING WAVELENGTH WANTED.			05004
C	FPN(4) IS THE ENDING WAVELENGTH WANTED.			05005
C	PROGRAM SWITCHES AND TAGS			05006
	DIMENSION LCNT(50),KSW(50),KTG(50),FPN(50)			05007
	COMMON LCNT,KSW,KTG,FPN			05008
C	INTERMEDIATE RECORD AREA			05009
	DIMENSION RECA(1020,2)			05010
	COMMON RECA			05011
C	INPUT AREA FROM MASTER OR AUXILIARY FILES			05012
	DIMENSION ABS(500),LWV(500),IDX(4)			05013
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			05014
	DIMENSION ABSA(500),LWVA(500),IDXA(4)			05015
	COMMON ABSA,LWVA,IDXA,BASA,ISNA,NA,INCA,LWEA,LWSA,ISQA,ISRA			05016
	DIMENSION ABSB(500),LWVB(500),IDXB(4)			05017
	COMMON ABSB,LWVB,IDXB,BASB,ISNB,NB,INCB,LWEB,LWSB,ISQB,ISRB			05018
	DIMENSION ABSC(500),LWVC(500),IDXC(4)			05019
	COMMON ABSC,LWVC,IDXC,BASC,ISNC,NC,INCC,LWEC,LWSC,ISQC,ISRC			05020
	DIMENSION ABSD(500),LWVD(500),IDXD(4)			05021
	COMMON ABSD,LWVD,IDXD,BASD,ISND,ND,INCD,LWED,LWSD,ISQD,ISRD			05022
C	OUTPUT AREA			05023
	DIMENSION ABSR(500),LWVR(500),IDXR(4)			05024
	COMMON ABSR,LWVR,IDXR,BASR,ISNR,NR,INCR,LWER,LWSR,ISQR,ISRR			05025
C	TITLE INPUT AREA			05026
	DIMENSION TITA(12),TITB(12),TITC(12)			05027
	COMMON TITA,TITB,TITC			05028
	DIMENSION DEN(5),PAR(5),B(5,2)			05029
	IF(ISEQ-1)20,10,20			05030
10	ISQA=1			05031
	J=1			05032
	KTRIP=0			05033
	LWEA = 100.*FPN(4) + .5			05034
	LWEA=MAXOF(LWEA,LWVE)			05035
	IF(FPN(3))5,5,6			05036
5	LWSA=LWVS			05037
C				05038-

C		D.33	BNWL-343	05039
C				05040
C				05041
	GO TO 7			05042
6	LWSA = 100.*FPN(3) + .5			05043
	LWSA=MINOF(LWSA,LWVS)			05044
7	INCA=INC			05045
	NA=(LWSA-LWEA)/INCA			05046
	IF(KSW(16))11,20,11			05047
11	CALL SCAT(B,DEN,KSW(16),IPCT)			05048
20	CALL CALIM(N,ISEQ,N1,NN,500)			05049
	IF(LWV(N1)-LWSA)21,21,50			05050
21	KTRIP=KTRIP+1			05051
22	NT=(LWV(1)-LWEA)/INC			05052
	NU = XMINOF(N1,NT)			05053
	IF(KTRIP-1)40,40,41			05054
40	I2=(LWV(1)-LWSA)/INC + 1			05055
	GO TO 30			05056
41	I2=1			05057
30	DO 70 I=I2,NU			05058
60	LWVA(J)=LWV(I)			05059
	YSC=0.			05060
	IF(KSW(16))63,635,63			05061
63	DO 631 K=1,IPCT			05062
	PAR(K)=1.0			05063
	DO 632 L=1,IPCT			05064
	IF(K-L)633,632,633			05065
633	PAR(K)=PAR(K)*(FLOATF(LWV(I))*1.0E-04-B(L,2))			05066
632	CONTINUE			05067
631	YSC=YSC+(PAR(K)*DEN(K))			05068
635	ABSA(J)=FPN(11)*(ABS(I)-YSC-FPN(12))*FPN(19)			05069
64	J=J+1			05070
	IF(J-499)70,80,80			05071
80	NA1=498			05072
95	CALL NWRITE(ISER,ISQA,LWSA,LWEA,INCA,NA,NA1,LWVA,ABSA)			05073
75	ISQA=ISQA+1			05074
	J=1			05075
70	CONTINUE			05076
	IF(NU-NT)50,120,50			05077
120	NA1=J-1			05078
	CALL NWRITE(ISER,ISQA,LWSA,LWEA,INCA,NA,NA1,LWVA,ABSA)			05079
	ISRA=0			05080
50	RETURN			05081
	END			05082
*	LIST8			05083
*	SYMBOL TABLE			05084
*	LABEL			05085
CSU11				05086
	SUBROUTINE SUBR11			05087
C	PROGRAM SWITCHES AND TAGS			05088
	DIMENSION LCNT(50),KSW(50),KTG(50),FPN(50)			05089
	COMMON LCNT,KSW,KTG,FPN			05090
C	INTERMEDIATE RECORD AREA			05091
	DIMENSION RECA(1020,2)			05092
C				05093-

C		D.34	BNWL-343	05094
C				05095
C				05096
	COMMON RECA			05097
C	INPUT AREA FROM MASTER OR AUXILIARY FILES			05098
	DIMENSION ABS(500),LWV(500),IDX(4)			05099
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			05100
	DIMENSION ABSA(500),LWVA(500),IDXA(4)			05101
	COMMON ABSA,LWVA,IDXA,BASA,ISNA,NA,INCA,LWEA,LWSA,ISQA,ISRA			05102
	DIMENSION ABSB(500),LWVB(500),IDXB(4)			05103
	COMMON ABSB,LWVB,IDXB,BASB,ISNB,NB,INCB,LWEB,LWSB,ISQB,ISRB			05104
	DIMENSION ABSC(500),LWVC(500),IDXC(4)			05105
	COMMON ABSC,LWVC,IDXC,BASC,ISNC,NC,INCC,LWEC,LWSC,ISQC,ISRC			05106
	DIMENSION ABD(500),LWVD(500),IDXD(4)			05107
	COMMON ABD,LWVD,IDXD,BASD,ISND,ND,INCD,LWED,LWSD,ISQD,ISRD			05108
C	OUTPUT AREA			05109
	DIMENSION ABSR(500),LWVR(500),IDXR(4)			05110
	COMMON ABSR,LWVR,IDXR,BASR,ISNR,NR,INCR,LWER,LWSR,ISQR,ISRR			05111
C	TITLE INPUT AREA			05112
	DIMENSION TITA(12),TITB(12),TITC(12)			05113
	COMMON TITA,TITB,TITC			05114
	DO 10 I=40,50			05115
10	KTG(I)=0			05116
	CALL RLOAD(1)			05117
	CALL RLOAD(2)			05118
	IF(KTG(8))307,309,307			05119
307	KTG(8)=0			05120
	GO TO 1000			05121
309	IF(ISQA-1)300,350,300			05122
300	KTG(5)=11			05123
	CALL ERROR2			05124
	GO TO 1000			05125
350	IF(ISQB-1)305,400,305			05126
305	KTG(5)=12			05127
	CALL ERROR2			05128
	GO TO 1000			05129
400	LWSR=100.*FPN(3)			05130
	LW5R=100.*FPN(4)			05131
	IF(LWSR) 3001,3001,3002			05132
3001	LWSR=LWSA			05133
3002	LWSR=XMINOF(LWSA,LWSB,LWSR)			05134
	LWER=XMAXOF(LWER,LWEA,LWEB)			05135
	INCR=XMAXOF(INCA,INCB)			05136
	ISQR=1			05137
	JK=0			05138
	KK=0			05139
	CALL MATCH3(INCA,INCB,INCA,INCA,INCR)			05140
	IAB=INCR/INCA			05141
	IBA=INCR/INCB			05142
	NR=(LWSR-LWER)/INCR			05143
25	CALL CALIM(NR,ISQR,NR1,NNR,500)			05144
C				05145-

C	D.35	BNWL-343	05146
C			05147
C			05148
	3003 J=1-JK+(LWSA-LWSR)/INCA		05149
	IF(J-500)50,50,3005		05150
	3005 CALL RLOAD(1)		05151
	40 JK=JK+500		05152
	GO TO 3003		05153
	50 K=1-KK+(LWSB-LWSR)/INCB		05154
	IF(K-500)200,200,100		05155
	100 CALL RLOAD(2)		05156
	IF(KTG(8))307,41,307		05157
	41 KK=KK+500		05158
	GO TO 50		05159
	200 DO 500 I=1,NR1		05160
	ABSR(I)=(FPN(11)*(ABSA(J)-FPN(12))+FPN(13)*(ABSB(K)-FPN(14)))*FPN(		05161
	X19)		05162
	LWVR(I)=LWVA(J)		05163
	IF(LWVA(J)-LWVB(K))352,302,352		05164
	352 KTG(5)=6		05165
	CALL ERROR2		05166
	GO TO 1000		05167
	302 J=J+IAB		05168
	IF(J-500)425,425,402		05169
	402 CALL RLOAD(1)		05170
	IF(KTG(8))307,42,307		05171
	42 J=J-500		05172
	425 K=K+IBA		05173
	IF(K-500)500,500,450		05174
	450 CALL RLOAD(2)		05175
	IF(KTG(8))307,43,307		05176
	43 K=K-500		05177
	500 CONTINUE		05178
	CALL NWRITE(ISRR,ISQR,LWSR,LWER,INCR,NR,NR1,LWVR,ABSR)		05179
	IF(NNR-1)600,1000,600		05180
	600 ISQR=ISQR+1		05181
	GO TO 25		05182
	1000 RETURN		05183
	END		05184
C			05185-

C		D.36	BNWL-343	05186
C				05187
C				05188
*	LIST8			05189
*	SYMBOL TABLE			05190
*	LABEL			05191
CSU21				05192
	SUBROUTINE SUBR21			05193
C	PROGRAM SWITCHES AND TAGS			05194
	DIMENSION LCNT(50),KSW(50),KTG(50),FPN(50)			05195
	COMMON LCNT,KSW,KTG,FPN			05196
C	INTERMEDIATE RECORD AREA			05197
	DIMENSION RECA(1020,2)			05198
	COMMON RECA			05199
C	INPUT AREA FROM MASTER OR AUXILIARY FILES			05200
	DIMENSION ABS(500),LWV(500),IDX(4)			05201
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			05202
	DIMENSION ABSA(500),LWVA(500),IDXA(4)			05203
	COMMON ABSA,LWVA,IDXA,BASA,ISNA,NA,INCA,LWEA,LWSA,ISQA,ISRA			05204
	DIMENSION ABSB(500),LWVB(500),IDXB(4)			05205
	COMMON ABSB,LWVB,IDXB,BASB,ISNB,NB,INCB,LWEB,LWSB,ISQB,ISRB			05206
	DIMENSION ABSC(500),LWVC(500),IDXC(4)			05207
	COMMON ABSC,LWVC,IDXC,BASC,ISNC,NC,INCC,LWEC,LWSC,ISQC,ISRC			05208
	DIMENSION ABD(500),LWVD(500),IDXD(4)			05209
	COMMON ABD,LWVD,IDXD,BASD,ISND,ND,INCD,LWED,LWSD,ISQD,ISRD			05210
C	OUTPUT AREA			05211
	DIMENSION ABSR(500),LWVR(500),IDXR(4)			05212
	COMMON ABSR,LWVR,IDXR,BASR,ISNR,NR,INCR,LWER,LWSR,ISQR,ISRR			05213
C	TITLE INPUT AREA			05214
	DIMENSION TITA(12),TITB(12),TITC(12)			05215
	COMMON TITA,TITB,TITC			05216
	DO 100 I=40,50			05217
100	KTG(I)=0			05218
	CALL RLOAD(1)			05219
	CALL RLOAD(2)			05220
	CALL RLOAD(3)			05221
	IF(KTG(8))307,309,307			05222
307	KTG(8)=0			05223
	GO TO 1000			05224
309	IF(ISQA-1)300,350,300			05225
300	KTG(5)=11			05226
	CALL ERROR2			05227
	GO TO 1000			05228
350	IF(ISQB-1)305,400,305			05229
305	KT7(5)=12			05230
	CALL ERROR2			05231
	GO TO 1000			05232
400	IF(ISQC-1)405,500,405			05233
405	KTG(5)=23			05234
	CALL ERROR2			05235
	GO TO 1000			05236
C				05237-

C		D.37	BNWL-343	05238
C				05239
C				05240
	500	LWSR=100.*FPN(3)		05241
		LWER=100.*FPN(4)		05242
		IF(LWSR)10,10,20		05243
	10	LWSR=LWSA		05244
	20	LWSR=XMINOF(LWSA,LWSB,LWSC,LWSR)		05245
		LWER=XMAXOF(LWEA,LWEB,LWEC,LWER)		05246
		INCR=XMAXOF(INCA,INCB,INCC)		05247
		ISQR=1		05248
		CALL MATCH3(INCA,INCB,INCC,INCA,INCR)		05249
		IAB=INCR/INCA		05250
		IBA=INCR/INCB		05251
		IBC=INCR/INCC		05252
		NR=(LWSR-LWER)/INCR		05253
		JK=0		05254
		KK=0		05255
		LK=0		05256
	25	CALL CALIM(NR,ISQR,NR1,NNR,500)		05257
	50	J=1-JK+(LWSA-LWSR)/INCA		05258
		K=1-KK+(LWSB-LWSR)/INCB		05259
		L=1-LK+(LWSC-LWSR)/INCC		05260
		IF(J-500)155,155,156		05261
	156	CALL RLOAD(1)		05262
		IF(KTG(8))307,40,307		05263
	40	JK=JK+500		05264
		GO TO 50		05265
	155	IF(K-500)200,200,101		05266
	101	KK=KK+500		05267
		CALL RLOAD(2)		05268
		IF(KTG(8))307,50,307		05269
	200	IF(L-500)202,202,102		05270
	102	MK=MK+500		05271
		CALL RLOAD(3)		05272
		IF(KTG(8))307,50,307		05273
	202	DO 501 I=1,NR1		05274
		ABSR(I)=(FPN(11)*(ABSA(J)-FPN(12))+FPN(13)*(ABSB(K)-FPN(14))+FPN(1		05275
		X5)*(ABSC(L)-FPN(16)))*FPN(19)		05276
		LWVR(I)=LWVA(J)		05277
		LDIF=LWVR(I)+LWVA(J)-LWVB(K)-LWVC(L)		05278
		IF(LDIF)351,301,351		05279
	351	KTG(5)=6		05280
		CALL ERROR2		05281
		GO TO 1000		05282
	301	J=J+IAB		05283
		IF(J-500)425,425,401		05284
	401	CALL RLOAD(1)		05285
		IF(KTG(8))307,43,307		05286
	43	J=J-500		05287
	425	K=K+IBA		05288
		IF(K-500)460,460,450		05289
	450	CALL RLOAD(2)		05290
C				05291-

C		D.38	BNWL-343	05292
C				05293
C				05294
	IF(KTG(8))307,44,307			05295
44	K=K-500			05296
460	L=L+IBC			05297
	IF(L-500)501,501,470			05298
470	CALL RLOAD(3)			05299
	IF(KTG(8))307,45,307			05300
45	L=L-500			05301
501	CONTINUE			05302
	CALL NWRITE(ISRR,ISQR,LWSR,LWER,INCR,NR,NR1,LWVR,ABSR)			05303
	IF(NNR-1)600,1000,600			05304
600	ISQR=ISQR+1			05305
	GO TO 25			05306
1000	RETURN			05307
	END			05308
C				05309
C				05310
C				05311
C				05312
*	LIST8			05313
*	SYMBOL TABLE			05314
*	LABEL			05315
CSU31				05316
	SUBROUTINE SUBR31			05317
C	PROGRAM SWITCHES AND TAGS			05318
	DIMENSION LCNT(50),KSW(50),KTG(50),FPN(50)			05319
	COMMON LCNT,KSW,KTG,FPN			05320
C	INTERMEDIATE RECORD AREA			05321
	DIMENSION RECA(1020,2)			05322
	COMMON RECA			05323
C	INPUT AREA FROM MASTER OR AUXILIARY FILES			05324
	DIMENSION ABS(500),LWV(500),IDX(4)			05325
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,-WVS,ISEQ,ISER			05326
	DIMENSION ABSA(500),LWVA(500),IDXA(4)			05327
	COMMON ABSA,LWVA,IDXA,BASA,ISNA,NA,INCA,LW+A,LWSA,ISQA,ISRA			05328
	DIMENSION ABSB(500),LWVB(500),IDXB(4)			05329
	COMMON ABSB,LWVB,IDXB,BASB,ISNB,NB,INCB,LWEB,LWSB,ISQB,ISRB			05330
	DIMENSION ABSC(500),LWVC(500),IDXC(4)			05331
	COMMON ABSC,LWVC,IDXC,BASC,ISNC,NC,INCC,LWEC,LWSC,ISQC,ISRC			05332
	DIMENSION ABSD(500),LWVD(500),IDXDI(4)			05333
	COMMON ABSD,LWVD,IDXDI,BASD,ISND,ND,INCD,LWED,LWSD,ISQD,ISRD			05334
C	OUTPUT AREA			05335
	DIMENSION ABSR(500),LWVR(500),IDXR(4)			05336
	COMMON ABSR,LWVR,IDXR,BASR,ISNR,NR,INCR,LWER,LWSR,ISQR,ISRR			05337
C	TITLE INPUT AREA			05338
	DIMENSION TITA(12),TITB(12),TITC(12)			05339
	COMMON TITA,TITB,TITC			05340
	DO 100 I=40,50			05341
100	KTG(I)=0			05342
	CALL RLOAD(1)			05343
C				05344-

C		D.39	BNWL-343	05345
C				05346
C				05347
	CALL RLOAD(2)			05348
	CALL RLOAD(3)			05349
	CALL RLOAD(4)			05350
	IF(KTG(8))307,309,307			05351
307	KTG(8)=0			05352
	GO TO 1000			05353
309	IF(1SQA-1)300,350,300			05354
300	KTG(5)=11			05355
	CALL ERROR2			05356
	GO TO 1000			05357
350	IF(1SQB-1)305,400,305			05358
305	KTG(5)=12			05359
	CALL ERROR2			05360
	GO TO 1000			05361
400	IF(1SQC-1)405,410,405			05362
405	KTG(5)=23			05363
	CALL ERROR2			05364
	GO TO 1000			05365
410	IF(1SQD-1)411,500,411			05366
411	KTG(5)=23			05367
	CALL ERROR2			05368
	GO TO 1000			05369
500	LWSR=100.*FPN(3)			05370
	LWER=100.*FPN(3)			05371
	IF(LWSR)10,12,10			05372
12	LWSR=LWSA			05373
10	LWSR=XMINOF(LWSR,LWSA,LWSB,LWSC,LWSD)			05374
	LWER=XMAXOF(LWER,LWEA,LWEB,LWEC,LWED)			05375
	INCR=XMAXOF(INCA,INCB,INCC,INCD)			05376
	ISQR=1			05377
	CALL MATCH3(INCA,INCB,INCC,INCD,INCR)			05378
	IAB=INCR/INCA			05379
	IBA=INCR/INCB			05380
	IBC=INCR/INCC			05381
	IBD=INCR/INCD			05382
	NR=(LWSR-LWER)/INCR			05383
	JK=0			05384
	KK=0			05385
	LK=0			05386
	MK=0			05387
25	CALL CALIM(NR,ISQR,NR1,NNR,500)			05388
50	J=1-JK+(LWSA-LWSR)/INCA			05389
	K=1-KK+(LWSB-LWSR)/INCB			05390
	L=1-KL+(LWSC-LWSR)/INCC			05391
	M=1-MK+(LWSD-LWSR)/INCD			05392
	IF(J-500)155,155,156			05393
156	JK=JK+500			05394
	CALL RLOAD(1)			05395
	IF(KTG(8))307,50,307			05396
C				05397-

C	D.40	BNWL-343	05398
C			05399
C			05400
	155 IF(K-500) 200,200,101		05401
	101 KK=KK+500		05402
	CALL RLOAD(2)		05403
	IF(KTG(8))307,50,307		05404
	200 IF(L-500)2020,2020,102		05405
	102 LK=LK+500		05406
	CALL RLOAD(3)		05407
	IF(KTG(8))307,50,307		05408
	2020 IF(M-500)202,202,2026		05409
	2026 MK=MK+500		05410
	CALL RLOAD(4)		05411
	IF(KTG(8))307,50,307		05412
	202 DO 501 I=1,NR1		05413
	ABSR(I)=(FPN(11)*(ABSA(J)-FPN(12))+FPN(13)*(ABSB(K)-FPN(14))+FPN(1		05414
	X5)*(ABSC(L)-FPN(16))+FPN(17)*(ABSD(M)-FPN(18)))*FPN(19)		05415
	LWVR(I)=LWVA(J)		05416
	LDIF1=XMAX0F(LWVA(J),LWVB(K),LWVC(L),LWVD(M))		05417
	LDIF2=XMIN0F(LWVA(J),LWVB(K),LWVC(L),LWVD(M))		05418
	IF(LDIF1-LDIF2)351,301,351		05419
	351 KTG(5)=6		05420
	CALL ERROR2		05421
	GO TO 1000		05422
	301 J=J+IAB		05423
	IF(J-500)425,425,401		05424
	401 CALL RLOAD(1)		05425
	IF(KTG(8))307,44,307		05426
	44 J=J-500		05427
	425 K=K+IBA		05428
	IF(K-500)460,460,450		05429
	450 CALL RLOAD(2)		05430
	IF(KTG(8))307,45,307		05431
	45 K=K-500		05432
	460 L=L+IBC		05433
	IF(L-500)5010,5010,470		05434
	470 CALL RLOAD(3)		05435
	IF(KTG(8))307,46,307		05436
	46 L=L-500		05437
	5010 M=M+IBD		05438
	IF(M-500)501,501,5011		05439
	5011 CALL RLOAD(4)		05440
	IF(KTG(8))307,47,307		05441
	47 M=M-500		05442
	501 CONTINUE		05443
	CALL NWRITE(ISRR,ISQR,LWSR,LWER,INCR,NR,NR1,LWVR,ABSR)		05444
	IF(NNR-1)600,1000,600		05445
	600 ISQR=ISQR+1		05446
	GO TO 25		05447
	1000 RETURN		05448
	END		05449
C			05450-

C		D.41	BNWL-343	05451
C				05452
C				05453
*	LIST8			05454
*	SYMBOL TABLE			05455
*	LABEL			05456
CTHN1	THIN THINS DATA FOR PLOTTING OR PUNCHING IN COMPUTATIONAL PROGRAM			05457
	SUBROUTINE THIN(LX,Y,N,L,F,K,ISEQ,INC,LX1)			05458
C	THIS VERSION DETERMINES A CONSTANT CHANGE VECTOR RATHER THAN CONSTANT			05459
C	WAVELENGTH OR WAVENUMBER CHANGE.			05460
	DIMENSION LX(500),Y(500),LX1(500),F(50),L(50)			05461
C	LX= WAVELENGTH ARRAY			05462
C	LX1= WAVENUMBER ARRAY			05463
C	Y= ABSORBANCE OR PERCENT T ARRAY			05464
C	N=NO OF DATA TO THIN			05465
C	L=1,WAVENUMBER ON CARY OR WAVELENGTH ON P.E. (L(3))			05466
C	F(9)= MAXIMUM DELTA VECTOR ON X AXIS IN WAVENUMBERS OR WAVELENGTH.			05467
C	F(10)= MAXIMUM DELTA VECTOR ON Y AXIS IN ABSORBANCE, ABSORPTIVITY, ET			05468
C	WAVELENGTH OR WAVENUMBER CONTROLLED BY KSW(3)			05469
C	K=NO OF POINTS BETWEEN SPACING TO BE SAVED FOR NEXT GROUP			05470
C	ISEQ=SEQUENCE NO.			05471
	IF(ISEQ-2)10,20,20			05472
C	INITIALIZATION			05473
10	K=0			05474
	IF(F(9))15,15,16			05475
15	F(9)=5 *INC			05476
16	IF(F(10))17,17,18			05477
17	F(10)=0.01*F(19)			05478
18	AC=F(9)/F(10)			05479
	VEMAX=1.414*F(9)			05480
C	ACTUAL THINNING			05481
20	J=1			05482
	N1=N-1			05483
	DO 30 I=1,N1			05484
	IF(L(3))25,21,25			05485
21	RX=INC			05486
	GO TO 24			05487
25	RX=1.E 08*(1./FLOATF(LX(I+1))-1./FLOATF(LX(I)))			05488
24	RY=AC*(Y(I+1)-Y(I))			05489
	VEX=SQRTF(RX**2+RY**2)			05490
	KMAX=VEMAX/VEX			05491
	KMAX=XMAXOF(KMAX,1)			05492
	K=K+1			05493
	IF(K-KMAX)30,27,27			05494
27	LX(J)=LX(I)			05495
	LX1(J)=LX1(I)			05496
	Y(J)=Y(I)			05497
	J=J+1			05498
	K=0			05499
30	CONTINUE			05500
1000	N=J-1			05501
	RETURN			05502
	END			05503
C				05504-

C		D.42	BNWL-343	05505
C				05506
C				05507
*	LIST8			05508
*	SYMBOL TABLE			05509
*	LABEL			05510
CTRAN				05511
	SUBROUTINE TRANS(RECA,J,ISEQ,LWVS,LWVE,INC,N,ISIGN,BASE,IDX,ABS,LW			05512
	XV)			05513
	DIMENSION RECA(1020,2),ABS(500),LWV(500),IDX(4)			05514
	CALL MOVE(RECA(1019,J),ISEQ)			05515
	CALL MOVE(RECA(1018,J),LWVS)			05516
	CALL MOVE(RECA(1017,J),LWVE)			05517
	CALL MOVE(RECA(1016,J),INC)			05518
	CALL MOVE(RECA(1015,J),N)			05519
	CALL MOVE(RECA(1014,J),ISIGN)			05520
	ISIGN=XMAXOF(ISIGN,1)			05521
	BASE = RECA(1013,J)			05522
	JJJ=1			05523
	DO 26 I=1009,1012			05524
	CALL MOVE(RECA(I,J),IDX(JJJ))			05525
26	JJJ=JJJ+1			05526
	JJJ=1			05527
	DO 29 I=9,508			05528
	ABS(JJJ)=RECA(I,J)			05529
29	JJJ=JJJ+1			05530
	JJJ=1			05531
	DO 30 I=509,1008			05532
	CALL MOVE(RECA(I,J),LWV(JJJ))			05533
30	JJJ=JJJ+1			05534
	RETURN			05535
	END			05536
*	LIST8			05537
*	SYMBOL TABLE			05538
	SUBROUTINE TRISPE			05539
C	PROGRAM SWITCHES AND TAGS			05540
	DIMENSION LCNT(50),KSW(50),KTG(50),FPN(50)			05541
	COMMON LCNT,KSW,KTG,FPN			05542
C	INTERMEDIATE RECORD AREA			05543
	DIMENSION RECA(1020,2)			05544
	COMMON RECA			05545
C	INPUT AREA FROM MASTER OR AUXILIARY FILES			05546
	DIMENSION ABS(500),LWV(500),IDX(4)			05547
	COMMON ABS,LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER			05548
	DIMENSION ABSA(500),LWVA(500),IDXA(4)			05549
	COMMON ABSA,LWVA,IDXA,BASA,ISNA,NA,INCA,LWEA,LWSA,ISQA,ISRA			05550
	DIMENSION ABSB(500),LWVB(500),IDXB(4)			05551
	COMMON ABSB,LWVB,IDXB,BASB,ISNB,NB,INCB,LWEB,LWSB,ISQB,ISRB			05552
	DIMENSION ABSC(500),LWVC(500),IDXC(4)			05553
	COMMON ABSC,LWVC,IDXC,BASC,ISNC,NC,INCC,LWEC,LWSC,ISQC,ISRC			05554
	DIMENSION ABD(500),LWVD(500),IDXD(4)			05555
	COMMON ABD,LWVD,IDXD,BASD,ISND,ND,INCD,LWED,LWSD,ISQD,ISRD			05556
C	OUTPUT AREA			05557
C				05558-

C	D.43	BNWL-343	05559
C			05560
C			05561
	DIMENSION ABSR(500),LWVR(500),IDXR(4)		05562
	COMMON ABSR,LWVR,IDXR,BASR,ISNR,NR,INCR,LWER,LWSR,ISQR,ISRR		05563
C	TITLE INPUT AREA		05564
	DIMENSION TITA(12),TITB(12),TITC(12)		05565
	COMMON TITA,TITB,TITC		05566
	K=KSW(1)-20		05567
	GO TO (1,2,3,4,5,6,7,8,9,10),K		05568
	1 CALL SUBR21		05569
	RETURN		05570
	2 CALL SUBR22		05571
	RETURN		05572
	3 CALL SUBR23		05573
	RETURN		05574
	4 CALL SUBR24		05575
	RETURN		05576
	5 CALL SUBR25		05577
	RETURN		05578
	6 CALL SUBR26		05579
	RETURN		05580
	7 CALL SUBR27		05581
	RETURN		05582
	8 CALL SUBR28		05583
	RETURN		05584
	9 CALL SUBR29		05585
	RETURN		05586
	10 CALL SUBR30		05587
	RETURN		05588
	END		05589

APPENDIX E

RECALL PROGRAM

C				E.1	BNWL-343	
C						
C						
*		SYMBOL TABLE				05594
*		LABEL				05595
		CRECALLS SPECTRA STORED ON MASTER FILE FOR PLOTTING. ISP(1) DESIGNATES				05596
		CTHE SPECTRAL SERIAL NO. NS. THE NO OF SPECTRA. THIS NO CAN NOT EXCEED				05597
C	100.					05598
C	CARD NO	FORMAT	COLUMNS	SYMBOL	DEFINITION	05600
C				INPUT		05599
C	A	I-2	1-2	KSW(1)	0=BOTH PRINT,PLOT,1=PRINT,2=PLT	
C	A	I-2	3-4	KSW(5)	2=LINES,4=POINTS,8=FREE RUN PLOT	
C	A	I-2	5-6	KSW(6)	MAX. SKIPPED IN THINNING DATA	
C	A				(KSW(6)/500) INCHES	
C	1	I-5	1-5	NS	NO OF SPECTRA TO BE RECALLED	05601
C	1	I-5	6-10	ISP(1)	SERIAL NO OF 1ST SPECTRUM	05602
C	1	I-5	11-15	ISP(2)	SERIAL NO OF 2ND SPECTRUM	05603
C	.	.	.	.	.	05604
C	.	.	.	.	.	05605
C	1	I-5	66-70	ISP(13)	SERIAL NO OF 13TH SPECTRUM	05606
C	2	I-5	1-5	ISP(14)	SERIAL NO OF 14TH SPECTRUM	05607
C	.	.	.	.	.	05608
C	.	.	.	.	.	05609
C	2	I-5	66-70	ISP(27)	SERIAL NO OF 27TH SPECTRUM	05610
C		REPEAT UNTIL ALL SPECTRA LISTED.				05611
C		DESIGNATE (A5) MASTER INPUT,(B6) SCRATCH INPUT-OUTPUT,(B5) OUTPUT (LD)				05612
C		COMMON FROM PLOTT				05613
C		PROGRAM SWITCHES AND TAGS				05618
		DIMENSION LCNT(50),KSW(50),KTG(50)				05619
		COMMON LCNT,KSW,KTG				05620
C		INPUT AREA - FROM PTI				05621
		DIMENSION RECA(510)				05622
		COMMON RECA				05623
C		MASTER FILE RECORD - OUTPUT AREA				05624
		DIMENSION ABS(500),LWV(500),IDX(4)				05625
		COMMON ABS, LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER				05626
		DIMENSION RECB(1020,18)				05627
		COMMON RECB				05628
		DIMENSION RECI(1020,2)				05629
		DO 10 I=1,50				05630
		KTG(I)=0				05631
10		LCNT(I)=0				05632
		READ INPUT TAPE 2,5,KSW(1),KSW(5),KSW(6)				56321
	5	FORMAT(3I2)				
		KSG=KSW(1)+1				
		KSG=XMINOF(KSG,3)				
		KSG=XMAXOF(KSG,1)				
		CALL FIND (KTST)				05633
		IF(KTST-1)20,40,40				05634
20		IER=LCNT(38)				05635
C						

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E.2

BNWL-343

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      CALL READ6(RECI,1020,J,IWD,IER)                                05637
      LCNT(38)=IER                                                    05638
      GO TO (30,30,40,40,501),IER                                    05639
B 501 FILE=606022066060                                             05640
      GO TO 50                                                         05641
      30 CALL MOVE(RECI(1019,J),ISEQ)                                05642
      IF(ISEQ-18)31,31,32                                             05643
      32 CALL IOTST(1)
      WRITE OUTPUT TAPE 3,33,ISER                                     05644
      33 FORMAT(1H0,8HSPECTRUM,16,57HHAS BEEN SHORTENED BECAUSE IT EXCEEDS 05645
      XCAPACITY OF MEMORY.)
      GO TO 20                                                         05647
      31 CALL MVFLD(6120,RECI,1020,J,1,RECB,1020,ISEQ,1)           05648
      CALL MOVE(RECI(1015,J),N)                                       05649
      IF(N-500*ISEQ)850,20,20                                         05650
      850 KPT=0                                                        05651
      CALL MOVE (RECB(1020,J),ISER)                                    05652
      ISMAX=ISEQ                                                       05653
      1008 DO 1012 KP=1,ISMAX                                          05654
      36 CALL TRANB(KP)                                                05655
      N1=N-(ISEQ-1)*500                                               05656
      IF(KPT-1)1002,1004,1004
      1002 GO TO (1005,1005,1004),KSG
      1005 CALL RWRITE                                                  56572
      1004 GO TO (1006,1012,1006),KSG
      1006 CALL IOTST(2)
      CALL PLOTT(KPT,KP,N1)                                           05658
      1012 CONTINUE
      IF(KPT)1010,1010,20                                             05659
      1010 KPT=1                                                       05660
      GO TO 1008                                                       05661
      40 GO TO (41,42,41),KSG
      41 REWIND 5
      CALL HALT                                                         05664
      42 REWIND 6
      PRINT 7,LCNT(6)                                                  05665
      7 FORMAT(1H1,27H JOB IS COMPLETE. THERE ARE, 16,74HPLOTS ON B5 OR B5 05666
      X,S. REMOVE A5 AND B5. PRESS START TO PROCEED TO NEXT JOB.)    05667
      60 PAUSE                                                         05668
      CALL EXIT                                                         05669
      50 PRINT 11,FILE
      11 FORMAT(1H1,A6,48H FAILED TO READ. CHANGE TAPE AND RESTART PROGRAM)
      REWIND6
      GO TO 60
      END
```

C

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C
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*      LIST8                                05683
*      SYMBOL TABLE                        05684
*      LABEL                                05685
CFIND LOCATES SPECTRA FROM A MASTER FILE (A5) AND TRANSFERS THEM TO 05686
C AN INTERMEDIATE FILE (B6) FOR FURTHER USE.                        05687
      SUBROUTINE FIND(KTTST)                                          05688
C FOLLOW BY COMMON FOR EDIT PASS                                      05689
C      PROGRAM SWITCHES AND TAGS                                      05690
      DIMENSION LCNT(50),KSW(50),KTG(50)                             05691
      COMMON LCNT,KSW,KTG                                           05692
C      INPUT AREA - FROM PTI                                         05693
      DIMENSION RECA(510)                                           05694
      COMMON RECA                                                    05695
C      MASTER FILE RECORD - OUTPUT AREA                             05696
      DIMENSION ABS(500),LWV(500),IDX(4)                             05697
      COMMON ABS, LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER      05698
      DIMENSION RECB(1020,18)                                       05699
      COMMON RECB                                                    05700
C END OF COMMON                                                      05701
      DIMENSION ISP(100)                                           05702
      KTTST=0                                                        05703
      PRINT 21                                                       05704
      21 FORMAT(1H1, 76HMOUNT TAPES AS PER INSTRUCTION ON PROCEDURE CARD AN 05705
      XD PRESS START TO PROCEED.)                                  05706
      PAUSE                                                         05707
      23 REWIND 5                                                    05708
      REWIND 6                                                       05709
      READ INPUT TAPE 2,15,NS,((ISP(I),I=1,NS))                    05710
      15 FORMAT(14I5)                                               05711
      LSQ=0                                                         05712
      DO 602 I=1,NS                                                 05713
      IF(ISP(I)-0)603,603,602                                       05714
      603 IF(NS-13) 605,605,606                                       05715
      606 WRITE OUTPUT TAPE 3,608                                    05716
      608 FORMAT(1H1,111H THE NUMBER OF SPECTRA CALLED ON THE FIRST DATUM CAR 05717
      XD(S) EXCEEDS THE NUMBER LISTED. CHECK CONSISTENCY OF FIELDS.) 05718
      1000 KTTST=1                                                  05719
      GO TO 1200                                                     05720
      605 NS=I-1                                                     05721
      GO TO 600                                                      05722
      602 CONTINUE                                                  05727
      600 IER=LCNT(43)                                              05728
      CALL RETB5(RECB,1020,J,IWD,IER)
      LCNT(43)=IER                                                  05731
      GO TO (610,610,620,620,250) ,IER                             05732
      250 CALL IOTST(3)                                             05733
      PRINT 14                                                       05734
      14 FORMAT(1H1, 87HMASTER FILE (A5) FAILED TO READ. RESTART PROGRAM ON 05735
      XCE. IF FAILURE REOCCURS, BYPASS JOB.)                       05736
      GO TO 690                                                      05737
      610 CALL MOVE(RECB(1020,J),ISER)                             05738
C

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E.4

BNWL-343

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DO 640 I=1,NS                                05739
IF (ISER-ISP(I))640,650,640                    05740
650 CALL MOVE(RECB(1019,J),ISEQ)
IER=LCNT(46)                                    05742
CALL WRITE6(RECB,1020,J,IWD,IER)
LCNT(46)=IER                                    05745
GO TO (601,601,620,620,670),IER                05748
670 CALL IOTST(3)                                05749
PRINT 680                                        05750
680 FORMAT(1H1, 67H THE TAPE ON UNIT B6 IS BAD. PLEASE CHANGE TAPE AND 05751
XRESTART PROGRAM.)                             05752
690 REWIND 5                                     05753
REWIND 6                                         05754
GO TO 1200                                       05755
601 IF (ISEQ-1)667,667,600                      05756
667 LSQ=LSQ+1                                   05757
GO TO 600                                       05758
640 CONTINUE                                    05759
IF (NS-LSQ)620,620,600                         05760
620 END FILE 6                                  05761
REWIND 6                                         05762
REWIND 5                                         05763
1200 RETURN                                     05764
END                                              05765

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* LIST8                                         05770
* SYMBOL TABLE                               05771
* LABEL                                         05772
CTRAB TRANB TRANSFERS IN THE SAME MANNER AS TRANS EXCEPT WITH RECB 05773
C FOR PROGRAMS ASSOCIATED WITH THE EDIT PASS 05774
SUBROUTINE TRANB(J)                             05775
C PROGRAM SWITCHES AND TAGS                     05776
DIMENSION LCNT(50),KSW(50),KTG(50)             05777
COMMON LCNT,KSW,KTG                             05778
C INPUT AREA - FROM PTI                        05783
DIMENSION RECA(510)                             05784
COMMON RECA                                     05785
C MASTER FILE RECORD - OUTPUT AREA             05786
DIMENSION ABS(500),LWV(500),IDX(4)             05787
COMMON ABS, LWV,IDX,BASE,ISIGN,N,INC,LWVE,LWVS,ISEQ,ISER 05788
DIMENSION RECB(1020,18)                        05789
COMMON RECB                                     05790
CALL MOVE(RECB(1019,J),ISEQ)                    05791
CALL MOVE(RECB(1018,J),LWVS)                    05792
CALL MOVE(RECB(1017,J),LWVE)                    05793
CALL MOVE(RECB(1016,J),INC)                     05794
CALL MOVE(RECB(1015,J),N)                       05795
CALL MOVE(RECB(1014,J),ISIGN)                   05796
ISIGN=XMAXUF(ISIGN,1)                           05797
BASE = RECB(1013,J)                             05798
JJJ=1                                            05799
DO 26 I=1009,1012                              05800
```

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E.5

BNWL-343

	CALL MOVE(RECB(I,J),IDX(JJJ))	05801
26	JJJ=JJJ+1	05802
	JJJ=1	05803
	DO 29 I=9,508	05804
	ABS(JJJ)=RECB(I,J)	05805
29	JJJ=JJJ+1	05806
	JJJ=1	05807
	DO 30 I=509,1008	05808
	CALL MOVE(RECB(I,J),LWV(JJJ))	05809
30	JJJ=JJJ+1	05810
	RETURN	05811
	END	05812

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